ISBN NO: 1234567890

IN SEARCH OF NEW PARADIGM ON SUSTAINABLE HUMANOSPHERE

PROCEEDINGS OF THE 1st KYOTO UNIVERSITY – LIPI – SOUTHEAST ASIAN FORUM

Organizers:

Kyoto University – Indonesian Institute of Sciences (LIPI)

Kyoto University Alumnae Association (HAKU)

ISBN NO: 1234567890

IN SEARCH OF NEW PARADIGM ON SUSTAINABLE HUMANOSPHERE

PROCEEDINGS OF THE 1st KYOTO UNIVERSITY - LIPI - SOUTHEAST ASIAN FORUM

Organizers:

Kyoto University - Indonesian Institute of Sciences (LIPI)

Kyoto University Alumnae Association (HAKU)

November 26-27, 2007

PDII Building 2nd Floor, LIPI

Jl. Jendral Gatot Subroto Kav. 10

Jakarta - Indonesia

ISBN NO: 1234567890

Organizing Committee

Advisors:
Prof. Dr. Rochadi Abdulhadi
Dr. Neni Sintawardani
Prof. Dr. Kosuke Mizuno
Prof. Dr. Kenichi Abe
Associate Prof. Masaki Okamoto

Chairman:
Prof. Dr. Bambang Subiyanto

Members:

R & D Unit for Biomaterials - LIPI
Dr. Subyakto
Dr. Suleman Yusuf
Euis Hermiati
Mohamad Gopar
Linda Kriswati
Ika Bachtiar
Fitria
Dwi Hadi Restuningsih
Kurnia Wiji Prasetyo
Ismadi
Yusup Amin
Herry Samsi
Dede Heri Yuli Yanto
Syam Budi Iryanto

Centre for Southeast Asian Studies (CSEAS)
Dr. Yumi Kitamura
Dr. Yasuyuki Nagafuchi

Bureau for Cooperation & Promotion of Science & Technology - LIPI
Nur Tri Aries S.
Sri Amiyati
Nirma Yossa
Heni Rosmawati
Ina Ihdiana
Murti Martoyo
Ruben Silitonga
Agung Legowo
Martahan Tambunan
Sancoyo

Kyoto University Alumnae Association (HAKU)
Prof. Dr. Supiandi Sabiham
Dr. Arie Damayanti
Kanti

Proceedings:
Dr. Wahyu Dwianto
Dr. Kenichi Abe
Faizatul Falah
Ika Wahyuni
Teguh Darmawan

Preface

Eleven years after the fall of the Suharto authoritarian region, Indonesia continues to muddle through in search of a “New Indonesia.” There continues to be no simple solution to the main problems the country faced in the last 32 years: *corruption, collusion and nepotism* (or as the Indonesians refer to as KKN). Not even the formalization of democratic practices and the decentralization of governance – all aimed at further breaking up the autocratic order of the Suharto era – have reversed this slide. Jakarta continues to define what “national development” is all about, causing economic dislocation and losses among the regions and the least-privileged social classes, and untold ecological damage to an already fragile Indonesian eco-system. As if their travails were not enough, Indonesians would likewise come to grips with terrorism, natural disasters (earthquakes and tsunami), and epidemics like the bird flu.

Given this sordid condition we ask: what is the role of both Indonesian and Japanese and researchers? It is obviously not enough to simply show a picture of a society without its fissures, or describe a political community as having attained democracy while ignoring disparities in wealth and political influence between individuals and groups, as well as the economic and ecological challenges it faces. Rather, we must reexamine the pre-existing concepts that we – consciously or unconsciously – use to frame our approach to Indonesian society, and reconsider their usefulness in the light of these realities. More importantly, we must re-evaluate our research together or in collaboration with our colleagues in Indonesia. Whatever “new paradigm” that may arise from this profound re-examination should pay closer attention to what local communities could realistically aspire for in the immediate and medium terms, without losing perspective on a desired future that is fair and safe for these societies. Moreover, considering the fact that more than half of the global population will soon live in the tropical Asian and African area, this “new paradigm” must be sensitive to the area it studies and in the case of Indonesia, doubly so given the above issues the country and its people

have to deal with.

Kyoto University's Global COE project, "Sustainable Humanosphere," is seen as one of the starting points towards the formulation of this new paradigm. It is a multidisciplinary effort that aims to combine Asian and African area studies with frontier science and technology. In so doing, it hopes to train a new generation of area studies specialists and scientists equipped with a more comprehensive and diverse range of perspectives.

Kyoto University has been closely working together with its Indonesian counterparts, especially LIPI, in the study of politics, society and culture in Indonesia. In 2006, these two institutions have signed an MOU to further these collaboration and academic exchanges. The Kyoto University Alumni Association of Indonesia (HAKU) was also established in July 2007 and is expected to participate in this collaboration by acting as a mediator between Kyoto University and Indonesian academia, as well as the general public.

The First Kyoto University and LIPI Southeast Asian Forum is the first concrete project of this collaboration. This is a two-day seminar that will explore the concept of "Sustainable Humanosphere," as well as related themes like "Bio-energy for Community" and "Forest as Humanosphere." We hope that this seminar series will become an important starting point in the attempt to develop this new paradigm.

Organizing Committee

Opening Remark 1

Assalamu'alaikum warakhmatullahi wabarakatuh,

First of all, it is my great pleasure today to introduce this forum, "In Search of Sustainable Humanosphere." I am very pleased that Kyoto University has been able to organize it, in collaboration with Lembaga Ilmu Pengetahuan Indonesia (the Indonesian Institute of Sciences, LIPI) and Himpunan Alumni Kyoto University, or インドネシア京都大学同窓会 in Japanese.

If we may look to the past for a moment, we can see that Kyoto University has had a long history of academic communication with Indonesia, as with other Southeast Asian countries. The first concrete step in our relationship was taken in 1970 when we opened a liaison office in Jakarta, following the opening of our Bangkok liaison office in 1964. Since then we have developed continuous and harmonious academic exchanges with Indonesia by sending Japanese scholars and researchers to Indonesia and by receiving undergraduate and graduate students from Indonesia. At present we have many MoUs with Indonesian universities and institutes, including LIPI, Hasanuddin University, and Cenderawasih University.

Bapak-bapak dan ibu-ibu, Kyoto University is quite well known for its commitment to "academic liberty" and its high esteem for intellectual distinctiveness and creativity. It is this academic culture that has pushed the scholars and researchers of Kyoto University to do fieldwork in Asia and Africa, to find things unrecorded in books and documents, and to rethink worn-out concepts and theories. Kyoto University researchers have even created new ideas and terminologies for poorly understood or unexplained global phenomena. Perhaps this unique academic culture comes from the intellectual atmosphere of Kyoto city, this ancient capital of Japan that has been robust enough to ward off all kinds of ephemeral and fragile academic trends and to sustain the intellectual tenacity to grasp the essentials of things.

In 2001, in order to integrate the academic disciplines holistically, Kyoto University hammered out a new intellectual mission, to aim "for the harmonious coexistence of humans

and ecology on our planet." This mission is based on the understanding that our community should not only comprise human society but also the flora and the fauna and even the pebbles, creeks, and brooks. Kyoto University firmly believes that this concept of harmonious coexistence would no longer seem strange or foreign once we consider that excessively human-centered thinking has caused the critical environmental problems we face, such as global warming. I wish that Indonesian intellectuals will learn something new from the concept.

Bapak-bapak dan ibu-ibu, we are proud to announce to you that in October of this year, the Center for Southeast Asian Studies, in collaboration with the Research Institute of Sustainable Humanosphere and other seven institutes and departments in our university, launched a new and ambitious five-year research program called Global COE Program "In Search of Sustainable Humanosphere in Asia and Africa." Here is the program leader, Prof. Sugihara Kaoru

The aim of this research program is to propose a new paradigm of "sustainable humanosphere" in the field of Asian and African area studies, by bringing the knowledge of frontier science and technology into contact with the conventional disciplines of agronomy, ecology, politics and economics, sociology and anthropology, history, and medical science. In doing so, we will train a new generation of area studies specialists and scientists equipped with a more comprehensive range of humanities, social science and science disciplines than hitherto possible.

One of the main research sites of this program is Indonesia. I am sure many Indonesians were startled when they heard that their country is the third largest greenhouse gas emitter after the United States and Canada – ahead of Brazil, Russia, and India. Such emissions in Indonesia are mainly caused by deforestation, and Indonesia is urgently required to take steps to solve this problem. So I believe the time is right to strongly solicit the collaboration of Indonesian intellectuals to maximize the results of the "sustainable humanosphere" program.

In fact, Indonesia is now seriously geared to take a leadership role in solving greenhouse gas emission and other global environmental problems. This can be seen from

the fact that Indonesia will organize the Bali climate conference in early December as the first step toward a post-Kyoto protocol. In support of this role, Kyoto University sincerely hopes to make academic and intellectual contributions to Indonesia and hopes for Indonesia to become the most ecologically innovative developing country in the world.

Bapak-bapak dan ibu-ibu sekalian, this two-day forum is initiated with the hope that Indonesian and Japanese scholars can exchange ideas and concepts on the harmonious coexistence of humans and ecology. Our side will try to show the new paradigm called “sustainable humanosphere” and is glad to receive critical and constructive comments and advice. I am sure that the forum can be quite fruitful and productive for Indonesia and Japan and for the global community as well.

Finally, on behalf of Kyoto University, I am deeply grateful to LIPI and HAKU for co-organizing this forum. Thank you very much. Arigatou gozaimasu.

Masato Kitani
Vice President
Kyoto University

Opening Remark 2

Supiandi Sabiham
President
Kyoto University Alumnae Association

Opening Remark 3

Mr. Masato Kitani, Vice President of Kyoto University; Prof. Shuichi Kawai, Director of Research Institute for Sustainable Humanosphere, Kyoto University; Prof. Kosuke Mizuno, Director of Center for Southeast Asian Studies, Kyoto University; Dr. Narifumi Tachimoto, Director-General of Research Institute for Humanity and Nature, Dr. Kaoru Sugihara, Leader of G-COE, Kyoto University; Dr. Yoko Hamami, Professor of Center for Southeast Asian Studies, Kyoto University; Prof. Supiandi Sabiham, President of HAKU; Distinguished Guests, Ladies and Gentlemen.

Assalamu'alaikum Wr. Wb. Good morning. Allow me first of all, on behalf of the Indonesian Institute of Sciences to extend our warmest welcome to all of you especially to all delegates from Kyoto University. Please also allow me to convey warm regard from the Chairman of LIPI who could not be able to be with us. He is invited to present in Parliament House for special briefing. I am very much welcome and support this seminar. Through this seminar, strategic collaboration between our institute (LIPI), Kyoto University and The Kyoto University Alumni Association of Indonesia (HAKU) could be developed. The theme of **the First Kyoto University – LIPI – South East Asian Forum: In Search of New Paradigm on Sustainable Humanosphere** is very relevant to the hottest issues Global Climate Change and MDGs.

Distinguished guests, Ladies and Gentlemen. This seminar marked as the concrete project after LIPI and Kyoto University sign an MOU in Kyoto Head Quarter in 2006. This is a two-day seminar would be important as the basis to tightened our strategic collaboration between LIPI and researchers in Indonesia and Kyoto University in particular Centre for Southeast Asian Studies (CSEAS) and Research Institute for Sustainable Humanosphere (RISH) and Research Institute for Humanity and Nature. I am confident, that through this seminar, we could together explore the concept the most appropriate way to address global challenges issues, "Sustainable Humanosphere" while achieving MDGs e.g. to eradicate poverty, hunger, health problems, and biodiversity lost. I do appreciate the Organizing

Committee and sponsors who able to invite senior scientists from Japan and Indonesia to present their papers and share their knowledge to response to the above issues. The attendant of more than 120 Indonesian scientists coming from various universities, research institutes, NGO's and private companies will be of great value to the success of this two days seminar.

Distinguished guests, Ladies and Gentlemen. On this occasion, please also allow me to congratulate alumni of Kyoto University in successfully establish **the Kyoto University Alumni Association of Indonesia (HAKU)** in July 2007. I also learn that HAKU will be holding the **First Annual Meeting** here in Jakarta. I look forward to see the participation of HAKU in conducting collaborative research and bridging our Indonesian scientific community with scientific community in Japan in particularly scientists at Kyoto University.

Finally, I would like to again thank the Organizing Committee in successfully organizing this seminar and I do hope that all of you will have a very fruitful discussions. With bismillah hirrohman nirroohim, I officially open **the First Kyoto University – LIPI – South East Asian Forum: In Search of New Paradigm on Sustainable Humanosphere**.

Thank you very much for your kind attention.

Wassalamu'alaikum Wr. Wb.

Endang Sukara
Deputy of Life Sciences
Indonesian Institute of Sciences

Content

Keynote Speech 1

The Humanosphere-sustainable Path of Economic Development: A Global Historical Perspective

Kaoru Sugihara

Leader of G-COE, Center for Southeast Asian Studies, Kyoto University

Abstract

This paper outlines some of the key ideas behind the Global COE research program (2007-2012) on sustainability in Asia and Africa. It calls for broadening the current perspective of environment, which is often premised on land use, productive resources, and private property rights, by introducing the concept of "humanosphere", in order to capture the mobile, changeable and transformable qualities of life and environment more fully than hitherto possible. Humanosphere is a term already established at Kyoto University, to refer to the scientific study of material and energy flows and conversions, but we suggest that the term should also include all interactions between man and nature, including human and social responses to the environment.

The second part of this paper describes how the land-based perspective of environment has historically prevailed, and nature came to be understood in the context of resource use, by reviewing the Western and the East Asian historical experiences over the last few centuries. It argues that the relatively mild environment in the temperate zones, especially in Western Europe, Japan and the Yangzi delta provided the basis for the productivity-driven path of economic development. The kinds of institutions that were developed there are therefore not necessarily suited to the much more dynamic tropical environment with constant floods of major rivers, variable annual and seasonal rainfalls, and a much greater degree of biodiversity and activities of living organisms. Nevertheless, most of the institutions established in the tropics under colonialism were modeled on Western institutions, and the regime of private property rights and rigid territorial boundaries were imposed on their colonies. And this bias has not been fully rectified after independence.

The paper ends by suggesting that one of the key topics for Asian and African area studies today is to create an interdisciplinary framework under which to inform sustainability of the humanosphere in concrete terms. We would like to conduct this research by bringing the area studies knowledge into contact with the knowledge of frontier science. In economics and history, for example, a humanosphere-sustainable path of economic development should be contemplated. Given the centrality of the tropics in the earth's heat energy distribution system, it is crucial for the tropics to follow such a path, if we wish to ensure the sustainability of global environment.

Introduction

The Global COE

In July 2007 a major research initiative was launched at Kyoto University, to conduct a wide range of interdisciplinary studies on sustainable development in Asia and Africa. It is a Global COE (Center of Excellence) Program, funded by the Ministry of Education, Culture, Sports, Science and Technology through JSPS, which will be run for about five years. Nine research institutes, centers and graduate schools collaborate this program. The Center for Southeast Asian Studies acts as the organizer institution, and leads research in humanities and social sciences, in cooperation with the Graduate School of Asian

and African Studies, while the Research Institute of Sustainable Humanosphere undertakes the main part of scientific research.

By bringing the knowledge of frontier science and technology, including wood science and material science, climatology and atmospheric science, material conversion and energy science, into contact with the conventional area studies disciplines of ecology, politics and economics, sociology and anthropology, history, and medical science, this program aims to put forward a new paradigm of "sustainable humanosphere", which will enable us to address such vital issues as biodiversity, energy security and the impact of global warming, from truly interdisciplinary perspective. The regions we are primarily concerned are Southeast Asia, South Asia, the Middle East and Africa. It is important that most of them are located in the tropics, which arguably holds the key to global sustainability.

The Disciplinary Context

In this paper, I would like to outline some of the main ideas driving this research. Since I am an economic historian, I wish to express them by characterizing the path of economic development which these societies have followed in the past, and by suggesting the way forward.

The prevailing literature on sustainability in developing countries has been concerned with growth (to alleviate poverty and raise living standards) and environment (to deal with soil degradation, water shortage, deforestation etc.), trying to meet both goals (Neumayer 2003; Barbier 2005). Meanwhile, there has been a growth of literature on environmental sustainability on a trans-regional or global scale, like the linkages between energy consumption, carbon emissions and global warming, which involves both developed and developing countries (Stern 2007; Maddison 2007).

These streams of research share at least three problems. First, issues of sustainability in developing countries of Asia and Africa need to be studied in long-term historical perspective, as the nature of human interactions with environment there is just as path-dependent as in developed countries. Yet we know far less about their past than we do about the West and East Asia where written documents and recorded data are more abundant. Historical data on land use, vegetation, forestry, climate and diseases are only beginning to emerge, and they are yet to be incorporated into the mainstream historical narrative.

Second, most of our regions suffer a particular kind of path dependency, namely colonialism. In addition, under the colonial rule by Western powers, these regions were incorporated into the international economy as exporters of primary products and importers of manufactured goods. The primary aim of developing these regions was not to raise the welfare of the people living there, but to expand production for exports and create opportunities for Western trade and investment (Lewis 1970). Territorial boundaries, the infrastructure such as roads, railways and ports, the bureaucracy, and education and health systems (mainly for colonizers and local elites) were all created with this purpose in mind, and this focus

significantly modified the pattern of human interactions with local environment in tropical Asia and Africa. Even after independence it was hard for the new countries to change it to suit the needs for the welfare of local population. This, often unintended but serious consequences of colonialism on ecological and environmental history need to be explicitly brought into the picture, in accounting for the origins of ecological and environmental problems today.

Third, the deepening of globalization for the last thirty years or so has brought to tropical Asia and Africa both its benefits and costs, in some ways even more forcefully than colonialism did. In particular, the new technology, combined with the ideology of free trade and openness to the outside world, powerfully altered the landscape and the livelihood of local population, sometimes with disastrous ecological consequences. Be it chemical plants or deforestation, multinational companies operated for global markets, using local resources and employing local people. Yet the question of how to manage the indigenous environment for the sake of local population has been attended to very slowly. Clearly, climate change needs to be studied on a global scale, while the environmental and institutional implications of deforestation in the tropics can only be understood with full knowledge of local societies. And the findings from both streams of research must be combined, not just to serve for immediate global concerns but to contextualize them into the formulation of local and regional paths of economic development. In view of the fact that about a half of world population live in the tropics today and that this proportion is likely to increase in the future, finding the local-environment-inspired path seems to me to be a vital element in formulating the global vision of sustainability.

In the next section I argue that the prevailing thoughts on resources are too narrowly focused on land and bound up by the institutions based on private property rights, and suggest that we broaden our perspective by understanding the environment in terms of “humanosphere”, a more embracing category. The third section reviews the two most successful regional paths of economic development in global history, the Western and the East Asian paths, and shows how the “land-based” perspective of environment has become predominant though the observation of these successes for the last few centuries. The final section sketches an alternative, “humanosphere-driven” path of economic development, primarily with the tropics in mind.

Shifting the Perspective: From Land to Humanosphere

The Land-based Perspective and Its Limits

Over the last two centuries, capitalism diffused worldwide under the regime of private property rights, and economic actors increasingly regarded land, labor and capital as three main factors of production. Land, or more specifically land surface, became the key conceptual and administrative unit. Land was now freely bought and sold, which meant that “nature”, conceived as a space where soil,

vegetation, living organisms, water and air freely interact, was literally cut into pieces, primarily for the purpose of agricultural production. Other resources were also brought into this capitalist system, but were often understood as either attachment of land or a factor translatable to it. Water, for example, was usually recognized in relation to irrigation rather than as an independent commodity. Forests and other common resources were defined in relation to the dominant regime of private property rights, for example as "commons". And, until relatively recently, commons were typically recognized and administered in terms of land surface, so that they could be partitioned or territorialized, essentially in the same way as private land.

The overwhelming concern governing this regime was the need to secure and increase agricultural production. Between the sixteenth and eighteenth centuries the man-land ratio became a key factor in determining whether the society could provide enough food for the population. The increase of acreage was pursued wherever population grew and arable land was available (Richards 2003). At the same time, land productivity, that is, the amount of produce per unit of land became a decisive element in selecting the optimum size of land holding. Technological and institutional innovations were accumulated and diffused for the more efficient use of land. In pursuing these activities, land-owning rights, as well as land-holding rights, had to be legally protected. It became an important business of the state.

It was this land-based perspective that came to dominate the world of geopolitics. The system of nation states first developed in Europe in the seventeenth century, and the European idea of territorial boundaries diffused worldwide, through imperialism and colonialism, in the nineteenth and the first half of the twentieth centuries. In the second half, a number of Asian and African countries achieved independence and the nation state system became global. This not only helped the diffusion of the regime of private property rights, but created national borders all over the world. Many of them inherited colonial borders, but quite a few new borders were created as the number of nation states increased to over a hundred by the end of the century.

Some of these borders clearly do not correspond to environmental or socio-economic units. In the age of imperialism, borders in Asia and Africa were often drawn, reflecting the will of European powers rather than along ecologically sensible and locally agreeable lines. Politically motivated borders were frequently drawn in the post-colonial period as well. In addition, the more complex and interactive use of nature created new border issues. For example, most major rivers cross national borders, benefiting each country as they run over its respective territory, but monitoring the smooth flow from upstream to downstream have not been considered an obvious part of the business of the sovereign state in the past. As rivers increasingly came to be used for multiple purposes, ranging from transport and fishery to electricity generation, river management became a frequent source of international conflict (Conca 2006).

The point I wish to make here is the fundamental difficulties tropical Asian and African societies encountered in adopting this "land-based" perspective. Where severe environmental constraints prevail, it is not always appropriate to focus on the productivity of land and labor, for the understanding of the

options and priorities available to local society. The more urgent task might be to secure the livelihood of local people, by responding to changes the nature suddenly brings and by preventing catastrophes. They include monsoon failure and the lack of water, shortage of energy, and the prevalence of infectious diseases. Social instabilities and war could follow from natural disasters, and vice versa. That many societies pursue a path of development with these concerns deeply in mind can be confirmed on the site of fieldwork in the contemporary world. It had also been a norm for most human societies until a few centuries ago. More recently, increased trans-regional and global activities have exposed the limits of the territorially confined view of the world in responding to these concerns.

In other words, the ecological and historical circumstances of tropical Asia and Africa seldom allowed for a single-minded pursuit for efficient land use for agricultural production. Partly because of the more uncertain climatic and environmental conditions and partly as a result of colonial rule by Western powers, there was little chance of these regions prioritizing the improvement of living standards over the protection of local society against nature's violence. Technology, institutions and social norms were clearly affected by this, and it has been difficult to adapt Western technologies and institutions to cope with such diverse needs.

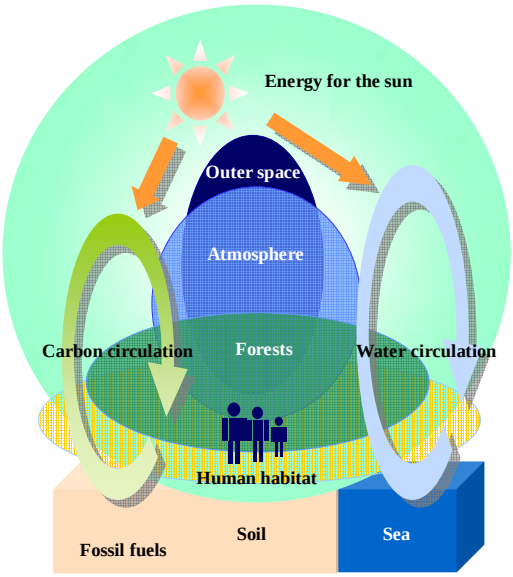
The Humanosphere

In order to capture all the environmental factors relevant to people's livelihood, we propose the more embracing perspective than the land-based one. We believe that, instead of studying land, forests, mountains and oceans from the perspective of resource use, the essence of the meaning of the environment would be better understood if we view all the natural elements that interact with local society from the perspective of the world of life itself. For example, we recognize the need to focus on water, air, biota and biomass, which move around the human habitat, in order to appreciate the environment as a vital supporter of human life. On the one hand, they are part of the system of energy and material flows and conversions around us. At the same time, local society adapts to this system to become part of it. We call it humansphere (see Figure 1).

Thus the first feature of this concept is its three-dimensional mobility and transformability. Unlike the land-based perspective, many of these materials and matters are movable, changeable and transformable entities without a permanent habitat or clear boundaries. In this perspective, it is entirely possible that we need to look at very large entities or distant space in order to understand the local phenomenon. For example, the study of energy flows could include the energy from outer space, while the earth's heat distribution system requires research into atmospheric circulation and oceanic currents on a global scale. On the more local scene too, material flows and conversions are vital to the life of land and forests, while it is impractical and unwise to study the movements of ground water or fish, with fixed political boundaries in mind, at least in the first instance. Finally, human activities, which can also be seen

as part of these flows and conversions, can, and increasingly do, cross fixed boundaries and become regional or global. Second, the humanosphere is the sphere where man and nature freely interact, without a well informed and articulated recognition of its structure. In its most descriptive form, it is a sphere, seen and perceived by the local population as the environmental basis of their livelihood. For example, water usually does not automatically become available to local population, following the logic of natural water flows. Local society tends to create some form of distribution system, in which not everyone has an equal access to water, and social or religious codes (e.g. purity) may affect such decisions. It is likely that some of these codes (e.g. restriction of access to water to a certain type of people) have been created in response to local environmental characteristics (e.g. the shortage of water). Of course, technological changes (e.g. introduction of well pumps) may lead to changes in the social system, which in turn may encourage further technological innovation. These dynamic interactions may not be sustainable in the long run, if the local environment cannot cope with them. And it has not been the norm that scientists could fully predict the potential impact of new technology on the environment before it was put in use. Whatever the consequences, these interactions between man and nature constitute central aspects of the humanosphere.

Figure 1 The Humanosphere



What we are proposing here is to construct a framework of analysis of such a sphere. The land-based perspective sees agricultural production essentially as man's intervention in nature, while technology is usually seen to have developed in order to extract resources by changing and controlling nature. By contrast, the humanosphere-based perspective recognizes that local society is dependent on the sustainability of humanosphere, and that we do not necessarily know if it is sustainable (on the issue

of how to utilize local knowledge to improve on the management of common pool resources, see Ostrom 1990). And, since both the society and the sphere encompass all aspects of life, we need to be concerned, not only with production, but with production, distribution, consumption and reproduction of the society and their respective counterparts of the sphere. Only by so doing can the concept fully embody and express the two-way relationships between man and nature.

The Productivity-driven Path of Economic Development: The West and East Asia

The Western Path

Why has the land-based perspective prevailed? In this section I wish to examine the basis on which it was built, diffused and came to be taken for granted. The question of why capitalism emerged in Western Europe, not anywhere else, in the early modern period has been traditionally answered in political, economic and cultural terms. The development of agriculture entailed a rotation system combining arable land with pasture, which produced wheat, wool, meat and dairy produce at the same time. Population growth, urbanization, and the growth of regional commerce increased the pressure on land. In the countryside, the issue was how to manage land to produce the largest amount of agricultural produce, so that the landed aristocracy could enjoy their power and wealth. A series of “enclosure” movements enabled the consolidation of small and divided plots and common lands into the more efficient larger managerial units, and the capitalist system of agriculture, under which managers would organize production and labor, prevailed. The change from “commons” to the private property ensured the protection of the owner’s capital (the cattle were better protected and were less likely to contract diseases), and allowed the manager to concentrate on the increase of productivity of land and labor. Thus labor was released from land, and national wealth enhanced through commerce and industry.

More recently, this classic picture has been revised from the perspective of the more gradual development of proto-industry, commerce and the change in consumption patterns. This revision made the early modern growth even more important for the understanding of modern economic growth, by considerably reducing the significance of the qualitative change as a result of the industrial revolution. One way of bringing environmental factors into the revised picture is that Europe's environmental diversity ensured the growth of geographical specialisation between fertile grain-producing regions and those which were either mountainous or of a poor soil and engaged in pastoral husbandry. Over time the former raised land productivity, earned a good surplus from grain sales, and tended to lose cottage industry, while the latter combined it with pastoral agriculture, and eventually began to produce industrial goods for sale. The access to sea, which does not easily freeze, big rivers (like the Rhine), which seldom flood, and resources from the surrounding mountainous areas and forests, all helped the growth of trade. This is the vision of “Smithian growth” (Wong 1997) under the “organic economy” (Wrigley 1988). Not yet dependent on fossil

fuels (coal), it nevertheless developed the market economy, which became the basic economic system today.

Another way of emphasizing environmental factors is that Western Europe developed a better technique of disaster management than other regions, and became relatively disaster-free (Jones 1981). This helped the accumulation of social overhead capital, such as buildings and roads, well before the industrial revolution raised labor productivity, while the rest of the world continued to suffer from chronic destruction of infrastructure caused by monsoons, earthquakes and fire. This might have biased the technology path taken by Western Europe towards investment in physical rather than human capital. It might also have created an environment favorable to scientific experiments aimed at the use of motive power. Meanwhile, the control of epidemics, and hence the decline of the mortality rate, lagged behind a little, although population pressure came from the increase of birth rate.

Towards the end of the eighteenth century, Western Europe faced the shortage of land and deforestation. This was overcome by the use of coal and, more important, the incorporation of vast resources in North America into the orbit of the economies of Western Europe. While land became the symbol of scarce resources, Western Europe acquired the conditions under which to combine capital, labor and resources, by territorial acquisition overseas, the provision of resources through trade, and the growth of capitalist agriculture through the commoditization of land. The industrial revolution occurred under these circumstances.

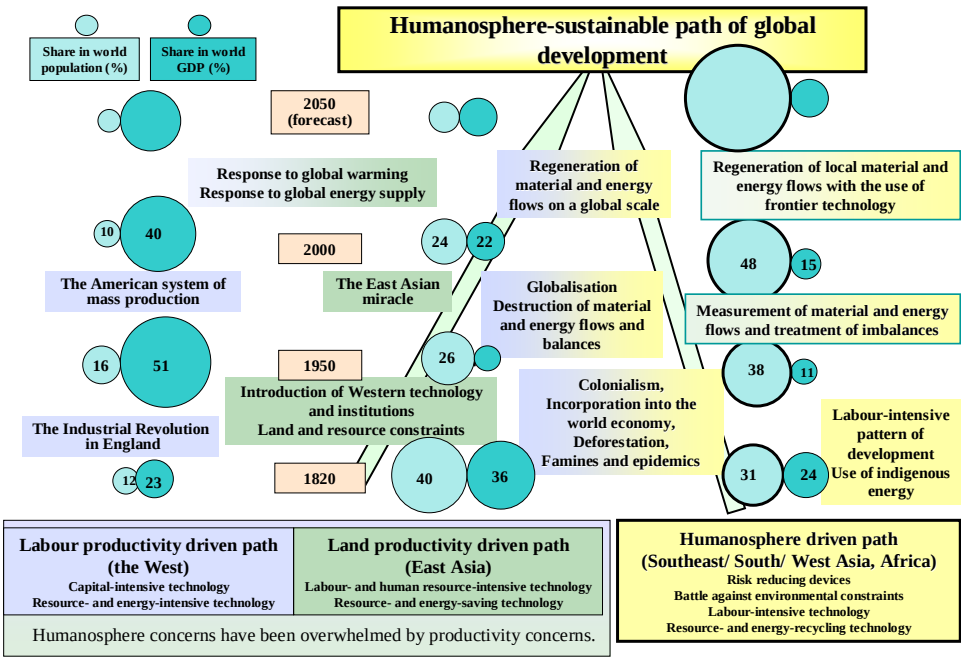
The recent literature on global economic history has focused on the comparisons between "world regions" such as Western Europe and East Asia rather than between nation states, and suggested that the standard of living of the ordinary people in the advanced areas of East Asia and that in Western Europe at the end of the eighteenth century were roughly comparable. It was the "great divergence" (Pomeranz 2000), which occurred mainly during the nineteenth century as a result of two contingent factors, i.e. the availability of coal near major industrial areas and the incorporation of huge land and other resources of North America into the orbit of the economies of Western Europe, that enabled the West to raise labor productivity significantly and dominate the world economy. The development of capital-intensive and resource-intensive technology, with the extensive use of fossil fuels, became a feature of the developed world for the last two centuries.

The East Asian Path

In contrast to the more traditional view, we now think that the standard of living of the ordinary people in advanced regions of China and most of Japan was well maintained, though not substantially improved, at least up to the end of the eighteenth century. While the Western path sought to raise labour productivity, East Asia had a much larger population relative to land, and had little pasture. It focused on the increase of land productivity rather than labour productivity. The result was the development of labour-

intensive technology and labour-absorbing institutions, and the number of working days per year became greater, with the diffusion of double-cropping and proto-industrial by employment (Sugihara 2003). Although clearly targeting at a different goal, this path too single-mindedly pursued productivity (see Figure 2).

Figure 2 The Sustainable Humanosphere Paradigm



Japan had a strikingly similar environmental profile to Western Europe,[1] except that the size of arable land was so much smaller. Thus, the Malthusian relationship between population and resources, which shifted favorably through geographical specialization in Western Europe, did not do nearly as much in Japan. On the other hand, he Japanese control of epidemics was far more successful than the European in the seventeenth and the eighteenth centuries (Jannetta 1987), while her battle against fire, flood and typhoons continued to be less so. This environmental differentiation must have reinforced differential technology paths, Europe towards labor-saving, and Japan towards labor-intensive. Blessed with water, wood and paper, as well as precious metals and sand iron, Japan pursued the development of labor-intensive technology and the "industrious revolution", without the expansion of foreign trade.

During the second half of the nineteenth century Japanese coal was exported to other Asian countries, in addition to serving for the industrialization at home. Timber remained plentiful, and was also

[1] Japan is a relatively small country with considerable climatic and geographical diversity. Four main and many smaller islands form a long chain along the western side of the Pacific Rim. The difference of latitude between the furthest north and south is about 10 degrees, being larger than any Western European nation situated on a similar latitude. The mountains take up some 80 per cent of the land and divide the habitable parts of the main island into the warmer and sunnier Pacific side and the colder and snowier Japan Sea side. Each area of habitable land of a relatively small size naturally tended to form a region, often along the coast, separated by surrounding mountains. There are great seasonal differences in rainfall and temperature.

an export item. Overall, Japan was a resource-rich country in almost all respects except for the shortage of arable land, until the 1920s when she suddenly faced the severe shortage of resources; the trade of timber and coal turned into deficit, and imports of oil increased rapidly, all at the same time.

Although China had pursued a very different institutional path from Japan, the economy of the lower Yangzi, one of the most advanced regions, followed a path of economic development rather to similar Japan's, with the "industrious revolution" of an East Asian variety (Sugihara 2004; Arrighi 2007). Unlike other major rivers, major floods disappeared by the early modern period, and a broad ecological stabilization was achieved in the Yangzi delta. Epidemics were generally not a major element in Chinese population trends of this period, although famines were frequent enough, especially in the northern part of the country.

The issue of resource scarcity featured largely in the subsequent East Asian history; Japan went to war partly to secure raw material and energy needed for the heavy and chemical industrialization she pursued during the 1930s, while the East Asian miracle, all the way from the Japanese high-speed growth of the 1950s and the 1960s to the growth of NIEs and ASEAN in the 1970s and the 1980s to the rise of China in the 1990s and the 2000s, was heavily dependent on the availability of imported oil, especially from the Middle East. In this respect, the United States-led international order and the regimen of free trade provided a vital framework for the East Asian miracle. On the other hand, Japan's historical sensitivity to the procurement of resources has been a major background to her commitment to the development of resource and energy-saving technology (Sugihara 2006).

It therefore seems possible to argue that the two most successful paths of economic development in global history benefited from stable environmental conditions, relatively free from epidemics and natural disasters. Although institutional devices certainly contributed to capitalizing on this, they were in themselves responses to relatively mild environmental constraints. The two different paths also shared the notion that the combination of land, labor and capital formed the basis of technological and institutional development. Resources were thus brought into the system as "factor endowments".

The Humanosphere-sustainable Path of Economic Development

The Tropics-centered View of the Earth

The realities of the tropics present a stark contrast with the above observations of Western and East Asian paths; Frequent floods of major rivers suggest that the broad ecological stabilization has not been achieved; Changes in annual and seasonal rainfalls could be too sudden and drastic to cope; infectious diseases are much more difficult to contain, because biota are much more voluminous, diverse and active; Other disasters such as El Nino induced climate change, tsunami, earthquakes and fire could bring extremely serious damages, as the infrastructure there remain weak.

On the other hand, there is no reason to think that the topical environment is “abnormal”, except that perhaps human beings have so far been unable to control it as fully as they did that of the temperate zones. In fact, from the point of view of heat energy distribution, the tropics act as an engine of the earth. Most solar radiation and heating of the surface occurs at the equator, where the sun’s rays are nearly perpendicular to the surface all year round. The climate system redistributes this heat energy more equally. Atmosphere and oceanic circulation contribute equally in moving energy from the equator towards the poles. It is therefore much more natural to view the earth system from the tropics-centered, rather than the temperate zone-centered, point of view, even if global warming today is primarily caused by the growth of carbon emissions in the temperate zones.

This leads to our notion that there are serious path-dependent gaps in the directions of technological and institutional development between the temperate zones and the tropics. Most of the modern technology and institutions were developed with the moderate environment in the temperate zones in mind. In order to come to terms with the realities of global environment, we need to develop the sort of technologies and institutions that accommodate all aspects of tropical humanosphere. Thus area studies need to address the issue of appropriateness and relevance of these technologies from the point of view of local societies. We should set our research agenda in terms of the transformation from the humanosphere-driven path to the humanosphere-sustainable path, by which we mean that the new technologies must serve for the humanosphere-sustainability of local societies, while local societies in turn should appreciate the scientific knowledge, and improve their capacity to respond to environmental, as well as developmental, issues by adopting this knowledge.

We also need major institutional innovations to accommodate the perceptions generated by new technologies. The private property rights regime (and the inter-state system) is based on the assumption that humans essentially control the society through the control of land surface. When we begin to control the atmosphere and space, we will need a different regime to capture the movement of material and energy on and around the earth. It is here that local knowledge, engrained in the humanosphere-driven path, could be reminded of as a thought better equipped with considerations for sustainability than productivity-driven ideas. The humanosphere-sustainable path can only be established when the purpose of institutions is transformed from productivity-driven, growth sustainability to humanosphere sustainability.

Finally, the issue of humanosphere sustainability is an issue of long-term developmental path. We need predictions of both the future of the environment and the future of human society, including the forecast of population and GDP. We would also need information on the long-term direction of technological and institutional path. We can understand the nature and the extent of the path dependency, only by bringing in history and social sciences on the one hand, and frontier technology on the other, to determine the long-term path of economic development of the local society.

References

Arrighi, Giovanni. 2007. Adam Smith in Beijing: Lineages of the Twenty-First Century, Verso, London.

Barbier, Edward B. 2005. Natural Resources and Economic Development, Cambridge University Press, Cambridge.

Conca, Ken 2006. Governing Water: Contentious Transnational Politics and Global Institution Building, the MIT Press, Cambridge, Mass.

Jannetta, Ann Bowman. 1987. Epidemics and Mortality in Early Modern Japan, Princeton University Press, Princeton.

Jones, E. L. 1981. The European Miracle: Environments, Economies and Geopolitics in the History of Europe and Asia, Cambridge University Press, Cambridge.

Lewis, W. Arthur ed. 1970. Tropical Development, 1880-1913, George Allen & Unwin, London.

Maddison, Angus. 2007. Contours of the World Economy, 1-2030 AD: Essays in Macro Economic History, Oxford University Press, Oxford.

Neumayer, Eric. 2003. Weak versus Strong Sustainability: Exploring the Limits of Two Opposing Paradigms, 2nd edition, Edward Elgar, Cheltenham.

Ostrom, Elinor. 1990. Governing the Commons: The Evolution of Institutions for Collective Action, Cambridge University Press, Cambridge.

Pomeranz, Kenneth. 2000. The Great Divergence: China, Europe, and the Making of the Modern World Economy, Princeton University Press, Princeton.

Richards, John. 2003. The Unending Frontier: An Environmental History of the Early Modern World, University of California Press, Berkeley.

Stern, Nicholas 2007. The Economics of Climate Change: The Stern Review, Cambridge University Press, Cambridge.

Sugihara, Kaoru. 2003. “The East Asian Path of Economic Development: A Long-term Perspective”, in Giovanni Arrighi, Takeshi Hamashita and Mark Selden eds, The Resurgence of East Asia: 500, 150 and 50 Year Perspectives, Routledge, London.

Sugihara, Kaoru. 2004. “Higashi-ajia ni okeru Kinben Kakumei Kiero no Seiritsu (The Emergence of the Industrious Revolution Path in East Asia)”, Osaka Economic Papers, 54-3.

Sugihara, Kaoru. 2006. “East Asia, Middle East and the World Economy: Further Notes on the Oil Triangle”, Working Paper Series for Afrasian Centre for Peace and Development Studies No.9, Ryukoku University, Kyoto.

Wong, R. Bin. 1997. China Transformed: Historical Change and the Limits of European Experience, Cornell University Press, Ithaca.

Wrigley, E. Anthony. 1988. Continuity, Chance, and Change: The Character of the Industrial Revolution in England, Cambridge University Press, Cambridge.

SUGIHARA Kaoru is Professor of Economic History at the Center for Southeast Asian Studies, Kyoto University. Trained in Japan, he taught at the School of Oriental and African Studies, University of London, from 1985 to 1996 and at the Graduate School of Economics, Osaka University, from 1996 to 2006. His Japanese-language publications include *Patterns and Development of Intra-Asian Trade* (1996), *The Rise of the Asia-Pacific Economy* (2003) and *The East Asian Miracle in Global History* (forthcoming). He is editor of *Japan, China and the Growth of the Asian International Economy, 1850-1949* (Oxford University Press, 2005), and co-editor of *Local Suppliers of Credit in the Third World, c.1750-1960* (Macmillan, 1993), *Japan in the Contemporary Middle East* (Routledge 1993), *Local Agrarian Societies in Colonial India* (Curzon 1996; Manohar 1997) and *Labour-intensive Industrialisation in Global History* (Routledge, forthcoming). He is currently program director of a large-scale interdisciplinary “Global COE” project on sustainability in Asia and Africa at Kyoto University. <sugihara@cseas.kyoto-u.ac.jp>

Keynote Speech 2

Mainstreaming Forest Biodiversity: Its Prospect for Regional Economic, Social and Environment Development Program

Endang Sukara

Deputy of Life Sciences, Indonesian Institute of Sciences

Abstract

Indonesia is a maritime country with the islands laid across Asia and Australian continent. It covers a large land and oceanic areas. It consists of diverse terrestrial and marine ecosystems representing unique ecosystems from ice landscape in *Papua* to various humid low land forest, mangrove, spectacular coral reefs, sea grass beds, and deep Weber seas. Indonesia is mega-diverse country both in biological and cultural. There is no doubt, that Indonesian as a mega diversity country should gain economic benefit from both cultural and biological diversity. It is urgently need to study the value of wild life species. Plant resources may be used not only for timber but also for non timber products e.g. food (grains/cereals, tuber, fruits etc.), vitamin, minerals, medicines, perfumery, and many others benefit for human kind. Meanwhile, study on wild life animals could also improve our knowledge on the value of wild life animals as a source of food, agriculture and event pharmaceutical industry. Similarly, also apply to the microbial genetic resources. For this purpose, protection of natural forest in Indonesia from illegal logging, encroachment, human made disaster is a must. At the same time, the development of forest plantation may be continued using the existing area and expanded to degraded areas which are abundantly available in the country. To ensure humanosphere be sustainable, joint research collaboration in urgently required.

Key words: ecosystem, mega-diversity, cultural and biological diversity, timber and non timber products, natural and plantation forest, humanosphere

Introduction

Indonesia is a maritime country with more than 17,000 islands laid across Asia and Australian continent. It covers 7.7 million km^2 consists of 1.9 million km^2 land areas, 3.1 million km^2 water, 2.7 million km^2 exclusive economic zones with the total coastal line about 80,791 km (Sukara, 2006).

Around 42 types of terrestrial and at least 5 types of marine ecosystems exist in this country. Those ecosystems representing diverse and unique ecosystems from ice landscape in *Papua* to various humid low land forest, peat swamp forest, spectacular coral reefs, sea grass beds and mangrove ecosystem. There are many of those ecosystems are unique and can not be found in any part of the globe. The present of Wallace and Weber Lines make the Indonesian even richer in term of biological diversity which distributed in 4 different Malesias distribution zones. Indonesia is one of mega-diverse country. With only 1.3% of the world total terrestrial area, more than 17% of living organisms in the entire globe are found in this country. More than 10% of the whole flowering plant species, 12% of mammal, 16% of reptile and amphibian, and 25% of fish species are found in Indonesia (Sukara, 2006).

There is no doubt, that Indonesian as a mega diversity country should gain economic benefit from

plant resources not only for timber but also for non timber products e.g. food (grains/cereals, tuber, fruits etc.), vitamin, minerals, medicines, perfumery, and many other.

For Indonesia, the mega-biodiversity country has an ample opportunity to attract global infestation for the establishing solar based industry through the harvesting process of solar energy by diverse plant resources for diverse products to serve humankind needs. Indonesia which is rich with sun light, humid and also supported by fertile volcanic soil is a perfect place for such initiative. When this program is attached to the eradication of poverty, creation of job, improvement of livelihood, and improving the condition of the environment, it is no doubt, that the program be promoted for *DEBT EQUITY SWAFT* program in the country.

Indonesian Biodiversity – State of the Art

Biodiversity, however, is poorly studied including in particular, Indonesian biodiversity. Their value is not being explored. The utilization of biodiversity if exists is generally only based on direct used with no added value and based on local knowledge from generation to generation. Timber generally harvested directly form natural forest and sell as raw material, no added value and no replanting program.

Only recently, LIPI through PROSEA Program, collecting information on Plant Resources exist in South-East Asia. The information includes taxonomic, botany, ecology, cultivation, and its usage on more then 6000 species (PROSEA Annual Report, 2005). That information should be of important for the development of crop estate to boost the economic of the country through. The establishment of crops estate on degraded land not only dedicated to support timber industries but also be directed to support food production, pharmaceutical and many other industries in Indonesia. This initiative could easily be linked to the economic, social and environmental program mandated by Millennium Development Goal and Agenda 21.

Establishment of Ex Situ Conservation Site (Botanic Garden) for Long Term Regional Economic Development

Botanical garden is known world wide as a vehicle in promoting the importance of plant resources to mankind. Botanical garden has very strong committeemen in plant conservation program, education and tourism. Botanical garden continuously promotes sustainable use of plant resources. In Indonesia, conservation program carried out by two institutions namely Department of Forestry (concern with *in situ* conservation – National Park etc.) and LIPI (concern with *ex situ* conservation – botanical garden). In addition to that, there are other conservation sites namely collection gardens, arboretum, University Garden etc.). It is hope that through various initiatives, plant resources can be conserved, study and utilized in sustainable manner.

It is predicted that the total number of plant species exist in Indonesia is about 40.000 species or around 10-12% of the total plant species in the whole world. Indonesia is therefore known as *mega-diversity country*. But, the rate of extinction is very high. Indonesia therefore is also known as *hotspots country*. Conservation initiatives are urgently required.

It is fortunate that many Provinces and Districts in Indonesia show an interest in establishing Conservation Sites (Botanical Gardens). For this purposes, LIPI actively engages. Wamena Biology Garden in Papua is already 15 years of establishment and shows a good progress. During the last five years, Bukitsari Botanical Garden in Jambi, Baturraden Botanical Garden in Central Java, Sungai Wein Botanical Garden in Balikpapan District are established. District of Kutai Kartanegara, South Sulawesi Province and Enrekang District in this province, district of Ogan Komering Ulu Timur (OKU), Province of Maluku, Province of Nusa Tenggara Timur, Kuningan of West Java, Malinau of East Kalimantan, Pulang Pisau of Central Kalimantan, and also Jakarta (Kelapa Gading, Cinere and Nort Beach of Jakarta) showing a very strong commitment in establishing Botanical Garden.

Sibolangit Botanical Garden in North Sumatera established in 1974 at the elevation of 1.250-1.450 m above sea level and Setia Mulia Botanical Garden established in 1955 at the elevation between 350 and 900 m above sea level in West Sumatera may be revitalized. It is hope that more of plant resources can be conserved, studied and used and in the near future could contribute to the economic, social and environmental development program at regional and national level.

<u>Economic Valuation of Non Timber Product at Conservation Site of the Private Company Timber Estate Crops at Province of Jambi, a Case Study</u>

PT Wira Karya Sakti (PT WKS) is a private estate crop company recieving permit from the government of Indonesia to manage 250.000 ha of forest for Forest Timber Estate Project (HTI). This company also has an obligation to set aside 10% of their concesion for conservation site (25.000 ha). Purwanto *et al.* (2005) in 2003 carried out study at the conservation site of this company. Their study was focused on the natural diversity of plant species exists in this conservation area. For this purpose, two permanent plots with a 1 ha size was established within the conservation site of this company. Floristic analysis, identification of tree species and the identification of the usefulness of those species were done. Local knowledge related to the etno-botany aspects were gathered from the local people surrounding the area of study.

Conservation zone of this company is scattered within the concession area. Conservation zone is actually post logged zones. It is more a secondary forest rather than natural forest. It is heavily logged illegally including for direct used by local people as a raw material for construction. Even though, some important commercial tree species e.g. *Shorea parvifolia, Dyera costulata, Eusideroxylon zwageri, Dialium, Palaquium, Alseodaphne, Koompasia* are found. Tree species frequently found are *Hydnocarpus*

polycephala, Parashorea aptera, Pentaspadon motleyi, Pimelodendron griffittii, Santiria rubiginosa, Artocarpus kemando, Dysoxylum ridgewayi, Diospyros, Knema cinerea, Nephelium maingayii, N. uncinatum, Shorea spp., and *Syzygium* are found (Purwanto, *et al*., 2005) .

Within the conservation zones where it is dominated by Dipterocarp, wild animal e.g. *Macaca fernoralis*, *Hylobatas agilis*, *Felis bengalensis*), *Buceres rhinoceros*, and *Ducula aenea* are also found. Main while, within the conservation zoned which is dominated by fruit tree species, wild animal e.g. bird (*burung beo, elang, srigunting, punai*), monkey (long tail macacca and *beruk*) are found. On secondary forest where it is dominated by tree species e.g. *mahang* and *balam,* wild animal such as bird (*murai, burung madu*, and *burung kipas*) were found abundantly. In shrub area, wild bird e.g. *burung bubut, burung perenjak*, and *kucica* are found. Deer, antelope, and honey bear are also found. This zone found to be rich in germ plasma which may of great important for the future economic development program of the country.

Etno-botanic study on plant species shows, that more than 300 tree species were known by local people (Malay ethnic) living surrounding the forest concession as useful for food, timber, religious purposes and religious ceremonies (ritual), energy, clothing, coloring agents, poison ingredient, craft, cosmetics and other purposes. Our inventory in established permanent plot shows that we could found at least 77 plant species useful as a raw material for medicines, 51 plant species used as a source of food, 21 species use as vegetables, 6 plant species as spices and food additives, 2 species use as a source for poison, more than 45 species used for cooking energy, and around 65 species used for making tool, craft and cultural purposes. Within the permanent plot, we also found around 157 plant species used as a raw material for construction purposes, and about 27 plant species suitable for pulp and paper, plywood and particle board industry. In addition, we also found 8 species of rattan.

Exploration of Microbial Resources to Improve the Conversion of Sun Light Energy to Biomass and Extent the Durability of the Biomass Produced

Join collaboration with Osaka Gas Company, LIPI evaluate biofertilizer based on VAM (prviously developed in Japan) and microbial consortium to improve the performance of plant species from nursery to the field. Effective microorganisms such as VAM, Rhizobium and Azospirillus proved to more effectively absorbe nutrient and water for the benefit of plant growth. With this association, plant is more resistant to frought, soil borne pathogen, and as a consequenses, the yield is improved significantly. In collaboration with Osaka Gas R & D Center, VAM base biofertilizer could work effectively on 77 plant family. The effect of VAM and microbial consortium on growth of various crops is significant and could boost the greening program for economic, social and environment development program in Indonesia.

Exploration of Microbial Resources from Forest Floor

It is also worth to note that the richness of microbial resources at forest floor is tremendous. A join work between LIPI and NITE (Japan) on *'Taxonomic and ecological studies of fungi and actinomycetes in Indonesia and in Japan'* which is started in 2003, found that the forest floor is rich in *fungi* and *actinomycetes*. During 2003, the total of 500 fungi and 500 actinomycetes was isolated and evaluated on the basis of morphological structures, 18S rDNA (600bp), ITS (500bp), and 6S rDNA (1500bp). It is surprising that 30% of the isolates are species NOVO.

Begining in 2002-2003, LIPI exploring microbes from the plant tissues known as endophytic mircrobes. Plant resources available at Botanical Garden, Tesso Nilo Forest and forest in Sumbawa were evaluated. More than 6,000 microbial endophyte collected and only a few of them were evaluated. An endophytic fungus, Muscodor albus produces mixture of gasses having antimicrobial activity (volatile antibiotics, *biofumigan*) (Atmosukarto *et. al*., 2005). This finding could be of great important for biofumigation of exported fruit, vegetable and flower. Biofumigan could prevent microbial deterioration during shiftment. Our finding also shows that most of endophyte synthesizes useful metabolites e.g. herbicide, anti fungal, anti yeast, anti bacteria, and anti-oxidant (Sukara, 2007; Tanaka *et., al.* 1999; Tanaka *et., al*., 2001)

Major Threats to Indonesian Biodiversity

The conversion of forest to support a short term need of the country e.g. timber estate crops, palm oil plantation, agriculture, housing, roads is also tremendous reaching to almost 44% of the total forest exist in Indonesia. The rate of forest degradation is tremendous. Only 19 million ha of natural forest is in a good condition from more than 121 million ha in early 1980s. There is no doubt if Indonesia being top listed country in the world where plant and animal species are in danger and may close to the extinction. More than 126 species of birds, 63 species of mammal, and 21 species of reptile are in great danger. Ramin population depleted. Gaharu is almost extinct so does sandal wood (cendana). There are around 2 to 3 million ha of forest being degraded each year.

Conclusion

Indonesia with sun light energy and fertile volcanic soil and biodiversity do have an opportunity to harvest solar energy and convert to chemical energy through its photosynthetic ability of green plant and develop an environmental friendly business. The absorption of CO_2 through photosynthesis could be promoted through two systems e.g. conserving natural forest and the development of forest estate crops in marginal land or degraded areas. Those initiatives could be intensified and coupled to the global initiative e.g. CBD, Global Climate Change, Global Strategy for Plant Conservation, *Certified Emission*

Reduction (CER) program and reducing emission caused by deforestation and degradation (REDD/REDDI) while maintaining biological diversity richness in remaining forest for the future of human need including addressing MDGs e.g. eradicate poverty, hunger, improve health and prevent biodiversity lost. Indonesia should play an important role and for this, joint effort to do more research to study the importance of biological resources including in particularly plant and microbial resources is urgently required. Multidisciplinary approaches program involving scientists from both Japan and Indonesia is urgently necessary.

References

Atmosukarto, I., U. Castillo, W. M. Hess, J. Sears and G. Strobel. 2005. Isolation and characterization of *Muscodor albus* I-41.3s, a volatile antibiotic producing fungus. Plant Science, 169 (5): 854 – 861.

PROSEA Annual Report 2005

Purwanto, Y., E. B. Walujo, S. Susiarti, M. Rahayu, Samiran, J. J. Afriastini, D. Kumara, A. Suyadi, B. Abimanyu, S. Zein, Sholihudin, Arifin, Yassid, Wasono, Yudi, and E. Bangun. 2005. Economic Valuation of non wood product from forest – multidisciplinary approaches for biodiversity management at Wira Karya Sakti Complex, Jambi. Technical Report, Research Center for Biology, LIPI, Bogor.

Sukara, E. 2006. Biodiversity – its prospect for regional economic, social and environment development program Paper presented in international symposium on sustainable forest utilization, LIPI, Science Center Cibinong – Bogor.

Sukara, E. 2007. Bioprospecting dan strategi konservasinya. Prosiding Seminar Konservasi Tumbuhan Usada Bali dan Peranannya dalam Mendukung Ekowisata. Bali 6 September 2007. UNUD, LIPI dan UNHI. 1-7 p.

Tanaka, M., K. Asano, M. Yoshimura, T. Sone, M. Suto, A. Yokota, E. Sukara, and F. Tomita. 2001. The Production of Lepidimoide by Endophytic Fungus from Polysaccharide extracted from Abelmoschus sp.- Identification of the Product and the Producing Organism. In Murooka, Y. *et al*. Biotechnology for Sustainable Utilization of Biological Resources in the Tropics Vol. 15, International Center for Biotechnology, Osaka University, Japan, pp. 82- 88.

Tanaka M., Sukiman, H., Takebayashi, M., Saito, K., Suto, M., Prana, T. K., Prana, M. S., And Tomita, F. 1999. Isolation, Screening and Phylogenetic Identification of Endophytes from Plants in Hokkaido Japan and Java Indonesia. Microbe Environ. 14 (4): 237-241

Keynote Speech 3

Futurability of Humanosphere: Toward Global Humanics of the Environment

Narifumi Tachimoto

Director General of Research Institute for Humanity and Nature

Global Environmental Problems

Homo sapiens (modern man, the "wise" species of *Homo*) has, like other life forms, adapted to environmental change and himself modified his environment in order to survive. Being "wise," man has not only adapted to the environment but also changed it by exploitation of its resources. Civilization has progressed with such developments as the invention of tools, the agricultural revolution and the urban revolution, and spoken and written language have contributed greatly to this progress. As a result, man has been able to build rich societies.

The remarkable development of civilization in the early modern and modern periods brought about by the energy revolution and the resulting industrialization have allowed feeble man to impact decisively upon the natural environment. Environmental changes have been part of earth's history from time immemorial, whether slow and gradual or sudden and drastic like volcanic eruptions or earthquakes; and many sciences and other fields of study have been established to investigate environmental changes. Environmental problems, on the other hand, while in part attributable to changes brought about by man's activities since the distant past, have mostly emerged as a result of industrial civilization. Industrial development and medical progress have brought about rapid growth of human population and higher living standards; but the cost has been more massive consumption of resources in society and a level of waste that far exceeds the threshold at which it can be processed by natural circulation. Such mass production, mass consumption and mass wastage have resulted in dwindling resources, damaged health and threatened amenity.

Environmental change is a problem not only of quantity but also of time. Man would probably adapt unconsciously to gradual change over a long period. However, today's environmental problems have emerged rapidly over a short space of time. Their rise is symbolized by the steeply exponential curve of population growth in the past two centuries; and the fact that population growth has exceeded the limit for co-existence is an environmental problem. What defines such changes as problems is the recognition that they are not a matter of fate but something that man can do something about. [Takahashi et al. 1998–1999]

From the mid-20th century, the first environmental problems to be tackled were those of pollution. These were followed by ecological problems of destruction of nature and disturbance of ecosystems, and finally environmental problems in general. Intellectuals began to realize that problems of garbage,

destruction of nature and environmental degradation are not local problems but must be considered on a global scale. Since then, people's daily lives have come unquestionably to be impacted by global environmental problems: global warming, ozone holes, the water crisis, desertification, acid-rain, pollution of the atmosphere and oceans, toxic waste, loss of biodiversity, deforestation and energy problems.

It should be noted here, first, that environmental change is not itself an environmental problem. As mentioned, environmental change has been ongoing on various time-scales since the earth's formation. Global warming is not itself a problem: the problem is that it appears to be the result of human activity. In the face of long-term global warming and cooling, man at present can only adopt defensive strategies. But if warming is man-made, then solutions must be sought. This is why it is an environmental problem.

Secondly, it should be noted that global environmental problems are not globally uniform. Most people blame global environmental problems on a number of developed countries; not everyone is uniformly at fault. Developed countries are both offenders and victims, while developing countries, though they may be victims, are rarely responsible for today's environmental problems. At the least, environmental problems cannot be solved by depriving people in developing countries of their right to livelihood, people whose basic human wants are not met. Perceptions of environmental problems differ between rich countries seeking to maintain a comfortable environment for daily life and poor countries seeking at least to meet basic human wants. Even within the same country, the rich and the poor differ in their perceptions.

Global environmental problems represent a situation in which the system of the human sphere or humanosphere is threatened by changes in the earth's sphere or geosphere, i.e., the "environment" of the humanospheric system; and these involve non-uniform changes and non-uniform human activities. Individual environmental problems are parts of the geospheric system that, at times, threaten to have a global impact. They therefore need to be tackled comprehensively on a global scale. Without progress towards solving global environmental problems, the earth has no future. Science can provide predictions, albeit uncertain, and unless action is taken considering the future of society on the basis of those predictions, it will be too late. Observations of the balance of ecosystems show that recovery is impossible once a certain threshold has been passed, and the systems collapse.

Sustainability and Futurability

Restricting the human activities that cause them will not be enough to solve environmental problems. Ideally we should reduce the burden on the environment while continuing to enjoy the wealth of civilization, and pass that wealth on to future generations. The concept that has emerged to make this possible is that of sustainable development. It would be ideal if this were possible, and it is clear that concerted efforts are required to bring it about, but perhaps a little more fundamental consideration is needed.

What is threatened by global environmental problems is human well-being, the state of health, happiness and prosperity [Griffin 1986] or to live well. Well-being does not mean simply the satisfaction of excessive material desires, but rather richness of heart, peace of mind. We must set our sights firmly on well-being as our ultimate objective and figure out the steps needed for its realization. In the modern age, the goal must be universal well-being, not restricted to specific groups but enjoyed by young and old, rich and poor, the healthy and the weak or disabled, citizens of America and citizens of Africa.

The humanospheric system has as its environment the sun, air, earth and water, animals, plants and minerals. In addition, the environment includes appurtenances to the system: man-made objects like buildings and machinery, civilizations and social systems. The chains of interaction between man and nature should, strictly speaking, be termed the dynamic equilibrium between the humanosphere, which is part of the natural world, and its environment [Luhman 1984], the geosphere, but for convenience I shall use the phrase the chains of interaction between man and nature here. Elucidation of this dynamic equilibrium is the role of global humanics of the environment. Global environmental problems represent a situation in which a system whose primary purpose is well-being faces a crisis caused by environmental changes the system itself has generated.

Theories advanced to explain these changes and their varieties in the humanities and social sciences include environmental determinism, demographic view of history, a theory of limitation that posits limiting factors rather than determining factors, and a theory of interaction that posits a trajectory (in French, *trajet* or *trajection*) between culture and nature [Berque 2000]. What is difficult about global environmental problems, as various controversies show, is obtaining scientific proof of causal relationships. Mechanistic models of problems can be built by specifying a chain of causal relationships and reducing the complexity of causes, but testing such models is difficult. Nevertheless, countermeasures must be taken immediately some form of inference or prediction is made. Otherwise, we face with a situation in which we have no strategies whatsoever for resolution,

In view of these features of global environmental problems, the concept of sustainable development has been taken up internationally. Nevertheless, the pursuit of permanent sustainability of natural capital, man-made capital, and the social capital [Morotomi 2003] is liable to sink into conservatism, including maintenance and approbation of the status quo. Another possible route should be to seek new transformations rather than maintaining the status quo. We must learn from the history of civilization that unless plans are premised upon constant change, circulation and flow, they are likely to become uniformly standardized; and such plans, ironically, offer no guarantee of permanent sustainability. This is not to deny a possibility to keep the sustainability for a millennium by new technologies and by the development of science[Oki 2001], but this kind of sustainability would be only possible with incessant, not only technological but also socio-cultural, innovations to change the status quo. We must also take into account not only the balance between generations but also the balance between regions. What is

important here is not sustainability in terms of maintaining the status quo of what is sustained, but the maintenance of well-being or, more fundamentally, the security of life and livelihood. Such security does not necessarily require maintenance of the status quo.

Rather than sustainability, with its strong nuance of maintaining status quo, the more romantic term futurability, though not clearly defined, is probably more suitable to describe designs for a new dynamism of interaction between man and nature that have the potential to create a new future. However, to build a civilization premised on flow, fluidity or mobility, involving as it does the pursuit of apparently contradictory goals of change and continuity, is extremely difficult. Success depends on whether we can find a form of governance (a new order or system) to replace sustainability and whether people will accept it. The term futurability does not deny sustainability. Sustainability is one form of futurability, and it may turn out to be the only possibility left to mankind. Building a foundation of scholarship that will clarify these issues is the task of global humanics of the environment.

A Basic Approach to Solving Global Environmental Problems

The basic approach to solving environmental problems will need to take the standpoint of anthropology (human sciences, or humanics) in order to define a dynamic equilibrium between humanosphere and geoshperere that will lead to futurability. In cooperation with the natural sciences, initiatives will need to come from the viewpoint of the humanities and social sciences, namely, humanics. Of course, this is not something that can be done in a day, for we have barely reached the starting line. In this situation, how should we set about finding solutions; what specific approach should we take?

While it is necessary to devise countermeasures on a global scale, there is the danger of losing sight of environmental problems by insisting too closely on the global scale of the environment. The global point of view is of course necessary, but because “environments” are essentially separate and distinct, it is important to take the standpoint of the area, region or locality. By returning as it were to our starting point, we can say that the specific target is to establish rules for man’s involvement with the earth, with nature as a whole.

In the chains of interaction between man and nature, nature influences and imposes restrictions on man. Conversely, there are actions that man takes that change nature. These actions of nature on man and of man on nature are, of course, not unilateral but form part of a chain of action and reaction. For individual sciences it is natural to evaluate natural changes and human activities separately, but for environmental studies it is necessary to understand the chains of interaction in order to explain the realities of interconnectedness of the whole. The earliest frameworks set up on the basis of such interconnectedness were the systems theories incorporated into various fields of study in the latter half of the 20th century. Whether a system is open or closed, whether its logic is deductive or inductive (fact-

based), the concept of system is a metaphor [Lakoff & Johnson 1980; Tachimoto 2001a, 2001b]. It allows a perspective on reality. While avoiding a discussion of the pros and cons of systems theory, I should here accept both systems that exist in objective reality and systems that are completely subjective creations at the same time. We can then ask how close the metaphor is to the essence of the problem. Metaphors that capture the essence of a problem will be termed root metaphors. They might also be called fundamental concepts that act as the foundations for model-building.

While there are many ways to understand reality, I would propose as a starting point for environmental studies that integrate various disciplines the establishment of interdisciplinary root metaphors. As root metaphors that express the dynamic equilibrium of man and nature, circulation and diversity are unlikely to meet with objections. These must take into account not only actions from nature but also from man. Consequently, societies modeled on circulation or flow as well as those modeled on harmony or cooperation, seeking harmony not only in the diversity of life forms but also in cultural and individual diversity, fall within the purview of these metaphors. In both cases, however, these metaphors address the aspect of environmental mechanism and do not directly deal with human activities. In a sense, what mediates man's action on nature are energy and resources in their widest meaning. Resources are those parts of the natural world that have passed through the filter of human choice. As a root metaphor, resources are parts of the natural world that mediate between man and nature. By securing the continuity of food and resources, societies are modeled on maintaining the basis of survival by realizing amenity, safety, security and stability. [Sugihara 2007]

If the three root metaphors, circulation, diversity and resources, are taken as analytical tools of global humanics of the environment, then they must be integrated within a frame. They must encompass temporal change and spatial distribution. History provides a comprehensive viewpoint within the temporal frame as duration. A similarly comprehensive viewpoint is possible with the spatial frame as areal unit. Rather than analyzing individual phenomena along temporal and spatial axes, a comprehensive viewpoint is required.

The environmental history of civilization, symbolizing both change and continuity, is a metaphor of the time axis, seen in such spans as day, year, life, centuries, millennia or millions of years. Sustainability alone does not guarantee the continuity of all things; rather, we should seek certain transformations for the future. Our task is to create a design for futurability by clarifying the structural mechanisms of continuity of civilization and environmental change. The unit of time, its divisions and range should, of course, not be limited to the short period mentioned in connection with global environmental problems but must be long enough to encompass macroscopically long-term environmental fluctuations. [Wada 2002]

A metaphor for the spatial category (= axis) is area or place because space is simply an expanse. Area studies deal with the question of areal units which becomes one of scale of place. Seeking meaning for people within space means investigating places; and here places are understood as being stratified

from the community level to the global level. The choice of global area studies or ecosophy [Takaya 2001] as a metaphor for the spatial axis is because of the compatibility of the concepts of area in global or interdisciplinary area studies and of environment in global humanics of the environment [Tachimoto 2001]. What sets the boundaries of place is governance. Without governance, solutions to environmental problems lie open to the criticism of being impractical.

As a hypothesis of regional division, the earth seen from space can be called the ultimate expanse. It should be remembered, however, that it is only very recently that man has been able to know and see the earth as a whole. From the viewpoint of land-dwelling man, the largest area is the continent. These mega-areas can be divided into meso-areas (for example, the EU), including areas linking continents (for example, the world of the Mediterranean) and areas spanning boundaries into the maritime world (for example, Southeast Asia). Nation-states are of various sizes, and it is impossible to say in general whether a nation should be treated as a single unit, a collection of units, or part of a larger unit. From the global standpoint of global humanics of the environment, the nation is not a sacred framework. Global area studies from which humanics of the environment arose takes as its mission the planning of environmental governance that will solve local problems on a global scale without making regional divisions. Such governance needs not only to be of global scale but to have macro-micro links between the various levels of place and the geosphere as a whole.

In sum, an environmental history of civilization is not the aim itself: global humanics of the environment extracts futurability from its findings. Researchers do not carry out area studies as such: global humanics of the environment seeks to establish environmental governance by using the findings of global area studies.

Global Humanics of the Environment

Global humanics of the environment seeks to build theory by consilience [Wilson 1998)], the unifying of inductive conclusions, based on the research findings of the disciplines concerned with the root metaphors. Each discipline naturally adopts an analytical approach and at the same time is required to pursue internal coherence and consistency with neighboring disciplines. Ideally, miniature versions of the macrocosm that is global humanics of the environment are realized in each of the microcosms represented by the five metaphors. Global humanics of the environment can only be said to exist when the homology of the part and the whole and the idea of participation, or sharing properties (scientifically speaking, the model of macro-micro link between strata and the whole) permeate from the earth to man.

Figure 1 illustrates the concept of global humanics of the environment. The mechanisms of the natural environment occupy the center as a part of geopshere, with the spatial axis to the left and the temporal axis to the right. They are a part of the humanosphere, which comprises the geosphere as a

whole. Global humanics of the environment comes out of the inductive results of these five research fields together in a unitary whole.

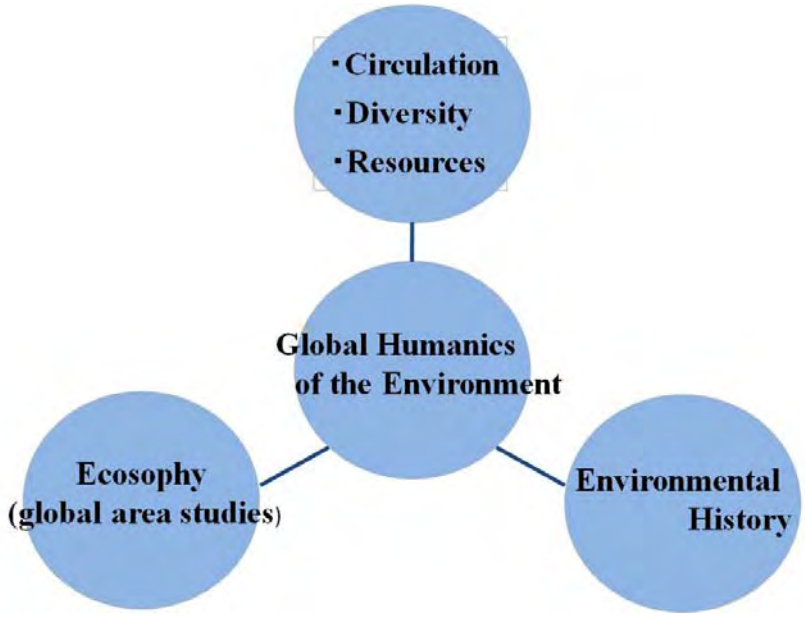


Figure 1. The Concept of Global Humanics of the Environment.

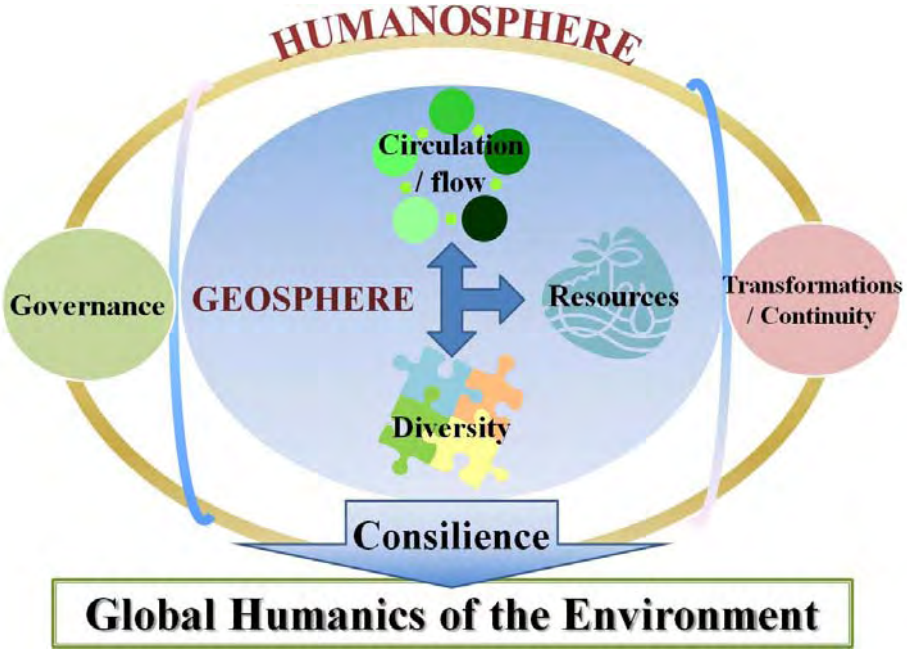


Figure 2. The Structure of Global Humanics of the Environment

Also we can understand the structure of global humanics of the environment created by the linking together of the environmental history of civilization (sustainability) and global area studies (governance theory) with environmental studies in the narrow sense: environmental dynamics - the

dynamics and systems of the chains of interaction between man and nature (circulation, diversity and resources). These are, as shown in Figure 2, the three pillars that support global humanics of the environment and the foundation on which it rests. Based on global humanics of the environment, it will be possible to draw up a plan for building a futurable society.

Acknowledgments

I am grateful to members of the Research Institute for Humanity and Nature for their suggestions while I was refining my ideas. Many people have also reviewed various versions of the manuscript, and I am particularly grateful to Ishii Yoneo, Fukushima Yoshihiro and Yumoto Takakazu for their pertinent comments. Special thanks to Peter Hawkes who edited the Japanese version into the English.

Glossary

Consilience: "Literally a jumping together of knowledge by the linking of facts and fact-based theory across disciplines to create a common groundwork for explanation." [Wilson 1998: 8]

Humanics: This word was coined in the mid-19th century by an American chemist Roger I. Williams in the sense of the study of the nature or affairs of humankind. Here it is used to mean the comprehensive, interdisciplinary study of man as distinct from the humanities.

Futurability: The German term for "sustainability" translates literally into Japanese as "future potential" or "future possibility," and this Japanese term has been used at the Research Institute for Humanity and Nature since its founding in preference to the more usual Japanese word for sustainability. Futurability is mentioned in a 1980 article in *Time* magazine as a neologism. [Peter Hawkes]

References

Berque, Augustin. Écoumène: Introduction à l'étude des milieux humains. Paris: Éditions Belin, 2000.

Griffin, G. Well-Being: Its Meaning, Measurement, and Moral Importance. Clarendon: Oxford University Press, 1986.

Lakoff, George and Johnson, Mark. Metaphors We Live By. Chicago & London: The University of Chicago Press.

Luhman, Niklas. Social Systems. (Tr. by John Bednarz, Jr.) Stanford: Stanford University Press, 1995. (Soziale Systeme: Grundriß einer allgemeinen Theorie. Frankfurt am Main: Suhrkamp Verlag, 1984.)

Morotomi Toru. Kankyō. Iwanami Shoten, 2003.

Oki Taikan. Sennen Kagakugizyutu wo Mezasou. Kagaku vol. 71(December), 2001.

Sugihara Kaoru. Personal communication. 2007.

Tachimoto Narifumi. "Chiiki to chikyū: kankyō sekkeigaku ni mukete" Gakujutsu geppō 54, no. 11 (2001).

Tachimoto Narifumi. Chiiki kenkyū no kadai: shakaibunkaseitairikigaku no kokoromi. Revised edition. Kyoto University Press, 2001a.

Tachimoto Narifumi. Kyōsei no shisutemu wo motomete: Nusantara sekai karano teigen. Kōbundō, 2001b.

Takahashi Yu, Kato Saburo, Takeuchi Kazuhiko, Yasunari Tetsuzo, and Wada Eitaro, eds. Iwanami kōza "chikyūkankyōgaku." 10 volumes. Iwanami Shoten, 1998–1999.

Takaya Yoshikazu. Chikyūchiikigaku joron: Global Ecosophy. Kōbundō, 2001.

Wada Eitaro. Chiiki seitaigaku. Iwanami Shoten, 2002.

Wilson, Edward O. Consilience: The Unity of Knowledge. New York: Alfred E. Knopf, 1998.

TACHIMOTO Narifumi is Director-General at Research Institute for Humanity and Nature at Kyoto. He obtained M.A. on Anthropology-Sociology at Kyoto University, and Ph.D on Anthropology at University of Chicago. He has been worked as Professor of Center for Southeast Asian Studies (CSEAS), Kyoto University (1980-2001), Director of CSEAS, Kyoto University (1998-2001), and Professor of Graduate School of Global Humanics, Chubu University (2001-2006). He also worked as Chairman, Resona Asia-Oceania Foundation, Science Counselor, Ministry of Education, Science and Culture (1990-1998), Vice Chair of Scientific Steering Committee, MOST Programs, UNESCO (1995-1997). He has written and edited numbers of publications including *Global Area Studies and Field Work: GSID Discussion Paper 129* (2004) and "Touristic Impressions of Social Transformations in Melaka," *Journal of College of International Studies* 30:1-31(2003). He received The Medal of Honor with Purple Ribbon from Japanese Government (2003).

Grand Session 1

In Search of New Direction of Development in Indonesia: Possibility of Sustainable Humanosphere Type Development in Indonesia

Kosuke Mizuno

Director of Center for Southeast Asian Studies, Kyoto University

Introduction

Recent annual economic growth of 6% in Indonesia is fairly good performance; however, its capacity for continued future growth is low, compared with neighboring countries, such as China and Vietnam. Numerous reasons are evident as to why Indonesia can not grow strongly. Low levels of foreign direct investment, and limited governmental investment in infrastructure, both central and local governments, are only two of the reasons. The process of transition from authoritarian centralized regime to democratized and decentralized system is another important reason why the growth potential is low.

However, we can point out the other important reasons. One of them is that the direction of the Indonesian economic development is not clear. Of course, the present development system is not like the one during the former regime of Soeharto, especially in 1970's when the BAPPENAS (National Development Planning Agency) functioned as the headquarters of national developmental strategy, and the organization's strategies determined the planned economic activities. Democratized Indonesia cannot have that kind of headquarters. However, currently, economic orientation and strategy is not clear, both the government, and also the people themselves.

This paper attempts to show a new direction for Indonesian development with particular reference of the concept of the sustainable humanosphere that our research program intends to develop. Of course, we see the historical and social context of Indonesian economic development, and not a mere application. This concept can be used to understand the other countries' development, especially tropical Asia and African countries. However, it is important to develop awareness and understanding of the historical and socio-economic, ecological and atmospheric conditions of each country, region and area.

This paper firstly sees the directions and strategies of economic development as well as the performance both during the Soeharto era, and during the post Soeharto era. We discuss the advantages that these strategies had afforded on a few limited factors of production. Secondly, we discuss the possibility of sustainable humanosphere type development in Indonesia. Thirdly, we discuss the reinterpretation of growth and decline of some industries from the view point of sustainable humanosphere type development in Indonesia. Finally, we conclude this paper with a summarized discussion on the applicability of sustainable humanosphere type development in Indonesia.

Orientation and Strategies during Soeharto Era, and Post Soeharto Era in Indonesia

Strategies of Development in the 1970's

The authoritarian and centralized regime made use of ODA and foreign direct investment since the end of 1960's. The government cultivated an atmosphere favoring direct foreign investment, such as removing foreign currency control, introducing the concept of independent central bank, controlling the activities of trade unions, and so on. These policies had the characteristics of open door policy to foreign direct investment, and these characteristics were totally different from the former Soeharto's policy characterized by the nationalistic policy of Socialism *a la* Indonesia.

The Malari riot in 1974 led to the open door policy being revised, and the introduction of protectionist policies for indigenous entrepreneurs that were thought of as victims of the open door policies. However, its nationalistic policies financed by oil revenues oriented to import substitution boosted the Chinese-Indonesian businesses that had close relations with the central regime, especially the circle around the president. These policies had negative effects such as dependency to ODA, and unsustainable logging of the forests of Sumatra and Kalimantan.

Structural Adjustment

Reverse oil schlock in 1979, decreasing of oil price, changed the policy drastically. In view of a deteriorating foreign balance, the Indonesian Government sought further assistance from the World Bank. The World Bank (and IGGI) agreed to increase foreign assistance, however this time; the aid came with conditions attached, such as liberalization of financial market, lifting protections on domestic industry by way of subsidies and tariffs. These conditions represent severe criticism by the bank of the Government of Indonesia's import substitution policies, and state intervention policies. The World Bank advocated the boosting industries that were suitable to the socio-economic climate and local production capacity. Indonesia has plenty of labor; on the other hand capital is scarce, so that the industry promoted should be labor intensive rather than capital intensive.

In 1982, the first financial reform was implemented, the deregulation policy was followed in 1984-86, and the second financial reform was implemented in 1988. As a result, many new banks as well as bank branches were established. An investment boom has taken place since 1988, and a lot of foreign direct investment has flowed from Japan and NIES countries, such as South Korea, Taiwan and Singapore. Labor intensive industries such as garment and foot wear industries have flourished, creating many new jobs, and a large amount of foreign currency flowed into Indonesia.

Habibie's Policy

B.J. Habibie, who studied in Germany and got a position as one of executives at German Airplane Company, went home in 1980's. He criticized the World Bank's policy and said "Why is Indonesian able to become only sawing workers?" He decided to develop the high-tech industry, such as the airplane industry, and promoted scientific research and application at BPPT. The government supported the industry intensively, often using non-budgetary funds, such as forestation fund (*dana reboisasi*). He emphasized the importance of human resources development especially in the field of science and technology. Huge numbers of Indonesian students were sent to foreign countries under the system of Habibie Program.

In the 1990"s he developed the Silicon Valley in the northern part of Bandung, West Java. He advocated value-added intensive strategies, meaning that value-added creative industries can be promoted with the technology intensive industries with huge investment for human resources development. His airplane company could produce small and middle scale airplanes, and some where exported; however, their export experienced many difficulties. Some times the government exchanged the airplanes produced for foreign goods, such as proton national cars in Malaysia, or rice from Vietnam.

Labor Intensive Industry after Step-down of Soeharto

Although labor intensive industries, such as garment and foot wear, earn around 8 billion US dollars and accounted for 11% of total exports in 2004, these industries seem to have lost growth momentum. For example, labor intensive industries share of total exports decline from 14.5% in 1994. Some researchers suggest that the textile industry in Indonesia is a sun set industry, with many companies and factories moving out of Indonesia. According to Akamatsu theory, the textile industry within a country will experience various stages, from the stage of import, the stage of import substitution, the stage of export, and finally to the stage of import again. This cycle of a product will take place for each industry of spinning, textile manufacture, machine of spinning and textile, and mother machine to make the machine for spinning and textile. With changes of each product cycle, textile related industries can sustain their growth momentum, and diffuse the industry and technologies to developing countries [Akamatsu 1961].

From the point of Akamatsu theory, Indonesia has experienced the growth of export, especially for garments, however facing a reduction in growth momentum for garment manufacture; Indonesia seems to be failing to develop successor industries such as machinery industry for textile, or higher valued product of textile related industry.

These weaknesses were caused by many factors, such as failing to enhance the human resources to support the production of higher valued products. Organizations and institutions are needed to support the enhancement of human resources, or skill formation. Of course, some industry succeeded to support the skill formation of workers, such as motorcycle industry, or some sectors of the electronics

industry.

If industries, such as the textile industry, fails to enhance the skill level of their workers companies tend to move to foreign countries such as Vietnam, or Sri Lanka, for example, because recent wage hikes would not be supported by the low endemic skill levels. These mobile industries could be said that they rely on cheap labor only, and once wages increase, they do not make efforts to enhance the skill of the work base, but instead move the factories to areas where wages are lower, such as Vietnam, or other part of Indonesia.

High-tech Industry after Soeharto's Step Down

LOI between the Government of Indonesia and IMF in January 1998 ordered the Government to stop the assistance to the Habibie related airplane company. The company, of course, experienced harsh management conditions. Because no more financial assistance was supplied from the government, the company faced major difficulties. The workers who were fired demanded that the company declare bankruptcy, because that way the workers could get severance pay, and compensation. The company verges on bankruptcy. The court ordered the closure of the company bank account and ordered the company to go bankrupt.

Although the company now receives order from many companies for repairs, or the manufacture of spare parts, and partly for making small airplanes, the company apparently faces major financial difficulties. During the restructuring of the company, it has relied on the resources of the government, and without governmental assistance the company could hardly continue operations.

Strategies of Present Government

After the step-down of Soeharto, various policies were made by the government. Decentralization and Democratization were essential parts of the policies. Economically, policies resembling laissez faire is applied; with each government taking similar policies. For example, the Wahid Government tried to protect the textile companies that include the textile machine production. However these policies were inconsistent between administrations. The Congress of the Indonesian Economist Association at Manado in 2006 declared the necessity of a "Back to the agriculture" policy. At that time the growth of agriculture was around 4 % per annum. Prof. Saragih, former minister of agriculture advocated the necessity of forest related industries and oil palm industries. However, since then agricultural production has lost growth momentum, with the exception of oil palm and rubber production. The government headed by Yudoyono issued the package of policies to attract foreign direct investment; however, it lacked the impact in boosting investment.

Possibility of Humanosphere Type Development in Indonesia

Conditions for a New Direction for Development Strategies in Indonesia

Two major direction and strategies mentioned above have relied on quite a few factors for their success. Labor intensive industry has relied on cheap labor only, whilst high-tech industries rely on governmental assistance.

Based on the critique of the former directions and strategies, we can predict the following conditions that can satisfy the present demands of the society, and be based on the lesson that can be gotten from the former experience.

Firstly we need to think the factors endowed that are favorable in Indonesia. World Bank recommended labor intensive industries because labor is abundant in Indonesia. This strategy succeeded in boosting industry; however, the development of labor based industries has several limitations as noted above. However, it remains important to consider the factors that are abundant in Indonesia.

Secondly we can extend our scope not only the conventional factors of productions, such as labor, capital and technology, but also abundant factors in Indonesia; these are natural capital such as biodiversity and landscape, and also social capital such as community-ties and local knowledge. Sunshine is also abundant in Indonesia. However, solar power can not be accumulated so solar cannot be regarded as natural capital. Despite this, Indonesia has many factors required for industrial development which are abundant. Why not we pay attention to these abundant factors such as natural capital, social capital and solar power?

Thirdly, we should consider the demands of the present age. Decentralization, freedom of association, and freedom of speech, guarantees people the right to make demands on the local government, and to companies. Ideas of participation, community-based development, gender bias free policy, and so on are also factors that people should consider when they think about the direction of the development, and its strategies.

Sustainable Humanosphere Type Development

Chart 1 shows the schema of sustainable humanosphere type development. Each factor is related among them. Timber exploitation has linkages to carbon circulation, water circulation, condition of habitat, and atmospheric conditions. Balance with these factors is always important. The more stable of the balance of timber exploitation, the more extensive the linkage, and vice versa. Deviation of a circulation will affect the balance of other spheres, for example deviations in carbon circulation causes global warming, and will effect negatively on the conditions of human habitat. Under these conditions and circulations, abundant factors of productions should be made use of in the new direction of the development, and strategies for development.

As noted above, production factors that are abundant in Indonesia are solar irradiance, natural capital (bio-diversity, landscape and so on), social capital (local knowledge, community tie, trader's networks, and so on), labor force, local based small businesses (entrepreneurship) amongst others.

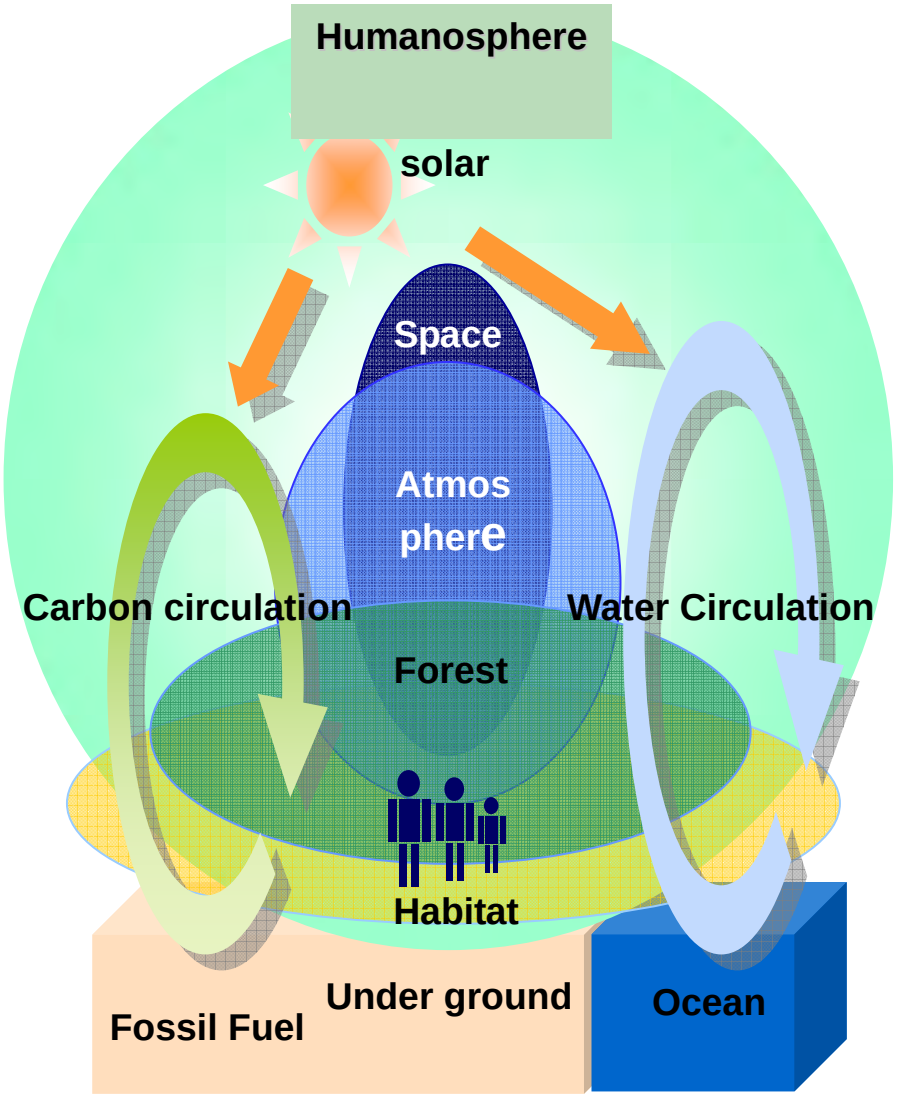


Chart 1. Sustainable humanosphere type development.

Natural capital is the factors that can be used for the production of goods and services. Bio-diversity can be meaningful to this in two ways. One way is when it can be used directly for production. The other is the potentials both for the production, and for maintaining ecological balance. The knowledge and technology to make use of biodiversity can be developed, and can be accumulated. Thus, bio-diversity is counted as natural capital.

Industries that are included in the concept of sustainable humanosphere type development vary largely. Agriculture, forestry, and fishery, and related industries from upstream productions to downstream production are of course included. Not only palm oil, rubber and bio-fuel but also newly born industries that can couple local knowledge with high-technology are also included. Carbon circulation related industries, and water circulation related industries also were included. The manufacturing industry is not excluded, of course. The important point is how the potential or capability of resources including human resources can be increased. Organizations and institutions should be developed to enhance the capabilities of human resources. These high level resources can be further developed with the way of making the linkage with other abundant factors to develop them further.

These sustainable humanosphere type industries can include various ecologically related industries; for example, organic agriculture, eco-tourism, ethnithicy and locality emphasized industry such as handy craft. Locality is important factor because family based small scale businesses and people's organization can play important roles. However the system is open, so that large scale company and foreign company can also develop, will their own role in society.

Mechanisms for making consensus decisions among the people are essential, because democratization and decentralization are assumed to be conditions.

Reinterpretation of Growth and Decline of Some Industries from the View Point of Sustainable Humanosphere Type Development in Indonesia

Sugar Industry

The sugar industry prospered during colonial times. It was one of the biggest producers of sugar in the world especially during 1920's. Cultuur banken had extensive networks including the management of sugar factories, insurance companies and trading houses. Syndicate of companies had an experimental institute that could accumulate biological knowledge, and develop technologies to increase production efficiency.

They developed the Reynoso stelsel which developed the cyclical land utilization system. They made use of traditional labor mobilization systems and also made use of village control system to capture the land on which the sugar was planted.

Here we can see that the sugar industry during the colonial time made use of not only labor and land, but also traditional rural organizations to mobilize the labor and land. They developed the technology, and capital was accumulated.

The prosperous sugar industry, however could not survive during the Japanese occupations, independent movement, and post colonial nationalistic periods. Many factors explained the decline, one of the most important is that farmers prefer to plant rice rather than planting sugar cane. During colonial

times, there was always some coercion by the company and state to plant sugar. Once coercion became ineffective, people were reluctant to plant sugar cane.

Rubber Industry

Rubber was introduced to Indonesia at the end of 19th century. Initially, large scale plantations were opened in Northern Sumatra. Along with the development of the car industry in the US, and European countries, rubber production in Indonesia developed. The rubber plantations were managed by an agency house, especially using UK capital. The capital borrowed the land with long-term base, and brought the labor from Java Island.

However at the 1930's, the production of rubber by small farmers were developed. At the end of Dutch colonial rule, a third of the export of Netherlands Indies was the production of estate crops by small farmers, especially in Sumatra. The farmers used a diversified management system, combining the rubber production for the market with the subsistence production of rice, casaba and so on.

The rubber industry survived the Japanese occupations, post colonial Indonesia, and even now the export is growing, especially by small farmers. The deficiency is the weakness of manufacturing industry using the rubber. This character is apparent even now.

Conclusion

Strategies of development during the Soeharto era partly succeeded in developing the economy of Indonesia, especially the World Bank's strategy; it developed the garment and foot wear industry and employs a lot of workers, and brings in a stream of foreign currency. However, labor intensive industries experienced some stagnation recently. Many factors explained the stagnation. One of the most important factors is that the companies fail to enhance the skills of the workers. Once wages increase, many factories move to other countries that can offer cheaper labor. From these phenomena, we can say that a lot of labor intensive industry in Indonesia has relied on only cheap labor.

Habibie's high-tech industry experienced far hard times after the step-down of Soeharto. Although he made efforts to develop human resources, his main resource that industry relied on was government assistance. After the decline in government assistance, the industry became unprofitable and bankruptcy followed.

Based on this experience, the following three points were shown as the conditions when considering a new direction for the development of Indonesia.

Firstly, the availability of resources is important. Abundant resources should be considered and utilized appropriately. Secondly, not only the conventional resources for industrial production, such as labor, capital and technology, but also natural capital (bio-diversity, landscape and so on), and social capital

(local knowledge, community tie and so on) should be considered. Solar is also abundant in Indonesia.

Thirdly, social and political factors are also important. New strategies should take into consideration; democratization, decentralization, participation, freedom of association and community-based development. In this environment, the recognition by the local community or harmonious coexistence with local community is important for every strategy.

Considering these factors this paper proposed the concept of sustainable humanosphere type development. Carbon circulation and water circulation, balance among the atmosphere, forest and habitat must be considered. Varied industries were posited as examples. Strategies should be oriented to enhance the potentials and capabilities of resources including human resources.

Experience of sugar industry provided a good example of an industry that had extensive implications to social capital such as rural organizations, and natural capital such as biological and technological development. However, coercion was essential to the industry, that why the industry declined after coercion was lifted.

Rubber industry was supported not only by the plantation capital, but also small farmers who made combinations with subsistence crops. Social organizations were developed. The weakness is the lack of powerful manufacturing industry that makes use of rich rubber supplies.

Grand Session 2

National Park Management in Local Autonomy from the Viewpoint of Political Ecology [1]: A Case Study of Tanjung Puting (Central Kalimantan)

Herman Hidayat [2]

Research Center for Society and Culture, Indonesian Institute of Sciences

Abstract

This paper analyses national park management from the viewpoint of political ecology which emphasizes stakeholders' perception. The role of national park is very significant as the last resort of natural forest existence. Because it has strategic functions as water catchments, hydrology, watersheds, micro climate, carbon sink production, educational discourses to study biodiversity, eco-tourism, etc. There are three main purposes for national park management: (1) the protection of ecological process in order to guarantee sustainable its function and role as ensuring systemic life; (2) to preserve various of natural resources and its ecosystem in order to maintain genetic preservations; (3) and to generate sustainable benefits for improvement social welfare for society who live in and around national park particularly and society at large in general. But, currently the real condition of national park Tanjung Puting is in a threat because of two factors: namely illegal logging activities which have been carried out by wood traders and illegal mining which eventually affected of water contamination in the upstream. Therefore to anticipate these critical problems the affirmative action such as collaborative management on reforestation program, law enforcement, hard sanction and empowering socio-economic of local people must be carried out by stakeholders (central and local government and NGOs) in order to implement sustainable forest management on national park in the long run.

It was occurred conflict of interest between central and local government on natural forest resources particularly on national park management. The central government argues based on the Law number 5/1990 article 14, which 'highlights national park as natural forest preservation that owns ecosystem life and managed with specific zone (core, forest and for research activities). The authority of management belongs to central government and the main mission is to defense national park for its preservation, protection and utilization for research in the buffer. In contrast, local government's argues that the existence of national park in her district could be utilized natural resource to extent as original income for local government (PAD), for infrastructure building and society as large purposes, especially in autonomy era. In line with local government's mission, local people also see 'national park' from viewpoint of direct economic values. Therefore, the excess of illegal logging and mining occurred in Tanjung Puting national park which subsequently affect on deforestation. In this context, both conflict of interest between two actors of stakeholder (central and local as well) are fascinating to be elaborated.

Key words: national park management (ecology, economic and social), stakeholders, central and local government conflict of interest, and collaborative management.

[1] This paper is presented on "In Search of New Paradigm on Sustainable Humanosphere", in The 1st Kyoto University-LIPI Southeast Asian Forum, in LIPI, Jakarta on November 26-27, 2007. The data of Tanjung Puting National Park management was carried out field research in May, 2006.

[2] Researcher (APU) at Research Center for Society and Culture (PMB), Indonesian Institute of Sciences (LIPI).

Introduction

Forest is one of the renewable natural resources that could provide elements for human being to produce and consume. Yet, forest has regeneration potential and limited assimilation, until during its exploitation under the limited assimilation, forest resources could be utilized on sustainable. In contrast, if it is exceeded, forest resources could be degraded and forest resources' function as production and consumption factors will be in a threat (Soemarwoto, 2001: 59). Therefore as potential resources, forest are important, not just for the production of the timber, but also for many social and ecological functions such as conservation of biodiversity, the supply of water, and the prevention of global warming (M. Inoue & H. Isozaki, 2003: xi). On the other hand, forest resources often become a capital that could be utilized for national development in any country, as done for timber industries (*plywood, sawn wood, pulp and paper*, etc.) in New Order (Soeharto regime) period and became the second largest foreign exchange earnings after of oil boom in 1980s-1990s.

National parks in Indonesia which are currently (2007) accounted more than fifty units (at least 23.5 million hectares) is one of the last resort for *forest conservation* in order to prevent forest degradation and to keep sustainable natural forest which their specific ecosystem and biodiversity on flora and fauna. As it was well-known in Earth Summit June, 1992 in Rio de Janeiro that 'forest conservation' was one of the key issues in this Summit meeting. Although countries adopted Agenda 21, which called actions to prevent 'deforestation', and the Forest Principles, the Earth Summit failed to conclude with the creation of a Forest Convention.

After the Earth Summit, a number of international initiatives emerged, such as the Intergovernmental Panel on Forest (IPF), the World Commission of Forests and Sustainable development (WCFSD), and others; in order to find ways to halt worldwide deforestation and degradation of all types of forestlands. And its development at the Special Session of the General Assembly of the United Nations to Review and Appraise the Implementation of Agenda 21, in June 1997, was agreed that work should be continued in order to reach an international consensus on forest conservation.

Obviously, in the past, most debates regarding various aspects of forests tended to focus on the forest sector and the direct causes of deforestation and forest degradation and not on the cross-sectoral aspects of the underlying causes linked to them, such as the connection between forests and societies. After the UN Special Session, non-governmental organizations took the initiative on one of the most pressing agendas and started researching the underlying causes of deforestation and forest degradation.

In recent years, the world's forests have been affected by over exploitation, over harvesting, over grazing, pests and diseases, climate changes, global warming, floods, soil erosion, droughts, storms, air pollution, forest fires, as well as economic crisis in Asia and other regions-all leading to an overall decrease in world's forest cover. Forestry in Asia, particularly in Southeast Asia which traditionally as

timber supply to forest industries in Japan and others, have been strongly impacted. A number of initiatives have suggested forest policy reforms, reforestation program, against illegal logging actors, and the need for the sustainable managements of forest has been widely recognized and encouraged. Because implementation of reforms at the local level has been insufficient, it is imperative that local people begin to effectively participate in forest planning and management as well as in protected-area management.

This paper discusses the role of Tanjung Puting National Park in Central Kalimantan from political ecology perspective which emphasizes the role stakeholders/actors in the collaborative management and its implication on various ecological issues. This paper also will analyze conflict of interest between central and local government on the policies of natural forest resources particularly on national park management.

Theoretical Review

This study uses “political ecology” as an analytical framework which emphasizes on stakeholders movement (Figure 1).[3] Now we must clarify, what political ecology means. Many scientists (Paterson, 2000; Bryant, 1992; Vayda, 1983; Blaikie and Brookfield, 1987; Abe Ken-ichi, 2003) define it differently. (Paterson, 2000) notes that, "political ecology as an approach that combines the concerns of ecology and political economy to represent an ever-changing dynamic tension between ecological and human change, and between diverse groups within society at scales from the local individual to transnational as a whole." Other scientists define it as, "political ecology” a framework to understand the complex interrelations between local people, national and global political economies, and ecosystems" (Blaikie and Brookfield, 1987). The concept has been adapted in a variety of ways, such as Third-World political ecology, where (Bryant, 1992) notes that: "political ecology may be defined as the attempt to understand the political sources, conditions and ramifications of environmental change." Most current political ecology tends to overlook ecological dynamics and focus upon the structure of human systems (Rocheleau et al., 1996). Abe Ken-ichi (2003) defines political ecology, as “a collective name for all intellectual efforts to critically analyze the problems of natural resource appropriation and political economic origins of resource degradation, be they for the purpose of academic study or practical applications”.[4] In other words, political ecology is concerned with the political dimensions of natural resource use and subtleties of those politics. Apparently, the scope of political ecology has been referred to as ‘a method of analyses, rather than a

[3] See Bryant, R & Bailey, Sinead (1997). *Third World Political Ecology*. London: Routledge Press. Further the implementation for political Ecology concept, see Yoshiki Seki, “The Political Ecology of the Philippine Restoration Program: ODA, Government, and Local People”, in *Philippine Political Science Journal*, Vol 22, Number 45, 2001, pp. 79-93.

[4] Abe, Ken-ichi (et.al). *The Political Ecology of Tropical Forests in Southeast Asia ; Historical Perspectives,* Kyoto University Press, Japan, 2003, pp. 3-4

unified scientific discipline or sub-discipline, which is usually characterized by a set of related ideas, premises, and theories.

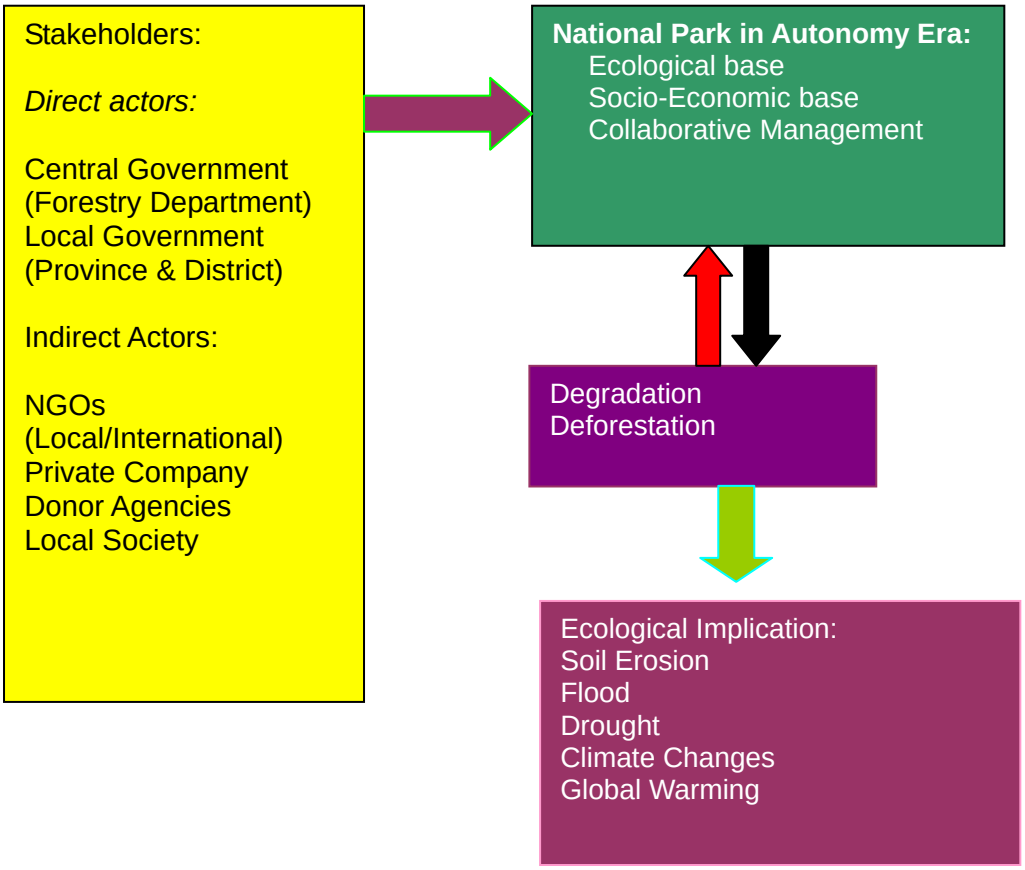


Figure 1. Stakeholders on National Park Management and its Implication (Source: improvement from Bryant and Bailey's Concept of Political Ecology, 1997).

Meanwhile, (Vayda, 1983) commented: political ecology is similar to a method applied by human ecologists analyzing policy-relevant environmental questions that is 'progressive contextualization'. This approach starts with actors, in this case direct resource users, and considers the contexts within which they act or do not act in a particular way towards a resource. This approach also intends to explain why people use the environment in particular ways, sometimes causing resource decline or degradation detrimental to their own and others' uses of the resources (Peluso, 1992).

From the above definitions, apparently, Bryant's definition, which emphasizes 'putting politics first' on the political ecology of sustainable development aspects is more operational on reviewed Tanjung Putting National Park. There are two reasons for this condition. First, that 'political and economic pressure' from the Soeharto government was predominantly colored on forest management since three decades. Second, the implication of political and economic pressure upon 'ecological' perspective was ignoring by forestry bureaucrats, which subsequently affect into forest degradation and deforestation.

'Political ecology' is a framework to approach to the subjects mentioned. It is a generic term used for the field research connecting two types of studying by bringing the point of view politics into the study of environmental disruption. It includes a small-scaled study centered on local society (e.g., cultural anthropology, applied anthropology) and a large-scaled study from national and worldwide standpoint (e.g., political economy).

Description of Tanjung Puting Area

Tanjung Puting National Park initially established and consisted on two conservation areas, namely Kotawaringin areas which width 100,000 ha based on Zelfbestuur van Kotawaringin number 24 June 13, 1936 and Sampit conservation areas 205,000 based on letter decision by Governor General of Dutch colonial number 39 August 18, 1937. Both conservation areas in Kotawaringin and Sampit eventually merged to become Tanjung Puting, with totally covered 305,000 ha.[5] This national park is very rich in flora and fauna, etc. It categorized fauna such as twelve various birds and 38 mammalian. Four among famous mammalian are Orangutan (*Pongo pygmaeus*), Owa-Owa (*Hylobates agilis*), Beruang Madu (*Helarctos malayanus*) , and Bekantan (*Nasalis larvatus*). In case of birds such as Sindanglawe (*Storm stork*, *Ciconia stormil*), etc. From the vegetation perspective, Tanjung Puting areas are the center for biodiversity storage. For example Dipteocarpus forest type which covers 50-60 percent and wet forest (10 percent) from all areas. It contains valuable trees such as Meranti (*Shorea* spp), Gaharu (*Aquilaria malaccensis*), Kayu Ulin (*Eusideroxylon zwageri*), Ramin (*Gonystylus*), Rattan, Damar Batu, etc.

In 1978 through the decision from Ministry of Agriculture number 698/Kpts/Um/II/1978 on November 13, 1978, which excluded 30,000 ha areas between River Serimbang and Segintung. Then, total width of Tanjung Puting National Park was reduced to become 270,040 ha. And its development in 1981 Tanjung Puting National Park declared as 'world heritage' for Biosphere Conservation by UNESCO. It means that from the management perspective, the responsibility of Tanjung Puting maintenance not just Indonesia government through Department of Forestry (Directorate General of Forest Protection and Natural Conservation) but also international community actively involved on NGOs formation such as Orangutan Foundation International (OFI) and World Education (WE) that sponsored by UNESCO and Illegal Logging Response Centre (ILCR) which sponsored by European Community (EC).[6]

Ecotourism Potential

Besides, as storage of flora and fauna, National Park Tanjung Puting familiarly well-known as

[5] See Book two on *Planning and Tanjung Puting Management: 1999-2024*, published by Department of Forestry and Plantation, Directorate General of Protection and Forest Conservation, Tanjung Puting National Park Institute, p. 5-10.

[6] Hidayat, Herman (eds.) (2006*). Conflict Potential between Central and Local Government on National Park management in Local Autonomy (A Case Study of Tanjung Puting and Kutai*), Jakarta: LIPI Press, p.44.

recreation resort for domestic and foreign tourist. There are three driving factors Tanjung Puting appointed destination by visitors: (1) the status of Tanjung Puting National Park as 'world heritage' for the biggest Orangutan habitat in Kalimantan since the middle of 1990s; (2) it was occurred film shooting making about Orangutan condition. This film has been told the bad condition of Orangutan because some factors such as forest fires, deforestation, catches up by hunters and sold them by traders to the third parties (black market). This film used as campaign tools to change international views on Orangutan as be an extinguished animal in Kalimantan; (3) the positive support by local and central government because it has been provided by good access to the location, infrastructure, security, safety and social and political stability in the district level.

Some eco-tourism areas which mostly visited by visitors:

1) Tanjung Harapan area which has been designated as utilization and research and it well equipped with resort home for tourist, location for Orangutan Rehabilitation Center, tracking and Orangutan Meal Exhibition in certain time every morning at 8.00 o'clock and afternoon at 14.30.
2) Tanggui Camp used for specific utilization for tracking in night visiting and Orangutan rehabilitation activities and might to see to feed up at 8.00 o'clock. This location is the habitat for deer, forest pig, and various birds such as Rangkong, Paruh Bangau, and others.
3) Leaky Camp was designated as specific utilization zone since 1970 for research and protection of Orangutan. This camp could find out wild Orangutan (*Pongo pygmaeus*) rehabilitation and Owa-Owa (*Hylobates agilis*). In the upstream of Sekonyer River in Leaky camp could find out Buaya Muara (*Crocodilus porosusu*) and Buaya Senyulong/Sapit (*Tomistoma schlegelli*) which well-know very wild.

There are visitors as well domestic and foreign in 2004 (Table 1). For example visitors based on their nationality derived from United States 115, United Kingdom 101; Australia 51, Germany, 50, Japan 12. Mostly foreign visitors visited in September and October and domestic tourists in July and September. From the incomes perspective, totally received in 2004 Rp. 226.922.000 and slowly reduced in 2005 to become Rp. 178.827.000. The factors of income reduction related to the national security in terms terrorism issue and boom in Indonesia in 2000s.

After the realization of local autonomy since January 2001 the income from visitors' fees US$ 5/one day for foreign visitors and domestic Rp. 5,000/day/person.[7] The distribution of income divided 80 percent for local government and Tanjung Puting National Park Office received 20 percent.

[7] The decision of ticket fee to Tanjung Puting National Park based on *PERDA* (Local Government Regulation) number 11, 2002 and Head of District (Bupati) Kotawaringin Barat, July 2002.

Table 1. Visitors to Tanjung Puting National Park in 2004

No	Activities	Foreign/man	Domestic/man	Foreign/days	Domestic/days
1.	Visitors	580	444	4,380	1,479
2.	Research	3	17	148	366
3.	Film Shooting	11	-	-	75
4.	Volunteer	24	-	-	432
5.	Official	-	-	-	
	Total	618	461	5,528	2,352

Source: Tanjung Puting National Park Office's Statistic, 2004.

Stockholder's Perception on National Park

Central Government

National Park (such as Tanjung Puting) has the significant role and strategic function for conservation and protection for biodiversity, flora and fauna. To achieve this role, central government and other stakeholders have task strategic function to maintenance for catchments area, hydrology resources, watershed, to produce O2 (carbon sink) and micro climate, and as educational and research facilities, eco-tourism and ecological services, etc.[8] There are three main purposes of national park management: 1) the protection of ecological process in order to guarantee sustainable its function and role as ensuring systemic life; 2) to preserve various of natural resources and its ecosystem in order to maintain genetic preservations; 3) and to generate sustainable benefits for improvement of social welfare for society who live in and around national park particularly and society at large in general.[9] Obviously, three purposes of national park established are appropriate with the law number 5, 1990 about "Natural Conservation and its Ecosystem "which highlighted that central government has responsibility to manage the national park. In line with these purposes, national park management in any districts in Indonesia, the National Park Officers (as representative of Directorate General of Forest Protection and Natural Conservation) must always pay attention of three dimensions namely ecological, economic and social. Hopefully this dimension has positive implication to other stakeholders' especially local people. Therefore to realize this dimension should make strategic step by establishing internal zone (core zone, forest zone and research zone) and external zone, so called "buffer zone" as the border line with society's land.

In fact to prevent national park management from against of crime among society who enter national park and make *illegal logging* and *mining* activities, the active role of local government (province

[8] See Wiratno, et.al (2004). *Berkaca di Cermin Retak: Refleksi Konservasi dan Implikasi bagi Pengelolaan Taman Nasional*. Dephut dan Gibbon Foundation, hal. 200-202.

[9] Interview with Ady Susmianto, Director of Conservation area, Directorate General of Forest Protection and Natural Conservation (Department of Forestry), May 27, 2005, in Jakarta.

and district) in autonomy era on establishing “Buffer zone” (zona penyanggah) is very necessary. The function of this zone that used by Agro-forestry program could be facilitated by local government and National Park Officer. The role of Agro-forestry which could be planted leading local species trees and plantation (such as Potatoes, Kayu Manis, Albazia, Durian, Rambutan, Kemiri, Jengkol, etc.) could be positive implication for income generating of local people. But, the reality until now none of ‘buffer zone’ was established by local government cooperated with national park officer.

Local Government

Although local government has not real ‘authority’ to manage national park, based on the law (number 5/1990), but the co-management with central government is very necessary. As told by head of forest agency in local government (district) that the function of Tanjung Puting national park is very strategic and significant such as for hydrology resources, watershed, catchments area for the purposes of agricultural water supply. Therefore, in order to maintain this national park, local government has moral obligation to cooperate with National Park Office. For example, for increasing local people’s income generating, local government (districts) had been established four (4) resort homes for tourist in Sekonyer village. The management of resort home was organized by local people. The charge of average room Rp. 120,000/per day, plus breakfast for foreign and Rp.80,000 per day for domestic tourist. While this research carried out in May 2006, 4 persons tourist from Belgium came and spent for tow days. The distribution of income divided, namely 80 percent for local people and 20 percent for local government.

In crushing illegal logging activities such as Balak Telabang Operation One which was held on December 5-24, 2000 and continuously launched with Balak Telabang Operation Two from January 22 until February 10, 2001. The synergic operation between local government, National Park Officer and local people could capture 50 men in jail and more 1.500 m^3 mix forest trees and 1.176 m^3 Ramin trees. It was six driving factors caused deforestation in Tanjung Puting areas: 1) economic crisis occurred in 1998-2001; (2) the change of political order from centralization power to decentralization (local autonomy) since January 2001; 3) the weakness of coordination between law officers and the function of court in central and local as well; 4) the KKN practices (*corruption, collusion and nepotism*) happened between government officers and private business); 5) the weakness of forest security system and the inspection of forest products; 6) and the price of illegal logging is cheaper than the formal wood from HPH (Logging Forest Concession) holders.[10]

Collaborative Management

There were shift paradigms from government based management to become *collaborative*

[10] Interview with Tanjung Puting National Park Officer was held on May 4, 2006. And Forester, staff of Forest Agency in District, West Kotawaringin, May 11. 2006.

management which involve other stakeholders.[11] It means there is indication to realize effective management on protection area, social justice and democratize on natural resources management. Moreover, because Indonesia categorized as a member has ratified Biological Diversity Convention. Therefore, Indonesia must loyal to realize this convention related with biodiversity conservation. NGOs's perception on national park is very strategic function for conservation areas, and it should be maintained on the principles of sustainable forest management.

Related with Tanjung Puting National Park have been carried out collaborative management with other NGOs such as OFI (*Orangutan Foundation Indonesia*), FNPF (*Friends of National Park Foundation*), WE (*World Education*), Yayorin (*Yayasan Orangutan Indonesia*) and ILRC (*Illegal Logging Response Center*) on establishing of *journal* about program and national park activities.

Friends of National Park Foundation (FNPF)

It was made cooperation with Tanjung Puting Office in 1997. The fund rising came from national and international agencies such as Gibbon foundation and local private companies who has responsibility on forest and environmental conservation and empowering on social economic of local people. Actually FNPF in Kotawaringin is branch office and the head office is located in Denpasar, Bali. In realizing the program FNPF supported with other volunteer staff and local people worker. As previously told that Tanjung Puting areas was 65 percent forest degradation because of illegal logging practices and forest fires in 1990s and the early 2000s. FNPF seriously involved for conducting rehabilitation and land conservation program in many areas with provided by self preparation of local trees seeding such as Meranti (*Shorea* sp), Gaharu, Ulin (*Eusideroxylon zwageri*), Keruing (*Dipterocarpus* sp), Jatimas, Jelutung, Tengkawang, Ramin (*Gonystylus*), etc. In 2004 was carried out rehabilitation or reforestation program about 24 ha width and slowly reduced to become 16 ha in 2005, and in 2006 increased to become 29 ha in Camp Pesalat and Beguruh. According to Basuki, alumni of Mulawarman University, Samarinda, Head of Rehabilitation program, that he is very optimistic on acceleration of reforestation program with provided by local trees seed and actively supported by other volunteers from high school pupils and local people, etc. Mostly pupils who actively engage on reforestation program campaign and previously taught conservation subject as extra curriculum in High Scholl (SMA 2) in West Kotawaringin. But, a critical problem regarding the limited fund from other parties (international and local agencies) to carry out reforestation program in large areas.

Meanwhile FNPF cooperated with local people to carry out empowering socio-economic program. This NGO launched on buying 6 female cows and two goats for breeding program in 2005-2006. The

[11] The practice of collaborative management among stakeholders on national park management program especially on forest rehabilitation and empowering socio-economic program of local people was familiarly carried out in 1990s.

target of these breeding activities after several years will be fruitful. Other activities, FNPF also established *Demplot* (agricultural and fishery practices demonstration) area. This training of Demplot invited local people to train their capacity and knowledge in order is able to increase fishery and agricultural products by using technical and mechanical tools, and excellent seeds. As told by FNPF field officer that actually agricultural was very potential sector from the viewpoint of width area, quality of land, irrigation from Sekonyer River and manpower. On the other hand, on the improvement of skill, FNPF officer gave facilities among 2 persons from Sekonyer village to attend training of curving statue and *Batik* printing about one month (2003) in Bali. Hoping, after returned home, they actively involved teaching statue and Batik on technical knowledge to local people. Based on the village report (2006), eventually obtained about 20 persons who practiced as statue and Batik trainees. Mostly their products such as Orangutan statue, garment products (kaos/sport clothes) and kitchen tools- made by local people as souvenirs and sold to tourist. The income generating from these activities such as souvenirs to become best selling for domestic and foreign tourists as well and could improve their social welfare.

World Education (WE)

The *WE* is categorized as international NGO, because it has some programs on conservation and empowering local socio-economic in many countries. The head office of WE is located in Boston, United States of America. The *WE* has *MOU* (Memorandum of Understanding) with Doctorate General of Forest Protection and Natural Conservation (PHKA) and it represented by Balai Taman Nasional (National Park Office).

There are two principles aims for developing WE on the promotion of *ICDP* (Integrated Conservation and Development Project) namely: 1) to improve process of planning and decision making from stakeholders movement in terms of forest conservation, reforestation program in Tanjung Puting National Park; and 2) to launch empowering socio economic program through improving agricultural and poultry products.

In general the achievements target in period October 2003 and February 2006, among of them:

1) The fix establishment of WE operational office in Pangkalan Bun for Tanjung Puting Integrated Conservation and Development Project (TPICDP);
2) Intensively cooperate with Tanjung Puting National Park Office and other stakeholders on synergic constructing program;
3) The food endurance and empowering economic program through implementing of paddy rice, poultry, fishery, agro-forestry products;
4) And improvement of Group organization.

We could realize about fifty up sixty percent the above program. For example, the endurance of food in twelve villages to give service about 1.000 poor farmers, namely 5 villages located in East

Kotawaringin (Seruyan) and 7 villages located in Pangkalan Bun (Figure 2). As told by WE symbol: "because we learn together and produce excellent products." WE develop leading program such as fishery (fish pool, breeding), agricultural products (paddy rice, fruits, vegetables, etc.), poultry (hen, a leading chicken/ayam buras) in some villages in Kumai sub-district.[12] For example, in terms of agricultural products, the intensification of mechanism through using various leading seeds (punggur, mendawa, martapura, etc.), technical instructions, participation of local people eventually produce good results. In 2005 the production of rice increased to become 4.5 ton/per ha, which previously produced average 2 ton/per ha in 2004. This condition has positive impacts to improve social benefits for local people, particularly to provide their food sustainability stock in the future. The response from local people also positive, as told by informants (Yd) that cooperation between NGOs (such as WE, FNPF, etc.) and National Park Officer and local people to promote socio-economic and ecological environments could impact on increasing benefits for their incomes generating.

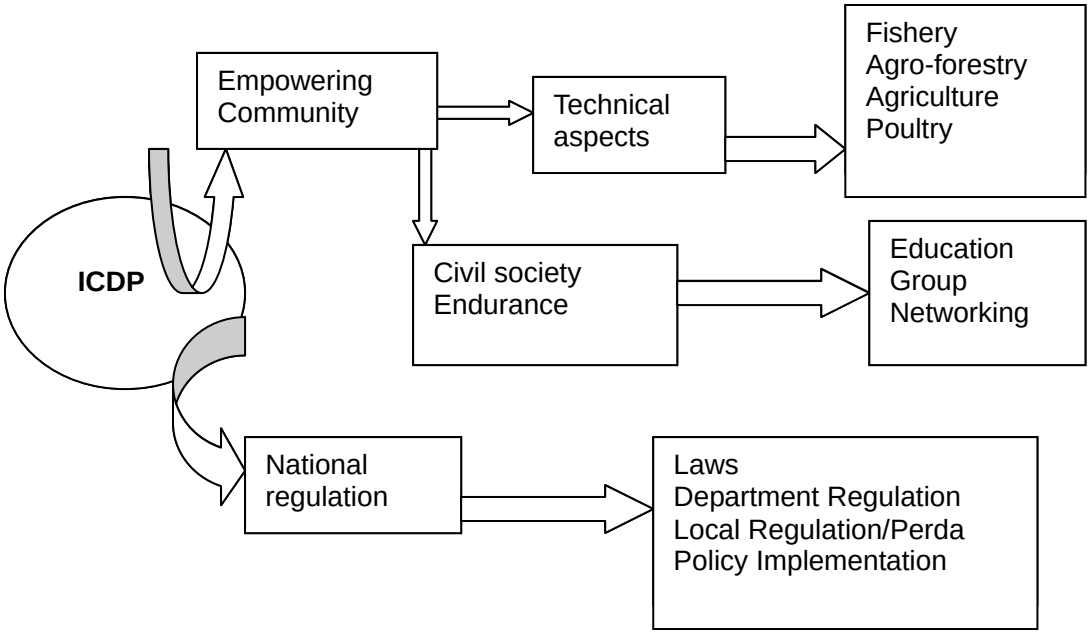


Figure 2. Grand Operational Program of World Education (Source: Booklet of WE (World Education), 2005).

Conflict of Interest Central and Local Government

The spirit of reformation (1998-2005) in autonomy era was strongly demand on positive values such as *democratization, accountability and transparency*. As we know that 'democratization' is characterized by "conflict interest among stakeholders. Therefore, freedoms of expression eventually

[12] See Quarterly report of WE program Period October 2003 to February 2006, Pangkalan Bun.

cause freedom to criticize other parties who has different ideas.[13] In context the relationship between central and local government have been occurred 'conflict interest' particularly on forest resources and natural resources in general. Centralization which had been carried of by central government in Soeharto regime has been shifted into a new paradigm of 'decentralization'. It is because local autonomy is one of the formations of the real practice of democracy to guarantee individual, group, community rights and freedom in society. In line with central and local government relation, democracy demands freedom for local government to manage their affairs in many aspects. On the other hand, autonomy era hoped by local government to develop self reliance and independence and to promote many things to be more progress and subsequently drive local people to be more welfare and prosperity. Related with "national park management" happened" conflict of interest.

Local government sees national park is very potential resources, minus conservation, economic orientation and could be exploited from timber and non-timber exploitation in order to expand their *PAD* (original income of local people). But so far this planning just reach into intellectual discourse among political elites and still not yet publish *Perda* (local government regulation) as regulation from the association decision of executive (head of district) and legislative institutes (local parliament). This condition based on interpretation on law No. 32/2004 about "Local Autonomy". Even if local government's land occupied more than half, it is worth to ask "Special Compensation Fees" (DAK) from central government. This DAK can be used to establish infrastructure and empowering socio-economic of local community who live in and around the border of national park (Figure 3). From this point, actually there is a plan to manage national park by their authorities. But, because of the real condition suffered by local government namely limited of manpower and allocation of local budget beyond their capacities. As a result, local government (Kotawaringin Barat) just want to cooperate with central government (through National Park Officer) and other stakeholders for this areas, based on consideration as follows: (1) strategic function of Tanjung Puting National Park as asset for local, national and international and its function for bio-diversity conservation, protection of fauna and flora especially Orangutan and other animals; (2) it is as ecotourism area for domestic and foreign tourists; and (3) to improve socio-economic program for local people.

Central government's perspective highlighted that conservation in national park areas is very significant.[14] The area categorized as its strategic function as catchments area, hydrology resources, bio-diversity storage, flora and fauna conservation, eco-tourism, etc. Therefore any illegal activities such as illegal logging and mining, land encroachment, land cultivation by local people and others s intolerable and

---

[13] Maswadi Rauf, "Local Government and Horizontal Conflict" in Syamsuddin Haris (eds.), *Decentralization, Democratization and Accountability: Local Government*, Jakarta: AIPI and Partnership for Government Reform in Indonesia, 2002, p. 145.

[14] Interview with Bappeda staff (Local Planning Agency) in Kotawaringin Barat, on May 4, 2007. See, Hidayat, Herman (ed.) (2006). *Op cit*. p. 77.

actors must be captured in jail. For this purpose, the authority rights to manage still belong to 'central government', based on Law No. 5/1999 about "Natural resources conservation and Its Ecosystem").

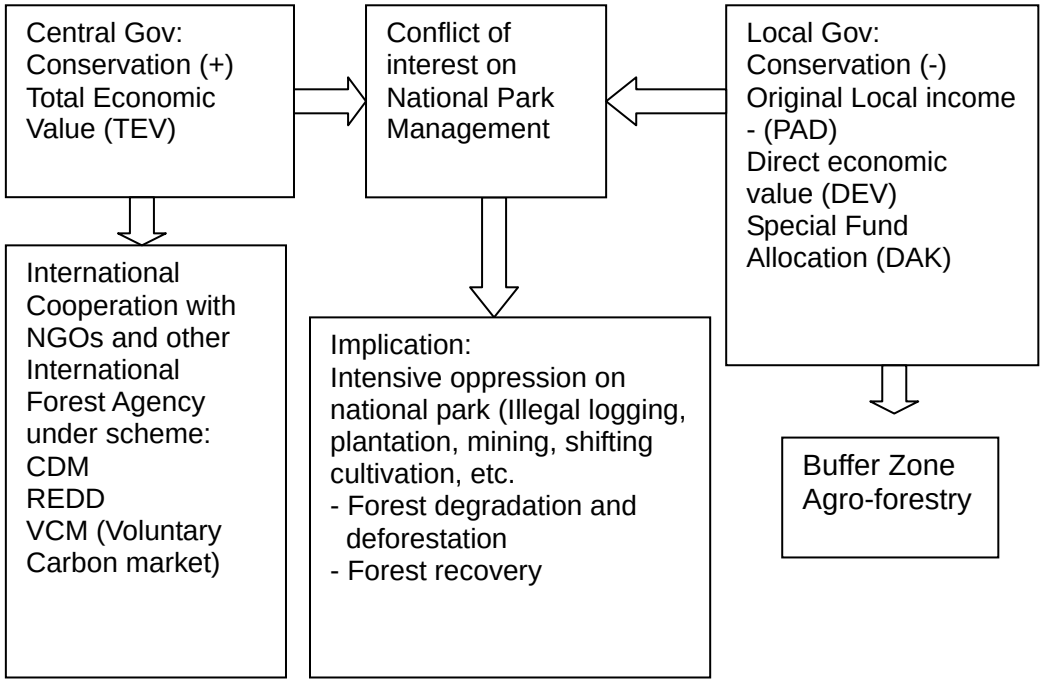


Figure 3. Conflict of interest on National Park and Other Co operations (Source: Data improvement (2006).

Currently happened that increasing of global warming which eventually affect into climate changes as indication of fail the 'Kyoto Protocol' agreement in 1997. There are many affects of global warming: (1) from 1974-2004 the effect of *green house* (*rumah kaca*), CO2 increases 70 percent (from 28,7 billion ton to 49 billion ton CO2); (2) the sea level increases about 18 cm until the end of 21 century; (3) the provided clean water decreased in Asia; (4) in Africa until 2020 about 75-250 million of people suffer the lack of water; (5) and intensity of heating wave as the affect of climate change happened in South Europe and other part of Europe (*Kompas,* November 19, 2007). Underlying factors of Kyoto Protocol fail, because of three critical rationales. First, United States of America (USA) and Australia which considered significant contribution on gas emission do not agree to make signature. Second, the concept of CDM (*Clean Development Mechanism*) which highlighted on *reforestation and afforestation* program among developing countries who especially own 'tropical forest' reluctant to perform this program. The concept of CDM is unrealistic which emphasizes that critical forest land before 1960s must be carried out for reforestation program. Even the practice of logging industries (HPH) among developing countries, including Indonesia began in the early 1970s. The consequence of HPH's practice emerged forest

degradation and deforestation mostly occurred in 1980s, which do not properly perform a sustainable forest management. Third, the emerging of China, Brazil and India as industrialized countries which greatly contribute carbon dioxide must ratified 'Kyoto Protocol' agreement on reduction of gas emission.

What is the role on national parks Indonesia which own about 23.5 million ha? Its role is very significant for production carbon sink to protect global warming. Actually the real challenge how central government which represented by Department of Forestry encourages with international foundation agencies whether among advanced countries, *OPEC* (*Organization of Petroleum Exporting Countries*) international NGOs (*Greenpeace, World Education, WWF*, etc.), United Nations on Climate Changes, etc., cooperate for maintaining national park management. In contrast advanced countries (include G-8) which mastering science, technology and wealth must cooperate with developing countries, especially who own tropical forest for realizing reforestation program and empowering of socio-economic local people.

Vice President, M. Jusuf Kalla launched idea that *oil for education* and *oil for forest* in Summit OPEC meeting on November 17-18, 2007 in Riyadh. Oil for education considered to become significant, issue, because oil consumer countries (include Indonesia) really suffered heavy burden as oil's price up to spend their budgets. Meanwhile, oil for forest related to environmental issue, because oil is the greater part to produce (fossil elements) that cause CO2 and finally affect into global warming. The Conference subsequently agreed the idea and finally established 'fund rising' to take US$ 50 cent/per barrel from OPEC members. This fund intends to sustainable forest development and to overcome global climate change and educational program in developing countries (*Kompas*, November 19, 2007). And even King Abdullah bin Abdul Aziz in closing of summit OPEC meeting gave donation about US$ 300 million for carrying out an initial energy research, environment and climate change issue to developing countries (*Media Indonesia*, November 19, 2007).

Currently, Department of Forestry launches concept of REDD[15] (*Reduction Emission on forest degradation and deforestation*) on November 6, 2007 while held national workshop on reduction 'gas emission' in Jakarta. This concept highlights to maintain a sustainable forest and could continuously contribute its benefits to local people and other parties. But, global responsibility must be performed by advanced country's contributions for giving 'incentives' as fund raising scheme to this program. In fact this concept will be adopted in *UNFCCC* (on climate change) in Bali on December 3-14, 2007. But in case of Indonesia, REDD concept schema has examined in three areas. First, it has done on 'forest hope' areas 101,000 hectares (*Hutan Harapan*) as forest production restoration project that located in the border of Jambi Province and South Sumatra in 2006. Actually allocation of concession from Department Forestry for 100 years to restore the forest areas done by *Restorasi Ekosistem Indonesia* Company (*Kompas*, November 7, 2007). According to Sukianto Rusli, Director of *Wild Bird Conservation* that "forest hope

[15] See Wahyudi Wardojo, "about Forest and Climate Change Anticipation", in *Tempo*, Edisi Khusus 3 Tahun SBY-JK. 29 Oktober-4 November 2007. Wahyudi Wardojo, "about Forest and Climate Change Anticipation", pp.137.

(Hutan Harapan) is tropical forest in low land which a final rest areas about 500, 000 ha and previously existed 3 million hectares. This forest land contains rich of mammalian species in Sumatra." Second, Malino district in East Kalimantan efforts to categorize its protected forest areas about 325,416 ha to voluntary carbon market (*Kompas,* November 9, 2007). The cooperation of three parties initiates by *Borneo Tropical Forest Rain Forest Foundation* (BTRF) with Malino district and *Global Eco Rescue* (*Ecological Service Company*) from Nassau, Bahamas Caribbean Archipelago. This cooperation for forest utilization under schema of voluntary carbon market (VCM) to protect forest areas and maximally its benefits to improve social welfare of people. The VCM schema is one of carbon trade scheme out of CDM (*Clean Development of Mechanism*). According to John Alexander Embiricos, CEO of Global Eco Rescue (GER) said that economic values considered uncertain from this project cooperation for two years. But the GER will give 1 Euro/per ha of forest land which covers of its agreement. That amount of money will be utilized to identification process of carbon sink production from this forest absorption. Marthin Billa, head of Malino district said that carbon trade scheme could not get benefits anymore. But at least, he is very optimism, that this project could elevate social welfare of his people and maintain of forest areas. Third, to prevent global climate change until 2025, Emmy Hafild, Executive Director of Greenpeace Southeast Asia cooperates with Local government Riau to protect *peat swamp forest* (Hutan Rawa Gambut). As known that Riau owns 4 million ha from 22 million ha of peat swamp forest Indonesia could produce 14.6 billion ton carbon dioxide which currently saved in 4 million ha. This cooperation between both parties (local government of Riau and Greenpeace), if Riau could manage 4 million peat swamp forest ha from forest fires and conversion forest land into plantation will be paid US$ 5 until 20 per ton/carbon dioxide

Another example of 'carbon emission reduction' scheme trade between Japan and Indonesia Power and Fajar Futura Company with supported by *BPPT* Agency (Technology Assessment and Application Agency) highlights of five project of micro hydro in Indonesia (Cilencak, West Java with 1 megawatt/MW, Siteki and Blumbungan in Banjarnegara, Middle Java 1.2 MW and 1.6 MW, Ketenger in Purwokerto 0.5 MW and Rante Bala, South Sulawesi 2.4 MW) (*Kompas*, November 10, 2007). This cooperation to reduce carbon emission bought by Japan about 30,000 ton carbon dioxide per year under the scheme of CDM (*Clean Development* of Mechanism) under the Protocol Kyoto mandatory.[16] According to Irhan Febijanto, Coordinator of CDM Team in BPPT that "electric power Engine by using micro-hydro energy is well know ecological friendship and low investment compared with other renewable energy resources". But this scheme is actively engage local people on managing of electric distribution and get benefits of energy and encourage local people to maintain ecological conservation by protecting rain water in catchment's areas.

[16] The estimation of carbon emission reduction market currently cost US $ 5-20 per ton.

Its Implication

There are two ecological impacts which eventually affect on Tanjung Puting areas in the near future. First, illegal logging practice by local people and big wood traders who own company for wood trading in local and export to overseas. Second, illegal mining which affect on water contamination.

Illegal logging means as exploitation forest products (timber) from forest product, conservation and protected areas), through illegal log cutting and its wood process networks.[17] The intensive illegal logging occurred in 1998 and the early 2000s in reformation era. While happened economic crisis in Indonesia which seriously affect in hard difficulties of life among local people, unstable of social and politics, less of security and law sanction. This condition cause driving factors on illegal logging in Tanjung Puting National Park. The protected trees such as Ramin (*Gonystylus bancanus*), Ulin (*Eusideraxylon zwageri*), Meranti (*Shorea* sp), Keruing (*Dipterocarpus* sp), etc., were seriously cut by local people and new comers. The big wood trader as well-known from Tanjung Lingga Group, which leaded by Abdul Rasyid, actively involved as actor of illegal logging. The illegal logging products after shipping from Seknyer River to Kumai port subsequently exported to Singapore, Malaysia, China, Hongkong, and Taiwan.[18] Obviously, illegal logging practice in field, could be identified actively by six main actors:(1) wood traders (cukong), capital holders, and bureaucrats and military); (2) local people and new comers; (3) factory holders (plywood, sawmill, molding, pulp and paper, etc.); (4) HPH holders or IPKH as thief and timber collectors; (5) government officers from forest agency; and (6) and foreign businessmen.

The six actors above eventually support in the operation by various parties such as Indonesian bureaucrat, soft sanction and regulation, and collusion between bureaucrats and businessmen. The ecological impact from serious illegal logging eventually affect into forest fires in 1998-1999, flood in Sekonyer River in rainy, drought in summer season, soil erosion, loss of biodiversity, extinction of flora and fauna such as Orangutan and other animals.

It happen ‘water pollution’ in Sekonyer River because of Indo Turba Factory Company with previously running for CPO of oil palm. This factory initially process CPO from oil palm plantation which is located in upper Sekonyer River and eventually got damage on water treatment. It was happened ‘water pollution that seriously affects animals in river such as Crocodile, turtle, various fishes in Sekonyer River-were among them died. The water pollution also affect into local people which previously use water for their needs such as agricultural, take bath, kitchen water utilization, clothes washing, etc. The effect of mining activities which produce *Pasir Zirkon* (Zirko sand) and *Pasir Puya’* (Puya sand) as raw material for ceramic and asbes. According to Bappeda staff in Kotawaringin, there was no legal ‘permission’ on mining

---

[17] Riza Suarga, *Pemberantasan Illegal Logging: Optimisme di Tengah Praktek Premanisme* Global, Tangerang: Wana Akasara Press, 2005, p. 6-7.

[18] *See Illegal Logging in Tanjung Putting National Park: And Update on the Final Cut Report,* by Telapak and Ela NGOs (*ELA: Environmental Investigation Agency*), 2000, p. 13-19.

exploration. Obviously this mining exploration which carried out by migrant workers from Java, Banjar, Bugis, Madura and some local people seriously affect local government income loss, ecological damage: soil erosion, forest degradation, water pollution, etc. This condition encourages ecological and tourist cost because of water pollution toward local people from their primary and secondary subsistent, supply water for their households affairs (take bath, clothes washing, etc.)-which finally obliged local people to buy water for their needs. Focusing on tourism section income's loss happened in the resort places surrounding in Kumai and Sekonyer village. The domestic and foreign tourists that usually visited in July and September annually decreased just reached 865 persons for foreign and 393 for domestic in 2002, if compared with tourist visited in 2001 reached fantastic 2,380 foreign and 506 domestic. The income from ticket fees reached Rp. 7,144,000,-.

Conclusion

The impacts of human activities on utilizing of fossils (oil and gas) species and land changes (forest land conservation into plantation areas) have been causing 'global warming'. This phenomenon currently happened on 'climate change' which eventually affects on reducing food products, water distribution constraint, flood, drought, sea water tide, and plantation diseases, etc. According to *Stem Review* report that deforestation in developing countries such as Indonesia, Brazil, India, etc.' contributed gas emission (CO2) about 20 percent from global gas emission. Meanwhile, carbon sink which currently saved in forest ecosystem considered to produce greater amount compared with saved in the atmosphere. From this perspective, in order to establish conducive sphere, international support is very significant to protect existed forest areas.

Actually Indonesia owns 23.5 million hectares of forest conservation (national park, Suaka Alam/natural forest for flora and fauna, etc); from total Indonesian forest areas 123.4 million hectares. This condition, actually contribute to produce carbon sink (O2) to protect 'global warming'. Therefore, implementation of gas emission reduction through concept of *REDD* (reduction on forest degradation and deforestation) could eventually give positive 'incentive' into developing countries who own 'tropical forest'. This incentive from advanced countries by paying *REDD* (per ha/1 Euro) could be intensively utilized for forest conservation through huge reforestation program and empowering socio-economic program for local people. As told by Susilo Bambang Yudoyono, Indonesian President in the seminar on 'Climate Change Convention' in New York, in September 2007 that he launched positive idea which supported by other developing countries 'on the necessary to cooperate between developing and advanced countries on managing environmental issues'. Therefore, this cooperation will be established on forest sustainable management and even to formulate developing countries position together who own tropical forest to realize affirmative action on forest conservation. Hopefully the 'financial mechanism scheme on *RADD*'

eventually agreed by participants in the COP-13 in the international seminar on *UNFCCC* (United Nations Framework Convention on Climate Change) in Bali December 3-14, 2007.

Currently forest degradation and deforestation which causing by illegal logging, forest land conservation to plantation and mining activities, etc., occurred in many districts in Indonesia. Based on the report from Department Forestry officer that deforestation reached 1.5 million ha annually. Certainly the real phenomenon of flood, drought, soil erosion, climate changes, global warming, etc., provide us as serious impacts on ecological disaster from forest degradation and deforestation. Therefore to overcome this serious threat 'political ecology' concept that actively engaged stakeholders' movement from central and local government and private sector as direct actors and NGOs whether local and international as well, academician, and local people as indirect actors are very significant to be involved as integrated solution for national park management.

'Collaborative management' which currently promoted in reformation era as alternative concept to be implemented on national park management is very fascinating. It occurred on conflict of interest of national park management between central and local government. This concept highlights among stakeholders role on promoting rehabilitation or reforestation program and empowering socio-economic local people, apparently looked at as 'positive solution' to recover forest degradation and deforestation in the near future. Therefore the commitment and consistency to perform 'affirmative program' among stakeholders such as the central government on encouraging international donation agencies cooperation, National Park Office and NGOs which invited local people and the serious attention to establish "buffer zone" for *agro-forestry program* by local government as means of incomes generating for local people is very necessary to be realized in autonomy era.

References

Abe, Ken-ichi (et.al.). 2003.*The Political Ecology of Tropical Forests in Southeast Asia: Historical Perspective.* Japan. Kyoto University Press.

Blaikie, P & Brookfield, H. 1987. *Land Degradation and Society*. London. Methuen Press.

Brookfield, Harold & Byron, Yvonne. 1993. *South-East Asia's Environmental Future: The Search of Sustainability.* Singapore. Oxford University Press.

Bryant, et.al. 1993. " Forest Transformations and Political Ecology in South-East Asia", *Global Ecology and Biogeography Letters*, Vol. 3, pp. 101-103.

Bryant, Raymond. 1991. "Putting Politics First: The Political Ecology of Sustainable Development", *Global Ecology and Biogeography Letters,* Vol. 1, pp. 164-166.

Bryant, Raymond. 1998. "Power, Knowledge and Political Ecology in the Third World: A Review", *Progress in Physical Geography,* Vol. 22, 1, pp. 79-94.

Bryant, Raymond. 2000. "Politicized Moral Geographies: Debating Biodiversity Conservation and Ancestral Domain in the Philippines", *Political Geography,* Vol. XIX, Issue 6, pp. 673-705.

Bryant, R & Bailey, Sinead. 1997. *Third World Political Ecology.* London. Routledge Press.

Hidayat, Herman (ed.) (2006).*Potensi Konflik Pemerintah Pusat dan Daerah dalam Pengelolaan Taman Nasional (Studi Kasus Taman Nasional Tanjung Putting, Kalteng dan Kutai, Kaltim*). Jakarta. LIPI Press.

Inoue, Makoto and Isozaki, H. 2003. *People and Forest Policy and Local Reality in Southeast Asia, the Russian Far East, and Japan*. London. Kluwer Academic Publishers.
Kompas, , November 7,9,10, 14,and 19, 2007.
Media Indonesia, November 19, 2007.
Peterson, Garry. 2000. "Political Ecology and Ecological Resilience: An Integration of Human and Ecological Dynamics", in *Ecological Economics,* Vol. 35, Issue 3, December, pp. 323-336.
Peluso, Nancy Lee. 1992. "The Political Ecology of Extraction and Extractive Reserves In East Kalimantan. Indonesia", in *Development and Change,* Vol. 23, No. 4, October.
Rocheleau (eds.). 1996. *Feminist Political Ecology: Global Issues and Local Experiences.* London. Routledge Press.
Rauf, Maswadi. 2002. "Local Government and Horizontal Conflict" in Syamsuddin Haris (eds.), *Decentralization, Democratization and Accountability: Local Government*, Jakarta: AIPI and Partnership for Government Reform in Indonesia.
Riza Suarga, *Pemberantasan Illegal Logging: Optimisme di Tengah Praktek Premanisme* Global, Tangerang: Wana Akasara Press, 2005.
Soemarwoto,Otto. 2001.*Ekologi, Lingkungan Hidup dan Pembangunan*. Jakarta. Djambatan.
Tempo, Edisi Khusus 3 Tahun SBY-JK. 29 Oktober-4 November 2007. Wahyudi Wardojo, "about Forest and Climate Change Anticipation", pp.137.
Wiratno, et.al (2004). *Berkaca di Cermin Retak: Refleksi Konservasi dan Implikasi bagi Pengelolaan Taman Nasional*. Dephut dan Gibbon Foundation.
Yoshiki Seki, "The Political Ecology of the Philippine Restoration Program: ODA, Government, and Local People", in *Philippine Political Science Journal*, Vol 22, Number 45, 2001.

HIDAYAT Herman is Senior Researcher of Political Ecology at the Research Center for Society and Culture, Indonesian Institute of Sciences (LIPI), Jakarta. He received his Doctorate Degree in Department of Forest Science, Graduate School of Agricultural and Life Sciences, The University of TOKYO in January 11, 2005. He took Ronpaku Program (Ph.D) under the sponsorship of *JSPS* (Japan Society for the Promotion of Sciences), Tokyo from 2000-2005. The topic of his dissertation entitled:" *Dynamism of Forest Policy in Indonesia: Focusing on the Movement and Logic of Stakeholders under the Soeharto Government and Reformation Era.*" He was received IDE-JETRO scholarship for six months (August 2006-February 2007) in Makuhari, Chiba Prefecture to carry out research and published his manuscript entitled:" *Pulp and Paper Industries in Japan and Indonesia: from the Viewpoint of Political Ecology* (2007). His major publications include: Hidayat, Herman (eds.), *National Park Management in Local Autonomy Era: Conflict Potential between Central and Local Government: A Case Study of Tanjung Putting (Central Kalimantan) and Kutai (East Kalimantan)* (2006); *National Park Management in Local Autonomy Era: A Case Study of Kerinci Seblat (Jambi) and Buki Tigapuluh (Riau)* (2005); *National Park Management in Local Autonomy Era: A Case Study of Bogani Nani Wartabone (North Sulawesi) and Rawa Aopa Watumohai (Southeast Sulawesi)* (upcoming publish 2008) "Coffee Plantation from the Viewpoint of Traders: Local to National: A Case Study in Kepahiang, Rejang Lebong Districts, Bengkulu, South Sumatra in AB Lapian et.al, *Taufik Abdullah 70 Years Commemoration: History and Civilization Dialog* (2006).

Grand Session 3

Seeking Sustainable Society through Science and Technology

Shuichi Kawai

Director of Research Institute for Sustainable Humanosphere, Kyoto University

Abstract

Humankind is now facing the serious crisis such as the population explosion, energy crisis, and global warming. Interdisciplinary research with broader perspective view is highly requested to solve such critical issues. Research Institute for Sustainable Humanosphere (RISH) lays special emphasis on the new concept of Humanosphere where human activities interact to the surrounding environments. Thus, humanosphere science covers a wide range of research fields on the humanospere from ground to the atmosphere and space- all of which are vital to human existence. RISH acts as a core research institute for inter-university and international collaboration, provides eight research facilities and equipment and a variety of databases on the humanosphere, and also holds research conferences/symposia to promote interdisciplinary and exploratory research programs.

Since the tropical region receives the highest concentration of solar energy which is the ultimate energy source of all organisms of earth and is the driving force of global atmosphere dynamics and of the production of plants, RISH has been collaborating with the National Institute for Aeronautics and Space, Indonesia (LAPAN) for equatorial atmospheric observation, and with the Indonesian Institute of Sciences (LIPI) for the research on sustainable production and utilization of tropical trees, respectively, for more than 20 years.

RISH installed the Equatorial Atmosphere Radar (EAR) at Koto Tabang in West Sumatra, Indonesia and has investigated the atmospheric circulation and waves closely related to environmental changes by satellites and high performance radars being designed for the accurate monitoring of minor components such as carbon and water in the atmosphere.

Reforestation of fast-growing tree species from the devasted inperata grassland seems to recover the vegetation and to contribute to the CO2 fixation, supply the wood resources/biomass energy and vitalization of the regional economy, though it may introduce the degradation of the biodiversity with its mono-cultural plantation and socio-economic conflicts in the region. We chose the industrial plantation forests of tropical trees in South-East Asia as research sites, and organized inter-disciplinary research projects that included the evaluation of the tree biomass production by both, tree growth analysis and remote sensing technology, environment monitoring and assessment by atmosphere and biodiversity observations, and biotechnology for enhancing tree functions. The purpose of these projects is to develop the academic and technological solutions and to establish the cyclical system of resource and energy in the region, which supports the harmonization of the ecology and economy of the country.

Introduction

The rapid expansion of world population, shortage of resource and energy, and degradation of environment has created many concerns which may endanger these indispensable regions and become a great threat of the survival of mankind. Continuous growth of world population and economy will accelerate the aggravation of these problems.

Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report of Working Group I clarified the role of human activity in climate change, resulting in the following conclusions; 1) Climate change is accelerating and its effects are becoming manifest, 2) Human impact is clear. It is likely

that the warming of global temperatures observed in the second-half of the 20th century is attributable to increases in anthropogenic greenhouse gas emissions, 3) Continued emissions at this pace will engender a crisis

Advanced science and technology has been specialized recently and each discipline is tended to be disconnected with each other. The network of the information and integrated knowledge based on the broader view is required to give the solutions to such critical issues on the global environment.

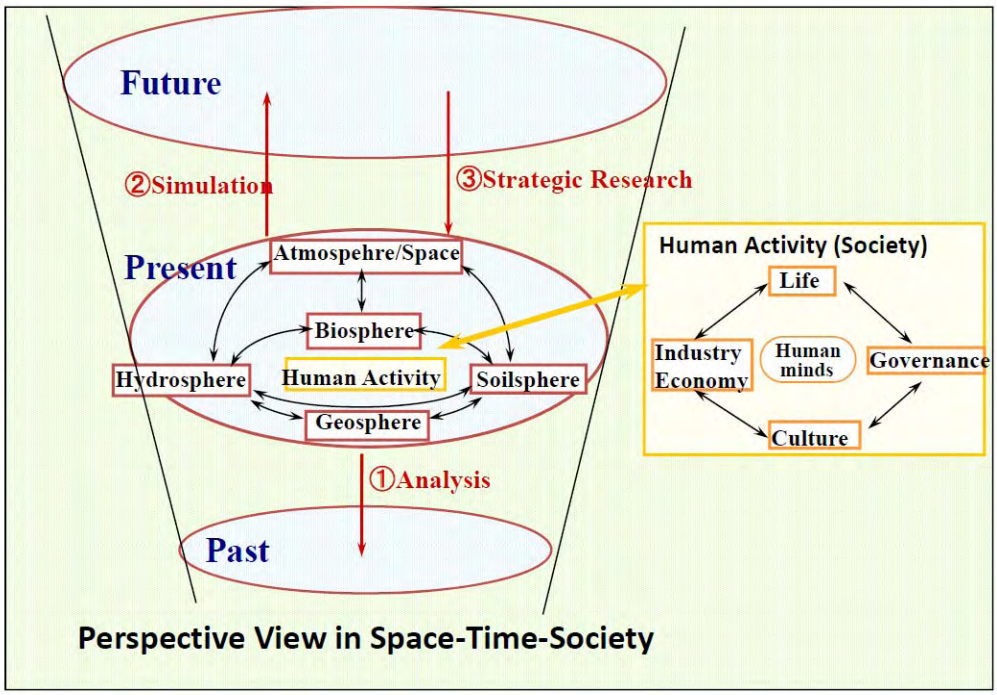


Figure 1. Perspective view in space-time-society (from B Tomita).

From this point of view, the Japan Perspective published by the Science Council of Japan in 2002 pointed out the importance of perspective view in space-time-society as shown in the Figure 1. It also emphasizes the social responsibility of the scientists to address critical issues to the public, what we know from our research and what we need to do. The most important of all is to return outcomes of our research to the societies for their benefits. In this paper I would like to discuss the role of science and technology in establishing sustainable society based on the research activities of the Research Institute for Sustainable Humanosphere (RISH), Kyoto University.

Humanosphere Science

Taking into the consideration on such idea of science for society, the RISH sets its primary objective to explore the innovative sciences and technologies which will contribute to establishing a solar

energy-dependent sustainable society amenable to the environment. RISH lays special emphasis on the new concept of Humanosphere where human activities interact to the surrounding environment. Thus, humanosphere science covers the research fields on the humanospere from ground to the atmosphere and space- all of which are vital to human existence for establishing the sustainability of both the human society and eco-system on the earth. Humanosphere science is an interdisciplinary field of study which assesses the conditions of this humanosphere, foresees its needs, and provides with the academic and technological solutions to the critical issues.

The objectives of RISH are to understand the conditions of humanosphere as accurately as possible (diagnosis), and to provide solutions to its problems (remedy).

RISH acts as a core research institute for inter-university and international collaboration, provides eight research facilities and equipment and a variety of databases on the humanosphere, and also holds research conferences/symposia to promote interdisciplinary and exploratory research programs. The eight research facilities and equipment at RISH are shown in Figure 2. Some of the facilities are located and operated outside the Kyoto University campus.

.

Figure 2. Eight Collaborative Research Facilities and Equipment (yellow) and Databases on the humanosphere (pink) (RISH pamphlet 2007)

Since the development of technology for renewable energy such as solar and biomass energies is an interdisciplinary new research field of transformation and utilization of solar energy, RISH has conducted research on Solar Power Satellite (SPS) which directly converts the solar energy to electric energy, and transfers to the earth through microwave. SPS can provide a large capacity of power generation without fossil fuels resulting in the reduction of CO_2 emission while meeting the increasing energy demands. Microwave Energy Transmission Laboratory (METLAB) is composed of an anechoic radio wave chamber and experimental rooms especially designed for microwave power transmission experiments.

The social infrastructure based on renewable resources rather than non-renewable ones can be achieved through the extensive utilization of renewable wood resources. The technical base for the practical utilization of biomass energy leads to the reduction of CO_2 emissions. The conversion technologies of wood biomass to ethanol, chemicals and advanced carbon materials by using biological and thermochemical processing is intensively carried out as well

Collaborative Research Activities of RISH in Indonesia

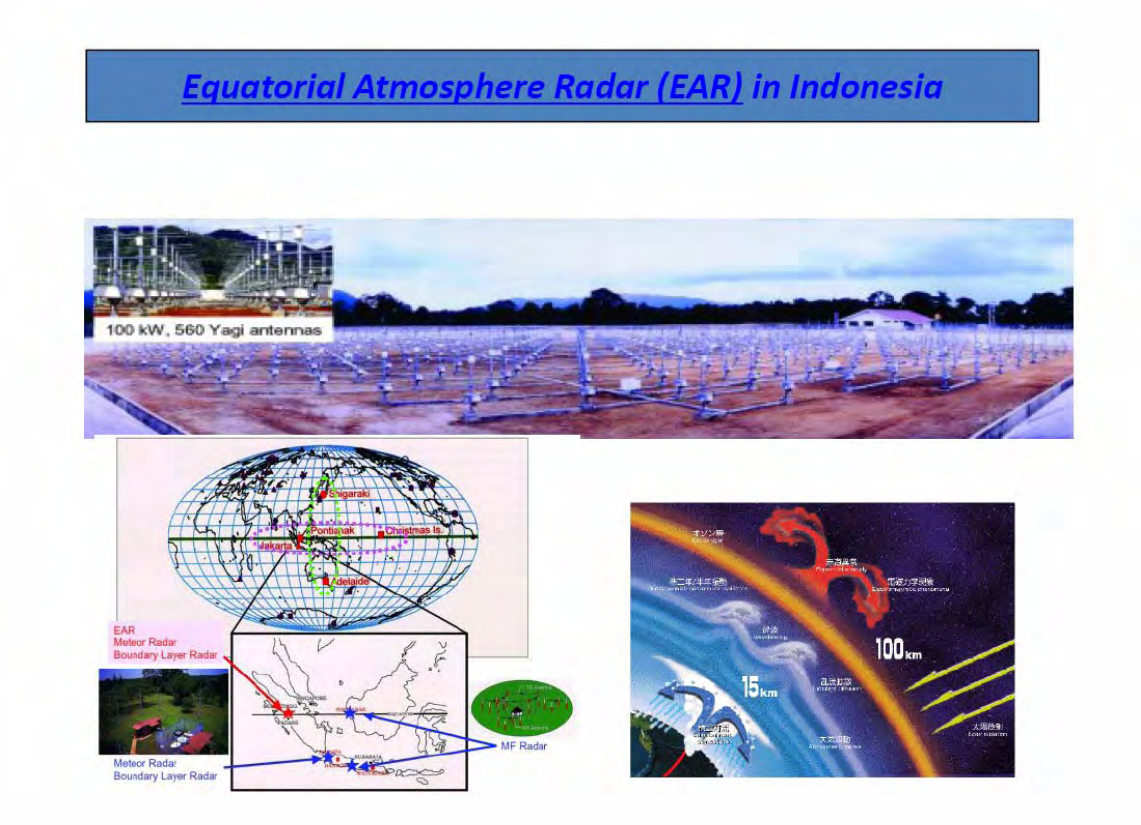


Figure 3. Equatorial Atmosphere Radar (EAR) in Indonesia (RISH pamphlet 2007)

Since the tropical region receives the highest concentration of solar energy which is the ultimate energy source of all organisms of earth and is the driving force of global atmosphere dynamics and of the production of plants, RISH has been collaborating with the National Institute for Aeronautics and Space, Indonesia (LAPAN) for equatorial atmospheric observation, and with the Indonesian Institute of Sciences (LIPI) for the research on sustainable production and utilization of tropical trees, respectively, for more than 20 years..

RISH installed the Equatorial Atmosphere Radar (EAR) at Koto Tabang in West Sumatra, Republic of Indonesia, as shown in Figure 3, and has investigated the atmospheric circulation and waves closely related to environmental changes by high performance radars being designed for the accurate monitoring of the global environmentThe sustainable forest management is getting more and more important especially in the South-East Asian countries, which supports the harmonization of the ecology and economy of the countries. Reforestation of fast-growing tree species from the devasted inperata grassland seems to recover the vegetation and to contribute to the CO_2 fixation, supply the wood resources/biomass energy and vitalization of the regional economy, as shown in Figure 4, though it may introduce the degradation of the biodiversity with its mono-cultural plantation and socio-economic conflicts in the region.

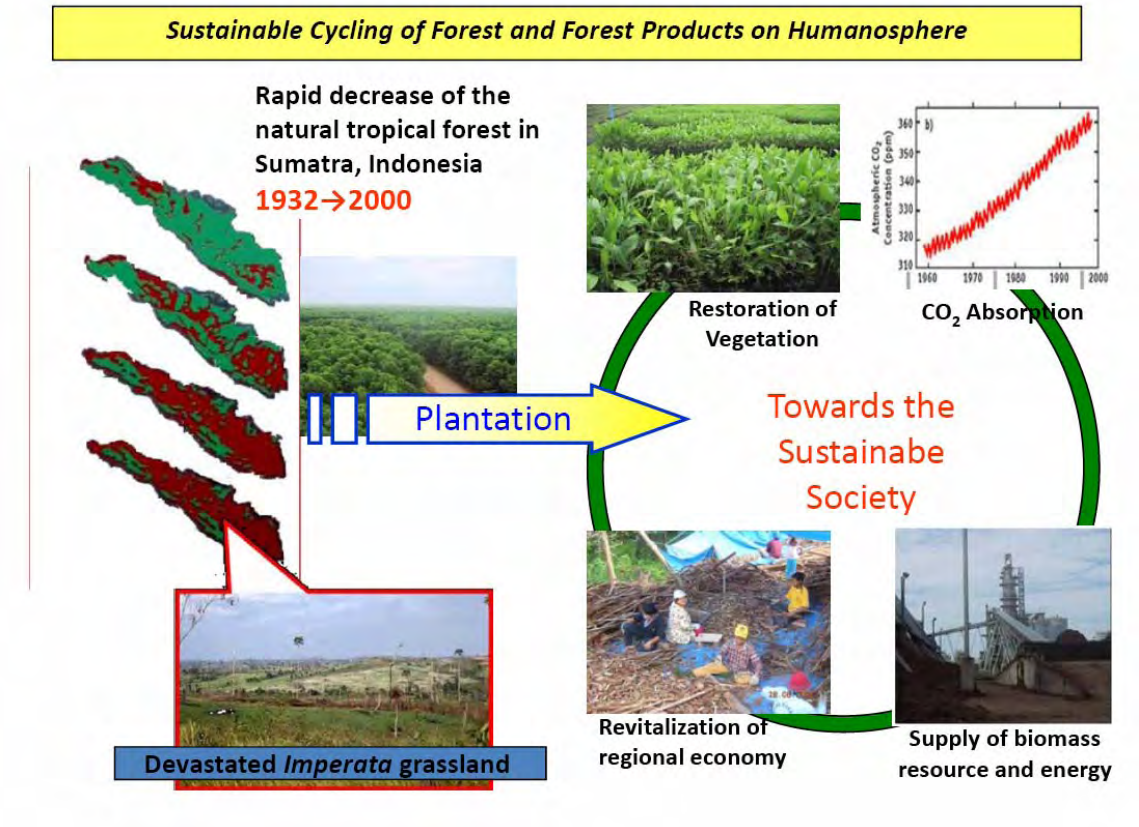


Figure 4. Sustainable Society through reforestation in Indonesia (RISH 2007)

A Case Study of the Acacia Plantation on Sustainable Forest Management, Forest Products and Regional Environment

We chose the industrial plantation forests of tropical trees in South-East Asia as research sites, and organized inter-disciplinary research projects that included the evaluation of the tree biomass production by tree growth analysis and remote sensing technology, environment monitoring and assessment by atmosphere and biodiversity observations, and biotechnology for enhancing tree functions. Figure 5 illustrates the holistic view of the project which shows the technical and analytical elements as well. The purpose of these projects is to develop the academic and technological solutions and to establish the cyclical system of resource and energy in the region, which supports the harmonization of the ecology and economy of the country.

Acacia mangium is one of the major plantation species in tropical region since it is fast-growing in degraded soil conditions. A large-scale *Acacia mangium* plantation could be a key strategy for establishing a sustainable society by fixing carbon dioxide and thus contributing to both the global environment and the local community. However, many concerns with the sustainability of the forest in terms of monocultural management, regional economy, and limited usage of its wood products have not yet been resolved.

In this context, a large-scale *Acacia mangium* plantation forest of PT Musi Hutan Persada (MHP) in southern Sumatra has been chosen as a case study which will integrate the various fields of research such as forest science, radio science, atmospheric science, materials science and bioscience in a collaborative research project.

Total concession area of the field investigated is ca 300,000 ha of which plantation forest provides the area of 190,000 ha. An area of 80,000 ha of them is preserved for natural (secondary) forest. An example of the projects is the analysis of biomass production of the plantation forest at Unit V (ca. 9,000 ha) of MHP. The annual biomass production with a 6-year rotational harvesting system is estimated by the data of the biomass production at the permanent sample plots in the year of 2000-2006, area of plantation, and so on. Tree biomass annual production is calculated by various organs, such as leaves, branches, stem and bark, and root as well. We found the total tree biomass is highly correlated by the tree diameter and height, which suggests that those factors will be the measure of the estimation of tree biomass production. Such evaluation of the tree biomass production leads directly to confirm the sustainability in the forest management and to evaluate the carbon-sink function of the plantation forest based on the data of biomass production.

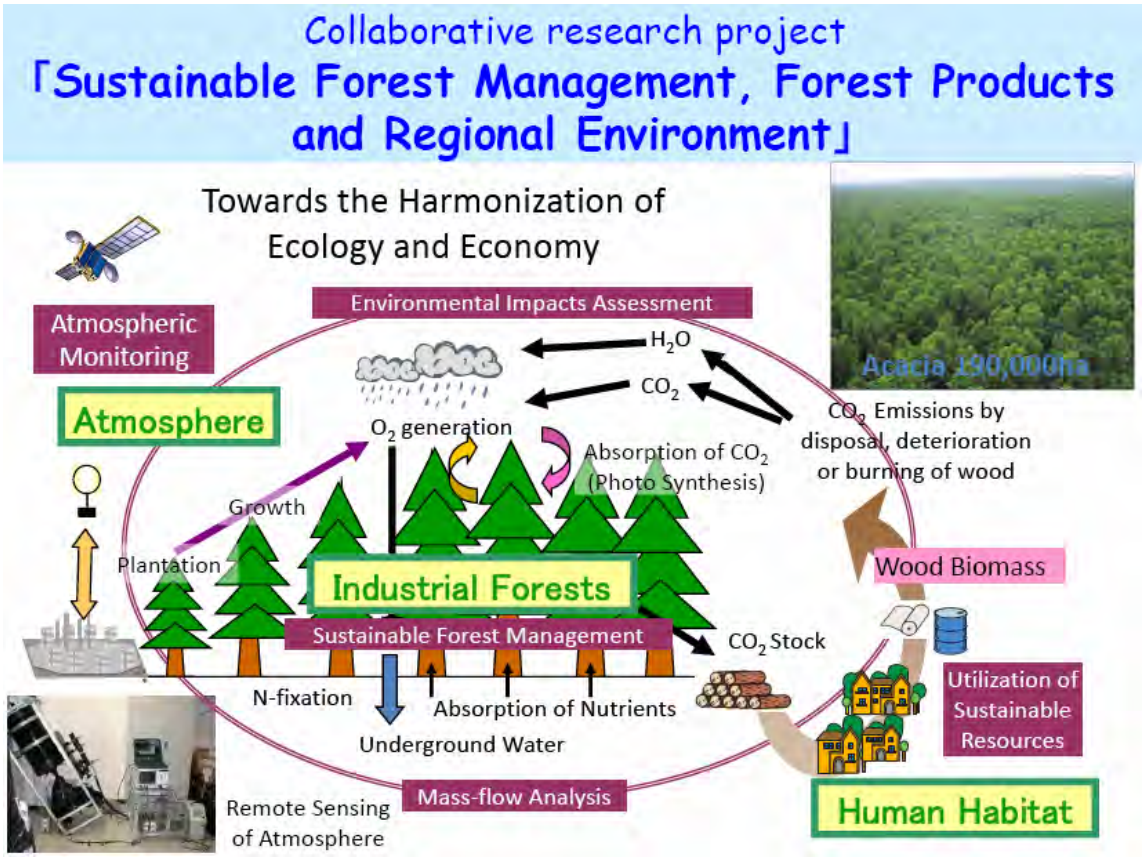


Figure 5. Sustainable forest management, forest products and regional environment (RISH 2007).

KAWAI Shuichi is professor of Sustainable Materials at the Research Institute for Sustainable Humanosphere (RISH), Kyoto University. He received his PhD in Wood Science from the Graduate School of Agricultural Science, Kyoto University (1980). He was an instructor (1980-1990), associate professor (1990-1995), and professor (1995-2004) of Wood Research Institute, Kyoto University. His fields of interest cover Plant fiber composites, Timber engineering, Mass flow analysis of wood products, Preservation of wooden cultural properties and Aging of wood and prediction of its service life. His major publication include Low-Density Particleboard, Steam-Injection Pressing Technology, Laminated Veneer Lumber and Composite Beams Produced with Thinning from Tropical Hardwood Plantation, Current Japanese Materials Research, Vol.11, ed. N. Shiraishi, et al, 1993, Elsevier Applied Science, Self-bonding characteristics of binderless kenaf core composites, Wood Science Technology 39 (2005). <skawai@rish.kyoto-u.ac.jp>

Grand Session 4

Improvement of Potency and Rehabilitation of Degraded Forest through Community Forest Management

M. Bismark

Forest and Nature Conservation Research and Development Centre, Ministry of Forestry

Abstract

Potential of natural forest in Indonesia during the last five years decreased as amount of 65%, but by substitutions of community forest, plantation forest, and conversion forest, the log production was still decrease as amount of 51%. Forest benefit which could be used currently is still 9.86% dominated by timber benefit, while erosion prevention benefit, water arrangement benefit is at the small portion. The reduction of potential forest due to forest degradation is about 0.42% to 2% per year, with utilizations beyond the carrying capacity. The community forest developed as a result of governmental building and community participation have reached the area of 1,570,000 ha where 780,000 ha areas are located in Java. Although having high timber potential, the contribution of community forest on timber production is only 0.6%, but the function of forest community is very important as a forest conservation tool, forest rehabilitation, and community economy improvement especially agro forestry which is located at the buffer zone of conservation areas.

Key words: *Forest potency, community forest, buffer zone*

Introduction

Forest as biological natural resources currently begins to be worried due to the reduction of their potential and function. The gap between forest productivity and utilization rate is more and more high, where during five years (1999-2003) the reduction of natural forest potential was 65% from 10.4 million m^3 in year 1999. To reach timber needs, it is supplied from convertible forest, community forest, plantation forest, and industrial forest, nevertheless the round timber productions in Indonesia still decrease as amount of 51% (Baplan, 2004)

The reduction of forest productivity will be related with the impact of forest exploitation on environment, among others erosion increase, land use changes, and water arrangements as ecological function and socio-culture value. The change of community attitude from conservationist based on custom system applied to become illegal forest utilization to increase economy has triggered degradation process and deforestation, so that reducing forest value as life buffer.

Related to various important problems on forest potential decrease, community socio-economy aspect, and forest function as life buffer, therefore the priority policy of forestry development during the years of 2005-2009 (five priority policies, Decision Letter of Forestry Minister No. SK 456/Menhut-VII/2004), among others rehabilitation and conservation of forest resources and empowerment of community economy inside and outside forest area. The direction of long term forestry development program (2006-

2025), among others to realize welfare and active role of community in forest management, so that community forest development becomes the most strategic national program in Indonesia, because supporting the aspects of ecology, socio-culture, and community economy.

Forest Management and Degradation

During the last three decades, forest resources have become the capital of national economy development giving positive impact on foreign exchange receiving, labor absorption and motivate region development and economy growth. As of year 1997 their contributions reached 3.5 percent of the state foreign exchange. The main contribution of forestry sector is timber yields. In year 2001 there was 351 production forest management companies with the managed areas of 36.4 million ha and in year 2003 reduced to become 267 companies with the areas of 28.1 million ha (Baplan, 2004). It means that 8.3 million ha potential forest areas are not good managed. Therefore, it will give the opportunity of the occurrence of illegal logging; even at the active areas including at conservation areas the illegal logging is still occurred. In one year it is predicted that illegal logging could reach 50 million m^3/year causing the state loss of Rp. 30 quintillion/year (Kaban, 2006). Non active companies could be caused by less balance of the yields, or reducing forest potency, fault management, and increasing illegal logging at the region.

The other types of forest management are managements of convertible forest, community forest, plantation forest and industrial plantation forest. Log productions during 5 years are presented on Table 1. The decreases of natural forest potency as above indicate that forest degradation has been occurred. The occurrence of degradation was also triggered by the decreases of biodiversity, fault management of forest utilization, forest land use, illegal logging, low efficiency of timber use, and less handling on environment. Table 1 shows that all timber yields from each forest sources during 5 years (1999-2003) were decrease as amount of 51%.

Table 1. Log productions during the year of 1999-2003 (Baplan, 2004)

No	Source	Volume m^3/year (x 1000)				
		1999/2000	2000	2001	2002	2003
1	Natural Forest	10,373.9	3,450.1	1,809.1	3,019.8	3,652.3
2	Conversion Forest	7,271.9	4,564.6	2,323.6	182.7	956.5
3	Community Forest	895.4	488.9	0	0	59.6
4	Plantation Forest	1,890.9	1,511.0	1,455.4	1,599.1	967.8
5	Industrial Plantation Forest	187.8	3,783.6	4,463.4	3,898.4	4,411.1

According to reality: 1) stand stock and timber production ability decrease sharply which could not be renewable in the short time; 2) the role of forestry economy will decrease if optimal utilization of economy potential of ecosystem is not conducted; 3) the various conditions of production forest ecosystem and social environment require various management systems as well (Darusman, 2006). Therefore, the changes of utilization orientation of forest yields from timber to non timber and environment services should be done. The contribution of directly and indirectly forest benefit could be seen on Table 2 where in the next 10 years the forestry economy growth is hopped to increase as amount of 143-327% from the condition of year 2004.

Table 2. Scenarios of the direction and the frame of industrial forest resources utilizations (Darusman, 2006).

No	Benefit Types	Optimal Contribution	Contribution of Year 2004	Future Contribution (Year)				
				5	10	15	20	30
1	Direct benefit							
	• Timber and energy	4.1	9.46	5.0	2.0	3.0	3.5	4.1
	• Non timber	5.7	0.04	0.1	0.5	1.5	3.0	5.7
2	Indirect benefit							
	• Erosion prevention	2.0	0.28	0.5	1.0	1.5	2.0	2.0
	• CO_2 absorption	77.9	0.00	1.0	5.0	10.0	15.0	25.0
	• Flood control	0.8	0.00	0.1	0.4	0.6	0.8	0.8
	• Water transportation	1.2	0.08	0.2	0.5	0.8	1.2	1.2
3	Optional benefit	8.2	0.00	0.1	0.5	1.0	2.0	5.0
	• Flora fauna							
	• Tourism							
Total		100	9.86	7.0	9.9	18.4	27.5	43.8

The increase of productivities and management of production forest with various sources through ecosystem restoration activities which are appropriate with economy benefit will be options for the future management, such as creations and arrangements of regions which have high eco-tourism values, limited hunt areas, and agro forestry development at the areas surrounding community in order to trigger community participation in forest conservation to increase planned forest function and value (Bismark, 2006).

The consequence of high rate forest utilization of timber yields triggering the appearance of

environmental problems viewed negatively, the forest areas in Indonesia have been decreased such as 2% per year in Sumatra, 0.42% per year in Kalimantan, and 1% per year in Sulawesi. In addition, the indication of degraded forest ecosystem could be seen from the management of critical lands reaching 23.2 million ha (year 2000), 8.1 million ha inside forest regions (Kaban, 2006). As of year 2003, the efforts of new land rehabilitation reached 1.1 million ha (4.7%) (Baplan, 2004).

Social Forestry

Social forestry development which is community forest involving community in forest management constitutes the change of forest management paradigm to reach ecological and social functions in balance. It is a part of Indonesian forest management scenario to increase contribution value from the direct and indirect benefits (Table 2), especially carbon absorption and conservations of soil and water at critical lands, because the two forest models are planted with rapid growth plantations.

The activities of social forest, researches on carbon potential at plantation forest and seedlings supporting the activities have been much conducted previously by cooperation with researchers of Japanese government including their funds (JBIC, JICA). In relation with increasing critical land productivities, community socio-economy, and food security, BAPPENAS – JBIC programs have realized 19,000 ha social forest in 10 provinces in year 2001. Generally, as of year 2003, the potential of community forest in Indonesia has reached 1,570,000 ha where 780,000 ha (50%) were located in Java (Mindawati *et al*., 2007).

Log productions from the yields of community forest as shown on Table 1 were still relative low i.e. 0.6% in year 2003, but the existence of community forest is the most important to show active participation of community in forest conservation especially in inhibiting critical land rate. According to Decision Letter of Forestry Minister No. 49/Kpts-II/1997, year 1997, community forest is a forest belong to community with minimum area of 0.25 ha, canopy coverage of timber plantation is 50% or at first year planting has 500 plants/ha. The effort of community forest is aimed to increase community welfare, to supply material for industries, and to improve environment quality (Baplan, 2004).

Historically, community forest development was started in year 1951 and organized by Dinas Pertanian Rakyat to plant bare lands in order to protect the land from erosion and to increase soil fertility. This activity became the forestation and critical land rehabilitation programs by *Jawatan Kehutanan*/Forestry Agency in year 1956 (Mindawati *et al*., 2007). As of year 2003, community forest has been conducted in 31 provinces with the various areas from 3,500 ha to 213,000 ha. Provinces having community forest more than 100,000 ha are shown on Table 3.

Table 3. The areas and potential of community forests having more than 100,00 ha *) and critical lands in some provinces.

Province	Community forest area (ha)	Potential m^3 (x 1000)	Critical land areas outside regions (ha) in year 2000 **)
West Java	166,524.14	6,476.8	362,828
Central Java	325,729.41	11,058.4	349,725
East Java	213,371.65	3,536.3	953,211
East Nusa Tenggara	161,745	3,362.5	1,057,466
South Kalimantan	108,436.50	2,021.6	221,602
South Sulawesi	164,583.64	4,981.9	451,505

*) Modification from Mindawati *et al*., 2007

**) Baplan Dephut, 2004

From the above Table, six provinces with the largest area of community forest are located in Java, so that the community forest activities have role and potential to be organized in the critical land rehabilitation program. From the aspect of economy benefit, the vegetations growth of community forest are dominated by fast growing species, such as riap (*Paraserianthes falcataria*) with 37.4 m^3/ha/year in 5 years cutting rotation, mahogany with 16.7 m^3/ha/year in 15 years cutting rotation, teak with 10.9 m^3/ha/year in 60 years cutting rotation, *Eucalyptus deglupta* with 24.5 m^3/ha/year in 9 years cutting rotation, pine with 19.9 m^3/ha/year in 15 years cutting rotation, and resin with 27.4 m^3/ha/year in 25 years cutting rotation (Mindawati *et al*., 2007). Forest land productivity could be increased by planting horticulture crops using agro forestry system. At agro forestry system, for timber production between 50 – 150 m^3/ha there are also yielded 2.5 tons/ha rice, 4 tons/ha corn, 7.5 tons/ha cassava, 1.5 tons/ha peanut, 0.5 tons/ha chili, 1,500 banana plants/ha/year, 4,000 pineapples/ha/year, and 1,500 papayas/ha/year (Widiarti, 2003).

Table 4. The building of economy efforts of community forest (HR) *)

Year	Model area establishment, HR (ha)	Nursery establishment (million of seedling)	Institutional building and training (people)
1999	350	2.15	450
2000	100	0.7	4,102
2001	2,210	1.98	3,011
2002	4,385	1.07	1,464
2003	1,279	1.20	1,280

The research results on productivities of timber and horticulture plants are clearly seen that the forest management involving community or active participation of community has given economy and ecological values for the efforts of controlling and rehabilitating critical lands, therefore the Forestry Department needs to increase the participation through community building of social forest management as presented on Table 4.

According to Table 1 and 3, the recorded low timber yields of community forest show that the communities prefer forest yields of non timber from agro forestry system. It is very positive for soil and water conservations, critical land rehabilitation, as well as biodiversity conservation of flora and fauna living at the community forest. In Central Java, the community could harvest birds to be sold so that getting added yield from the benefit value of fauna (Bismark, 2005).

Buffer Zones and their Arrangement

The strategic policy of Forestry Department in supporting forest as life buffer, in UU No. 5 year 1990 about natural resources conservation and their ecosystem among others states to sustain forest function as life buffer through efforts to increase community welfare and life quality by realizing natural resources preservation and ecosystem balance. For community of forest village, forest area becomes living sources. At some conservation regions, community activities to open forest land become a quite serious problem and could trigger illegal logging.

In line with the efforts to prevent community intervention to forest region, it is needed a pattern of land utilization and increasing land productivities outside region. Management and arrangement of lands outside forest region or conservation region are meant as buffer for forest region and to increase community economy. Management of buffer zones could be divided into zones appropriate with the form of region safety based on ecosystem i.e. green belt zone, interaction zone, and culture zone (Bismark, 2002). As discussed above, that social forest, community forest with objectives of forest preservation and community welfare increase, so that one of the management models of buffer zone is development of community forest.

The research results at buffer zone of Gunung Ciremai National Park showed that distribution frequency of community forest at buffer zone was quite high on the utilization of other lands, it was 44.7% in 0.5-5 km distance from boundary of forest region of national park, where 22.6% in green belt zone and 22.1% in interaction zone. It shows that the communities of forest village have quite high dependence on forest land, but it is persisted to be managed as a forest by agro forestry pattern (Bismark *et al*., 2007). At this region, the community planted 33 trees and fruits species with tree densities about 120-300 trees per ha and becoming the habitat of 20 birds species including rare birds.

Research Application

The researches to overcome critical lands through development of social forest in the forms of land rehabilitation, carbon contents (Heriyanto and Siregar, 2007), seedlings, pests, diseases, bacteria, and soil fertilizer micorhiza conducted at Badan Litbang Kehutanan (Forestry Research and Development Agency) have got many supports and cooperation with the government and Japanese researchers (JICA and JBIC). These research activities need to be improved in the form of larger applications.

Conclusions

Timber needs are not in balance again with natural forest productivities. The decrease of natural forest productivities as amount of 65% during the last 5 years followed by the decrease of forest land quality as an impact of the environment of forest utilizations which are beyond carrying capacity causing the occurrence of forest and land degradations.

Community forests which have been established outside forest region with the areas of 1,570,000 ha to subsidize timber needs are still relative small (0.6%), but the extensive areas of community forest especially in Java (778,000 ha), the vegetation function is more to the stand value, while the functions as soil conservation and critical land rehabilitation as well as economy value are obtained from agro forestry system. Community participation to develop social forest is very potential to be promoted to raise their active roles in land rehabilitation and economy improvement of forest village communities.

References

Bismark, M. 2002. Integrasi kepentingan konservasi dan kebutuhan sumber penghasilan masyarakat dalam pengelolaan kawasan konservasi [Integration of conservation importance and the need of community income sources in management of conservation regions]. Proceedings. Diskusi hasil Litbang Rehabilitasi dan Konservasi Sumberdaya Hutan [Discussions on the results of Research and Development of Rehabilitation and Conservation of Forest Resources]. P. 61 – 70. Pusat Litbang Hutan dan Konservasi Alam [Center for Research and Development of Forest and Natural Conservation].

Bismark, M., Sawitri, R. and Eman. 2007. Zonation and management of Gunung Ciremai National Park Bufferzone. Kuningan Region, West Java. Journal for Research. (In press).

Bismark, M. 2005. Kajian habitat dan populasi burung di kawasan hutan Baturraden [Assessments of habitat and population of birds at forest region of Baturraden]. Laporan Pusat Litbang Hutan dan Konservasi Alam [Report of Center for Research and Development of Forest and Natural Conservation].

Badan Planologi Kehutanan. 2004. Eksekutif data strategis kehutanan [Data executive of forestry strategic]. Departemen Kehutanan [Department of Forestry]. Jakarta.

Darusman, D. 2006. Pengembangan potensi nilai ekonomi hutan di dalam restorasi ekosistem [Potential development of forest economy value in ecosystem restoration]. Diskusi panel restorasi ekosistem : Optimalisasi pemanfaatan hasil hutan non kayu menuju pengelolaan hutan alam produksi lestari [Panel discussion on ecosystem restoration: Optimalization of utilization of non timber forest yields toward management of sustained-production natural forest]. 6 p. Jakarta.

Heriyanto, N.M. and Siregar, C.A. 2007. Biomasa dan konservasi karbon pada hutan tanaman mangium (*Acacia mangium* Willd.) di Parungpanjang, Bogor, Jawa Barat [Biomass and carbon conservation at mangium forest (*Acacia mangium* Willd.) at Parungpanjang, Bogor, West Jawa]. Info Hutan, Pusat Litbang Hutan dan Konservasi Alam, Vol. IV, No. 1, Tahun 2007 (65-73).

Mindawati, N., Widiarti, A. and Rustaman, B. 2007. Review hasil penelitian hutan rakyat [Reviews of research results on community forest]. 81 p. Pusat Penelitian dan Pengembangan Hutan Tanaman [Center for Research and Development of Plantation Forest], Bogor.

Kaban, H.M.S. 2006. Kebijakan Departemen Kehutanan dalam rangka pelaksanaan pengelolaan hutan sebagai penyangga kehidupan kehidupan [The policy of Forestry Department in the frame of application of forest management as life buffer]. Sosialisasi hutan sebagai sistem penyangga kehidupan [Socialization of forest as a life buffer system]. Jakarta, Januari 2006.

Widiarti, A. 2003. Kajian kredit usulan usaha hutan rakyat dengan pola kemitraan di Jawa Barat [Assessment of proposed credit of community forest efforts by partnership pattern in West Java]. Bul. Pen. Hutan 635 : 1-12. Pusat Litbang Hutan dan Konservasi Alam [Center for Research and Development of Forest and Natural Conservation], Bogor.

M. BISMARK is Research Professor of Forest Research and Development Agency (FORDA), in Wildlife Ecology and Conservation Management Expertise. He is graduated from Bogor Agriculture University (Ph.D) in 1994 and started as a researcher at Forda in 1979. He published more than 80 titles of paper related to conservation, buffer zone management, forest community, production forest management and wildlife ecology. He has also employed as a Team Leader in Monitoring Management for Social Forestry Development Program (JBIC-INP 22, 1999-2002); Team Leader of CIFOR-ITTO Project (R-LIV-021-2-ITTO 6/200) (2004; Team Leader of Study on Growing Stock and conservation of Ramin (ITTO Project PPD 87/03 REV.2 (F) (2005); Co. Team Leader on Berbak national Park Buffer zone Management. (World Bank and Wetland International Project, 1997-1999).

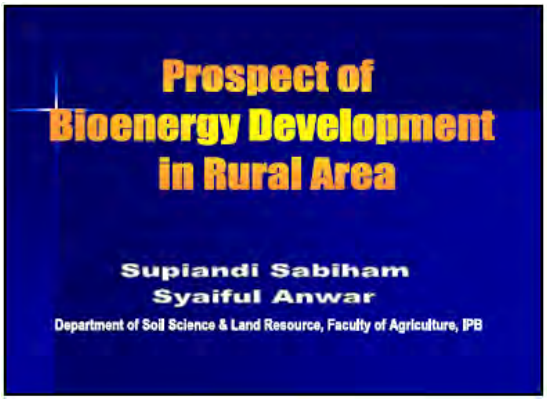
Scientific Session 1 - 1

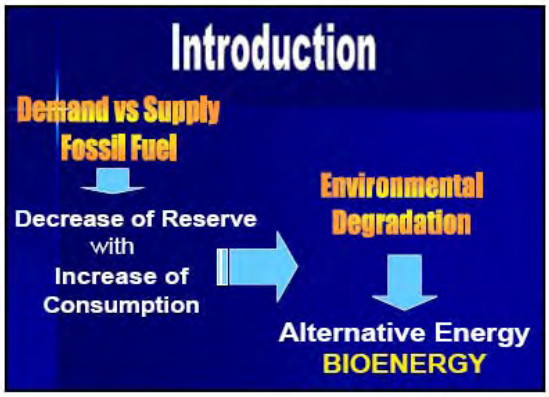
Prospect of Bio-energy Development in Rural Area

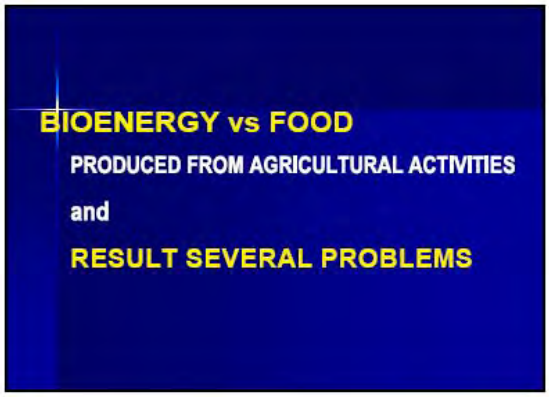
Supiandi Sabiham and Syaiful Anwar

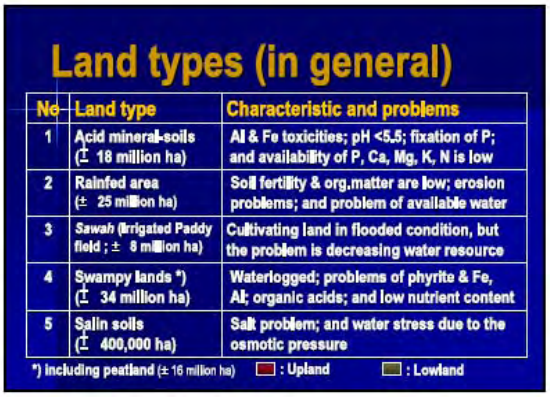
Department of Soil Science & Land Resource, Faculty of Agriculture,

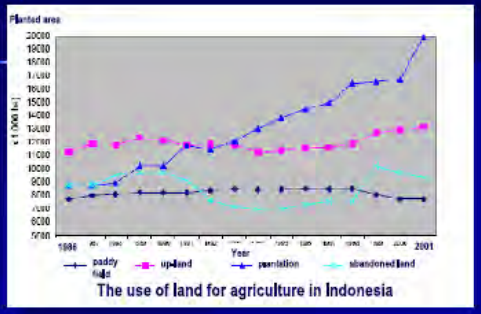
Bogor Agriculture University











The use of land for agriculture in Indonesia

Land Conversion (ha) during the period of 1981-2002

REGION	Conversion	Established New-paddy field	Balance
1981 -1999			
JAVA	1 002 055	518 224	-483 831
OUTER	625 459	2 702 939	+2 077 480
INDONESIA	1 627 514	3 221 163	+1 593 649
1999 - 2002			
JAVA	167 150	18 024	-107 482
OUTER	396 909	121.278	-274.732
INDONESIA	563 159	139 302	-423 857

Problems of Food Crop Production

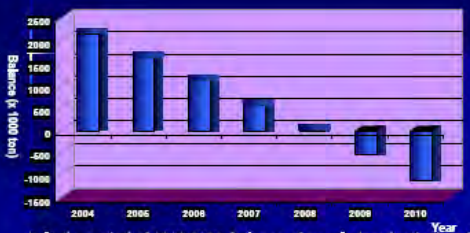
- Due to the increase of population, food demand is also increase; however agricultural sector is not able to produce enough food for the people.
- Therefore, food crop productions during the last five years tend to decrease.
- In 2003, Indonesia has imported food with the total cost of about US$ 900 millions.

Biomass

(in a narrow sense)
Mass of organism (in ecology): kg/m^3/y.

(in a broad sense)
Organism as a resource.

(Longman, Advanced American Dictionary)
Dead plant and animal as organic matter used to provide FUEL or energy.



- In the period of 2000-2008, balance of supply (production) and demand is decrease continually; in 2010, stock of paddy is predicted to be deficit of about 1.0 million ton.

Biomass

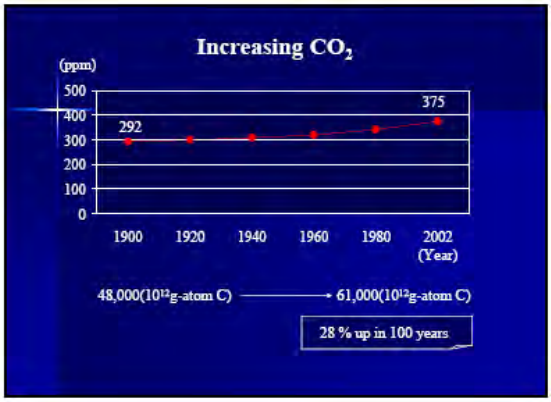
- OM available, renewable
- Humanity's earliest sources of energy
- Biomass → Bio-energy (electricity, heating homes, fueling vehicles and providing process heat for industry)

Biomass Potential

Biomass	Annual Potential
Forest	14.45 million m³/year
Estate/Plantation	64 million ton/year
Agriculture	144.5 ton/year
MSW *)	11,330 ton/day

Panaka, 2006

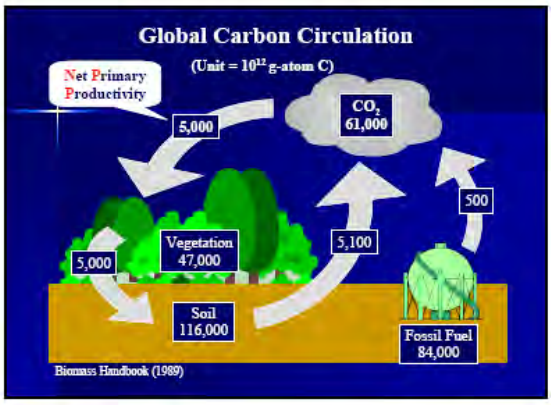
*) Municipal Solid Waste

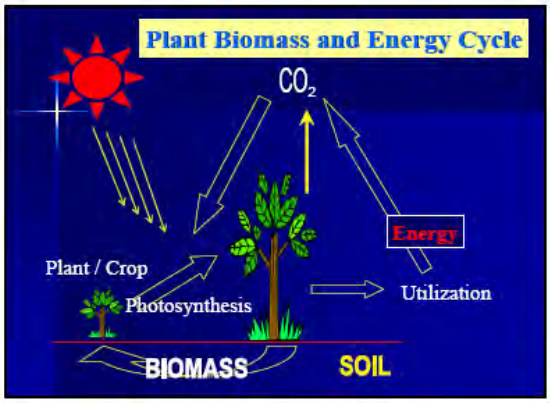


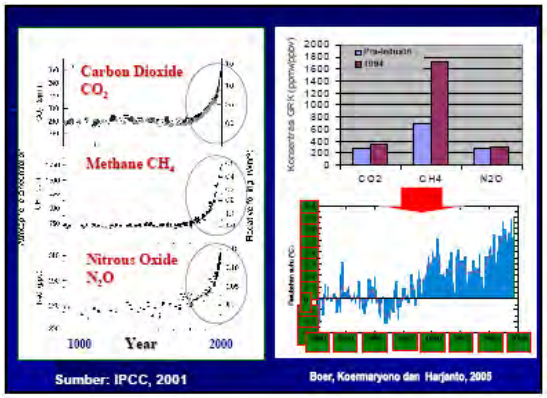
Biomass Potential

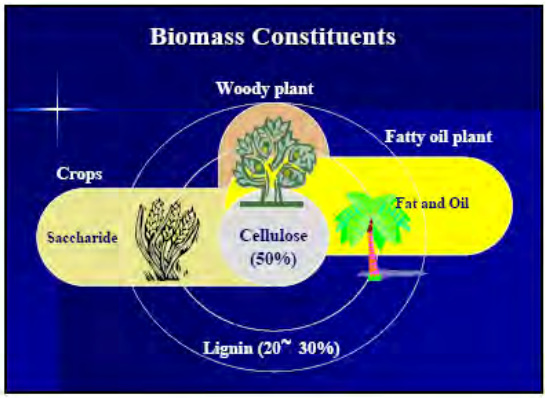
Landuse Type	Area (1000 ha)	Biomass Production (million ton/year)
Paddy rice field	7,517	180
Upland crops	9,008	162
Estate crops	9,917	357
Agro forestry	4,062	41
Forest	137,366	3,159
Total	163,808	3,899

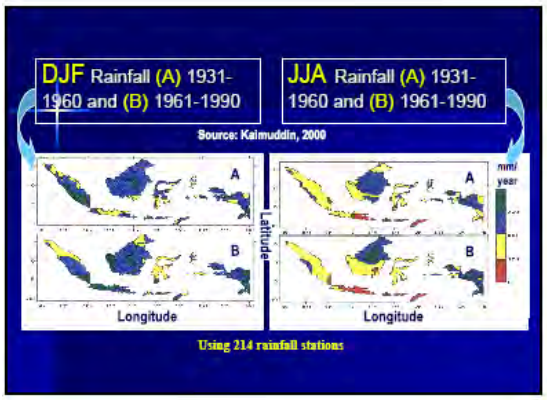
Sabiham and Mulyanto, 2005

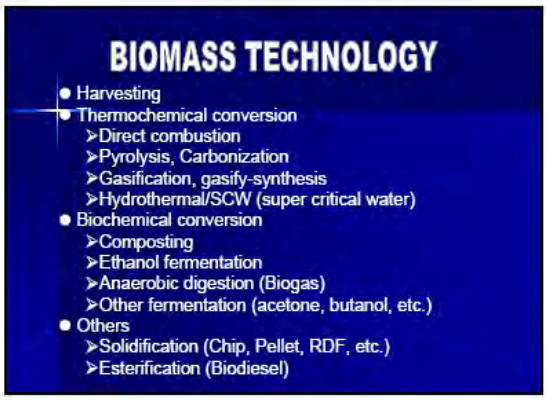


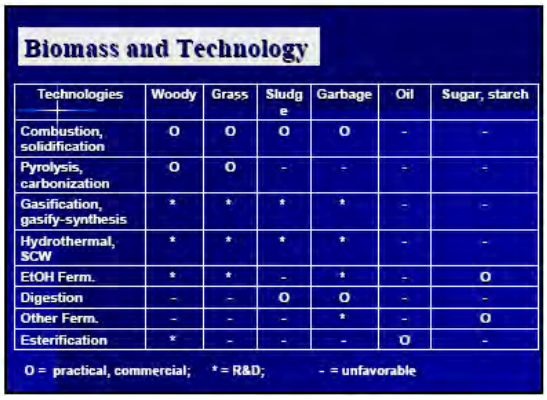












Biomass and Technology

Technologies	Woody	Grass	Sludge	Garbage	Oil	Sugar, starch
Combustion, solidification	O	O	O	O	-	-
Pyrolysis, carbonization	O	O	-	-	-	-
Gasification, gasify-synthesis	*	*	*	*	-	-
Hydrothermal, SCW	*	*	*	*	-	-
EtOH Ferm.	*	*	-	*	-	O
Digestion	-	-	O	O	-	-
Other Ferm.	-	-	-	*	-	O
Esterification	*	-	-	-	O	-

O = practical, commercial; * = R&D; - = unfavorable

Development of Bioenergy for Rural Community

- In part solving problem of Energy scarcity
- Expected multiplier effect → enhancement of rural economic activities

Needed Technology
- Simple
- Environmentally save

→ *Manageable by community*

Examples of Biofuel Industries In Indonesia

INDUSTRY	PRODUK
Bioethanol Plant	1. Produce capacity ranging from 30 kl – 90 kl per day in Indonesia. 2. Produce capacity of 180 kl per day or 60.000 kl per year South Sumatera, Lampung (in Construction).
Household scale Biogas Reactor in West Java Province	Bandung Regency 109 unit, Garut Regency 26 unit, Bogor Regency 10 unit, Sumedang Regency 3 and Tasikmalaya Regency 2 unit. Develop for Garut Regency 400 unit from Persada NGO.
Bioner-1 Instalation	Sampit Regency East Kalimantan capacity of 4-6 MV Sumatra, Kalimantan and sulawesi capacity of 16 kW
Gasificator	50 Unit in Indonesia, capacity of 15-100 kW/unit
Biofuel Generator	114 unit, capacity of 58 MV in Indonesi by PLN.
Diesel Electrik Generator	Indramayu Regency 1 unit, capacity of 100 kW

Development of Bioenergy for Rural Community

- 30,000 villages in Indonesia have no access to electricity
- Many population live in rural, including in remote or not easily accessible (mountainous and isolate)
- Principle of self-production and use
- Energy use in rural community: household, transportation, agriculture, construction, industry, and commercial service

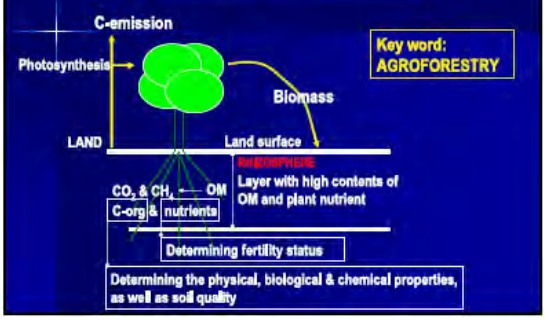
Bioenergy from Plantations

- Production of biofuel is undoubtedly an important part to reduce dependence on fossil fuel
- Recently, biomass is becoming more important resources with many utilization purposes
- Plantation of energy crops on degraded or marginal soils can enhances soil quality, sequesters C in soil and biomass, and improves quality of aquatic ecosystems (Garten and Wullschleger, 2000)
- Ideally, the plantation is located near the built processing plant

Four Bioenergies Relatively can be Produce With Simple Technology That Can be Established in Rural Community

- *Biodiesel* (for replacement or admixture of diesel) derived from feedstocks of plant oil such as palm oil and jatropha oil
- *Bioethanol* (for replacement or admixture of gasoline) derived from feedstocks containing carbohydrate or sugar such as sugar cane, cassava, sago, sorgum, etc
- *Bio-oil* or biokerosene (for replacement of kerocene) derived from plant oil, and *minyak bakar* (for replacement of *High Speed Diesel*, HSD) derived from biomass
- *Bio-gas* (for replacement of kerocene) derived from liquid waste and animal waste

Maintaining Soil Fertility



CONCLUSION

- Development of renewable energy from biomass, is important in maintaining the continuity of energy supply in rural community
- In order to achieved self production energy villages,
  1. the introduced technology should be simple since the system will be maintained and managed by the community, and
  2. environmentally friendly
- Soil productivity is dependent on the content of C-organic which is mostly maintained by returning plant residues to the land. It is important for maintaining plant growth as the resource of renewable energy for sustainability of life

Lignocellulosic Biorefinery for Sustainable Society in Southeast Asia

Takashi Watanabe, Takahito Watanabe and Rudianto Amirta

Laboratory of Biomass Conversion, Research Institute for Sustainable Humanosphere (RISH),

Kyoto University

Abstract

Biorefinery is a production system for fuels, energy, and chemicals from biomass in integrated chemical and energy industries, and it provides a new concept to change the petrochemical industry developed in 20th century. There is a growing demand to establish biorefinery to solve the problems of global warming and deficiency of fossil fuels. Biorefinery boosts rural development because biomass feedstock is widespread in rural region. Production of biofuels and chemicals from biomass feedstock creates employment and stimulates regional economy. The region-based system is in sharp contrast to oil refinery which needs large-scale investment to oil-producing countries, transportation of oil, and oil-refining factories located in coastal industrial zone.

Because biomass is our only "carbon-based" renewable resources, biorefinery plays a key role to replace oil-based chemical industry. Oil refinery is based on chemistry of hydrocarbons, such as ethylene and propylene. In contrast, biorefinery is based on the building blocks derived from plant components such as carbohydrates, lignin and lipids. The striking differences in the platform compounds bring revolution of chemical industry.

Among the potential industrial biorefineries, lignocellulosic biorefinery has immense potentials to replace oil refinery, due to large quantities of lignocellulosics, non-competitiveness in food supply and availability as plant wastes. Production of biodiesel from oil crops such as palm oil and Jatropha in Southeast Asia has received international attention. Lignocellulosic biorefinery in conjunction with the biodiesel production has a great potential to accelerate regional economy growth and the establishment of biomass-based societies in Southeast Asia. However, consumption and production of biomass must be carefully analyzed by assessing positive and negative impacts to the communities, to introduce adaptive measures that will maintain and enhance sustainable forest management, ecosystems including biodiversity, culture, health, disaster prevention, food supply, local economy and employment. The present article describes a vision of a lignocellulose-based biorefinery in Southeast Asia.

Key words: Biorefinery, biomass plantation, bioethanol, biodiesel, *Acacia mangium*, *Jatropha curcas*

Introduction

The energy and chemical industries that make use of fossil resources such as oil and natural gas developed in the 20th century have made our lives easier. On the other hand, they have also caused depleted energy problems and serious environmental issues such as global warming. Fundamental problems such as accelerating global warming and depleting fossil resources caused by mass consumption have led to a strong recognition that these are real issues we are facing. Today, to solve these problems humankind faces and to build sustainable societies, a shift is required to change our materials and energy basis from fossil resources to recyclable resources including biomass.

Principally, the carbon balance comes to zero with plant biomass. This is because a corresponding amount of carbon dioxide is maintained by photosynthesis when carbon dioxide is released

into the atmosphere by combustion and decomposition. In other words, plant biomass has a carbon neutral nature. In reality, fossil resources are often used in biomass conversion, thus, the balance of carbon dioxide is not equilibrated. However, compared to manufacturing energy or chemical products only from fossil resources, it is possible to reduce carbon emissions by developing efficient biomass conversion processes. Based on these perspectives, creating an industry that produces chemical products, fuel and energy from biomass is attracting wider attention.

In contradistinction to a petroleum refinery, the process of maximizing the added value of biomass by systematically producing chemical products, fuel, and energy from biomass is called a "biorefinery." Especially, the inedible lignocellulose-based biorefinery is expected to play a major role in the 21st century's chemical industry [1,2].

Impact of Creating a Biorefinery

The suppression of global warming and depletion of fossil resources are being emphasized as the background to establishment of a biorefinery. Moreover, a number of other important factors are involved, such as the creation of a new industry, energy security, revitalization of the local economy, and re-energization of agro forestry. These factors are discussed below.

Although plant biomass has a carbon neutral nature, it uses fossil resources to grow and convert biomass. This has caused lively discussion on whether or not the use of biomass would suppress the total balance of greenhouse gas emissions [3]. For example, bioethanol is now widely recognized as restraining carbon dioxide emission, applying LCA analysis based on the latest technology level of biomass growth and conversion [4]. Wang, from Argon National Laboratory, compared the suppressant effect of the greenhouse gas between cellulose-based ethanol and starch-based ethanol. He found that cellulose-based ethanol had a suppressant effect of 64% compared to 17–23% for starch-based ethanol, when comparing E85 to gasoline (gasoline with 85% ethanol) [5]. That is to say that the amount of carbon dioxide emission from bioethanol decreases more with lignocellulose-based materials than with starch-based materials produced from grains. In the case of lignocellulose, the amount of its emission is further decreased by using waste resources and unused resources that are not controlled or cultivated because it requires no fossil resources that are necessary for plant cultivation and management.

The impact of creating a biorefinery as a new industry is significant, and it is being called the industrial revolution of the 21st century. The 20th century was the era of petrol chemistry, where systematic chemical industries were constructed to mainly manufacture products based on hydrocarbon materials including ethylene, propylene and benzene. On the contrary, sugar and lignin (biomass materials) include many oxygen atoms as well as carbon and hydrogen. Because the material structure and chemical characteristics are completely different, and because fermentation is a significant tool for

conversion, the production system for biorefinery-based chemical products is fundamentally different from an oil refinery. This indicates that the country or company that determines basic chemical products placed upstream of the biorefinery and has the production technology for those basic chemical products plays a leading role in the new industrial structure: biorefinery. That is to say, it becomes possible to develop products strategically from platform compounds and to obtain patents; due to the fact that once the basic chemical products (platform compounds) are determined the corresponding minor chemical products are also defined. Based on these perspectives, the United States Department of Energy (DOE) selected 12 platform compounds for biorefinery and presented the relative chemical products immediately [6] after that. A number of American companies have already entered the production of platform compounds, and competition has been intensifying [2]. Europe has also been active in biorefinery, establishing the European Biofuels Technology Platform as a framework for biorefinery research in June 2006. The Vision Report shows roadmaps for the first generation of biofuels such as sugar, beets, bioethanol, vegetable oil and fats, waste-based biodiesel, biogas and ethyl tertiary-butyl ether (ETBE); and for the second generation biofuels such as cellulose-based ethanol, hydro-treated biodiesel, lignocellulose-based synthetic biofuels, biogas and hydrogen [7]. By 2030, the goal is to meet up to one quarter of the European Union (EU)'s transport fuel needs using clean and CO_2-efficient biofuels. Under the five-year Sixth Framework Programme (FP6), the EU has also implemented the research and development project "BIOCOUP" in 2006 to produce liquid fuels by thermal decomposition using existing petroleum refinery and chemical processes [8].

In the biorefinery concept, lignocellulose is mainly used instead of the starch and sucrose that were used to produce ethanol before. Commercial production of lignocellulose-based ethanol is planned to commence in a few years. The Department of Energy (DOE) also plans to cover 80% or more of fuel ethanol used in the U.S. with cellulose-based ethanol by 2025. Currently in the U.S., bioethanol is corn-based, however, corn grain can only supply 10–20% of gasoline consumed in the country. On the other hand, lignocellulose has a supply amount of 1 billion tons per annum in the U.S., comparable to alternating 50–70% of gasoline consumed in the country [2].

The biorefinery also contributes to energy security. Most oil producing countries are located in the Middle East, and not many of these countries have stable political situations. If these countries are non-friendly nations, it is crucial to maintain a certain power through diplomacy and possibly military force in order to stably import crude oil. In the U.S., the gap between supply and demand for transportation fuel is widening and it has become a top priority to stably secure transportation fuel. The self-sufficiency of the energy supply in Japan is only 4%, excluding nuclear power generation. Therefore, energy security is a significantly important issue in Japan, as well.

In the oil refinery industry, investment is concentrated on oil producing countries, crude oil shipping companies, large corporations with an industrial oil complex, and coastal industrial zones. On the

contrary, except for biomass from waste, biomass is widely dispersed generally in rural areas, not in urban areas. Thus, small-scale biomass conversion factories linked with agriculture and forestry are to be built in rural areas. Consequently, biorefinery investment can be spread across regions, activating local economies and employment. The era of using fossil resources made a clear distinction between industry and agriculture. However, in biorefinery, biomass is produced by agriculture and forestry, and is used comprehensively as materials for food, forestry products, chemical products and fuel. That is to say, the era of producing farm products for the sake of food production is shifting to an era of growing farm crops to produce food, chemical products, and energy simultaneously. The economic system will change significantly, as seen in an example of the increased market price of corn triggered by the bioethanol boom.

The benefits of natural resources will be widely shared by making the most of the earth's sustenance to grow plants through biorefinery. To do so, it is essential to create a system where those engaged in farming and forestry can make a profit. Appropriate forestry management can contribute to the forest environment, flood control, and disaster prevention. On the other hand, land use in the pursuit of individual or company interests will lead to large-scale environmental destruction. In fact, due to the shift to sugarcane and soybean farmlands in the Amazon rainforest, there is concern about reduction of the rainforest. An international framework is required to lead the growth and use of biomass from a long-term view. In the growth of biomass, taking nutrients from the land is also an important issue. Especially, there is concern that the cycle of phosphorus and nitrogen may be destroyed. Phosphorus is produced by acid treatment of phosphate rocks. The amount of high-quality phosphate rocks, however, has been decreasing since the 1990s and is predicted to be depleted by the middle of this century. The depletion of phosphate rocks is directly connected to the food crisis.

Perspectives on Biorefinery Development in Southeast Asia

Biofuels, one of the core substances of biorefinery, will be discussed using the example of biofuels in Southeast Asia, especially Indonesia. Bioethanol is usually produced from hydrolysis and fermentation of plant carbohydrates such as sugarcane or corn, followed by distillation refinement. Biodiesel refers to a fuel alternative to light oil produced from plants and animal oil and fat for diesel engines. It consists of fatty acid methyl esters. Bioethanol can be either directly mixed in gasoline or mixed after conversion to ETBE (ethyl tertiary-butyl ether – synthesized from ethanol and isobutene). On the other hand, biodiesel can be used as liquid fuel itself for diesel engines or can be used by mixing with light oil. Countries around the world have already recognized the usability of biofuels and have been making efforts to promote biofuels as a national strategy.

In the current bioethanol production, sucrose-based materials including sugarcane extract approximately accounts for 60% and starch-based materials including corn accounts for 40%. Other

materials such as flour, sugar beets, waste wine, and cassava (tapioca) are used appropriately according to each country's climate. For example, in Indonesia—tropical Asia, there are a number of corporations and oil companies that carry out sugarcane plantation. Waste molasses and starch-based cassava are mainly used as raw materials. Furthermore, sucrose-based materials can all be used for ethanol production or can be used for sugar production while producing ethanol with the co-produced molasses. While waste molasses is used to produce ethanol in the sugarcane-based sugar refineries, bagasse, which are strained sugarcane lees, are largely co-produced. Approximately 90% of the bagasse can be used as a heat source or fuel to generate power in the sugar refineries, while the rest of the bagasse is either discarded or used as fertilizer after conversion into added-value products. There are reported cases of using bagasse for pulp and boards. Recently, there is a tendency that the amount of unused bagasse increases with improvement in boiler efficiency.

In tropical Asia such as Indonesia, leguminous acacia that can grow actively by its own nitrogen fixing activity is widely introduced. The total planting area of acacia reaches 1,000,000 hectares just in Indonesia. At the same time, since the 1970s Japanese paper companies have dedicated themselves to establishing woody biomass plantations of fast-growing tropical trees, in order to revitalize forests and secure woody biomass resources. Some advantages of acacia are that it is fast-growing, that it completes large carbon fixation in a short period of time, and that it is able to grow in oligotrophic soil. The disadvantage of acacia is that nutrients are taken from the forest land as a result of repeated logging and harvesting in plantation, leading to impoverished soil. However, fast-growing tropical trees such as acacia are said to be promising resources for biorefinery because they are a cellulose-based biomass that does not compete with foods and can grow in hostile environments.

Acacia is used as a raw material to produce paper/pulp, ingredients, fuel, fertilizer, and chemicals. Regarding fuel and fertilizer, fast-growing tropical trees are commonly used as fuel materials in parts of the countryside except for urban areas in Indonesia. One of the reasons for this is because the calorific value of acacia is relatively high. Moreover, acacia has high ash content, an inorganic substance (Ca, K, P, Mg, Si, Al, Ba, Fe, Ti, Na, Mn, and Sr). Therefore, it is possible to apply the remaining ash after burning the land. Because chemical fertilizer is manufactured from fossil resources, acacia-based fertilizer is useful for the recyclable biomass production cycle [9]. Meanwhile, there are reported cases where the amount of crop for corn and peanuts increased after applying the charred bark of *Acacia mangium*, co-produced in pulp production, to the earth as fertilizer [10]. Furthermore, pH, total nitrogen, and available phosphorus are effective in improving the chemical compound of impoverished tropical soils with high precipitation. *Acacia mangium* is also a valuable tree species in that it is able to adapt to altisol soil with high Al saturation [11].

In Indonesia, the aim is to increase the national ratio of biofuels to 10% by 2010. The country carries out bioethanol production from waste molasses and cassava as well as biodiesel production from

Elaeis guineensis (palm) oil and *Jatropha curcas* oil [12]. In the case of *Jatropha curcas*, the national oil and gas company, Pertamina, formed the *Jatropha curcas* Biodiesel Project Development in 2005 and has been working on *Jatropha* cultivation and biodiesel production from *Jatropha* [13]. *Jatropha* is a fast-growing perennial plant that can be easily established. It is also strong against drought and insects, and can survive with an annual precipitation of 400 millimeters or less. It can be planted in impoverished soil such as a desert, and a small amount of agricultural chemicals and fertilizer is required. Although the amount of oil of raw materials extracted from seeds accounts for approximately 35% of the same amount from the palm tree, it accounts for 5 times as much as soybean and 3 times as much as cole-seed. *Jatropha* is characterized with being able to provide an on-site supply at an inexpensive price, without competing directly with cooking oil [14].

Conclusions

In early March 2007, the EU approved a 20% reduction in greenhouse effects by 2020, and set a target of 10% of all vehicle fuels to be biofuels. The EU has the world's largest biodiesel production and has begun moving toward palm-based/derived biodiesel imports, due to the popularity of biodiesel produced from palm oil, which is cheaper than coleseed. The development of *Elaeis guineensis* plantations by exploiting the tropical rainforest has the potential to influence communities in various ways, such as destruction of the ecosystem or decreased biodiversity, disruption of the forest culture and the local economy living on forestry, increased flooding and fire disasters caused by deforestation, and pesticide pollution. Moreover, it is pointed out that back-breaking work with low wages and child labor could increase. On the other hand, biomass plantations on degraded land provide an opportunity to generate more green and new employment on such land. One should take into account both the positives and negatives of using biomass. It is important to consider the production and use of biomass after carefully examining influences on local communities and on the environment multilaterally.

References

1) Watanabe, Takahito and Watanabe, Takashi, Biorefinery of tropical biomass, *Seizonken Kenkyu*, 3, 65-71 (2007).
2) Watanabe, Takashi, Trends in biorefinery and pretreatments of lignocellulosics by white rot fungi, *Mokuzai Gakkaishi*, 53, 1-13 (2007).
3) Pimentel, D. and Patzek, T. W., Ethanol production using corn, switchgrass, and wood; Biodiesel production using soybean and sunflower, *Nat. Resour. Res.*, 14, 65-76, 2005.
4) Elbehri, A., Cellulosic biomass for bioenergy: Economic and analytical issues, Economic Research Service and Farm Foundation Workshop on Biofuels, Washington, D. C., Feb. 27, 2007: http://www.farmfoundation.org/projects/documents/ElbehriCellulosic.pdf
5) Wang, M., Energy and greenhouse gas emissions impacts of fuel ethanol, NGCA Renewable Fuels Forum, the National Press Club, Aug. 23, 2005: http://www.oregon.gov/ENERGY/RENEW/Biomass/forum.shtml

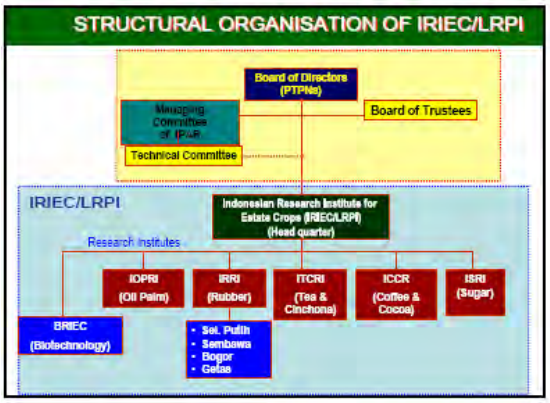
6) U.S. Department of Energy, Energy Efficiency, and Renewable Energy, Top Value Added Chemicals from Biomass Volume I—Results of Screening for Potential Candidates from Sugars and Synthesis Gas, http://www1.eere.energy.gov/biomass/pdfs/35523.pdf
7) Biofuels in the European Union, A Vision for 2030 and beyond, http://ec.europa.eu/research/energy/pdf/biofuels_vision_2030_en.pdf
8) BIOCOUP - Co-processing of upgraded bio-liquids in standard refinery units, http://www.biomatnet.org/secure/FP6/S2051.htm
9) Kuspradini, H., Yusuf, S., Meshitsuka, G., Supraptono, B. and Sardjono, M. A., An analysis of caloric values and characteristics of wood fuel quality preferred by some forest communities of Malinau in East Kalimantan, Tropical woods, properties and utilizations (Muladi, S. and Arifin, Z. eds), Gadjah Mada University Press, Indonesia, 318-326, 2005.
10) Yamato, M., Okimori, Y., Wibowo, I. F., Anshori, S. and Ogawa, M., Effects of the application of charred bark of *Acacia mangium* on the yield of maize, cowpea and peanut, and soil chemical properties in south Sumatra, Indonesia, *Soil Sci. Plant Nutr.*, 52, 489-495, 2006.
11) Tomita, K., http://www.tuat.ac.jp/~tropical/agroforestry/report20.htm
12) Wirawan, S. S., Current and future usage of biofuels in Indonesia, *Conference proceedings in Australia-Indonesia Joint Symposium in Science and Technology*, Sep. 13-14, 2006, Jakarta, Indonesia: http://www.science.org.au/events/indonesia/wirawan.htm
13) The Jatropha network worldwide: http://www.jatropha.net/network.htm
14) Jatropha Project: http://www.nbf-web.com/japanese/jatropha.html

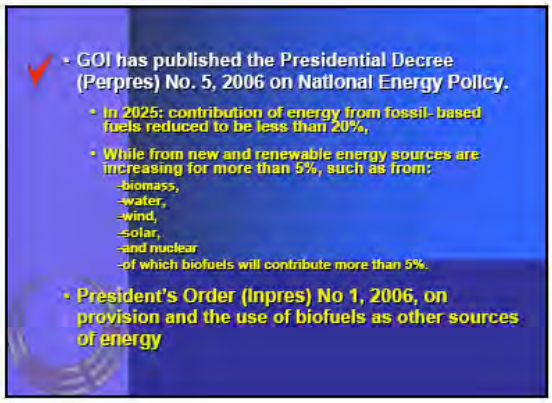
Scientific Session 1 - 3

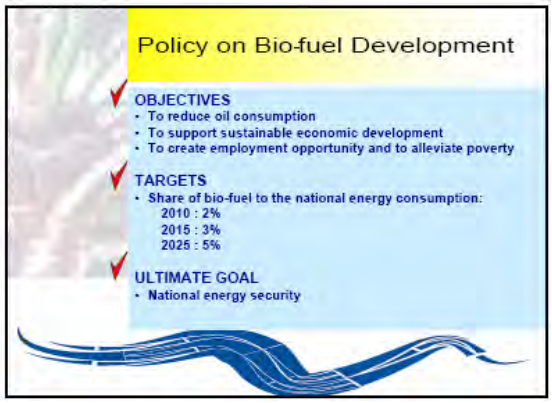
Current Status of Research and Development on Biofuels in Indonesia

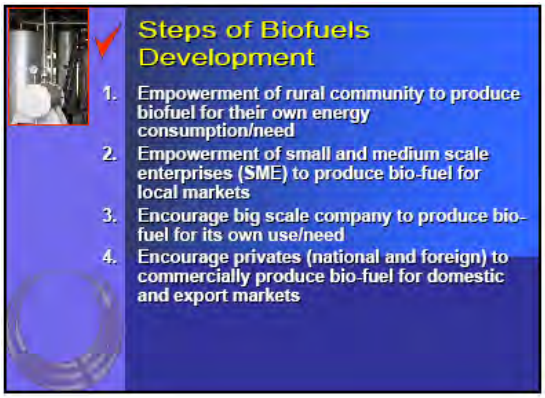
Gede Wibawa, Didiek Hadjar Goenadi, Tjahjono Herawan, and Yahya Kurniawan

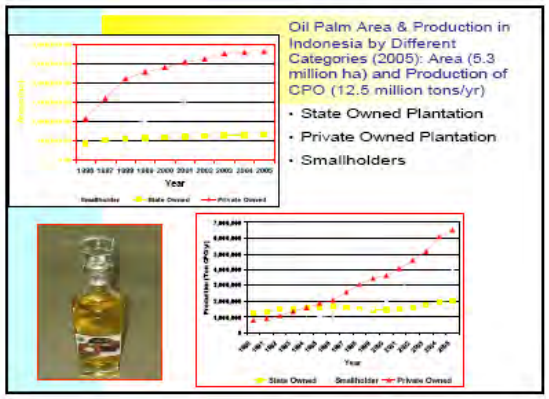
The Indonesian Research Institute for Estate Crops

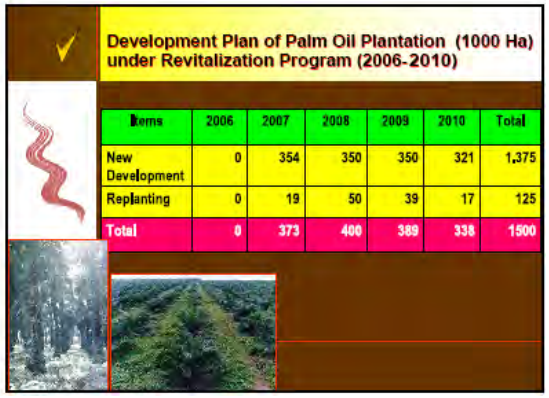












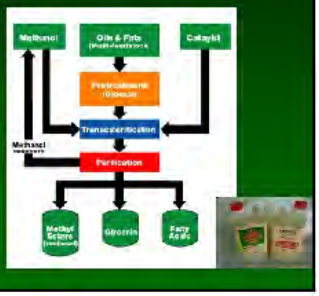
Items	2006	2007	2008	2009	2010	Total
New Development	0	354	350	350	321	1,375
Replanting	0	19	50	39	17	125
Total	0	373	400	389	338	1500

If 5% of the National Diesel need Is substituted by Biodiesel: then Biodiesel needed 1.3 millions kiloliter/yr

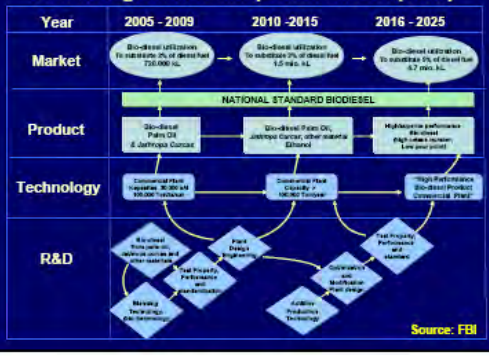
- Supplied by ± 340.000 Ha oil palm plantation
- Required: 11 - 37 Biodiesel plants with capacity 30.000 - 100.000 Tons/yr

❖ PROCESS OPTIMATION

- Raw Materials:
  - CPO standard (FFA < 5 %)
  - CPO off grade (FFA 5-20 %)
  - PFAD(FFA > 70 %)
  - RBDPO
  - RBDPS
  - Used frying oil
  - PKO
- Search for New Catalyst
- Reducing Cloud Point
  - *Additives; process*



Technological Roadmap of Biodiesel (TRM)



VALUE ADDED PRODUCTS FROM PALM BIODIESEL

Beta Carotenes : 500 – 700 ppm

- Source of pro vitamin A, Anti oxidant, Anti cancer,
- High price USD 192/kg (30%) - USD 640/kg (pure)

1 ton (1,15 kL) palm biodiesel contain 0,5 – 0,8 kg pure carotenes

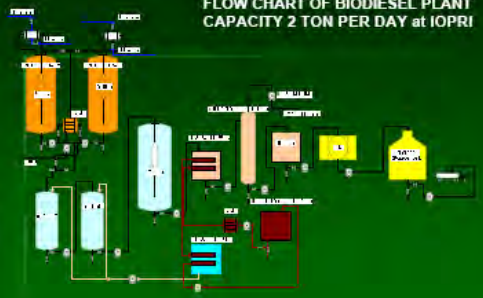
RESEARCH AND DEVELOPMENT OF BIODIESEL IN INDONESIA

Institutions involved:

- Indonesian Oil Palm Research Institute (IOPRI)
- Universities (ITB, IPB, Gajahmada)
- Agency for Technology Assessment and Application (BPPT),
- LIPI

Process Optimization
Biodiesel plant engineering design
Road Test
Performance test
Socialization

FLOW CHART OF BIODIESEL PLANT CAPACITY 2 TON PER DAY at IOPRI



❖ DESIGN ENGINEERING OF BIODIESEL PLANT

BIODIESEL PLANT CAPACITY 2 TON/DAY

Results of Gas Emission Test: B10 : B0

- NOx emission higher (10%) in B00 compared to B10
- CO & CO2 emission higher (30%) in B0 compared to B10
- SO2 emission significantly higher in B0 compared to B10

Source: Tjahjono, *et al.*, 2007

Road Test: Biodiesel (B10 & B20) : B0

Isuzu Phanter Touring: B20
Jakarta & Surroundings

Toyota Kijang Innova: B10
Jakarta – Medan (+/- 2200 km

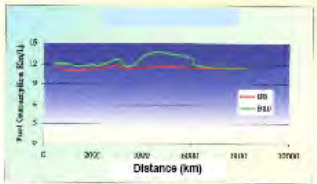
Bank MANDIRI peduli energi

Investment Plan in Bio-diesel Industry in Indonesia

NAME OF COMPANIES	LOCATION	Production Capacity (Ton/Year)
PT Asianagro Agungjaya	Jakarta	100,000
PT Sari Dumai Sejati Riau	Sumatera	100,000
PT Indo Bio Fuels Riau	Sumatera	150,000
PT Etherindo Wahanatama Tbk	Gresik, East Java	200,000
PT Bakri Rekin BioEnergy	Jambi/Batam, Sumatera	60,000 – 100,000
PT Sumi Asih Group	West Java	200,000
PT Darmex Oil & Fats	West Java	85,000
PT Wilmar Bioenergi Indonesia	Dumai, Sumatera	350,000
PT Rajawali Nusantara	West Java	10,000
PT Energy Alternatif Indonesia	Jakarta	450

STATE OWNED PLANTATION CONSORTIUM TARGETED: 1 million tons/year in 2018

Fuel Consumption (km/L):



Road Test Results comparing B10 : B0

SUGARCANE BASED BIOETHANOL

POTENCY AND OPPORTUNITY

A. Sugarcane Production Potential Raw Material for Ethanol

	Area (HA)	Yield (TONS)	Production (TONS)
JAVA	50.500	120	6.060.000
OUT SIDE JAVA	700.000	80	56.000.000

B. PRODUCTION OPPORTUNITY= 75 LITERS/TON SUGARCANE

- JAVA = 75 Ls X 6,06 Mio = 454,5 Mio Ls
- OUT SIDE JAVA = 75 Ls X 56 Mio = 4.200 Mio Ls

TOTAL = ± 4.654,5 Mio Ls

PROFIL of the NEW VARIETIES for BIOFUEL

	Irrigation	Upland
• Productivity		
Sugarcane (T/Ha)	105.5	81.8
Rendemen (%)	11.0	10.1
Sugar (T/Ha):	11.6	8.5
• Cane Juice	PS-851 (12 months)	PSCO 902411 (7 months)
Sucrose (%)	10.33	12.37
Reduction sugar (%)	1.94	0.56
Total sugar (%)	15.49	20.70

COST INFORMATION

1. INVESTMENT

RAW MATERIAL	PRODUCT	INVESTMENT (USD)	NOTES
SUGARCANE	- ETHANOL	0,10-0,18 Mio/TCD	- SM & Ethanol Mill ANNEX - Old Sugar Mill - New Sugar Mill
SUGARCANE	- SUGAR - ETHANOL	11.000-15.000/ TCD	- SM & Ethanol Mill ANNEX - Old Sugar Mill - New Sugar Mill

2. COST of PRODUCTION

- COST OF PRODUCTION OF ETHANOL WITH SUGARCANE AS RAW MATERIAL RANKS Between Rp 5.200 - Rp 5.700,- PER LITER of ANHYDROUS ETHANOL
- COST OF PRODUCTION IS DOMINATED BY COST OF RAW MATERIAL 60 – 65 %.

POTENCY of SUGARCANE VARIETIES

Early maturity Variety: 6-8 months

Variety	Sugarcane Productivity (ton/ha)	Sugarcane Characters			Total Sugar (ton/Ha)	Bioethanol Productivity	
		Fibre % SC	Brix % SC	TSAI % SC		L/ton	L/Ha/Yr
GX	70.36	18.11	19.73	17.67	12.43	108.74	11.473
GY	83.79	13.98	17.74	15.91	13.33	97.86	12.303
GZ	51.63	14.39	18.83	17.78	9.18	109.40	8.472

Source: P3GI/ISRI

Opportunity opened for Sugarcane Plantation and Distilleries for E-5 In 2010

2010 → 23 ML GASOLINE - *ESTIMATED DEMAND*

→ E-5 - *5 % ethanol blend in unleaded gasoline*

→ 1.15 ML ETH

→ 153,661 HA

→ 8-16 DISTILLERIES

Key Success Factors of Companies to Compete in Biofuels Industries

(Source: N. Goenadi, Accenture, 2007)

1. Sustainable supply of raw materials
2. Policy of Developed Countries on energy supply warranty and its domestic production
3. Policy that supports Agro- industry at various countries
4. Regulation that favors the use of biofuels

- Incentive will create new player at biofuels market
- Innovation will increases economic value of biofuels
- Sugarcane is a raw materials with a big market share for bioethanol
- Due to threat on Oil Palm, sources of biodiesel raw materials are not single but varies toward the cheaper.

BIOFUELS INVESTMENT : IS IT STILL FEASIBLE?

- Depend on 3 main factors:
  - Fossil based fuel price (Crude Oil)
  - Subsidy of Biofuels in Developed Countries
  - Cheap raw materials

At CPO price of 400 USD/ton; Biodiesel price in Malaysia 686 USD/ton; and Fossil based Crude Oil 377 USD/ton

There is a positive income on Biodiesel Industry

Concluding Remarks

- Indonesia continues to generate Bio fuels technologies, based not only on Palm Oil, but also from other sources.
- The biofuels R&D involving Research Institutes, Universities, and Private companies.
- Government of Indonesia (GoI) has facilitated the Biofuels R&D. The emergence of investment in Biodiesel Plants is responding to the potential market of the Biofuels and the facilitation of the GoI.
- The Government Develops Revitalization Program on Oil Palm plantation in order to improve the productivity and to increase the availability of Palm Oil.

BIOFUELS INVESTMENT : IS IT STILL FEASIBLE?

At the current CPO price or almost 1.5 time of the Fossil based *Crude Oil* price

- CPO based Biodiesel price is estimated Rp 7875-8000/l (difficult to compete Solar domestic price)
- Biodiesel Investment is still feasible if CPO price is about USD 550/ton
- CPO price of USD 550/ton will be difficult to occur in the coming year.
- If the Plantation Revitalization Program on Oil Palm is under control, the future Supply will increase, is the CPO price decrease ?

Scientific Session 1 - 4

Novel Thermal Conversion Process for Bio-energy by Microwave Heating at Research Institute for Sustainable Humanosphere (RISH), Kyoto University

Taro Sonobe*, Hiroaki Suzuki, Tomohiko Mitani, Naoki Shinohara, and Kozo Hashimoto

*Center for Exploratory Research on Humanosphere

Research Institute for Sustainable Humanosphere (RISH), Kyoto University

Abstract

Microwave (MW) heating is today a mature and familiar technology which finds wide application in food processing, domestic cooking and material processing as well as in chemistry. MW heating works by passing non-ionizing microwave radiation, usually at frequency of 2.45 GHz, through the substance. MW heating has a lot of advantages such as fast and selective hating as well as high efficiency compared with conventional heating by conduction. On the other hand, the use of MW heating has also limitation in applicable heating temperature which is around boiling temperature of water under atmosphere. Therefore, technological innovation for the wider application of MW heating at higher temperature is required for current our society so as to develop the high-efficiency thermal conversion process for energy saving in the various sectors such as industry, domestic, power generation.

At RISH, we have been also developing the several thermal conversion processes for renewable bio-energy production through MW heating techniques. As pretreatment of the enzyme saccharifcation of woody biomass for bio-ethanol production, the effect of MW irradiation has been investigated so as to improve the enzyme saccharification rate. 3D electromagnetic wave simulation is applied to develop a MW irradiation cavity which can perform highly-efficient MW irradiation pretreatment. Currently, MW direct heating of woody biomass as well as metal oxides at higher temperature is also investigated. In this paper, recent progress of research and valuable potential of MW heating for environmentally friendly thermal process are summarized.

Key words: Microwave heating, Bio-Energy, Energy Saving, Global warming

Introduction

It is recognized that the technical, social, economic, and environmental challenges of global warming as well as energy security through “New Energy Initiatives” are the most principal issues for sustainable development and the future our planet. In many economics, particularly in Asia Pacific region, where rapid economic growth in recent years, the demand for new energy resources and services are dramatically increased. Figure 1 shows the forecast for trends in world energy demand by region. Dramatic increase of energy demand in Asian-pacific region in next 20 years is predicted. According to the forecast, by 2030, Asian-pacific region will occupy the 36 % of world energy demand and its total demand will be increased to 2 times larger compared with that of 2002. So, in near future, Asian-pacific region is supposed to be the largest energy consumer in the world.

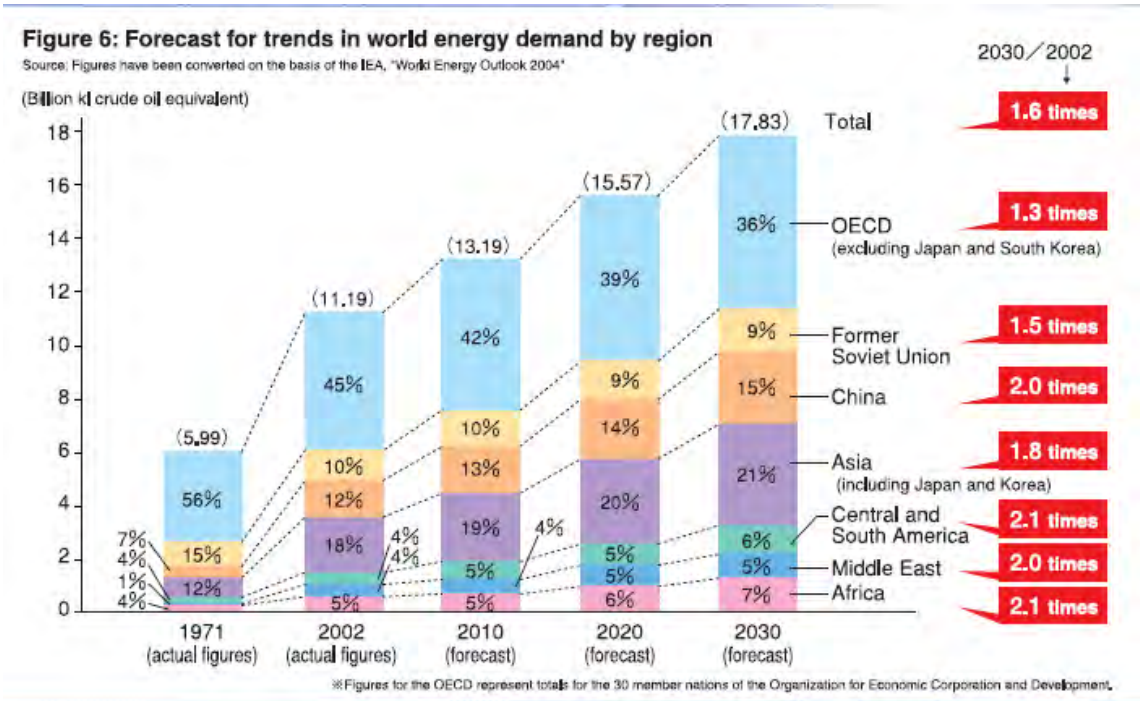


Fig. 1 Forecast for trends in world energy demand by region (*cite*: Energy in Japan 2006)

Table 1. Energy Consumption and CO_2 emission per GDP [2]

Country	ENERGY CONSUMPTION per GDP (Mtoe / BUSD) in 2003	CO_2 EMISSION per GDP (MtC / BUSD) in 2003
Japan	0.106	0.069
Korea	0.350	0.212
Thailand	0.526	0.408
Vietnam	0.543	0.433
Indonesia	0.702	0.539
Singapore	0.240	0.151
Philippines	0.373	0.227
Malaysia	0.542	0.410
India	0.618	0.539
China	0.865	0.82

Also, low energy-use efficiency in the same region is serious problem for energy security and global environment issues. Table 1 shows the energy consumption and CO_2 emission per GDP (MtC/BUSD) in 2003 of Asian Countries. As can be seen in this data, Japan has successfully achieved the high energy efficiency, however, the other countries show still quite low energy efficiency, particularly in

China, India, and Indonesia. In addition, the lower efficiency is corresponding to the higher CO_2 emission. As seen in Fig. 1, these Asian countries are supposed to be big energy consumer by 2030. So, it will be very serious for our environment unless we can improve the energy efficiency as much as possible in this region. Therefore, further improvement of energy efficiency is very important so as to reduce the environmental impact.

Due to the above concerns over excessive fossil fuel usage, renewable biomass resources have grown in importance as partial alternatives to fossil resources. Biomass including agricultural residues is one of the main renewable energy resources available especially in an agricultural country. Biomass can be converted to energy and clean fuels via thermo chemical and biochemical processes. However, technological innovation to improve the biomass conversion process is required in order to reduce the loss of biomass resources and prevent from excessive usage. For this purpose, MW heating is one of the promising techniques to improve the energy efficiency for biomass thermal conversion process.

MW heating is today a mature and familiar technology which finds wide application in food processing, domestic cooking and material processing as well as in chemistry. MW heating works by passing non-ionizing microwave radiation, usually at frequency of 2.45 GHz, through the substance. MW heating has a lot of advantages such as fast and selective hating as well as high efficiency compared with conventional heating by conduction. On the other hand, the use of MW heating has also limitation in applicable heating temperature which is around boiling temperature of water under atmosphere. Therefore, technological innovation for the wider application of MW heating at higher temperature is also required for current our society so as to develop the high-efficiency thermal process for energy saving.

At RISH, we have been also developing the several thermal conversion processes for renewable bio-energy production through MW heating techniques. As pretreatment of the enzyme saccharifcation of woody biomass for bio-ethanol production, the effect of MW irradiation has been investigated so as to improve the enzyme saccharification rate. 3D electromagnetic wave simulation is applied to develop a MW irradiation cavity which can perform highly-efficient MW irradiation pretreatment. Currently, MW direct heating of woody biomass as well as metal oxides at higher temperature is also investigated. In this paper, recent progress of research and valuable potential of MW heating for environmentally friendly thermal process are summarized.

Microwave Heating

Brief History [3]

Rapid heating by microwaves was discovered by Percy Spencer while building magnetrons for radar sets at Raytheon. He was working on active radar set when he noticed a strange sensation, and saw that a peanut chocolate bar he had in his pocket started to melt. Although he was not the first to notice this

phenomenon, as the holder of 120 patents, Spencer was no stranger to discovery and experiment, and realized what was happening. The radar had melted his candy bar with microwaves. The first food to be deliberately cooked with microwaves was popcorn, and the second was an egg, which exploded in the face of one of the experimenters.

By the late 1970s the technology had improved to the point where prices were falling rapidly. Formerly found only in large industrial applications, microwave ovens (often referred to informally as simply "microwaves") were increasingly becoming a standard fixture of most kitchens. Rapidly falling price of microprocessors also helped by adding electronic controls to make the ovens easier to use. By the late 1980s they were almost universal in the US and had taken off in many other parts of the globe. Current estimates hold that nearly 95% of American households have a microwave.

Principle

A microwave oven works by passing non-ionizing microwave radiation, usually at a frequency of 2.45 GHz (a wavelength of 12.24 cm), through the food. Microwave radiation is between common radio and infrared frequencies. Water, fat, and other substances in the food absorb energy from the microwaves in a process called dielectric heating. Many molecules (such as those of water) are electric dipoles, meaning that they have a positive charge at one end and a negative charge at the other, and therefore rotate as they try to align themselves with the alternating electric field of the microwaves. This molecular movement creates heat as the rotating molecules hit other molecules and put them into motion [3].

Recent Progress of MW heating development

Recently, MW has become paying attention to be as a clean, highly effective energy source. Shortening arrival time up to the setting temperature and achieving the uniform heating can be realized by using the micro wave energy. This makes a new application to not only a high-speed sintering ceramics technology but also the high purity synthesis of the exotic material and the chemical reaction. The technology of electromagnetic energy application will become greatly contribute to the field of the environmental, medical, and welfare fields [4].

M. Sato et al recently developed the microwave iron making process, which enable to produce the higher purity of pig iron compared with conventional method. Also, there are many research conducted to investigate MW induced meaningful chemical reactions, MW heating effects in the presence of inorganic materials such as functional ceramics. In order to promote the information exchange and knowledge spread for science and technology in the field of electromagnetic wave energy application, Japan Society of Electromagnetic Wave has been newly established in 2007.

Research on Microwave Heating for Bio-energy Conversion Process at RISH

Development of the microwave thermal conversion process toward fossil resource free society

This research aims at exploring the wider application of microwave heating at higher temperature for bio-refinery process as well as material processing of functional ceramics. Today, the microwave heating technique has been a mature and familiar technology as Microwave oven in domestic cooking, however, its applicable heating temperature is limited and heating mechanism is not understood well.

Utilization of biomass is considered as carbon neutral and renewable energy resources. So, further innovation on energy saving for bio-refinery process by microwave is big challenge and expected to reduce much environmental impact. In order to compete with conventional bio-refinery process such as carbonization, liquefaction, and gasification, it requires achieving high temperature at above 400°C at least. Through the numerous trials at our laboratory, we have done the feasibility study for this purpose well and bench scale investigation is carrying out at present.

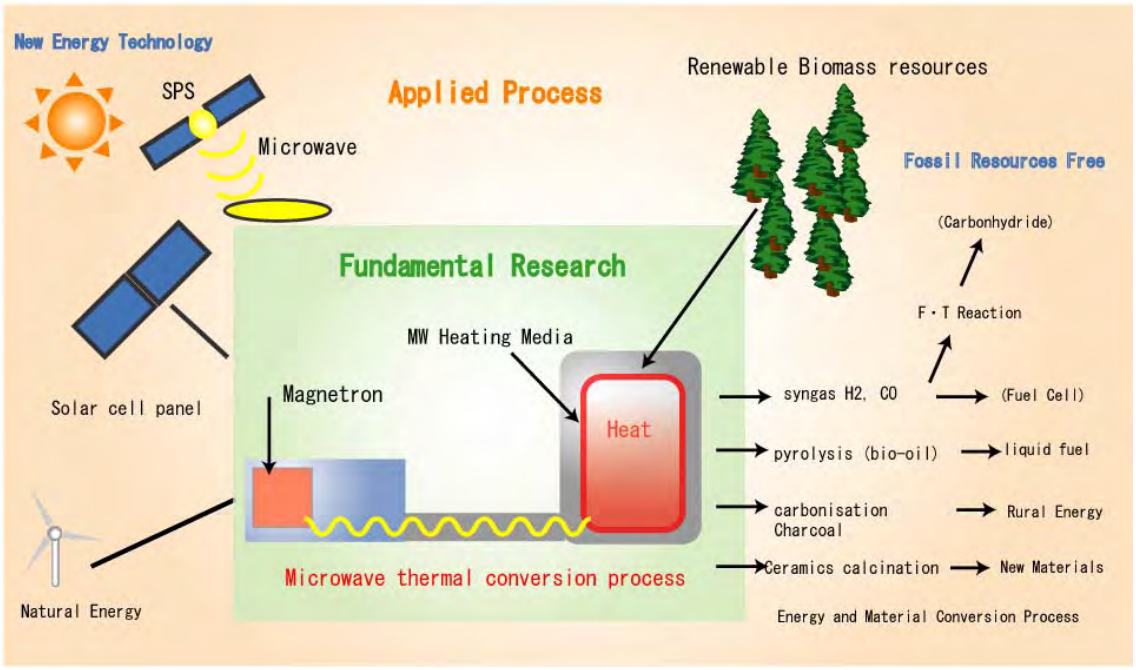


Fig. 3 Concept of microwave thermal conversion process toward fossil resource free society

In addition, we have also tried to apply the microwave heating to material processing of functional ceramics. This aims at investigating effects of microwave irradiation on the catalytic material as well as investigating microwave heating mechanism of inorganic materials. Microwave heating of inorganic has been considered to correlate closely with its dielectric property as well as structural property such as porosity, grain size, crystal structure, and so on. In this study, we are investigating the correlation factor of

microwave heating to understand heating mechanism and wider application for ceramics preparation such as calcinations and annealing process by microwave heating.

Finally, microwave heating is noted again recently due to its high potential for energy saving and creating new kind of thermal process. In order to achieve the fossil fuel free society, the technological innovation for more highly efficient bio-refinery process and material processing within limited resources is needed.

Study on a microwave irradiation cavity for pretreatment of ethanol production from woody biomass

It is known that we can improve enzyme saccharification rate by irradiating woody biomass with microwave as pretreatment of the enzyme saccharification. The objective of the present study is development of a microwave irradiation cavity which can perform highly-efficient microwave irradiation pretreatment.

Since MW heating efficiency and behavior depend on the electromagnetic field in the reaction cavity, so we have to carefully design the irradiation cavity. However, try and error by building real cavity is not effective and much costly, so in our group 3D electromagnetic wave simulation is applied to develop a MW irradiation cavity which can perform highly-efficient MW irradiation pretreatment. This technique can design the various types of MW irradiation cavity on the computer and check the behaviors of MW electromagnetic field.

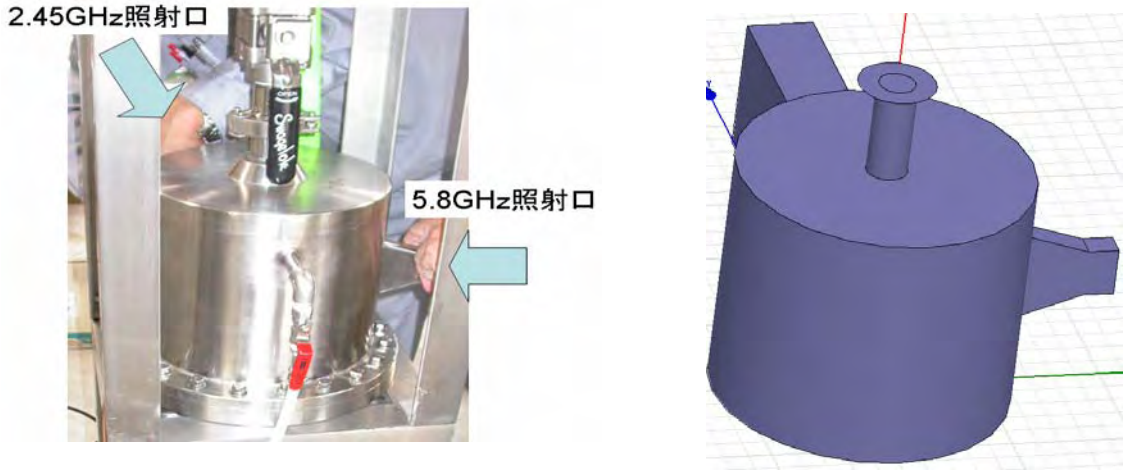


Fig. 4 Microwave irradiation cavity (left: real, right: simulation)

Role of Technological Innovation for Social Community

For achieving the sustainable energy and environment society in the future, there are required actions in energy side. In supply-side of energy, diversification of fuels is required so as to prevent from the energy crisis or energy security issues. For that, to increase the choice of an appropriate fuel portfolio

is needed, such as development of new energy source, biomass energy use, solar energy, wind energy, and so on.

On the other hand, in utilization side of energy, reduction of loss (improvement of efficiency) is needed to reduce the environmental impact. Japan has achieved the high energy saving society so that we can extract those technology through the cooperation based on their demand and requirement.

In such situation, the role of bio-energy is one of the options for each community so as to reduce the environmental impact and to prevent from the energy crisis. As we can notice currently some strange climate and increase of oil prices so on, our community is facing global warming and energy security issues. Thus, our community is requiring the some new energy resources which can be less environmental impact and capable to energy diversification. In new energy resources, there are several options such as bio-energy, solar energy, wind energy, and nuclear energy. However, what the important points are how it can be used as long as sustainable for each community and whether it is really required by each community or not. From technological aspect, improvement of efficiency in both utilization and production is very important to enhance the sustainability of energy system for each community.

Conclusion

In many economics and societies, particularly in Asia Pacific region, where rapid economic growth in recent years, the demand for new energy resources and services are dramatically increased so as to solve the common issues of global warming and energy security. Bio-energy is one of the options for New Energy Resources but how it can be used as much as sustainable is very important. Therefore, technological innovations for improving the efficiency are required to reduce the loss of valuable resources. Microwave heating can provide the effective thermal conversion process due to its rapid heating, selective heating, and direct heating. Microwave heating can contribute to the energy saving in the various thermal conversion processes for bio-energy production.

What is the important point is how it can be used as much as sustainable for each community. For that, there has to be two kinds of parameters should be achieved. One is (1) technological innovation for improving efficiency (reduction of loss) and the other is (2) Appropriate option for community or not; it has to be required by each community as a desired option.

Acknowledgements

The authors would like to acknowledge Professor Takashi Watanabe and Dr. Masafumi Oyadomari from RISH of Kyoto University and Mr. Takahiko Tsumiya from Japan Chemical Engineering & Machinery Co, Ltd.

References

[1] Energy in Japan 2006: Agency for Natural Resource and Energy, http://www.enecho.meti.go.jp/
[2] Y. Nishikawa, plenary lecture, International Conference of Sustainable Energy and Environment 2006, Bangkok, Thailand.
[3] Wikipedia: http://en.wikipedia.org/wiki/Microwave_heating
[4] Japan Society of Electromagnetic Wave: http://www.jemea.org/

SONOBE Taro is Mission Research Fellow at Center for Exploratory Research on Humanosphere of Research Institute for Sustainable Humanosphere (RISH), Kyoto University. He received his Master degree in energy science from Graduate School of Energy Science, Kyoto University. He received his Ph. D degree in energy technology from the Joint Graduate School of Energy and Environment (JGSEE), Thailand. He was also 21 COE Research Fellow (2004-2007) during his staying at Thailand. His major publications include “Study on Pyrolysis Behaviors of Agricultural Residues by TG-MS technique (2007)” in Journal of Analytical Applied Pyrolysis and “Kinetic Analysis of Biomass Pyrolysis Using the Distributed Activation Energy Model (2007)” in Fuel. <sonobe@rish.kyoto-u.ac.jp>

Scientific Session 2 - 1

Biotechnology of Tropical Fast-growing Trees

Toshiaki Umezawa

Research Institute for Sustainable Humanosphere (RISH), Kyoto University

Abstract

Forest biotechnology will play a very important role in establishing systems for sustainable production of *Acacia* spp., which are among the most important tropical plantation trees. Now that the genome sequence of *Populus* has been completely sequence, tree bioscience and biotechnology have entered into a “post-genomic era”. In the modern tree bioscience and biotechnology, a holistic approach that includes genomics, transcriptomics, proteomics, and metabolomics in combination with targeted studies on wood formation is becoming prevalent. However, although tropical *Acacia* is one of the most important tropical plantation trees in Indonesia and Malaysia, its biotechnology is still at a primitive stage. Because the construction of an *Acacia mangium* genome sequence database is far beyond the ability of university laboratories, it is important to construct expressed-sequence tag (EST) databases for this species. In addition, establishment of efficient systems for *in vitro* regeneration of transformed *Acacia* and identification of genes and metabolites responsible for commercially important traits are indispensable for successful genetic modification of the species.

Key words: Wood formation, Tropical fast-growing trees, *Acacia*, Biotechnology

The fossil resource-based industrial society that was established in the 20th century has provided us with prosperity, especially in developed countries. However it has also had serious negative impacts on the global environment due to increasing in the atmospheric concentrations of carbon dioxide, and a number of other pollution problems. Therefore, it is becoming important to establish a sustainable society that depends on renewable resources. Among renewable resources, wood or lignocellulosic biomass is the most abundant, thus, it is important to establish sustainable production and utilization systems for forest biomass resources.

To establish systems for sustainable production of tropical forest biomass that harmonize with the environment, a large research and development group including many scientific sectors must be established. These should include tree bioscience and biotechnology, environmental assessment of tropical forests, forest management, social science of sustainable maintenance of tropical plantation forests etc., in addition to advanced total utilization of forest resources. In particular, tree bioscience and biotechnology provide us with the basic information on wood or forest biomass formation. Such information is indispensable for developing methods to genetically modify trees. There is wide-spread interests in genetic modification of trees because of the potential commercial benefits, such as increased wood production or improved wood quality, resistance to insects and disease, reduced production and processing costs of chips, and reduced chemical costs for pulping and so on [1].

Acacia has been planted extensively in Indonesia and Malaysia for pulping purposes. In addition,

naturally occurring clones of the *Acacia* hybrid, *Acacia mangium* × *Acacia auriculiformis*, which is superior to *A. mangium* in terms of wood-based material production, are found in northern Sabah, Malaysia, and have now been planted commercially in Sabah [2]. Thus, because of their commercial importance, there are increasing demands for sustainable management systems for *Acacia* spp. that are also compatible with environmental conservation. In this context, the Research Institute for Sustainable Humanosphere (RISH) at Kyoto University has initiated a mission-oriented project across the whole institute that is focused on sustainable production and utilization of tropical *Acacia*. To establish environmentally sustainable systems, it is necessary to breed *Acacia* trees that have characteristics meeting these demands.

Forest tree species including *Acacia* are characterized by low levels of domestication and high levels of variation. Thus, selection in breeding populations with a broad genetic base has been the most common approach to forest tree improvement. However, due to the long life cycles, long generation times, and late sexual maturity, traditional tree breeding programs are very slow. Economic growth in developing countries will increase wood demand with decreasing land areas available for forestry. Hence, tree plantation for wood and wood products will have to be more intensive, while being more environmentally sustainable. Thus, there is a need for better tree improvement programs in which modern biotechnology may play an important role [1,3].

Generally, biotechnology of commercial plants requires several basic resources, such as transformation and regeneration systems, gene sequence information, and isolation of genes responsible for the target traits. These basic resources are not yet established for *A. mangium*, and its biotechnology is therefore still at an early stage.

First of all, to my knowledge, only two papers have been published on genetic transformation of *A. mangium* [4] and its hybrid [5]. Hence, more efficient transformation and regeneration systems for *Acacia* spp. must be established. Once these systems are established, we can immediately proceed to metabolic engineering of *Acacia* spp. to improve various attributes by modifying expression of genes that affect commercially important traits. For example, down regulation of the cinnamate/monolignol pathway genes can modify the compositions and contents of lignins and heartwood substances in *Acacia* spp., which is expected to result in financial gains from pulp processing improvements. There have already been promising results in this area reported for *Populus* [6,7].

Next, gene sequence databases must be established. A genome project is far beyond the resources of a single academic laboratory, but an expressed-sequence tag (EST) database can be established with a very much smaller budget. EST is a collection of short sub-sequences of transcribed genes that represent a snapshot of what is expressed in a given tissue at a given developmental stage. We have started to prepare an EST data base for *A. mangium* developing xylem tissue (Suzuki S, Sakurai N, Suzuki H, Shibata D, and Umezawa T, unpublished), since this information has not been published

elsewhere.

It is also very important to identify genes that are responsible for commercially important traits, such as insect and fungi resistance, drought resistance, fast growth, low tapering, circular cross section, less growth stress, less distortion during timber drying, optimal fibril angles, good heartwood coloration, high content of bark tannins, and so on. To identify these useful genes, intensive and time-consuming research must be carried out using differential analyses of each trait in populations of given tree species and/or other plants including model plants. To do that, both holistic (or non-targeted) analyses (i.e. genomics, transcriptomics, proteomics and/or metabolomics) and targeted analyses are necessary.

A. mangium EST databases are useful for identifying genes that are possibly involved in the expression of a given trait in combination with transcriptomics, especially using microarray techniques. In addition, metabolomics or comprehensive analysis of metabolites is a powerful tool to identify compounds that are responsible for important phenotypes, such as disease resistance, etc. Two strategies can be adopted to study metabolomics. One strategy is to carry out a non-targeted and high-throughput analysis with Fourier-transform ion cyclotron resonance mass spectrometry (FT-ICR MS), which can cover a larger number of compounds than any other type of mass spectrometry. However, FT-ICR MS instruments are expensive and are therefore not widely distributed. Besides, this technique is weak at quantitative metabolic analysis, and is therefore better when complimented by a targeted analysis. For precise metabolite analyses are needed, it is necessary to analyze rather limited but significant numbers of metabolites precisely using gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS) with stable isotope-labeled internal standards [8,9].

When the genetic modification approach is pursued, social acceptance is very important. For example, pollen and seed dispersal causes widespread public concern over transgenic trees. One solution might be to plant triploid trees, which are expected to be sterile. This could be achieved via the production of tetraploids followed by backcrossing with diploids. Tetraploid *A. mangium* and *Acacia dealbata* have been produced using colchicines treatment [10]. In addition, illegal logging of *Acacia* has also become a pressing issue, for example, the proportion of illegal harvest in 2001 in Indonesia was estimated to be up to 83% [11]. In this context, the target traits must be determined with due consideration for the welfare of local communities. This indicates that tree biotechnology research and development activities must be conducted in collaboration with social sciences, especially tropical area studies.

In conclusion, forest biotechnology will play a very important role in establishing systems for sustainable production of *Acacia* spp. *Acacia* biotechnology is still at an early stage, and several basic research resources must be established, such as transformation and regeneration systems, gene sequence information, and isolation of genes responsible for the target traits. In addition, *Acacia* tree biotechnology research and development activities must be conducted in collaboration with social sciences, especially tropical area studies.

References

[1] Umezawa T, Suzuki S, Shibata D (2008) Plant Biotechnology, in press.

[2] Matsumoto Y (2002) Report of *Acacia* Hybrid Plantation in Sabah, Malaysia. Abstract of International Symposium on Sustainable Utilization of *Acacia mangium*, pp. 124-127.

[3] FAO, 2004. Preliminary review of biotechnology in forestry, including genetic modification. Forest Genetic Resources Working Paper FGR/59E. Forest Resources Development Service, Forest Resources Division, Rome, Italy

[4] Xie DY, Hong Y (2002) *Agrobacterium*-mediated genetic transformation of *Acacia mangium*. Plant Cell Rep, 20: 917-922.

[5] Kao YY (2001) Genetic transformation of *Acacia magium* cross *Acacia auriculiformis* and molecular characterization of phenylalanine ammonialyase in quaking aspen. *PhD Thesis, Michigan Technological Univ., Houghton, MI, USA* (CAN 137:366571)

[6] Li L, Zhou Y, Cheng X, Sun J, Marita JM, Ralph J, Chiang VL (2003) Combinatorial modification of multiple lignin traits in trees through multigene cotransformation. Proc Nat Acad Sci USA, 100: 4939-4944.

[7] Hu WJ, Harding SA, Lung J, Popko JL, Ralph J, Stokke, DD, Tsai, CJ, Chiang VL (1999) Repression of lignin biosynthesis promotes cellulose accumulation and growth in transgenic trees. Nature Biotechnology, 17: 808-812.

[8] Sakakibara N, Suzuki S, Umezawa T, Shimada M (2003) Biosynthesis of yatein in *Anthriscus sylvestris.* Org Biomol Chem, 1: 2474 - 2485.

[9] Sakakibara N, Nakatsubo T, Suzuki S, Shibata D, Shimada M, Umezawa T (2007) Metabolic Analysis of the Cinnamate/Monolignol Pathway in *Carthamus tinctorius* Seeds by a Stable-Isotope-Dilution Method. Org Biomol Chem, 5:802–815

[10] Blakesley D, Allen A, Pellny TK, Roberts AV (2002) Natural and induced polyploidy in *Acacia dealbata* Link. and *Acacia mangium* Willd. Annals of Botany, 90: 391-398.

[11] Tacconi L, Obidzinski K, Agung F (2004) *Learning Lessons to Promote Forest Certification and Control Illegal Logging in Indonesia*, Center for International Forestry Research, Jakarta.

UMEZAWA Toshiaki is Professor of Metabolic Science of Forest Plants and Microorganisms at Research Institute for Sustainable Humanosphere (RISH), Kyoto University. He received his Doctor of Agriculture in Wood Science and Technology from Kyoto University (1987). He was appointed as an assistant professor of Wood Research Institute in 1982, an associate professor at the same institute in 1993, and a professor at RISH in 2005. He was Monbusho Visiting Fellow (1989-90) at Virginia Polytechnic Institute and State University, and Visiting Scholar at Michigan Technological University (1999). His major publications include Metabolic Analysis of the Cinnamate/Monolignol Pathway in *Carthamus tinctorius* Seeds by a Stable-Isotope-Dilution Method, Org. Biomol. Chem., 5, 802-815 (2007) and the subunit composition of hinokiresinol synthase which controls geometrical selectivity in norlignan formation (2007). tumezawa@rish.kyoto-u.ac.jp.

Man-made Forest as Humanosphere Component

Parikesit

Institute of Ecology, Padjadjaran University

Man-made Forest as Humanosphere Component

PARIKESIT
Institute of Ecology – Universitas Padjadjaran
Bandung, INDONESIA

Outlines

1. Man-made forest: facts and global issue
2. Case study: the Citarum watershed, West Java
3. Some future agendas

Objective

To promote awareness that we are losing a type of forest that is very important in coping global issue and at the same time ensuring food security, alleviating poverty in rural areas, conserving biodiversity, and preserving local knowledge

Background (1)

- Global issue like climate change is usually emphasized in relation to natural forest, therefore, focus has been given to protect natural forest
- The magnitude of resources poured for natural forest protection is excessive. But, degradation of humanosphere is worsening due to loss of natural vegetation cover → problem of social incompatibility?
- Rural people are usually resource-poor and they heavily rely on local resources.
- The use of local resources has provided them a flexibility to manage the lack of capability in using commercial resources.

Background (2)

- Man-made forest is the most important source of free biomass in place where forest is absent.
- But, man-made forest is currently under serious pressure from population growth, expansion of capital-intensive agriculture and expansion of industrial sector.
- Lack of concern towards preserving man-made forest and its important roles (social, economic, and ecological) are often overlooked:
  - Almost no protection measures against pressures
  - No insentitve and disinsentive systems
  - People's needs are not well accomodated: e.g. product marketing

Some facts about man-made forest (1)

- Man-made forest with its different forms of agroforestry types involves 1.2 billion people; many of the practitioners are poor
- Man-made forest provide products and services to poor people, thus, it helps to reduce the rate of deforestation. E.g.: in India, 14m – 24m trees are planted in ± 17m ha land outside natural forest producing ± 30m m^3; in Indonesia?
- Man-made forest has secondary social benefits, e.g inheritance asset, free energy for poor villagers

Some facts about man-made forest (2)

- In countries where fuelwood use is still significant, about 50% of supply comes from man-made forests
- Planting trees outside natural forest means producing more biomass and it may reduce dependence on fossil fuel
- Man-made forest with its diverse forms of agroforestry is a wealthy system of local knowledge, transmitted from generation to generation → loss of man-made forest means loss of national assets

Some facts about man-made forest (3)

- Man-made forest makes a more heterogeneous landscape important for:
  - Biodiversity maintenance: supports 50-80% of biodiversity pf comparable natural system
  - Biological pest control: complex landscape structure is a home of many natural enemies of agricultural pests
- Man-made forest supplies material for wood-based industry like wood carving, furnitures:
  - Supporting local knowledge on wood carving
  - Ensuring food security (income from wood-based economy)
  - Encouraging tree planting
  - Facilitating long-term locking-up of C in carved wood and furnitures

Man-made forest and climate change (1)

- Man-made forest in its various forms of agroforestry has the potential to store and remove carbon from the atmosphere → C storage from decades to centuries
- Advantages: solving the problem of climate change without neglecting food security, rural poverty, and environmental degradation
- C sequestration in Indian agroforests: 19.6 – 47.4 t C/ha/yr (Pandey, 2002); average sequestration potential 25 t C/ha
- C sequestration in Mexican agroforests: 17.6 – 176.3 Mg C/ha (De Jong et., 1997)

Man-made forest and climate change (2)

- In simpified man-made forest like *Albizia falcataria* forest, C sequestration is about 7 – 9 t C/yr (Pandey, 2002)
- Globally, various types of agroforestry systems sequester ± 7 Gt C within the period of 55 years (Sathaye & Ravindranath, 1998)
- Estimated land in the world potential for climate change mitigation through agroforestry development ± 400Mha
- Because of its secondary social and environmental benefits, tree planting for climate change mitigation is more cost-effective than other alternatives like switching from fuel fossil to energy alternative, energy saving, energy alternative development

Why man-made forest needs to be conserved?

- Conserving man-made forest:
  - 'think globally' → climate change
  - 'act locally' → tree management (planting, species selection, composition and structure) at local level
  - protecting man-made forest may contribute to solve global problem through local action, e.g. planting trees for GHG mitigation, poverty alleviation, deforestation reduction
  - Innovative mechanism is needed to integrate local action (tree planting) and global issue (climate change mitigation)
- Ensuring the integration of formal and local sciences:
  - Promoting interdisciplinarity in environmental management: a prerequisite to better manage NR
  - Equity of knowledge: reducing social barrier between scientists and the "real" resource managers (agroforestry practitioners)

Case study of structural and functional aspects of man-made forest in the Citarum Watershed, West Java

Man-made forest in the changing agricultural landscape (1)

- Understanding bio-ecological and socioeconomic aspects of man-made forest may reveal the importance of local knowledge and practices with regard to resource acquisition by resource-poor inhabitants.
- Characterizing local bioresources in relation to domestic energy fulfillment and to what extent the existing man-made forest subsidize local inhabitants in the form biomass energy is important to ensure sustainable rural society.

Man-made forest in the changing agricultural landscape (2)

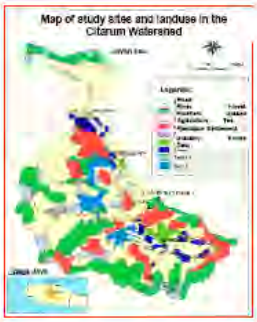
- The problem of fuelwood scarcity is often associated with forest degradation. E.g.: In Indonesia, 72% - 76% of forest removal has been attributed to fuelwood consumption (Lefevre et al., 1997).
- In fact, there are many agricultural landscape components, other than forests, that are potential sources of fuelwood.
- Very few studies on the importance of non-forest source of fuelwood and the extent to which this humanosphere component subsidizes the fulfillment of domestic energy among poor people.

Objectives

- To elucidate bio-ecological and socio-economic aspects of man-made forest in the changing agricultural landscape of the Upper Citarum Watershed
- To what extent the importance of man-made forest as source of domestic energy
- What is the magnitude of subsidy provided by man-made forest through fuelwood use

Study sites

- The Citarum Watershed is the largest catchment in the Province of West Java, Indonesia (app. 6000 km^2). The Citarum river is unique because it supplies water to 3 large reservoirs.
- Population density varies among villages, between 2000 and 10,000 persons/km^2; appr. 40% to 60% of the households are landless.
- Population growth, intensive agricultural activities and expansion of industrial area have resulted in some environmental problems.
- Agricultural-related activities contribute the most to the deterioration of water quality.



Compositional and structural patterns

- Man-made forest called *talun or talun* has existed long before 1900s indicated by:
  - The presence of figs species (*Ficus* spp) with dbh > 80 cm
  - Inheritance system : 19% of respondents inherited the land from their parents in 1920s or before.
- Before 1970's *talun* formed an extensive mat of vegetation, but nowadays it is fragmented
- *Talun* patches exhibit complex vertical as well as horizontal structure:
  - Number of layers: could be > 3
  - Trees with height up to 25 m: 'emergent' trees like *Ficus* spp and *Sterculia javanica*
  - Species assemblages were identified suggesting variations in the man-made forest (*Classification1*) (*Classification2*)
  - Various categories could be found: timber, industrial, vegetables, ornamental, trad. medicine, fruit, forages

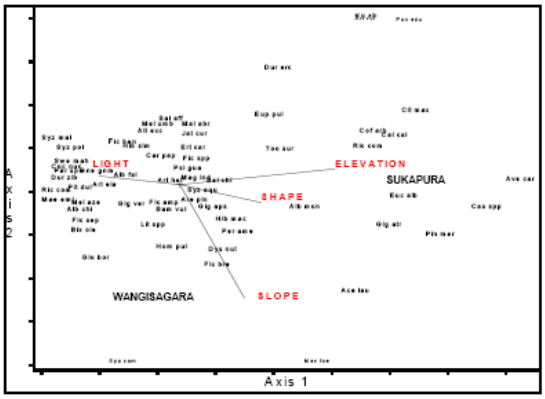
Some dominant species, its main use and occurrence in *talun* in Wanglasagars village

Botanical name	Local name	IVI (%)	Use	Occurrence
A. Trees				
Pithecellobium dulce Benth	Jengkol	23.34	Fr	P
Gnetum gnemon L.	Tangkil	21.07	Fr	P
Arenga pinnata (Wurmb) Merrill	Aren	16.31	Fr/St/B	W
Parkia speciosa Hassk.	Peuleuy	10.12	Fr/Fw	P
Artocarpus heterophyllus Lam	Nangka	9.38	Fr	P
Mangifera indica L.	Buah	7.01	Fr	P
Carica papaya L.	Gedang	6.86	Fr/Me	P
B. Bamboos				
Gigantochloa apus Bonuit & Schult	Awi tali	72.46	C/Fw/Fe	P
Gigantochloa atter Hassk	Awi lemer	51.73	C/Fw/Fe	P
Gigantochloa verticillata Willd	Awi ageung	48.61	C/Fw/Fe	P
Bambusa vulgaris Schrader ex Wendland	haur hejo	27.18	C/Fw/Fe	P
C. Shrubs				
Chromolaena odorata (L) RMKing&Robb	Kirinyuh	34.91	Fw	W
Sida rhobs Linn	Sidagori	16.43	N	W
Urena lobata	Pungpulutan	14.76	N	W
D. Non-graminoid herbs				
Eupatorium riparium Regel	Teklan	52.16	N	W
Ageratum conyzoides L	Babadotan	19.91	N	W

Some dominant species, its main use and occurrence in *talun* in Sukapura village

Botanical name	Local name	IVI (%)	Use	Occurrence
A. Trees				
Eucalyptus alba Reinw ex Blume	Kalloes	28.83	C/Fw	P
Albizzia Montana	Selong montana	28.43	C/Fw	P
Calliandra calothyrsus Meisn.	Kaliandra	26.37	Fw/Fo	P
Euphorbia pulcherrima Willd ex Klotzsh	Kastuba	11.81	O	P
Coffea arabica L	Kopi	10.89	B	P
Arenga pinnata (Wurmb) Merrill	Aren	9.63	Fr/Fw/St/B	W
Artocarpus heterophyllus Lam	Nangka	8.80	Fr/Fw	P
B. Bamboos				
Gigantochloa atter Hassk.	awi temen	74.80	C/Fw/Fe	P
Gigantochloa apus Schult&Schult	awi tali	67.26	C/Fw/Fe	P
Gigantochloa verticillata Willd	awi ageung	43.83	C/Fw/Fe	P
C. Shrubs				
Chromolaena odorata (L) RMKing&H.Rob	Kirinyuh	62.67	Fw	W
Sida retusa Linn.	Sadagori	61.14	N	W
Urena lobata	Pungpulutan	16.86	N	W
Cestrum nocturnum L.	Kembang dayang	14.48	Fe	P
D. Non-graminoid herbs				
Eupatorium riparium Regel	Teklan	68.27	N	W
Oxalis corymbosa DC	Calingoing	28.17	N	W

- Ordination analysis suggested that *taluns* in higher elevation were usually located in sloppy areas. The shape of this multi-layered agroforest in higher elevation tend to be elongated following topographical contours.
- The analysis indicated that elevation and slope were biophysical factors that correlated most significantly with the distribution of plant species in *talun*. This inferred that elevation and slope were the most important environmental factors taken into account by the owners when they planted particular tree species in their *talun*.
- Variable 'area' did not strongly correlate with species richness suggesting that the owners tended to plant similar species that have long-term economic value regardless of the size of their *talun*.



Multifunctional aspect of *talun*

1. Habitat for birds and insects

- It was found that the majority of the 62 bird species encountered during the study used *talun* vegetation for perching, foraging, and nesting. There was a tendency of more diverse bird species in more complex vegetation layering (Pearson's correlation = 0.47; significant at 0.01 level).
- Correlation analysis indicated a tendency of higher diversity of insectivorous birds in more complex vegetation structure (Pearson's correlation = 0.45; significant at 0.05 level). This suggested that the multi-layered agroforest was also a habitat for various insects that are important as birds' prey.
- The diversity of insects living in this agroforest was high; 66 families of flying insect were identified, and the diversity could be higher since particular families consisted of more than one species. While, soil surface insects were less diverse; only 23 families were identified.
- The role of talun in biological pest control needs further investigation

2. Socio-economic functions

- Ownership of *talun* reflected social status of the owners:
  - 96% of owners possessed rice field and/or vegetable gardens, other than *talun* land (up to 3 ha). While, not less than 40% of other villagers were landless; the average of land ownership in the study area was < 0.2 ha.
  - 75% purchased *talun* land suggesting that in spite of elevating price of agricultural land, they still possessed enough cash to purchase *talun* land.
  - About 9% belonged to families that for generations were considered as landlords.
- Prior to the expansion of intensive agricultural practices in the late 1970s, *talun* was an important source of income. Nowadays, owners seldom sell the products on a regular basis.

- Nowadays, the productive function of *talun* was only to support subsistence need. Constraint in marketing the product was the main reason that restrained replanting new trees. *Talun* is a valuable asset merely from the point of view of the land rather than the products. The land was considered as a saving that can be sold in case of cash is needed. Some owners rented their *talun* land in order to improve its economic function.
- *Talun* had social function:
  - Part of inheritance system for generations; the parents usually inherited the land to their descendants.
  - Source of free energy (fuelwood) for poor villagers; owners allowed other villagers to use their land as source of fuelwood as long as no tree is cut.
  - For family's cemetery; the vegetation was kept intact and product extraction was usually carried out with minor disturbance.

The dynamics of *talun* and its affecting factors

- Development and expansion of intensive agriculture, population growth, expansion of industrial areas caused the decline of talun considered as less productive agricultural land; indicated by:
  - Decreasing number of owners
  - Shrinking of talun area
  - Intensive conversion to a more productive agricultural land: conversion of one-*patok* (appr. 400 m²) of *talun* to cashcrop garden planted with carrots yielded about US$ 8.80 within 70 days; to gain the same amount of cash, owner had to wait for at least 5 years to log the planted timber (*Albizia* or *Eucalyptus*).
- The ongoing decline has resulted in:
  - Greater effort carried out by fuelwood users to collect adequate amount of fuelwood; fuelwood users had to spend more time to gather fuelwood because *talun* patches were becoming more fragmented.
  - Change in fuelwood supply from *talun*, although there has not been any difference with regard to the quality and the species used for fuelwood over time.

Fuelwood use: natural subsidy for poor villagers

- > 40% of the fuelwood users worked in low-paying jobs earning less than US$40.00 per month.
- The majority of fuelwood users obtained their fuelwood from various sources at no cost; only 18% purchased fuelwood.
- A family of 5 members consumed between 0.25 and 0.3 m³/week, if fuelwood was the only energy used for daily cooking.
- If fuelwood was used in combination with kerosene, the consumption of kerosene might be lessened by an average of 0.51 L/day.

Pattern of energy use in village located far from forest (in %)

Occupation	% of respondents					Total
	Fuelwood only	Kerosene only	Fuelwood & kerosene	Keros. & LPG	F'wood, kerosene & LPG	
On-farm labor	4 (5)	1 (1)	4 (5)			9
Off- farm labor		17 (19)	13 (14)			30
Farmer	2 (2)	2 (2)	11 (12)			15
Gov't employee		2 (2)	2 (2)	4 (4)		8
Informal sector		12 (14)	9 (10)	1 (1)		22
Retired/no job		5 (6)	5 (6)		1 (1)	11
Small scale business		4 (4)		1 (1)		5
Total	6 (7)	43 (48)	44 (49)	6 (6)	1 (1)	100 (111)

Note: numbers in parentheses are number of respondents

Land ownership among fuelwood and non-fuelwood users (in %)

	Land ownership					Total
	No land	RF only	KT only	RF and KT	Others	
Fuelwood only	5 (5)	2 (2)				7
Kerosene only	41 (46)	2 (2)				48
Fuelwood & kerosene	24 (27)	7 (8)	7 (8)	5 (5)	1 (1)	49
Kerosene & LPG	5 (5)	1 (1)				6
Kerosene, fuelwood & LPG	1 (1)					1
Total	76 (84)	12 (13)	7 (8)	5 (5)	1 (1)	100 (111)

Notes: numbers in parentheses are number of respondents;
RF = rice field; KT = agroforest; LPG = liquefied petroleum gas

Main source of fuelwood and distance from residence (in %)

Fuelwood source	Distance				Total
	< 1 km	1 - 2 km	> 2 km	don't know	
Agroforest (*talun*)	73 (42)	3 (2)	3 (2)		79
Forest			2 (1)		2
River	2 (1)		2 (1)		4
Agroforest & rice field	2 (1)				2
Agroforest & river	4 (2)	2 (1)			6
Agroforest & forest			2 (1)		2
Building construction residues			2 (1)		2
Purchasing/hiring someone				3 (2)	3
Total	81 (46)	5 (3)	11 (6)	3 (2)	100

Note: Numbers in parentheses are number of respondents

Family involvement, frequency and collecting time in fuelwood procurement

FW-freq	Collecting time	The most involved member (%)					Total
		Father	Mother	Son	Hired person	Vendor	
Every day	Morning		2 (1)				2
	Afternoon		2 (1)		2 (1)		4
	No particular time	2 (1)					2
Once in 2-4 days	Morning	3 (2)					3
	Afternoon		2 (1)	3 (2)	2 (1)		7
	No particular time	2 (1)		2 (1)			4
Once a week	Morning	9 (6)	7 (4)	2 (1)	2 (1)		20
	Afternoon		2 (1)				2
	No particular time	3 (2)					3
Once every 2 weeks	Morning	3 (2)		2 (1)	2 (1)		7
	Afternoon	3 (2)					3
Once a month	Morning			2 (1)			2
	Afternoon	2 (1)					2
	No particular time				2 (1)		2
Irregular	Morning	2 (1)	2 (1)				4
	Afternoon		2 (1)	2 (1)			4
	No particular time	10 (8)	3 (2)		5 (3)	9 (6)	27
	Don't know				2 (1)		2

Subsidy from fuelwood use

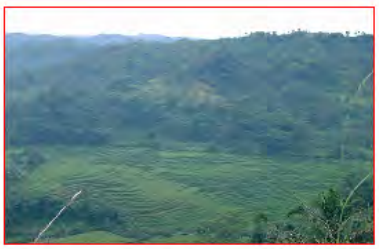
- Fuelwood collected from the various agroecosystem components was a natural subsidy because it is a 'free commodity'.
- At individual household level, the subsidy seemed to be insignificant. The subsidy became substantial if the estimate was applied to the entire village
- A conservative estimation of subsidy for the entire study village over the year was equivalent to ± 217 L kerosene per day.
- The estimate subsidy would be more impressive if it was carried out for the entire Watershed

Subsidy obtained from fuelwood use based on categories of energy used

Range of subsidy		Category		Total
		FW & Ker.	Ker., FW & LPG	
None	No. of respondents	2	1	3
	% within category	5	100	
	% of Total	5	3	8
Less than US$0.02	No. of respondents	12		12
	% within category	32		
	% of Total	31		31
US$0.02 – US$0.05	No. of respondents	21		21
	% within category	57		
	% of Total	55		55
US$0.06 – US$0.09	No. of respondents	1		1
	% within category	3		
	% of Total	3		3
More than US$0.09	No. of respondents	1		1
	% within category	3		
	% of Total	3		3

Some future agendas

- Policy-related studies:
  - To conserve and sustain the existing man-made forest in the course of rapid change of the agricultural landscape in many rural areas of Indonesia
  - To better understand the potential of man-made forest for climate change mitigation and human welfare
  - To enhance participation from local people in tree growing in non-forest lands
  - To develop of merit system aimed to promote tree growing
- Studies on structural and functional aspects of man-made forest aimed:
  - To meet the criteria of the Kyoto protocol
  - To establish an instrument for landscape health evaluation
- Development of mechanism and design aimed to lock-up the wood in non-emitting use as part of maintaining local knowledge and skills
- Market development of products and services to support local economy and poverty alleviation
- Other agendas???




Let the man-made forest prevail…

Scientific Session 2 - 3

Human Security in Peat Swamp Forest

Kenichi Abe

Center for Integrated Area Studies, Kyoto University

Introduction

Historically, tropical forests have been thinly populated. Health and hygienic problems arising form a climate of high temperature and high humidity has prevented people from inhabiting in the forest. In addition, the tropical forest has been the least “tamable” forest. High tropical forests with large trees are un-manageable and it is difficult to transform them into agricultural lands with simple and primitive tools. In this sense, the innovation of modern technology such as the introduction of chain saw was decisive to change the forest physiognomy and to attract the people to come in the tropical forests.

The introduction of chain saw and other heavy machines to cut down the timbers and carry the logs drastically changed the tropical forests. Not only those who worked for the logging, but other people, with various motives and intentions, began to enter tropical forests, which gradually deteriorated and disappeared under their pressure. Some people entered forests for new agricultural lands. Some looked for valuable forest products to make money. Refugees of war and ethnic conflicts migrated into the forest. They entered forests because they had no choice but to live in the untamable forests. Logging roads become access points for those migrants into forest.

Migration patterns vary. For example, either they are voluntary or forced, or ether they are permanent or temporary, or ether organized or ad hoc. The impacts of immigrants on forests are diverse according to the migration patterns. Tropical forest also varies ecologically. Tropical forests in Southeast Asia differ from those in Latin America and those in Africa. Whitmore (1984) classified 13 tropical forest types as “formation” in Southeast Asia alone. Of the various combinations of migration patterns and tropical forests, this paper focuses on self-motivated immigrants to the peat swamp forest (PSF hereinafter) of Sumatra.

First of all, the paper will introduce the characteristics of PSF in Sumatra. PSF was the most formidable of the many tropical forests. Agricultural development of PSF was particularly difficult because of the unique characteristics of peat. As a result, peat swamp forest has been uninhabited, unexploited and unutilized until quite recently compared with other forest types.

Secondly, the paper will explain the changing pattern of immigration into PSF in Sumatra. The immigration became considerable in 1960’s, and expanded in 1980’s for the cultivation of commercial crops. Ecological problems related to the conversion of PSF to farmland are also discussed later.

Following these somewhat introductory parts, the main topics of this paper is the developing, or “maturing”, process of the immigrant society in PSF, based on two separated field surveys. In 1993, the whole household census on social structure, family history, economic conditions and so on taken in two immigrant settlements. In 2001, the researcher revisited these two settlements in order to obtain the same sets of data for comparison. The comparison will highlight the changes of life and social developments within eight years.

Finally, the paper examines the future prospects of the immigrants and their community, and then examines the future PSF from “micrological” or micro-historical viewpoint. The future can best be seen from a holistic global perspective, but best understood at the local level.

In conclusion, PSF is an area where the immigrants are incapable of feeling “attached” to the community. Immigrants desire to leave PSF as soon as they get enough money to resettle outside PSF. The frontier communities in PSF, thus, can be termed a “meta community” or “pseudo-community” rather than a true or real community.

Peat Swamp Forest: Settings and History

PSF can be found exclusively in archipelagic Southeast Asia (Whitmore 1984). One of its unique ecological characteristics is that, on peat, not on "soil", forests exceeding 40 m in height are formed. Peat was thought to be distributed only under cold climate where plant residue remains to be un-decomposed. But if the humidity is high enough with high precipitation throughout the year, the decomposition of plant residue is also prevented even in tropical climate area.

PSF is a delicate ecosystem [note 1] and was "formidable" for human beings. The special environment of PSF had long resisted human activity throughout the history of mankind (Abe 1993). It is appropriately called the "land of miasma" especially for its extraordinary high humidity.

The areas surrounding PSF in Sumatra were not utterly devoid of habitants, however. There were fishing settlements of Malay people along seacoasts and riverbanks. They built houses on piles and earned a living by fishing in small boats (Photo 1). They did go to mangrove forests to obtain *Nipa* palm for roofing and logs for stakes, but dared not go deep into the recesses of the peat swamp forest. PSF was a desolate no-man's land.

In the history of PSF in Sumatra, the only people who entered PSF for forest products were probably Chinese logging worker called *Panglong* (Erman 1994). During the period from the late 19th century to the early 20th century, the *Panglong* entered PSF to harvest timber to meet the growing demand for building materials for the rising port of Singapore. Many of them, however, became exhausted, sick, and died in the unhealthy and poor working environment (Pastor 1929). Records of their activity attest to the fact that PSF is unsuitable for human activity.

The impact of *Panglong* on PSF was not crucial. Despite the fragility of PSF, extraction of the timber with primitive tools and manual labor has left little damage on the forest. PSF at this time resisted the human activity and remained largely unchanged.

The un-reversible deterioration or destruction of forest in Sumatran PSF started when people came into forest and settled down there to convert PSF to agricultural lands.

The first migration to PSF in Sumatra was incidental and didn't live long. In 1940's, flocks of *Banjarese* people evacuated from turmoil in their homeland Kalimantan, and found PSF in Sumatra as harbor. In fact, *Banjarese* lived in the same natural surroundings, PSF in *Kalimantan* and traditionally knew how to convert PSF into agricultural lands.

Conversion of PSF needs a special technique. Sulfuric acid soil is commonly found below the peat layer. When exposed to the air after the loss of the upper peat layer, sulfuric acid soil emits strongly poisonous sulfuric acid. It is, however, possible to create relatively stable farmland by constructing canals through which fertile river water is let onto the farmland at high tide and sulfuric acid is rinsed out at low tide. This is a technique known as *Pasang surut* or tidal irrigation.

The *Banjarese* adopted this technique in their new home. They cleared forests, dug canals, planted rice in the paddies and harvested coconuts on the mound in the paddy fields primary for self-sufficiency. Tidal irrigation is effective in the area where total variation is large and a large river is available. The immigration of the *Banjarese* was basically limited to peripheral peat area such as vicinity of rivers and never extended their activities deep into PSF. Thus the larger part of PSF was still left unchanged.

The second wave of immigrants started in the 1970s and continues ever since. This time, people came for money. In addition to *Banjarese*, *Buginese* came from the island of *Sulawesi*, Javanese from the islands of Java, and even local Malays, who had been living in villages on piles along the Malacca straits. They immigrated not for subsistence but for the cultivation of commercial products, especially coconut trees. Coconut price was then high in the international market in 70s. After harvesting matured coconuts, immigrants took out inner white flesh, dried them and made them into copra for the international market.

The newcomers planted coconut deep in PSF free from the influence of the tides because these coconut plantations need no irrigation unlike paddy. So, they did not disturb the old migrants who had utilized the peripheral peat area for rice cultivation by tidal irrigation. They do dig canals, but not for irrigation purposes, solely for draining excess water contained in peat. Virtually no capital or technology was needed for the conversion of the forest to coconut plantations. What the new migrants did was simply to cut down trees, dig canals, and plant coconut trees.

Agriculture incorporating irrigation using the tides is relatively stable, although in the long run the paddy fields can be eroded and subject to the floods. In contrast, coconut cultivation located deep in peat causes more serious problems related to the physical and chemical characteristics of peat.

The physical characteristics of peat are associated with the decomposition of peat. After the loss of the tree cover and continued drainage of water by canals, the peat dries and gradually shrinks and decomposes. Consequently, ground subsidence occurs, causing coconut trees to be easily felled by winds, leaving their roots exposed above ground. The subsiding ground is vulnerable to floods, in which case, immigrants have no other choice than to abandon their coconut plantations.

The problem derived from chemical characteristic is that peat is originally obligotrophic, lacking minor elements in particular, which are essential for plant growth. The tidal irrigation practiced in the peripheral peat area can supplement the shortage of nutrients by drawing nutrient-rich river water through canals. But commercial coconut plantations are located beyond the coverage. Without any fertilization, the yield of coconut decrease sharply after consuming out the nutrients contained in peat.

Peat, unless tidal irrigation is applicable, is ecologically unfit for sustainable cultivation. Establishing coconut plantations is technically easy with little capital, but maintaining them is difficult when the plantations are located deep in PSF. Consequently, coconut cultivators are, after getting some profits, obliged to leave their plantations, and seek other forest to convert again to coconut plantation, leaving waste land behind (Abe 2002). PSF are disappearing gradually but steadily while migrants repeatedly wander or resettle in the forest for the lands. The point is that these migrants, unfortunately, just think about the profits that they get from PSF and never care and worry about the sustainability of PSF.

Micrology of Communities in Peat Swamp Forests

Following the ecological settings of PSF and history of migration outlined and summarized above, this section deals with the real life ordinary immigrants in PSF, which is little understood and little exposed. Thick description on the immigrant communities helps us to understand the relationship between the immigrants and the forest in PSF. Micrology, going into particular aspect, of communities may count.

"Logic" and Dynamic of the Frontier Community

Generally speaking, settlements in peat swamp forest characteristically extend along canals. First pioneering immigrants approach the peat swamp forest from the river or the sea. They communally dig canals into the forest. Tenderfoots are allotted a forest plot at the far end of the canal. Eventually old migrants settle at the base and newcomers at the tip of canal. The allotted forest is defined by a certain length along the canal. The length differs in each canal or settlement, but usually *baris*, planting space of coconut is used as a unit. Eight *baris*, for example, means the length where eight coconut trees can be planted in a line. The length of *baris* accordingly differs in settlements depending on "fertility" of peat even though each *baris* equals with 7 or 8 *depa* or fathoms in general. The houses are built in roughly equal intervals along the canal. Immigrants are allowed to clear forests "without limit" in a direction perpendicular to the canal. As immigrants grow in number, the canal extends further and further into the forest.

Immigrants virtually need no capital or high technology. What they need is the work force to cut trees, to dig canals, and to plant coconut seedlings. They can create coconut plantations solely through their own labor. Thus, PSF has attracted immigrants eager for money, who have less capital but have lots of labor at their disposal.

In the beginning, there was no formal landownership in the area. Once accepted by the pioneer settlers, anyone who wants to establish a coconut plantation can get access to forest and convert it into plantation. There were still vast forests to be exploited and more and more immigrants came into PSF in accelerated pace. Those who came first got the better share.

For security and daily convenience, immigrants prefer living together to living separately in the coconut plantation. Immigrant workers firstly began to move into the base of canal, where other immigrants settled, too. Once the forest was cleared and coconuts are planted, there was little work in

coconut plantations before harvesting. Weeding was only done once in three months together with harvesting. They further move, then, to bigger settlements or traditional Malay villages on piles for more social and religious services, such as primary school, *madrasah* or Islamic school, mosque and kiosk.

Their mobility was quite high and it can be well exemplified in the census of the settlement A and B that the researcher revisited [note 2].

Many people had emigrated from the peat forest in the eight years since the first census (Table 1). Nineteen families, or half of the 38 families, emigrated from settlement A. Furthermore, four families moved their houses to the base of the canal within the settlements. Among those emigrated, four families returned to the island of Sulawesi, their home land. Two households moved to a big town on the island of Sumatra. They left the settlements, selling off their coconut plantations. Many of the people who emigrated from settlement A moved to live in traditional villages on pile within the same sub district. Their plantations and former houses that they use when they visit the plantations still exist. They visit their plantations only for harvesting or weeding purposes, their lives being based now in villages with a mosque and schools. The peat swamp is a place for making money, not for living.

Similar trends of emigration, although small in number, are also observed in settlement B. Twelve households (22.2%) of 54 have emigrated. None of them returned to their home land. Five households left the peat swamp after selling their plantations. Three household moved to the town after saving sufficient money to live while there were sawmill workers in other two households and they worked in rural area. Another five households maintain their coconut plantations, but have moved to a nearby village on piles.

Table 1. Social Movement in Studied Settlements Between 1993 and 2001

		Settlement A No of Household		Settlement B No of Household	
Total number of Household in 1993		38		54	
	Emigrated out	19		12	
	Move to village on pile		13		5
	Move to town		2		5
	Return to homeland		4		0
	Unknown		0		2
	Move within settlement	4		5	
	Newly recruited	10		12	
Total number of Household in 2001		29		54	

During the same period, ten families have immigrated to settlement A. All, except one, were Buginese from other settlements in Sumatran PSF. One *Buginese* came directly from homeland *Sulawesi*. Nine new immigrant families came to settlement B, three are *Banjarese*, five are *Malay* coming from adjacent settlements, and one Javanese of Sumatra origin. Three branch families from the same settlement are added. The total number of households has decreased by nine in settlement A, while in settlement B the number of households has not changed.

It is a startling fact that the heads of four households (11%) out of 38 household have died in settlement A, whereas the heads of nine households (16.7%) have died out of 54 households in settlement B. This fact, firstly, illustrates the physically demanding life conditions on peat swamp. Secondary it illustrates that medical condition is still poor in the area. Among the social infrastructure, medical treatment facility, such as clinic, is the last to set up. The fact also evokes the miserable life of *panglongs* nearly a century or more ago.

Development of Peat Swamp Forest: Village on Piles

The life in PSF has been simple and humble as before and seems neither improved nor developed. The population of immigrant settlements in PSF does not change substantially as well. However, a concentration of the population does occur in villages of pile dwelling and a sort of development is realized there. The old villages on piles now become the core of development and progress in the area.

The KS village is one of such centers and the Malay came first to settle there [note 3]. KS villagers have been living from fishing. Today fishing, especially prawn-fishing for export, is still the most important economic activity. Fishing people catch prawns using bag nets called *gumbang* and sell the catch to the resident Chinese brokers who grade prawns according to their quality. Expensive high quality prawns are packed in ice and carried to Singapore.

The census of KS village in 1992 showed fifty-eight households of 98 in total owned fishing boats, varying in size from motorized boats of about 1.5 tons to rowboats. Those who did not own boats were hired out as laborers and worked on fishing boats. Thus, most villagers were somehow dependent on fishing at that time.

The population of the KS village increased rapidly with the influx of immigrants from the canal communities. The number of households reached 223 in 1997 and further increased to more than 400 in 2001. Those newcomers still possess coconut plantations deep in PSF and periodically visit them for harvest. They came not for new livelihood or business but for education and other public services.

The number of pupils at KS primary school increased from 160 in 1994 to 289 in 2001. The schoolhouse with only three classrooms was already crammed full of increasing number of pupils from nearby villages. Private Islamic schools or *Madrasahs* were built to supplement the public primary school. In 2001, two *Madrasah Ibtidaiyah* equivalents to primary school, and one *Madrasah Tsanawiya* equivalent to secondary school were established. Though KS became an independent village officially in1999, KS has not had a secondary school.

As the population became denser, a fair was started to open once a week on a fixed day. This weekly fair, one of social formation, symbolizes and crystallizes the prosperity and development of the area. On the fair day, people come from neighboring settlements, some in boats with vegetables and fruits that they have grown. The village unusually becomes enlivened on the fair day. Some hawkers come with sweets and beverages hoping to sell them to the people. Dentists and barbers open their business. The fair is a place of information exchange for the surrounding communities.

Table 2 shows what goods were sold at the regular fair. An overwhelming number of merchants trade clothing. In 1993, there was only one circuit of weekly fair in the area. But in 2001, the circuit was doubled to meet the increasing demands of ever increasing population for commodities.

Most merchants traveling to and fro for regular fairs are *Minankabau*. Trading is the typical occupation of migrant Minankabau. They are called *Pedagan Belok* here or, *Manggaleh Balbelok* meaning ‘trading around’ in other places (Kahn 1980). They purchase and sell goods individually. Used clothes from Singapore have been one of the most popular goods in regular fairs, but the class of goods always changes over time. Cassette tapes, for example, were old-fashioned by 1993 and they were replaced by CD. They learn business skills at regular fairs and save some money in order to open their own shops in the future. They seldom work as *Pedagan belok* for more than 5 years. The job of *Pedagan Belok* is a stepping stone for the better future.

The location of regular fair moves over time. Fairs are held where large numbers of households congregate. However, traveling merchants tend to avoid a village that has developed enough to have general stores. In 2001, KS villagers talked about the possibility of the end of regular fairs because the village developed enough to have 18 shops, three kiosks, one coffee shop, and three restaurants.

Table 2 Commodities sold at periodic market and number of merchants.

Merchants are all *Minankabau* otherwise mentioned			
Commodities	Name of village		
	KS [1]	KS [2]	PC [3]
used clothes	32 (2 Banjarese, 1 Malay)	14	11 (1 Malay)
underwear and dress for women and children	1	3	1
shoes	2	4	3
unused clothes	2	2 (1 Bugis)	1
cosmetics/ toilet article	3	2	3
accessories	1	3	3
daily utensils(plastic)	2	2	0
daily utensiles (bamboo)	0	0	1 (1 Banjarese)
pictorial poster/book/toy	3	1	3
ironware	4	1	1
cassette tape	1	0	0
VCD	0	1	0
medicine(traditional)	3 (2 Javanese, 1 Banjarese)	2 (1 Javanese)	1
medicine	3 (1 Malay)	0	1
goldware	1	2 (1 Bugis)	0
dried goods	3 (2 Banjarese)	2	3
watch	2	3	2
coffee powder	0	2	0
vegetable and fruit	3	1	0
snacks	0	3	1
(dentist)	1 (Batak)	0	0
TOTAL	67	42	23

Notes:

[1] 13 August 1993

[2] 22 August 2001

[3] 2 September 2001

Characteristic and Prospect of Immigrant Community

Increasing number of immigrants came to PSF. In the sub district or *kecamatan* that includes the settlement A, for example, the population increased 10.9 percent from 60,797 in 1999 to 67,436 in 2000 (Interview with *Camat*, head of sub district). With the population increase, various social infrastructures, such as schools and clinics, were built [note 4].

Their motivation to come to PSF is to get a better life than at home. But not all immigrants had better life in PSF. The labor is the only capital that they owned. If a household lost its breadwinner due to illness or injury, the household would become destitute. No choice would be left for them but to sell their plantation and leave the PSF. On the other hand, some immigrants could become big plantation owners by buying up the coconut plantations of those unfortunate households. But most of immigrants are neither too rich nor too poor materially. Mediocre immigrants might be satisfied with their life if they could leave PSF and settle in a village on piles where they can enjoy public facilities. But what are they expecting further? What is the prospect of them? The micrological approach gives some hints on them.

Religion: Social Bond and Last Resort

The immigrant community is socially characterized with its great mobility and weak relationships among the inhabitants. In many cases, immigrants do come relying on kinship and/or birthplace relations. As a result, people from the same birthplace or of the same ethnic background tend to form a settlement. Nonetheless, their relationships are loose by nature. Immigrants come and go frequently one after another. The membership in settlements is neither fixed nor stable. It is not rare for people of different ethnicity to live together in a settlement along a canal. Settlement A was originally opened and dominated by *Banjarese* in early 1970's, but in 1993 the 54 households in the settlement was ethnically mixed, consisting of 28 households of *Banjarese*, 14 *Javanese* and 12 *Malay*.

In a heterogeneous community, each household tends to open and manage a coconut plantation individually. There is no communal work as often observed among *Buginese* and *Javanese* in their homeland.

The communal work can only be seen when they gradually build mosques or small praying houses with donations. The mosque serves as a meeting place that unites them. As the life in PSF is hash in unhealthy condition and the coconut production is unstable and risky, the immigrants tend be more pious Muslim. The people are often seen devotedly kneeling and bowing down for praying. At night, the elder instructs the younger about the way to read the Koran under the faint light of a homemade kerosene lamp.

Some successful men choose to spend money they have earned less on consumer products and capital goods but more on the pilgrimage to Mecca. The Indonesian government sets the cost of the package tour every year. In 2000, the pilgrimage cost 20,500,000Rp (some 2000 US dollars) per person, and this cost is not affordable for ordinary immigrant. Even ordinary immigrants dare to go to Mecca and return to the settlement as haji by selling their means of living such as coconut plantations and *pongpong* boats. It seems that they have little hope in this world and expect a better life in the next world. Five and seven people became *haji* in settlement A and B respectively.

Anticipation for Next Generations

The immigrants are concerned with the education of their children as well as with religion. The primary reason that they move their place of residence form PSF to villages on piles is for the convenience of their children's commute to school. They do not want their children to manage coconut plantations in PSF like themselves. They wish their children to attain the highest possible education in villages.

Even though the immigrant farmers try to give their children educational opportunities if they have some extra money, many of the poor families cannot afford pay for an education for their children, however and put their fifth or sixth grade children to work as valuable labor resource. In 2001, only 6 pupils out of 64 graduated from the primary school in settlement B. Nonetheless.

Any education-minded household leaves the settlement when the children reach school age. Those remaining in the settlement are from poor households with less educational opportunity.

Table 3 shows the whereabouts of those who were children at the time of first survey in settlement B in 2001 (Table 3). Their whereabouts are possibly indicative of the future of the PSF population. In the case of boys, twenty-one boys kept staying in the village. Eight of them helped his parents and/or established their own coconut plantations. Twelve were engaged in boards production in forest, which to be discussed later. One was a student of a *madrasah* within commutable distance. Three died.

Twenty-six boys left the village. Two were working to establish coconut plantations in a different canal. Ten became local recruits of government organized immigration project nearby and worked at coconut plantation that the government prepared for the ready to plant. Tree became construction workers in *Batam*, an island near from Singapore that was designed for special industrial zone in early 1990's. Four became trawler men based in the sub district and two became workers at a lumber mill. One was a rickshaw driver and another was a warehouseman in the district capital. Three were taking higher education while living in school dormitory.

Table 3. Occupation and whereabouts of second generation in settlement B

	Boy's Case No		Girl's Case No	
Remained in the settlement	21		31	
Establishing coconut plantation		8		-
Producing board		12		1
Higher education		1		0
Helping Housework		-		15
Housewife		-		15
Emigrated out	26		17	
Establishing coconut plantation		2		-
Joined government Project		10		- [1)]
Construction worker		3		0
Trawler men		4		0
SawmillI worker		2		0
Worker in town		2		3
Higher education		3		0
Helping Housework		-		2
Housewife		-		11
Unknown		0		1

Note:

1) Some of the girls joined Project following her husband, but not counted here

It should be noted that only ten boys (21.3%), both in and outside the old settlement continued working on their coconut plantations like their fathers.

In the case of girls, sixteen unmarried girls were still at their homes. All were helping their parents in household duties except one who was engaged in board production. Six unmarried girls left their homes. Two of them were caddies at a golf course and one was working at a supermarket in *Batam*. The whereabouts of one girl was unknown. Two were at their relatives' homes in the same sub district, helping them do their household duties.

Married girls number twenty-six. Many of them were housewives with no jobs outside their houses. Fifteen have remained in the settlements after marriage. Husbands of five of them had coconut plantations. On the other hand, husbands of eight were working on board production. The husband of one was a fisherman. Another ran a small general store.

Eleven married girls left the village. Husbands of only three were establishing conventional coconut plantations. The jobs of other girls' husbands were diverse. Two were agricultural workers, one a construction worker, one a sailor, one a speedboat diver, and three were sales clerks in the capital town.

More diversified job opportunities of younger generation gave the glimpse of future life in frontier community. Among them, those highly educated went out from PSF. They did exactly what their parents expected of them, breaking away or "escaping" from the frontier community in peat area for better careers.

Timber Extraction: Another Income Generating Opportunity

Many children who have grown up in PSF leave the PSF. Of those who have remained there, the number of coconut plantation owner is gradually decreasing. There are, instead, an increasing number of people who are engaged in timber extraction.

Under the decentralization policy, following Indonesia's economic and political crisis in 1997-1998, forest resources, formerly controlled and regulated by the central government, have become accessible to local population. Local governments, expecting revenue from forest, basically tend to grant license on small-scale logging and timber-related enterprise to local communities. But local people usually lack the required capital, expertise and even desire to operate forestry businesses. They just work physically as loggers supplying timbers for sawmill owned by outside investors or "partners" and they act like *panglongs*. As shown in Table 4 and Figure 1, small scale sawmills have been constructed one after another in large numbers since 1996 and scattered in the area. The decentralization laws pertinent to the usage of natural resources, such as Law 22/1999 on regional governance and Law 25/1999 on the fiscal balance between the central government and the regions have been implemented since 1999. *De facto* decentralization, however, occurred more quickly than *de jure* decentralization.

By 2001, some of sawmills went bankrupt, or moved, after having harvested profitable logs, to more forest-rich site. Instead of supplying logs to sawmill, board production in the depleted forest have become a major source of income (Photo 5). Although it is prohibited by law, local people make the boards by themselves using chain saws. Boards are carried through canals to the base of canals to be loaded on *pongpong* boat. As logging and board production allow them to earn money more quickly than coconuts, people prefer logging to working for coconut plantation. They had no chain saws eight years ago. At present, twenty-one households (38.9%) own chain saws, the strong weapon against forest. Today, immigrants are cutting trees not for coconut plantation but for timber and board.

Table 4 Forestry enterprises registered in *Indragili Hilir* Regency.

	Faculty	no. of employee	Investment (thousand rupiah)	Capacity (m^3/yr)	Year established
1	saw mill wood working wood chip dry timber	365	2,720,000	18,000 5,400 96,000 20,800	1988
2	chip mill	300	5,316,084	2,400	1986
3	saw mill	11	50,000	1,500	1993
4	saw mill	30	200,000	1,000	NA
5	saw mill moulding	20 18	2,154,000	1,800	1994
6	saw mill	70	143,000	1,600	1994
7	chip wood saw on timber dry timber	148	11,617,000	180,000 18,000 10,800	1994
8	saw mill	36	295,150	5,000	1995
9	saw mill	24	521,700	2,400	1996
10	saw mill	31	600,500	3,000	1996
11	saw mill	35	140,000	1,100	1996
12	saw mill	25	142,100	1,500	1996
13	saw mill	25	148,150	1,200	1996

	Faculty	no. of employee	Investment (thousand rupiah)	Capacity (m^3/yr)	Year established
14	saw mill	8	4,800	1,000	1996
15	saw mill	10	61,000	900	1996
16	saw mill	35	120,625	1,000	1996
17	saw mill	35	190,000	1,100	1996
18	mold dowel	328	3,330,000	1,500	1997
19	saw mill	25	660,000	1,250	1997
20	saw mill	25	670,000	1,250	1997
21	saw mill	10	445,000	4,500	1997
22	saw mill	28	241,000	1,200	1997
23	saw mill	24	140,000	3,000	1997
24	saw mill	13	100,000	2,400	1997
25	saw mill	35	74,000	7,200	1998
26	saw mill	12	70,010	2,500	1998
27	saw mill	16	350,000	1,750	1998
28	saw mill	14	95,500	2,100	1998
29	saw mill	10	78,000	1,500	1998
30	saw mill	10	161,000	2,400	1998
31	saw mill	175	941,000	3,000	1999
32	saw mill	28	244,500	2,500	1999
33	saw mill	18	707,200	2,100	1999
34	saw mill	12	395,000	1,250	1999
35	saw mill	15	230,000	1,500	1999
36	saw mill	16	170,500	1,600	1999
37	saw mill	6	300,000	1,200	1999
38	saw mill	10	98,000	2,500	2000
39	pencil		213,000	5,000	2000
40	saw mill	12	215,000	1,800	2001

Source: District Office

Conclusion

The characteristic encompassing the immigrant community is that of frontier. Progressive and democratic sprit of frontier communities has been discussed widely, but it is only recently that the ecological consequence associated with social characteristics of frontier has begun to be described.

Generally, the destructive and expedient management of resources in the frontier is replaced by a more sustainable management of resources as time elapsed. But it is not the case for PSF. Long uninhabited peat swamp forest has become populated with anticipating immigrants for better lives. The forest was converted into seemingly prosperous plantation of coconut. Social infrastructures are still insufficient, but are being improved rapidly. But this frontier community formed in peat swamp area ever remains as frontier. Immigrants continue to be immigrants or strangers in the area. The community is simply miscellany of immigrants without s sense of solidarity. It has never developed into a matured community.

Uncertain and precarious nature of production system in PSF, both ecologically and economically, is the main reason of formation of this superficial community, to be named meta-community or pseudo-community. PSF is biologically fragile system lacking buoyancy and stability. And immigrants are counting their livelihood on commercial coconut production which is affected directly by the international market or more and more on timber logging and board production.

In this community, nobody considers the sustainable resource management or care for the forest over-exploitation. They secure only short-term economic gains with little attention to long-term environmental consideration. The concern of immigrants is to earn much profit as possible from forest resources, without investing money to forest or land rehabilitation. The immigrants have no attachment to the land or community and expect nothing for its future. PSF cannot become their retirement homes. They do want to escape from the area after getting enough. Nobody desires to settle permanently in PSF. Consequently, nobody considers the future of PSF. They exploit PSF at most and left it depleted and destructed. What happens afterwards is of no concern to them.

Sustainable and sound forest management can be most efficiently and consistently realized by the local community in and around that particular forest. So far, the new communities in PSF are not real in term of indigenousness. There is no attachment to the land by immigrants. The most of community member feel themselves as strangers or alien to the PSF.

For the sound and sustainable future for PSF, it is important to “vernacularizing” or rooting the immigrant community. Let the immigrants to feel their surrounding, including forest, to be their own. The vernacularization can be realized by building the sound and sustainable community in the ecological, social and economic sense. But the forest is really disappearing and more immigrants are still coming for already limited resources. It is now on the point of reconsidering this never-ending and fundamental issue between immigrants and forest. Particular concerns are to be paid on the special characteristic of PSF and communities in it. It is the “local” community of new immigrants or original residents that could be a reliable steward of the forest there.

References

ABE Ken-ichi (1993). Peat swamp forest in Sumatra: A perspective, Southeast Asian Studies 31(3):191-205.

ABE Ken-ichi (1997). Cari Rezeki, Numpang, Siap: The Reclamation Process of Peat Swamp Forest in Riau Southeast Asian Studies 34}(4): 622-632.

ABE Ken-ichi (2003). Peat swamp forest development in Indonesia and the political ecology of tropical forests in Southeast Asia. In The Political Ecology of Tropical Forests in Southeast Asia: Historical Perspective Lye Tuck-Po, Wil de Jong and K.Abe eds.pp133-151, Kyoto University Press and Trans Pacific Press.

Erman, E (1994). Tauke, Kuli dan Penguasa: Exspolitasi Hutan Panglong di Riau. In SEJARAH: Pemikiran, Rekonstruksi, Persepsi, p20-33. PT Gramesia Pustaka Utama, Jakarta

Pastor, G (1929). De Panglongs. Weltervereden: Landsdruckkerij

Resosudarmo, I.A.P. (2005). Closer to People and Trees: Will Decentralization work for the people and the forests of Indonesia? In Democratic Decentralization through a Natural Resource Lens, edited by Jesse C Ribot and Larson. A.M., Routledge, London and New York.

Kahn, J.S.(1980). Minankabau Social formation: Indonesian peasants and the world-economy. Cambridge University Press.

Whitmore, T.C. and C.P. Burnham (1984). Tropical Rain Forests of the Far East Oxford: Oxford University Press

Notes

1. Biologically, PSF is very vulnerable. As with other tropical forests, once deforested it is very hard to regenerate. Particularly, PSF has a specific problem associated with peat itself. Clearance of forest cover invites drying of peat exposed in the sunlight, which then causes decomposition of peat. Deforestation, thus, implies the loss of peat and loss of forest foundation. Furthermore, peat is made up of organic contents that are extremely flammable when dried. In 1997, when the El Nino phenomenon occurred, wet peat was subjected to unusual dryness, resulting in fires at many locations in peat area by anthropogenic combustion. Peat swamp area has become one of

the “hot spot” for forest fire.

2. The anonymous two settlements are administratively located in the regency of *Indragiri Hilir*, Riau Province. Settlement A consisted of mainly *Buginese* immigrants and settlement B, of *Banjarese* immigrants. Besides ethological differences, two settlements differ in some ecological, social and economic aspects. But here in this paper, those tendency or feature common among them are shown and discussed. Details of such difference are to be discussed elsewhere.
3. A significant change occurred in this period. In addition to spontaneous immigrants, immigrants organized in a government project have also mobilized into conversion of PSF into coconut plantation. The project, called PIR-Trans, employ large machines to clear the forest, to prepare the land for plantation and to make wide canals. Canals are systematically arranged from widest primary canals with 22 m in width to tertiary canals. Houses for immigrants are also constructed. This development is carried out on a completely different scale from that performed by self-motivated immigrants. The immigration project has changed the whole situation of PSF. This report refrains from stating details of the major trends of PSF development which has already appeared (Abe 2003). This resulted in the demarcation of areas for one of the leading state-organized trans-immigration projects, the *Perkubunan Inti Rakyat* (PIR; “Nuclear Estate and Small-holders Project”). PIR projects’ stated aims are to increase production of plantation crops and raise the incomes of participating “farmers” as well as to contribute to regional development.
4. KS, anonymous, village was located in the same sub district as settlement A, and surveyed in 1992 and 1997. In 1992, native Malays form the majority, numbering 48 households. Twelve households are *Buginese,* fourteen are *Banjarese,* and two are Javanese. Nine Chinese households are all brokers. Some of them own more than one boat for renting. *Orang Laut* (literally, “people of the sea”), referred to as “sea gypsies”, have settled in the village, numbering ten households. There are three *Minankabau* households, running a restaurant, general store, and rice mill, respectively.

Figure 1. Location of study site and registered forestry entrepreneur

Photo 1. View of KS, a village on piles projecting to the sea.

Photo 2. *Batak* “dentist” at periodical fair. See a pile of extracted teeth displaying of his skill.

Photo 3. Collective logging work in 1997. Logs are sold to sawmill nearby.

Photo 4. Collective logging work in 2001. Logs are sawn to boards in the forest at this time.

Photo 5. Draining canal become a means of transportation

Scientific Session 2 - 4

Empowering Local Institutions for Sustainable Forest Management: Lessons from "Facilitative Research" on Community Forestry in Sumber Agung Village, Lampung Province

Keron A. Petrus* and Motoko Shimagami**

*University of Indonesia

**Center for Integrated Area Studies, Kyoto University

Pendahuluan

Pengelolaan hutan berbasis masyarakat terus bergulir setelah berbagai pengalaman membuktikan, paradigma pengelolaan hutan berbasis negara (sentralistik) memperlihatkan banyak kegagalan. Kerusakan hutan terus meningkat dari waktu ke waktu, konflik sosial merebak di mana-mana, demikian juga kemiskinan masyarakat lokal terus bertambah pula. Kondisi demikian, menggambarkan bahwa sesungguhnya permasalahan kehutanan terikat erat dengan persoalan sosial.

Pengalaman ini telah mendorong pemerintah, dalam hal ini departemen kehutanan untuk mengeluarkan berbagai kebijakan pengelolaan hutan yang memberikan kesempatan kepada masyarakat lokal untuk terlibat aktif dalam pengelolaan hutan. Masyarakat diberikan kesempatan menjadi pelaku utama di dalam mengelola dan memanfaatkan hutan di lingkungan mereka sebagai sumber penghidupan.

Sejauh ini pemerintah telah mengeluarkan kebijakan yang disebut hutan kemasyarakatan (HKm) melalui SK Menhutbun No. 677/Kpts-II/1998 dapat ditempatkan sebagai langkah awal bagi pelibatan masyarakat sebagai pelaku utama. Kebijakan ini membuka peluang kepada masyarakat untuk mengembangkan praktik-praktik pemanfaatan hutan sesuai kondisi sosial dan fisik (hutan). Namun, persoalan kemudian muncul bahwa dalam kenyataannya tidak semua masyarakat lokal telah memiliki kemampuan untuk mengembangkan praktik pengelolaan dan pemanfaatan hutan secara berkelanjutan. Ada sekelompok masyarakat memperlihatkan adanya kemampuan, sementara ada sekelompok masyarakat yang lain memperlihatkan ketidakmampuan itu. Oleh karena itu, diperlukan persiapan kepada masyarakat untuk membuat pengaturan-pengaturan bagi masyarakat yang belum ada, sementara bagi masyarakat yang sudah mempunyai pengaturan perlu didorong agar mulai berperan sebelum mendapatkan kesempatan tersebut.

Poinnya adalah jika kesempatan telah dibuka dan benar-benar diberikan maka tidak menciptakan kehancuan (meskipun dalam kenyataan terdapat kegagalan) yang lebih luas terhadap sumber daya hutan, sebaliknya menciptakan tertib dan perbaikan terhadap fungsi kawasan. Dengan kata lain, pengaturan yang efektif dapat menjadi jembatan bagi interaksi masyarakat dengan sumber daya hutan agar saling

memberi manfaat. Kehidupan ekonomi masyarakat setempat menjadi lebih terjamin, dengan demikian akan mendorong mereka untuk menjaga, memelihara agar fungsi ekologis hutan tetap terjaga pula.

Kawasan Hutan Gunung Betung dan Akses Masyarakar Sumber Agung

Kawasan hutan gunung Betung adalah sebuah kawasan konservasi di provinsi Lampung, dalam status terakhirnya sebagai Taman Hutan Raya Wan Abdurahman[1]. Kawasan ini seluas 22.244 hektar dari 1.004.733 hektar luas keseluruhan kawasan hutan di provinsi Lampung[2]. Sebagai kawasan konservasi dengan fungsi pengatur tata air bagi kehidupan masyarakat kota Bandar Lampung dan sekitarnya, Pemerintah Daerah Lampung, dalam hal ini pihak dinas kehutanan telah mengeluarkan berbagai kebijakan pengelolaan hutan. Kebijakan-kebijakan yang ada memperlihatkan secara jelas pengabaian peran, bahkan penutupan akses masyarakat di sekitar kawasan hutan gunung Betung, yang terdiri dari 36 desa, termasuk masyarakat Sumber Agung. Akibatnya, kerusakan kawasan hutan terus meningkat, konflik sosial antara masyarakat, demikian juga antara masyarakat dengan aparat kehutanan lapangan pun tak dapat terhindarkan[3].

Menurut sejarah pengelolaan hutan, masyarakat Sumber Agung mulai mengelola dan memanfaatkan kawasan hutan gunung Betung sejak tahun 1940-an. Sebagai masyarakat migran dari Jawa dan Sunda, mereka membuka dan menjadikannya sebagai lahan pertanian sekaligus membangun beberapa pusat pemukiman di dalam kawasan hutan. Keberadaan mereka masa itu relatif masih aman. Jauh dari kontrol pemerintah karena pihak dinas kehutanan memberikan izin pemanfaatan kawasan hutan kepada masyarakat dengan pola tumpang sari[4].

---

[1] Kawasan ini ditetapkan menjadi Kawasan Hutan Lindung Gunung Betung Register 19 oleh pemerintah Belanda berdasarkan *Besluit* Residen Lampung nomor 307 tanggal 31 Maret 1941. Penetapannya didasarkan atas pertimbangan fungsinya sebagai pengatur tata air (*hydrology*) bagi masyarakat kota Bandar Lampung dan sekitarnya. Dalam perkembangannya, Menteri Kehutanan melalui surat keputusan nomor 472/Kpts-II/1992, tanggal 12 Juli 1992 mengubah fungsinya menjadi Taman Hutan Raya (Tahura). Kemudian, melalui Keputusan Menteri Kehutanan nomor 408/Kpts-II/1993 tanggal 10 Agustus 1993, ditetapkan kembali dengan nama Taman Hutan Raya Wan Abdul Rahman.

[2] Data Dinas Kehutanan Provinsi Lampung menjelaskan kawasan hutan di provinsi Lampung seluas 1.004.733 hektar atau 30,43% dari luas daratan 35376,5 km^2 berdasarkan Perda nomor 5/2001 tentang Penataan Ruang Provinsi Lampung dan SK Menhutbun nomor 256/Kpts-II/2000. Luasan hutan tersebut terdiri dari: suaka alam = 462.030 ha, hutan lindung = 317.613, hutan produksi terbatas = 33.358 ha, dan hutan produksi tetap = 191.732 ha (Materi presentasi UPTD Tahura: Kebijakan Umum Pengelolaan Tahura, 2007).

[3] Menurut catatan yang dikeluarkan Dinas Kehutanan Provinsi Lampung, tingkat kerusakan kawasan hutan gunung Betung hingga saat ini telah mencapai 70% dari luasan 22.244 hektar. Keruskan ini akibat perambahan lahan hutan oleh masyarakat, penebangan liar, pengklaiman hak oleh masyarakat. Bentuk-bentuk kegiatan seperti ini, selain dilakukan oleh masyarakat di 36 desa/kelurahan yang mengelilingi kawasan Tahura, tetapi juga dilakukan oleh masyarakat pendatang dari daerah lain (Materi Presentasi Kepala Dinas Kehutanan, 2006).

[4] Kusworo (1997) melaporkan kebijakan memberikan izin pembukaan hutan oleh masyarakat untuk dijadikan sebagai lahan garapan di Provinsi Lampung mulai berlangsung pada tahun 1964. Izin ini diberikan berdasarkan Instruksi Kepala Dinas Kehutanan Tk.I Lampung nomor 7 Tahun 1964. Kusworo juga menggambarkan kebijakan pemberian izin penggarapan selanjutnya melalui Pengumuman Kepala Dinas Tk.I nomor 250/V/5 Tahun 1968 tentang izin tumpang sari. Secara umum, implikasi luas dari instruksi atau kebijakan memberi akses kepada

Tahun 1979 dan 1982/1983, dinas kehutanan mengeluarkan kebijakan menutup semua aktivitas pertanian dan pemukiman di dalam kawasan hutan termasuk di kawasan hutan gunung Betung. Lahan-lahan pertanian dan beberapa pusat pemukiman dilarang. Pusat pemukiman dibongkar dan lahan-lahan garapan mereka terkena program reboisasi. Masyarakat sebagian memilih mengikuti program transmigrasi lokal yang diadakan pemerintah, sebagiannya lagi memilih bergabung di pemukiman yang sekarang, Sumber Agung. Kelurahan Sumber Agung terletak di wilayah Kecamatan Kemiling, Kota Bandar Lampung, dan terletak sekitar 7 km sebelah barat pusat Kota Bandar Lampung. Jumlah penduduk sampai dengan Desember 2004, sebanyak 751 Kepala Keluarga atau 2892 jiwa, terdiri dari laki-laki 1098 jiwa dan perempuan 1794 jiwa.

Namun, karena terbatasnya sumber pendapatan di luar kawasan maka masyarakat tetap berusaha masuk ke dalam kawasan hutan mengambil hasil-hasil dari kebun yang mereka kembangkan. Kondisi ini mempengaruhi strategi pengelolaan dan pemanfaatan hutan. Lahan-lahan pertanian yang sudah dikonversi menjadi kebun-kebun dengan berbagai jenis tanaman perdagangan (masyarakat menyebutnya dengan kebun campuran), sebagian dikonversi kembali menjadi lahan-lahan pertanian. Masyarakat mengembangkan strategi pengelolaan hutan yang berorientasi eknomi jangka pendek, di antaranya mengembangkan tanaman semusim (padi, jangung) dan sayuran-sayuran. Supaya merasa aman mereka juga menempuh strategi pemberian ”upeti” kepada oknum petugas kehutanan lapangan (polisi kehutanan) yang mau bekerja sama.

Pada masa krisis ekonomi dan menjelang reformasi, pihak dinas kehutanan semakin memperketat pengamanan hutan. Mereka melakukan operasi pengaman ke dalam kawasan-kawasan hutan. Keadaan ini telah memicu tidak sedikit dari warga Sumber Agung tertangkap dalam operasi aparat kehutanan (jpolisi kehutanan). Permasalahan, konflik/sengketa antarwarga maupun warga dengan aparat kehutanan di lapangan pun terjadi.

Kondisi semacam ini telah mendorong masyarakat Sumber Agung mulai melihat pentingnya kerja sama antarwarga. Kerja sama perlu dilakukan secara organisatoris untuk membantu menyelesaikan permasalahan yang dihadapi dalam mengelola dan memanfaatkan kawasan hutan. Negosiasi-negosiasi akan lebih memungkinkan untuk mendapatkan respon jika itu dilakukan melalui kelembagaan, daripada dilakukan perorangan seperti yang dikembangkan selama ini dan terbukti tidak efektif.

---

masyarakat untuk memanfaatkan hutan diketahui, telah mempercepat laju kerusakan hutan dan meningkatnya pusat pemukiman di dalam kawasan hutan. Situasi ini telah mendorong pemerintah daerah untuk mencabut semua SK tesebut di atas melalui SK Gubernur nomor G/48/III/TU/72 tanggal 8 Desember 1972. SK Gubernur ditindaklanjuti oleh Kepala Dinas Kehutanan Tk.I Lampung melalui SK nomor 169/I/3/75 tanggal 20 Nopember 1975 bahwa semua izin pembukaan dan penggarapan yang diberikan kepada masyarakat sebagai tindak lanjut dari berbagai kebijakan pengelolaan hutan yang pernah dikeluarkan, termasuk Instruksi Kepala Dinas Kehutanan nomor 7 Tahun 1964 dan Pengumuman Kepala Dinas Kehutanan Tk.I nomor 250/V/5 Tahun 1968 dinyatakan tidak sah.

Membangun Kelembaga Pengelola Hutan bersama Masyarakat

Terhitung sejak pertengahan 1998 melalui fasilitasi pihak luar (P3AEUI, UNILA dan LSM Watala) masyarakat Sumber Agung mulai mengembangkan pengaturan bersama di tingkat lokal. Mereka difasilitasi untuk menemukenali secara bersama permasalahan-permasalahan dan/atau pengalaman-pengalaman yang diperoleh selama mengembangkan praktik-praktik pemanfaatan hutan untuk dicari solusi bersama. Melalui media ini pula mereka belajar mengembangkan organisasi, aturan dan mekanisme penyelesaian konflik baik internal maupun eksternal secara demokratis. Komunikasi dan jaringan sosial dengan pihak luar, seperti pemerintah, LSM, dan masyarakat yang mempunyai pengalaman mengembangkan pengelolaan hutan melalui kelembagaan yang ada pun dibuka.

Dari aspek proses, fasilitasi membangun organisasi dan aturan (kelembagaan) pengelolaan hutan secara simpel dapat dikategorikan dalam beberapa tahap, antara lain tahapan pembentukan kelompok, pembuatan aturan-aturan, dan menetapkan mekanisme penyelesaian permasalahan atau konflik/sengketa. Kelompok (organisasi) sebagai wadah mengembangkan kerjasama warga dalam melakukan berbagai aktivitas pemanfaatan hutan sekaligus menyelesaikan berbagai persoalan atau konflik/sengketa yang dihadapi. Aturan-aturan, digunakan sebagai acuan, pedoman dalam menyelenggarakan praktik pemanfaatan hutan berdasarkan fungsi dari kawasan hutan. Sedangkan, mekanisme penyelesaian masalah atau konflik/sengketa disepakati berbagai prosedur atau langkah-langkah yang harus ditempuh pada saat menghadapi persoalan-persoalan atau konflik/sengketa dalam pengelolaan hutan.

Melalui pendekatan proses belajar bersama, masyarakat membangun tiga kelembagaan lokal dalam mengembangkan praktik pengelolaan dan pemanfaatan hutan (Figure 1). Kelembagaan lokal tersebut, antara lain: *Pertama*, Kelompok Pengelola dan Pelestari Hutan (KPPH), adalah kelembagaan tingkat basis, yang beranggotakan warga penggarap lahan kawasan hutan. Berdasarkan kebutuhan, masyarakat terbagi dalam 7 KPPH. *Kedua*, Gabungan KPPH, merupakan kelembagaan payung (asosiasi) yang beranggotakan 7 KPPH. *Ketiga*, Forum Musyawarah Kelompok (FMK), adalah kelembagaan yang beranggotakan berbagai unsur (komponen) masyarakat untuk menyelesaikan permasalahan dan konflik/sengketa yang tidak dapat diselesaikan di tingkat KPPH dan Gabungan KPPH.

Tiga kelembagaan lokal ini merupakan satu kesatuan dalam mengembangkan praktik pengelolaan dan pemanfaatan hutan. Misalnya dalam upaya penyelesaian permasalahan. Jika di tingkat KPPH tidak dapat diselesaikan maka akan dilimpahkan ke tingkat Gabungan KPPH. Apabila di tingkat Gabungan KPPH pun tidak dapat diselesaikan maka akan ditingkatkan ke FMK. Di tingkat ini pun tidak dapat diselesaikan maka permasalahan tersebut akan dilimpahkan ke pihak dinas kehutanan sebagai mekanisme terakhir.

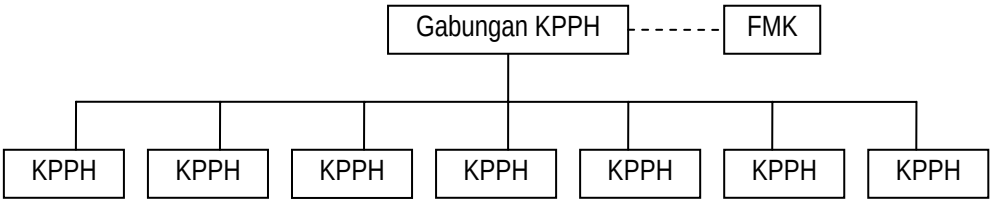


Figure 1. Structure of Local Institution for Forest Management in Sumber Agung Village

Mendapatkan Izin (Kepastian Akses) Pemanfaatan Hutan Kemasyarakatan dan Manfaat-manfaat yang Diperoleh

Bertepatan dengan dikeluarkannya kebijakan hutan kemasyarakatan dari departemen kehutanan, maka kelembagaan yang ada menjadi salah satu alat negosiasi masyarakat Sumber Agung untuk mendapatkan kepastian. Selama kurun waktu ± 1, 6 tahun menjalani proses fasilitasi membangun kelembagaan pada tanggal 19 November 1999 warga Sumber Agung mendapatkan ijin Pengelolaan Hutan Kemasyarakatan dari Menteri Kehutanan. Ijin diberikan atas nama Gubungan KPPH ini bersifat sementara selama 5 tahun dengan luas 492, 75 hektar (Table 1).

Table 1. Management Area and Number of Members of Each KPPH in Sumber Agung Village

Name of KPPH	Area (ha)	Number of the members	Average area (ha) per member
KPPH TM	143.50	115	1.25
KPPH UK	105.25	90	1.17
KPPH SK	94.00	75	1.25
KPPH MA	43.75	51	0.86
KPPH CT	40.50	60	0.68
KPPH PM	53.50	72	0.74
KPPH PG	12.25	20	0.61
Total	492.75	483	1.02

Source: Interview with the KPPH leaders in 2006

Pada saat ini usaha-usaha kebun yang dikembangkan adalah “kebun campuran”, artinya dalam satu areal ditanami dengan berbagai jenis tanaman (pohon). Apabila dilihat dari struktur vegetasi, maka terdapat tiga tajuk yakni tajuk tinggi, sedang dan rendah. Bervariasinya jenis tanaman dan perawatan yang lebih intensif terhadap kebun-kebun yang ada telah menyumbang pada peningkatan penghasilan

ekonomi rumah tangga masyarakat yang bersangkutan. Berikut disajikan dua manfaat positif yang didapatkan masyarakat Sumber Agung setelah mendapatkan kepastian melalui izin HKm.

Peranan HKm dalam Pelestarian Hutan (Keanekaragaman dan Jumlah Vegetasi)

Pengalaman mengembangkan kebun campuran bukan merupakan hal baru bagi masyarakat Sumber Agung. Mula-mula masyarakat mengkonversi lahan pertanian menjadi kebun monokultur terutama kebun kopi dan dadap sebagai pohon pelindung serta sedikit tanaman umur panjang seperti durian. Dalam perjalanan waktu pengetahuan dan pengalaman mengembangkan kebun campuran terus meningkat, demikian juga terhadap berbagai jenis tanaman umur panjang (perdagangan) yang mempunyai prospek bagus di pasaran. Karena itu, masyarakat mulai secara bertahap membudidayakan berbagai jenis tanaman lainnya pada areal kebun kopi atau pada areal-areal pertanian lainnya. Proses ini terus berkembang sehingga dalam satu areal kebun dapat ditanami dengan berbagai jenis pohon/tanaman perdagangan. Dengan kata lain masyarakat mengkonservasi kebun monokultur menjadi multikultur.

Menurut catatan satu areal kebun dapat ditanami berbagai jenis tanaman perdagangan dalam jumlah yang berbeda-beda bagi setiap warga. Perbedaan pilihan sangat tergantung pada pengetahuan dan pengalaman mengembangkan jenis tanaman tertentu termasuk prospek pemasaran hasil kebun. Misalnya, pada saat ini sejumlah warga Sumber Agung lebih memilih membudidayakan tanaman coklat dari pada tanaman kopi, dengan pertimbangan tanaman coklat lebih mudah mendapatkan penghasilan ekonomi rumah tangga. Sejak dipanen hingga dipasarkan membutuhkan waktu 3-5 hari pengeringan setelah itu sudah dapat dipasarkan. Sedangkan, kopi membutuhkan waktu pengeriang hingga pemasaran 1,5 – 2 bulan. Contoh kasus yang lain, masyarakat lebih memilih tanaman karet dari pada melinjo. Tanaman karet jika sudah berproduksi dapat memberikan penghasilan harian, dalam jangka waktu setiap 3-4 hari getahnya dapat diambil. Sedangkan, melinjo hanya dapat memberikan penghasilan musiman.

Sejak mendapatkan ijin pengelolaan HKm, 15 informan warga Sumber Agung yang dipilih secara acak ini membudidayakan 27 jenis tanaman mulai dari tajuk tinggi, sedang hingga rendah. Jumlah dan jenis taman yang dibudidayakan sejak mendapatkan ijin pengelolaan hutan kemasyarakatan di akhir 1999 sampai tahun 2004 sejumlah 46.895 pohon. Sampai dengan Maret 2006 jumlah tanaman meningkat menjadi 52.278 pohon. Dengan demikian telah terjadi peningkatan tanaman sebanyak 5.383 pohon atau 11,48 %. Dari jenis tanaman yang ada tanaman kopi yang lebih mendominasi, tetapi dalam perkembangan tidak mengalami peningkatan yang berarti. Berbeda dengan tanaman coklat dan karet yang terjadi peningkatan yang signifikan. Selanjutnya lihat Appendix 1.

Peningkatan Kehidupan Ekonomi

Izin pemanfaatan hutan telah mendorong masyarakat Sumber Agung merasa lebih yakin atas

hasil-hasil yang dapat diperoleh dari kebun-kebun mereka di dalam kawasan hutan. Pola dan stratgei pemanfaatan yang lebih mementingkan aspek ekonomi jangka pendek semata mulai beralih ke pola kebun campuran (mananam berbagai jenis tanaman dalam satu areal kebun). Perubahan ini telah berkontribusi pada perubahan (peningkatan) kehidupan ekonomi masyarakat yang bersangkutan.

Data yang diperoleh dari 15 informan warga Sumber Agung yang sama, menjelaskan bahwa dalam lima tahun terakhir telah terjadi peningkatan pendapatan secara signifikan yang bersumber dari dalam kawasan (areal HKm). Seperti nampak dalam Figure 2 dan Appendix 2 tahun 2001 total pendapatan yang diperoleh sejumlah Rp. 53.578.500,- meningkat menjadi Rp. 82.372.500,- atau meningkat 53,74% pada tahun 2002. Tahun 2003 meningkat menjadi Rp. 92.029.000,- atau 11,72%. Tahun 2004 meningkat menjadi Rp. 130.557.250,- atau 41,87%. Tahun 2005 meningkat menjadi Rp. 176.822.000,- atau 35,44%.

Terlihat jelas bahwa pendapatan yang bersumber dari dalam kawasan masih jauh lebih tinggi ketimbang yang bersumber dari luar kawasan hutan. Namun perlu ditegaskan bahwa usaha di luar beberapa di antaranya sesungguhnya tidak terlepas dari usaha yang dikembangkan dari dalam kawasan, misalnya pedagang pengumpul hasil kebun, pakan ternak dan lain-lain.

Dari gambaran ini memperlihatkan bahwa kepastian akses dan kelembagaan berkorelasi positif di dalam mengembangkan praktik pengelolaan dan pemanfaatan hutan. Kepastian akses telah mendorong warga untuk membudidayakan berbagai jenis tanaman, melakukan perawatan yang lebih intensif sehingga terjadi peningkatan kesejarhteraan masyarakat. Tentu saja, hubungan timbal balik,, masyarakat dan hutan akan menjadi lebih harmonis ketika dirasakan manfaatnya. Masyarakat akan merawat, menjada hutan dengan baik karena merasa yakin bahwa hutanlah kehidupan ekonominya terpenuhi.

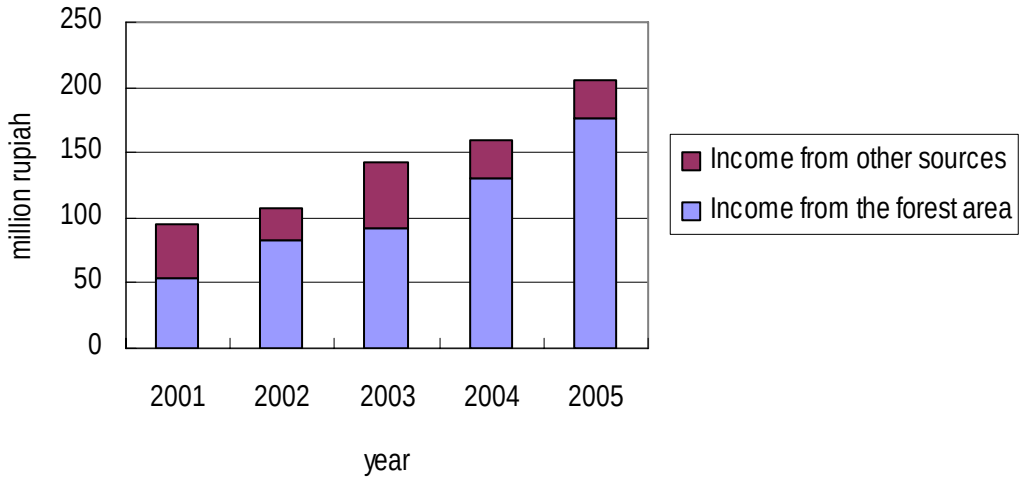


Figure 2. Total Income of 15 Informants in Sumber Agung Village Gained from 2001 to 2005 (Sources: Interview by Petrus in Feb.- Mar. 2006)

Dinamika Kelembagaan Pasca Ijin dan Berakhirnya Ijin Sementara

Kebijakan pengelolaan hutan yang menempatkan masyarakat sebagai pelaku utama tidak pernah sepi dari diskusi dan perdebatan oleh berbagai kalangan. Oleh karena itu, meskipun SK Menhutbun No. 677/Kpts-II/1998 (tentang Hutan Kemasyarakatan) sudah memasuki tahap implementasi tetapi sikap pro dan kontra masih terus berlangsung. Bagi kalangan pemerintah (Departemen Kehutanan) yang sudah menyadari pentingnay pelibatan masyarakat dalam pengelolaan hutan, melihat kebijakan tersebut sebagai sebuah terobosan baru karena memberikan kesempatan kepada masyarakat untuk mengelola dan memanfaatkan hutan. Berbeda dengan kalangan Lembaga Swadaya Masyarakata (LSM), misalnya masih terus mempersoalkan kurang lengkapnya substansi kebijakan.

Lepas dari sikap pro dan kontra kebijakan ini telah membangkitkan antusiasme masyarakat di dalam dan sekitar kawasan hutan yang selama ini hidupnya dalam ketidakpastian dan ketidaktenangan dalam memanfaatkan hutan melakukan penataan diri. Penataan bagi masyarakat Sumber Agung dilakukan melalui membangun kelembagaan (organisasi, aturan-aturan dan mekanisme) yang dibangun dan disepakati secara demokratis.

Diakui bahwa kelembagaan yang ada tidak langsung membuat warga Sumber Agung menjadi lebih tertib dan bertanggung jawab dalam memanfaatkan hutan. Mereka diterpa berbagai permasalahan seperti konflik antar warga, penebangan tamanan reboisasi dan sebagainya. Pengalaman ini telah membuat mereka belajar bagaimana pengelola organisasi dan aturan main secara lebih baik dan konsisten. Berbagai permasalahan, seperti pengamanan kawasan dari penyerobotan pihak luar maupun dilakukan warga sendiri secara perlahan dapat dihentikan melalui mekanisme kelembagaan yang ada.

Pasca mendapatkan izin pemanfaatan hutan kemasyarakatan dari pemerintah (Departemen Kehutanan) masyarakat Sumber Agung merasa lebih tenang dan yakin akan hasil yang diperoleh dari upayanya membudidayakan berbagai jenis tanaman umur panjang di dalam kebunnya. Di tengah antusiasme masyarakat berupaya mengelola dan memanfaatkan hutan yang telah memberikan manfaat ganda secara ekonomi dan ekologis, lahir surat keputusan Menteri Kehutanan No. 31/Kpts-II/2001 yang merevisi Kepmenhutbun No. 677/Kpts-II/1998. Jika SK Menhutbun No. 677/Kpts-II/1998 membolehkan masyarakat mengelola kawasan hutan produksi, lindung dan konservasi, sedangkan SK Menhut No. 31/Kpts-II/2001 hanya membolehkan kawasan hutan produksi dan hutan lindung, dan tidak untuk kawasan TAHURA yang masuk kategori sebagai kawasan konservasi.

Kondisi semacam ini telah menimbulkan keraguan bukan hanya pada masyarakat Sumber Agung, melainkan seluruh masyarakat di sekitar gunung Betung terhadap komitmen pemerintah untuk benar-benar membuka akses masyarakat dalam pengelolaan hutan. Celah ini teleh mendorong oknum petugas lapangan kehutanan mulai kembali melakukan tindakan-tindakan yang cenderung mengabaikan keberadaan kelembagaan yang telah dibangun oleh masyarakat.

Meski demikian, semangat masyarakat Sumber Agung nampaknya masih tetap kuat dan terus membenahi diri melalui kelembagaan yang ada. Meskipun belum berjalan optimal, tetapi mereka tetap berusaha membangun kerja sama, menyelesaikan permasalahan atau konflik/sengketa secara dinamis. Komunikasi dan koordinasi dengan pihak dinas kehutanan baik melalui saluran formal maupun informal terus dilakukan oleh para pengurus. Upaya-upaya yang dilakukan sesungguhnya ingin mencapai satu hal, yakni meyakinkan pemerintah bahwa mereka mempunyai kemampuan untuk mengelola dan memanfaatkan hutan yang tidak bersifar merusak. Fungsi kawasan hutan tetap terjadi di satu sisi, kehidupan ekonomi mereka tetap terjamin pula.

Sejauh ini pihak dinas kehutanan mulai menujukkan perubahan pendekatan, yakni mulai membuka diri atas upaya-upaya yang dilakukan oleh warga Sumber Agung. Terlepas, sejauh mana respon pemerintah (dinas kehutanan), tetapi banyak hal positif yang diperoleh dari pengalaman panjang tersebut. Kesadaran masyarakat tentang pentingnya kerja sama di dalam mengembangkan kelembagaan terus tumbuh. Tindakan pelanggaran seperti penebangan tanaman reboisasi, pencurian hasil kebun mulai menurun, penanaman berbagai jenis tanaman umur panjang secara swadaya pun terus dilakukan oleh masyarakat Sumber Agung. Kerja sama antarwarga bila menghadapi berbagai permasalahan internal atau menerima berbagai program-program dari luar pun dapat berjalan dengan relatif lancar.

Perkembangan ini menunjukkan melalui kelembagaan yang ada tingkat kepedulian warga terhadap keberadaan fungsi kawasan dan keberlanjutan kehidupan ekonomi tidak dapat dipisahkan, melainkan satu kesatuan yang utuh. Kehidupan ekonomi membaik, akan mendorong masyarakat Sumber Agung untuk menjaga lingkungan hutan secara lebih baik.

Penutup

Kebijakan pengelolaan hutan sudah bergeser dari paradigma yang berpusat pada negara ke paradigma yang berpusat pada masyarakat. Perubahan ini ditandai adanya kebijakan hutan kemasyarakatan (HKm) yang menempatkan masyarakat sebagai pelaku utama dalam pengelolaan hutan. Terlepas dari berbagai kendala di lapangan ketika kebijakan ini diimplementasikan, tetapi kebijakan ini telah menambah pengalaman empirik bagi masyarakat bukan hanya soal bagaimana mengembangkan praktik-praktik pemanfaatan hutan secara lebih tertib melainkan juga bagaimana membuka diri untuk bekerjasama dengan berbagai pihak yang mempunyai kepentingan langsung maupun tidak langsung terhadap hutan.

Sumber Agung dua adalah sebuah desa hutan gunung Betung yang mendapat kepercayaan pemerintah (Departemen Kehutanan) untuk mengelola dan memanfaatkan hutan melalui ijin pengelolaan hutan kemasyarakatan. Sejak itu mereka merasa lebih tenang dan yakin mendapatkan hasil-hasil atas usaha-usaha pertanian/kebun di dalam kawasan. Pola pemanfaatan lahan yang berorientasi pada

kepentingan jangka pendek (ekonomi semata) secara perlahan berubah menjadi pola pemanfaatan yang berorientasi jangka panjang. Perubahan pola ini telah pula membawa peningkatan kehidupan ekonomi masyarakat, peningkatan keanekaragaman vegetasi dan fungsi ekologis dari kawasan hutan gunung Betung, minimal di wilayah kelola Sumber Agung.

Bila mencermati lebih jauh perubahan-perubahan yang dicapai oleh masyarakat Sumber Agung, ada dua hal pokok yang dapat dipelajari dari proses ini. *Pertama*, adanya kepastian akses masyarakat mengelola dan memanfaatkan hutan. Kepastian akses merupakan spirit bagi masyarakat untuk mengembangkan praktik-praktik pemanfaatan hutan secara lebih tertib dan bertanggung jawab. *Kedua*, dukungan kelembagaan masyarakat yang kuat. Kuat dalam pengertian melalui kelembagaan yang ada masyarakat dapat secara mandiri mengambil keputusan-keputusan penting yang terkait upaya-upaya mendorong, menegakan aturan dan mekanisme kelembagaan yang ada demi kepentingan hutan dan kehidupan ekonomi mereka.

Dalam praktik dua hal ini tentu tidak bisa berdiri sendiri. Adanya kepastian akses tanpa dukungan kelembagaan yang kuat dari masyarakat maka legitimasi yang ada tidak banyak artinya. Sebaliknya, kelembagaan masyarakat yang kuat tetapi tidak adanya kepastian akses tentu akan sia-sia, sebab kepastian akses bukan hanya terkait dengan kepastian wilayah kelola melainkan terkait pengakuan terhadap kelembagaan masyarakat yang ada. Oleh karena itu, diperlukan upaya kolaboratif dari berbagai pihak agar dua hal ini (kepastian akses dan kelembagaan masyarakat yang kuat) dapat berjalan seiring dalam kerangka menyelesaikan permasalahan di tingkat lokal (masyarakat).

Korelasi fungsional antara dua hal ini telah memperlihatkan masyarakat Sumber Agung dan lingkungan hutannya dapat saling memberikan manfaat. Kehidupan ekonomi atau kesejahteraan semakin meningkat di satu sisi, dan fungsi kawasan hutan terus mengalami perbaikan di sisi yang lain.

Appendix 1. Plants that have been Planted by the Community Forestry Groups in Sumber Agung Village from 1999 to 2006.

	Kind of plants	1999-2004	2005	2006	Total
A	Tajuk Tinggi				
1	Alpukad	751	35	45	831
2	Aren	21	0	0	21
3	Asam	1	0	0	1
4	Dadap	396	0	0	396
5	Durian	1307	56	34	1397
6	Duku	23	0	0	23
7	Jambu Bol	31	0	0	31
8	Jengkol	40	0	0	40
9	Karet	306	300	1464	2070
10	Kemiri	344	0	0	344
11	Kayu Manis	81	0	0	81
12	Kelapa	56	0	0	56
13	Ketupa	5	0	0	5
14	Mangga	33	0	0	33
15	Melinjo (Tangkil)	1094	75	7	1176
16	Nangka	53	0	0	53
17	Petai	400	13	9	422
18	Pinang	94	0	0	94
19	Randu	155	0	0	155
20	Sonokeling (kayu)	118	0	0	118
B	Tajuk Sedang				
21	Bambu	74	0	0	74
22	Rambutan	12	0	0	12
C	Tajuk Rendah				
23	Kopi	21550	70	0	21620
24	Cengkeh	78	60	200	338
25	Coklat	15352	1865	1150	18367
26	Pisang	4420	0	0	4420
27	Vanili	100	0	0	100
	T O T A L	46895	2474	2909	52278

Sumber: Penelitian Lapangan, Pebruari - Maret, 2006

Appendix 2. Income of 15 Informants in Sumber Agung Village Gained from 2001 to 2005

(Unit: Rupiah)

	Household number	2001	2002	2003	2004	2005
Income from the forest area (Community Forestry)	1	1,340,000	1,150,000	3,600,000	4,215,000	5,150,000
	2	350,000	200,000	2,420,000	1,914,000	2,347,000
	3	3,283,000	3,997,000	4,055,000	4,335,000	5,050,000
	4	6,585,000	13,375,000	11,410,000	6,830,000	8,347,500
	5	3,000,000	3,750,000	2,970,000	3,450,000	5,760,000
	6	0	3,600,000	2,400,000	1,971,250	3,466,000
	7	1,280,000	1,400,000	3,544,000	4,054,000	7,105,000
	8	1,300,000	800,000	4,600,000	6,900,000	7,145,000
	9	4,850,000	3,794,000	4,820,000	10,857,500	13,300,000
	10	3,600,000	3,600,000	2,100,000	12,500,000	18,100,000
	11	5,950,000	7,800,000	5,750,000	18,250,000	30,020,000
	12	6,090,000	5,940,000	5,440,000	5,490,000	3,257,500
	13	9,235,500	19,776,500	26,425,000	31,522,500	44,219,000
	14	4,915,000	9,590,000	9,185,000	13,868,000	16,965,000
	15	1,800,000	3,600,000	3,310,000	4,400,000	6,590,000
	Total (A)	53,578,500	82,372,500	92,029,000	130,557,250	176,822,000
Income from other sources	1	3,060,000	4,800,000	4,800,000	4,800,000	4,800,000
	2	800,000	1,000,000	1,300,000	1,000,000	700,000
	3	5,400,000	5,400,000	5,400,000	6,400,000	5,400,000
	4	0	0	0	0	0
	5	7,200,000	7,200,000	7,200,000	7,200,000	7,200,000
	6	0	0	0	0	0
	7	5,040,000	5,040,000	5,040,000	5,040,000	5,040,000
	8	4,000,000	500,000	1,500,000	500,000	0
	9	525,000	0	5,017,000	1,440,000	1,755,000
	10	0	0	0	0	0
	11	0	0	0	0	0
	12	15,000,000	0	20,000,000	0	2,230,000
	13	100,000	805,000	1,005,000	2,060,000	2,120,000
	14	0	0	0	0	0
	15	0	0	0	0	0
	Total (B)	41,125,000	24,745,000	51,262,000	28,440,000	29,245,000
Total (A+B)		90,703,500	106,617,500	141,791,000	158,497,250	206,067,000

Source: Interview by Petrus, Feb.-Mar. 2007

PETRUS Keron A. is Ph.D candidate at the University of Indonesia. He received his M.A. in anthropology from the University of Indonesia (2000). While continuing his study, he served as public servant of Department of Forestry (1985-2002) and Nusa Tenggara Timur Provincial Government (2003-present). He also engaged in various activities related to community-based forest management as facilitator as well as researcher, including the community forestry program in villages in and around Mt. Betung forest, Lampung Province (1998-2002). His major publication include “Partnership Building in Forest Resource Management: Experience Sharing of Facilitation for Building Partnership in Implementing Social Forestry”

and “Empowering Local Institution of People Managing Forest”, papers presented at the training for capacity building of forestry officials organized by Department of Forestry (2004).

SHIMAGAMI Motoko is a researcher at Center for Integrated Area Studies, Kyoto University. She received her M.A. in Human and Environmental Studies from Kyoto University (1996). Her major field of interests is village autonomy and community governance in Indonesia and Japan. Her major publications include “Decentralization and Village Autonomy: The Revitalization of Adat in Tana Toraja District”, in Kazuhisa Matsui ed., *Decentralization in Indonesia: Central-Local Dynamics and the Realities*, Institute of Developing Economies (2003) [in Japanese], **“**Linking Experiences: Community-based Resource Management Practices in Mountain Villages in Indonesia and Japan”, *Journal of the Socio-Cultural Research Institute* (2006) [in Japanese], and Kokki, Goto (edited, annotated, and with an introduction by Shimagami) “*Iriai* Forests Have Sustained the Livelihood and Autonomy of Villagers: Experience of Commons in Ishimushiro Hamlet in Northeastern Japan”, Afrasia Working Paper (2007). <motoko55@r4.dion.ne.jp>

Wrap up Session

Resolution and Future Perspectives

Wahyu Dwianto

Research and Development Unit for Biomaterials

Indonesian Instititute of Sciences

THE 1st KYOTO UNIVERSITY - LIPI - SOUTHEAST ASIAN FORUM IN SEARCH OF NEW PARADIGM ON SUSTAINABLE HUMANOSPHERE

Warp up by Wahyu Dwianto
R&D Unit for Biomaterials
Indonesian Institute of Sciences

Aims:

- in search of a **New Indonesia**
- to define what **National Development** is all about
- to explore the concept of **Sustainable Humanosphere**
- anticipate the **Global Warming/Climate Change** and **MDGs**
- **forest model** for Sustainable Humanosphere (Y. Hayami)
- more studies on **biodiversity** of flora and fauna (E. Sukara)

humanosphere

Scopes

- **The new concept of humanosphere**: human activities interact to the surrounding environments (S. Kawai).
- **Humanosphere** is not only a term to refer to the scientific study of material and energy flows and conversions; but should also include **all interactions between man and nature**, including human and social responses to the environment (K. Sugihara).
- **Kyoto University's Global COE Project** (2007-2012) is to create an interdisciplinary framework under which to inform sustainability of the humanosphere in concrete terms (M. Kitani; K. Sugihara).

socio-economic & environment perspectives

Problems & Resolutions

- **Biodiversity lost**
- Our responsibility (E. Sukara):
  (1) exploration, inventory and study on biological resources
  (2) promote in situ and ex situ conservation
  (3) efficient, effective and sustainable based industry
  (4) strengthened National Science and Technology capacity

Futurability of Humanosphere:
Toward Global Humanics of the Environment (N. Tachimoto)

- Global Environmental Problems
- Sustainability and Futurability
- A Basic Approach to Solving Global Environmental Problems
- Global Humanics of the Environment

socio-economic & environment perspectives

Problems & Resolutions

- **Two critical problems** in Tanjung Putting National Park: (1) illegal logging and mining activities; (2) conflict of interest between central and local government (H. Hidayat).
- **National Park Management:** (1) collaborative management on reforestation program, (2) law enforcement, (3) hard sanction and (4) empowering socio-economic of local people (H. Hidayat).
- **Forest benefit** currently is still dominated by timber benefit, while erosion prevention benefit, water arrangement benefit is at the small portion (M. Bismark).
- The function of **forest community** located at the buffer zone of conservation areas is very important as (1) a forest conservation tool, (2) forest rehabilitation, (3) community economy improvement (M. Bismark).

socio-economic & environment perspectives

Problems & Resolutions

- **State-based centralized forest policy** neglected the role of local people living in and around forest area has shown many failures (K.A. Petrus & M. Shimagami).
- **Community forestry policy:** forest is a basis of their livelihoods, therefore they utilize the resources in a way that harmonizes with the characteristics of the forest (K.A. Petrus & M. Shimagami).
- **Humankind crisis**: population explosion, energy crisis, and global warming (S. Kawai).
- Interdisciplinary research with broader perspective view is highly requested to solve such critical issues (S. Kawai).

science & technology perspectives

Scopes

- **The tropical region** receives the highest concentration of solar energy which is the ultimate energy source of all organisms of earth and is the driving force of global atmosphere dynamics and of the production of plants (S. Kawai).
- **Humanosphere science** covers a wide range of research fields on the humanospere from ground to the atmosphere and space for human existence (S. Kawai).

Research fields:

- to organize inter-disciplinary research projects that included (1) the evaluation of the tree biomass production by tree growth analysis and remote sensing technology, (2) environment monitoring and assessment by atmosphere and biodiversity observations, and (3) biotechnology for enhancing tree functions.
- to develop the academic and technological solutions and to establish the cyclical system of resource and energy in the region, which supports the harmonization of the ecology and economy.

science & technology perspectives

Problems, Resolutions & Future Perspectives

- Global warming and deficiency of fossil fuels (T. Watanabe).
- **Lignocellulosic biorefinery** plays a key role to replace oil-based chemical industry because biomass is carbon-based renewable resources and large quantities of lignocellulosics (T. Watanabe).
- The biodegradation in combination with thermochemical and physical treatments can be applied to the production of biomethane, bioethanol and feed for beef cattle (T. Watanabe).
- **Technological innovation**: the effect of MW irradiation has been investigated to improve the enzyme saccharification rate of woody biomass for bio-ethanol production (T. Sonobe *et al.*)

science & technology perspectives

Problems, Resolutions & Future Perspectives

- Contribution of energy from fossil-based fuels reduced to be less than 20% in 2025 (G. Wibawa *et al.*).
- **Bio-fuels development in Indonesia:**
  (1) empowerment of rural community to produce bio-fuel for their own energy consumption/need.
  (2) empowerment of small and medium scale enterprises (SME) to produce bio-fuel for local markets.
  (3) encourage big scale company to produce bio-fuel for its own use/need.
  (4) encourage privates (national and foreign) to commercially produce bio-fuel for domestic and export markets.

science & technology perspectives

Biotechnology of Tropical Acacia

Toshiaki Umezawa, RISH, Kyoto University

- **Tree biotechnology** will play a very important role for sustainable production of *Acacia*, which is the most important tropical plantation trees.
- Bioscience and biotechnology in forestry has entered into **post-genomic era.**
- They have started *Acacia mangium* expressed-sequence tag (EST) project in RISH as collaboration with Research Institute of Sustainability Science and Kazusa DNA Research Institute.

socio-economic, environment, science & technology perspectives

Future Perspectives

- Biodiversity studies (E. Sukara).
- Development of sustainable humanosphere industries (K. Mizuno).
- Reforestation by forest community (H. Hidayat; M. Bismark; K.A. Petrus & M. Shimagami).
- Biomass production of plantation forest (S. Kawai); and man-made forest as humanosphere component (Parikesit).
- Development of appropriate bio-energy (S. Sabiham; T. Watanabe; G. Wibawa; T. Sonobe) and tree biotechnology (T. Umezawa).
- Stop the exploitation of timbers from natural forests, and more utilize lesser known wood species for any purposes (W. Dwianto)

Should be supported by Politic & Law Enforcement from the Government

biodiversity perspectives

New Potential Lesser-known Wood Species in Indonesian Botanical Gardens

Wahyu Dwianto *et al.*, R & D Unit for Biomaterials, LIPI

- Indonesian Botanical Gardens (IBGs) are conservation areas, which collects plant species from the entire Indonesian regions and some plant species from foreign countries.
- The information of wooden plant species collection in IBGs is still limited.
- The objectives:
  (1) to arrange the **data-base** of wood species in IBGs, which contained information about the physical and mechanical properties, natural durability, distribution, prospect and other supporting data
  (2) to analyze and to recommend the **lesser-known** wood species that can be developed through Plantation Forest Management

biodiversity perspectives

IBGs	wooden plant species distributed in Indonesia*	lesser known wood species **
Bogor	804	341
Cibodas	291	142
Purwodadi	377	157
Bali	469	206
Total	1941	846

Source:
* IBGs catalog
**Soerianegara & Lemmens 1994; Lemmens *et al.* 1995; Sosef *et al.* 1998

Further researches of the **lesser known** wood species were needed, especially concerning wood characterizations, growth rate, resistance to diseases, propagation and reforestation.

Closing Remarks

Kosuke Mizuno

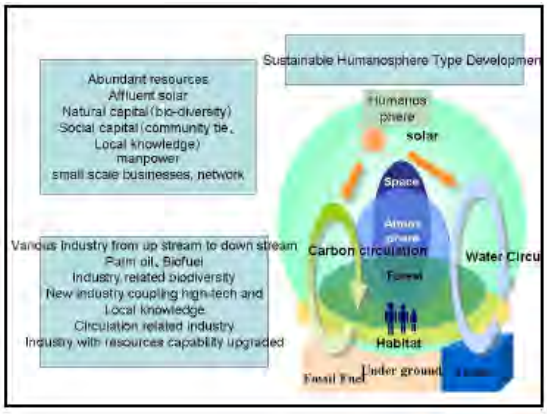
Director of Center for Southeast Asian Studies, Kyoto University

In Search of New Paradigm of Sustainable Humanosphere
Kyoto University-LIPI, November 26-27, 2007

In Search of Paradigm of Sustainable Humanosphere; Forestry Model of Sustainable Humanosphere: the Case of a Sumatran Community

Kosuke Mizuno

CSEAS, Kyoto University



Palembang Project (1)

- Location of PT. Musi Hutan Persada (PT.MHP), Joint venture between PT. Inhutani V (state owned company) and PT. Enim Musi Lestari (Barito Pacific group).
- PT. MHP has right of Industrial Forest Plantation (Hutan Tanaman Industri) based on the Forest Minister Decree of January 1996. It covers 296,400 ha.

Palembang Project (2)

- Width of Plantation. (HTI) 193,500 ha
- Protected area (Kawasan Lindung) 87,034 ha
- Multi purpose Tree area, and local species area (Tanaman Hehidupan, Tanaman Lokal) 7,300 ha
- Infrustructure and housing 9,150 ha

Previous land use

Grass land 70,563ha, Bushes & Shrubs 59,891ha, Unpruductive land 63,046ha

Location & Trees

- Benakati (198,741 ha), Subanjeriji (87,345 ha), and Martapura (10,305ha), about 200 km from Palembang, Province of Palembang, Sumatra
- The area is planted by PT. MHP with fast growing trees which is suitable for pulp, Acasia mangium (95%) and the rest are Eucalyptus Urophylla, Pinus Mercusii, Paraserianthes Falcataria, Gmelina Arborea, Meranti ets
- MHP promotes the community collaboration program named MHBM and MHR.

Sales of PT. MHP

- The wood is sold to PT. Tanjungenim Lestari (PT.TEL).
- The production target of Acasia mangium delivered to PT.TEL by PT. MHP is 2,400,000 m3/year that is equal o 2,200,000 ton/year.
- PT.TEL prpduces 450,000 to 1,000,000 ton pulp/year from the forest plantaion od Acasia mangium.

スマトラ島南部のアカシア大規模産業造林

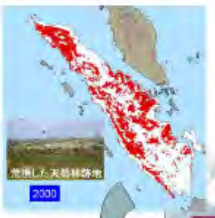
PT. Musi Hutan Persada

持続的経営に向けて －種から苗へ－

スマトラ島・MHP社

丸太はパルプに

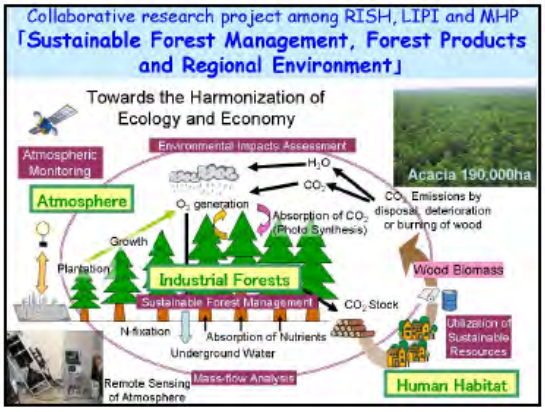
200,000 ton/月：日本の森林伐採量の約１／７

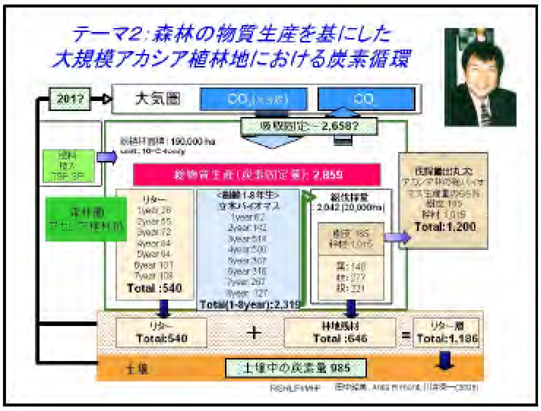


生存圏における重要性
熱帯大規模造林の
環境貢献と
その持続的生産・利用

Collaborative research project among RISH, LIPI and MHP

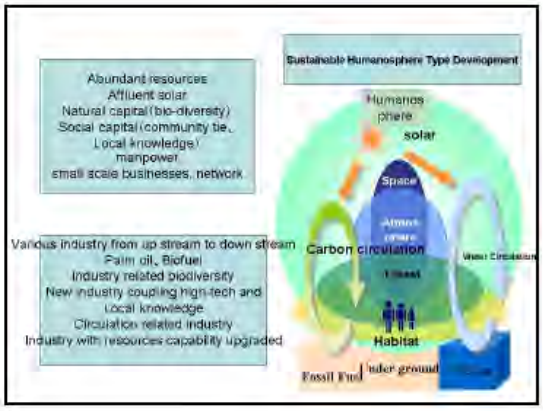
「Sustainable Forest Management, Forest Products and Regional Environment」





Fragility of Plantation

- Monoculture → high productivity
however a lot of risks
- Marketing risk, disease risk, soil nutrition risk
- Social risk → limited number of people will get the benefit. People out side the benefit will be frustrated.
- Diversification within the plantation, and outside the plantation, with creating the complex.



Project 1;Program for collaboration with local community

1) Functions and performance of MHBM and MHR
- 2) Activities of people' s organizations as the counterparts of MHP's programs, functions, and local politics
- 3) Commitments of community, company and governments on resources management
- 4) Relations between company, and community, and creation of collaborative relations
- 5) Organizations and institutions for enhancement and utilization of the resources potentials

Project 2; Program for creation of sustainable forest zone

- 1) Circular system of Acasia Mangium, and contributions to the society
- 2) Rubber and oil palm's circulation and their contribution to the society
- 3) Enhancement and utilization of Trees' potentiality to support the sustainable forest zone
- 4) Household economic survey that intends to study local economy and understanding of kinship and social reorganizations
- 5) Dynamism study on local economy, such as community-based industry and trade networks that would support the sustainable forest zone.

Report on Proceedings

Retno Kusumaningtyas

Center for Southeast Asian Studies, Kyoto University

Date : November 26th – 27th, 2007

Venue : PDII Building 2nd floor, LIPI, Jakarta Indonesia

This two day forum can be seen as the first concrete activity of the research collaboration between Kyoto University and LIPI. The forum explored the concept of a "Sustainable Humanosphere" as well as related themes such as "Bio-energy for Community" and the "Forest as Humanosphere".

Day one (November 26th, 2007)

Opening ceremony [09.30-10.00]

The forum was opened by 4 delegates from the participating organizations. Three of the addresses were delivered at the Forum by: the vice president of Kyoto University, Mr. Masato Kitani; the president of HAKU (Kyoto University Alumni Association in Indonesia), Prof. Supiandi Sabiham; and the deputy chairman of Life Science, LIPI, Prof. Endang Sukara. The representative of CSEAS, Prof. Yoko Hamami, finally, addressed the forum via a live Internet connection from the CSEAS office in Kyoto.

Keynote speech [10.00-11.30]

The morning session consisted of three keynote speeches.

1. Prof. Kaoru Sugihara from CSEAS Kyoto University addressed the forum on the topic of: *The humanophere-sustainable path of economic development; a global historical perspective.* His speech outlined some of the key ideas behind the Global COE research program on sustainability in Asia and Africa and suggested that one of the key topics for Asian and African area studies today is to combine area studies with frontier science and to create an interdisciplinary framework under which to promote sustainability of the humanosphere in concrete terms.
2. Prof. Endang Sukara (Deputy of Life Science, LIPI) talked on the subject of: *Mainstreaming forest biological diversity.* His speech highlighted that the biodiversity richness in Indonesia is in many cases yet to be documented properly, and as such unexplored. He also outlined the threats to the existence of this biodiversity, such as forest conversion to support short term economy benefit, illegal logging, poaching, fires, etc.

3. Prof. Narifumi Tachimoto from the Research Institute for Humanity and Nature lastly, discussed: *Futurability of humanosphere; Toward global humanics of the Environment.* In his speech he sought to approach environmental-humanic global research from a philosophical standpoint. He argued that the global nature of humanity's relationship to the environment makes it possible to draw up a plan in building future societies' potential.

Grand session: Towards harmony between environment and economy: in search of sustainable humanosphere in Indonesia [12.30-14.00]

Four panelist delivered presentations on related topics.

1. Prof. Kosuke Mizuno, director of CSEAS, Kyoto University delivered a presentation with the title: *In search of new direction of development in Indonesia; Possibility of sustainable humanosphere type development in Indonesia.* In his presentation he attempted to show a new possible direction for Indonesian development, referring in particular to the concept of sustainable humanosphere that the G-COE research program intends to develop.
2. Prof. Herman Hidayat, from the Research Center for Society and Culture, LIPI, delivered a presentation with the title: *National park management in local autonomy from the viewpoint of political ecology (case study of Tanjung Puting, Central Kalimantan).* His presentation discussed the conflicts occurring between central and local authorities in managing the national parks of Indonesia. He also looked at the fascinating prospects of "collaborative management", currently promoted as an alternative concept in managing national parks, as a solution to these conflicts.
3. Prof. Shuichi Kawai from the Research Institute of Sustainable Humanosphere (RISH), Kyoto University, delivered a presentation with the title: *Seeking Sustainable Society through Science and Technology*. In his presentation he showed the various activities undertaken by RISH in Indonesia (in the field) and Japan (in the laboratory). RISH conducts research in industrial plantation forests of tropical trees in Southeast Asia and organizes inter-disciplinary research projects.
4. Prof. M. Bismark from the Forest and Nature Conservation Research and Development Center held a presentation entitled: *Improvement of potency and rehabilitation of degraded forest through community forest management.* Against the background of community forests in Java, he argued that the function of the community forest is very important as a forest conservation tool, for forest rehabilitation, as well as for improving the economy of the communities involved, especially in agro-forestry located in the buffer zones of conservation areas.

Comments [14.30-15.00]

Prof. Kaoru Sugihara and Dr. Anita Firmanti commented on the presentations given during the mornings' Grand Session.

Prof. Kaoru Sugihara:

- Looking at nature from man's perspective, it is still primarily seen as capital in land and as a means to create labor, thus nature is changed through differing land-use and labor. There remains a need for comprehensive revision of the economical situation in order to create better, and better sustainable, development.
- In the role of small business versus large-scale business: historically this debate has taken the direction where smaller units may perform better in integrating the welfare of the people and the welfare of the environment.
- In the management of national park management, the approach of political ecology and the interaction of many stakeholders hold interesting possibilities. In general, central and local governments need to institute a "clean" form of government, and to put in place transparent and democratic mechanism to make people agree in issues such as biodiversity. More collaboration efforts are a necessity.
- The conclusions on community forests are positive, but the question remains as to what extent this solution can actually encounter the massive forest destruction as a whole.

Dr. Anita Firmanti:

- The most important issue is the need for Indonesia to clarify the direction of the country's future development, taking into consideration matters of decentralization and democratization. The role of these concepts in further development need to be discussed in greater detail to make possible the drawing up of a grand scenario for a clearer direction of the country's development.
- Kyoto University (RISH) has made a progressive step in research development and technology. The question remains however, what benefits these activities hold for local communities.
- In community involvement in forest management, research activities should be transferred more to address practical issues, with a need to emphasize the importance of the people/local communities.
- This event is to develop better cooperation between LIPI and Kyoto University, to improve capacity building among the Indonesian-Japanese scientist society and to make a better grand scenario for forest development.

Panel Discussion [15.30-17.00]

Moderated by Prof. Bambang Subiyanto (LIPI) and Prof. Kenichi Abe (Center for Integrated Area Studies, Kyoto University).

Two questions/comments were raised by CSEAS participants from Kyoto (via a live internet connection).

1. Prof. Ikrar Nusa Bhakti: why is the research activities of RISH conducted in acacia forests? Why do they not extent to other areas such as natural forests and swamp forests? Indonesia has many other types of landscape that are believed to have sufficient potential for exploration.
2. Dr. Dewi S Sitepu furthermore remarked that poverty problems caused the environmental problems.

Day two (November 27th, 2007)

Scientific session 1: Bio-energy for community [09.30-12.00]

Moderated by Ms. Nuengnam Navaboonniyo (Kyoto University Alumnae from Thailand) and Prof. Bambang Prasetya (Research Center for Biotechnology, LIPI).

Four panelists delivered a presentation:

1. Prof. Supiandi Sabiham from Bogor Agricultural University held a presentation entitled: *Prospect of bio-energy development in rural area.* In his presentation he argued that the development of bio-energy for rural communities is in part solving the problem of energy scarcity, and that the development of bio-energy is expected to have multiple effects in enhancing rural economic activities.
2. Prof. Takashi Watanabe (RISH, Kyoto University) delivered presentation entitled: *Lignocellulosic biorefinery for sustainable society in Southeast Asia.* He discussed the potential of lignocellulosic bio-refinery to replace oil refinery. It has a great potential to accelerate regional economic growth and to generate biomass-based societies in Southeast Asia.
3. Prof. Gede Wibawa (Indonesian Oil Palm Research Institute) delivered a presentation entitled: *Current status of research and development on bio-fuels in Indonesia.* He presented the achievements to date of research and development of oil palm and sugar cane based bio-ethanol industries in Indonesia.
4. Prof. Taro Sonobe (RISH, Kyoto University) held a presentation entitled: *Novel thermal conversion process for bio-energy by microwave heating at Research Institute for Sustainable Humanisphere, Kyoto University.* He presented his research on microwave heating as a pretreatment of the enzyme saccharifcation of woody biomass for bio-ethanol production.

Comments [12.00-12.30]

Prof. Kosuke Mizuno commented on the presentations held during scientific session 1.

1. Within the development of bio-energy, a number of issues should be given further consideration, such as:
   - the global environment, national energy security, and the continuation of economic development;
   - the enhancement of rural economies;
   - the relationship between the high potential of biomass resources and the increase of (fossil) oil prices;
   - are energy crop monocultures consistent with the sustainable humanosphere?
3. Local supply of rural energy. Bio-diesel and bio-gas are conventional technologies for generating energy locally. However we should not forget to look at the economic feasibility of these technologies in the setting of the local economy.
4. Who actually needs these alternative energy-sources? It is quite necessary to consider the point.

Scientific Session 2: Forest as Humanosphere [13.00-16.00]

Moderated by Prof. Kono Yasuyuki (CSEAS, Kyoto University) and Dr. Dorothea Agnes Rampisela (Hasanudin University).

Four panelists held a presentation:

1. Prof. Toshiaki Umezawa (RISH, Kyoto University) gave a presentation entitled: *Biotechnology of tropical acacia.*
2. Prof. Parikesit (Padjajaran University) delivered a presentation entitled: *Man made forest as humanosphere component.* He illustrated many of the important roles that man-made forests can play and the challenges that man-made forests face through a case-study conducted at the Citarum Watershed, West Java, Indonesia.
3. Prof. Kenichi Abe (CIAS, Kyoto University) held a presentation entitled: *Human security in Peat Swamp Forest.* He argued the importance of “vernacularism” for the principally immigrant community of the peat swamp forests.
4. Mr. Keron A. Petrus (University of Indonesia) and Ms, Motoko Shimagami (CIAS, Kyoto University) gave a presentation entitled: *Empowering local institution for sustainable forest management: Lesson from “facilitated research” on community forestry in Sumber Agung Village, Lampung Province.* They presented the participatory research experiences at Sumber Agung Village and found that in order to make local institutions function effectively in managing the

forest, it is crucially important that the state officially recognizes local community's rights to the forest.

Wrap up session: Resolutions and future perspectives [16.00-17.00]

Moderated by Dr. Masaaki Okamoto (CSEAS, Kyoto University).
In this session Prof. Kono Yasuyuki (CSEAS Kyoto University), Prof. Takashi Watanabe (RISH Kyoto University) , and Dr. Wahyu Dwianto (Research and Development Unit for Biomaterials, LIPI) report on the findings from the scientific sessions.

The objectives defined from the forum were listed as follows:

- to seek a new Indonesia;
- to define what is national development;
- to explore the concept of a sustainable humanosphere;
- to anticipate global warming, climate change and MDG's;
- to develop a forest model for a sustainable humanosphere;
- to intensify the number of studies on biodiversity of flora and fauna.

What is understood to comprise a "humanosphere" was identified as follows:

- Human activities and how they interact with their surrounding environments.
- A humanosphere is not only a term to refer to the scientific study of material, energy flows and conversions, but should also include all interactions between man and nature, including human and social responses to the environment.
- Kyoto University's Global COE Project (2007-2012) is to create an interdisciplinary framework under which to promote sustainability of the humanosphere in concrete terms.

Problems and solutions from socio-economic & environmental perspectives

PROBLEMS	SOLUTIONS
Two critical problems face the Tanjung Puting National Park: (1) illegal logging and mining activities; (2) conflicts of interest between central and local governments (H. Hidayat)	National Park Management: (1) collaborative management of reforestation programs, (2) law enforcement, (3) hard sanctions, and (4) socio-economic empowerment of local people (H. Hidayat)

Benefits from forests are currently still dominated by benefits from timber, while erosion prevention and water arrangement benefit only in small measures (M. Bismark).	The function of community forests located in the buffer zones of conservation areas is very important as (1) a forest conservation tool, (2) for forest rehabilitation, and for (3) community economy improvement (M. Bismark).
State-based centralized forest policy neglects the role of local people living in and around forest area and has shown many failures (K.A. Petrus & M. Shimagami).	In community forestry policy the forest is a basis of communities' livelihoods, therefore they utilize the resources in a way that seeks harmony with the characteristics of the forest (K.A. Petrus & M. Shimagami).
The crisis facing mankind: population explosion, energy crisis, and global warming (S. Kawai).	Interdisciplinary research with a broader perspective is urgently required to solve such critical issues (S. Kawai).

The scope for science and technology was identified as follows:

- The tropical region receives the highest concentration of solar energy which is the ultimate energy source of all organisms of earth and is the driving force of global atmosphere dynamics and of the production of plants (S. Kawai).
- Humanosphere science covers a wide range of research fields on the humanospere, from the ground, to the atmosphere, and the space for human existence (S. Kawai).

Research fields should:

- organize inter-disciplinary research projects that include (1) the evaluation of tree bio-mass production by tree growth analysis and remote sensing technology, (2) environmental monitoring and assessment through atmosphere and biodiversity observations, and (3) bio-technology for enhancing tree functions.
- develop the academic and technological solutions to establish a cyclical system of resources and energy in the region, and which supports the harmonization of ecology and economy.

Problem and resolution from the science and technology perspective

PROBLEMS	RESOLUTIONS
Global warming and deficiency of fossil fuels (T. Watanabe).	Lignocellulosic bio-refinery plays a key role in replacing the oil-based chemical industry because bio-mass is a carbon-based renewable

	resource with large quantities of lignocellulosics (T. Watanabe). The biodegradation in combination with thermo-chemical and physical treatments can be applied to the production of bio-methane, bio-ethanol and feed for cattle (T. Watanabe). Technological innovation: the effect of MW irradiation has been investigated to improve the enzyme saccharification rate of woody biomass for bio-ethanol production (T. Sonobe et al.) Bio-fuel development in Indonesia should involve: (1) empowerment of rural communities to produce bio-fuel for their own energy consumption/needs. (2) empowerment of small and medium scale enterprises (SME) to produce bio-fuel for local markets. (3) encouraging big scale companies to produce bio-fuel for its own use/needs. (4) encouraging private enterprises (national and foreign) to commercially produce bio-fuel for domestic and export markets.

A number of observations add background to the perspectives identified during this 2 day forum. These observations are:

1. There remains a big gap between bio-diversity conservation and large-scale plantation development;
2. The quick answer is to give up on conservation efforts and continue to do both in the present way, so we must jump at this challenge;
3. Environmental conservation requires reconsidering the basics such as talun, vernacularism, and CF;
4. Tree plantation and bio-technology have still to mature;
5. Our thoughts on the humanosphere are still limited and we have to expand them to include the bio-sphere and geo-sphere;
6. The time-scale for developments is a basic issue within the discussion; energy prices ultimately decided the feasibility of bio-fuel production by large-scale plantations;
7. CF expires after 5 years, but there is a need to develop good forest for a longer period;
8. Nobody thinks about the future of PSF;
9. How to synthesize the differences in time-scale between the humanosphere, bio-sphere and geo-sphere may be a serious question.

The following perspectives for the future will be possible when supported by the Government politically and through law enforcement:

- Intensified biodiversity studies (E. Sukara);
- The development of sustainable humanosphere industries (K. Mizuno);
- Reforestation by forest-based communities (H. Hidayat; M. Bismark; K.A. Petrus & M. Shimagami).
- Bio-mass production from plantation forests (S. Kawai) and man-made forests as humanosphere components (Parikesit);
- The development of appropriate bio-energy (S. Sabiham; T. Watanabe; G. Wibawa; T. Sonobe) and tree bio-technology (T. Umezawa);
- Stopping the exploitation of timbers from natural forests, and more utilizing lesser known wood species for different purposes (W. Dwianto).