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Kansai Research Centre

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International Symposium 2004 on "Business and the Environment"

March 2005 IGES Kansai Research Centre

"Business and the Environment" International Symposium Series

Business for Sustainable Society Project :
Inaugural International Symposium 2004

"Prospective Directions of Sustainable Society – Roles and Possibilities of Industry, Technology and Community–"

March 2005

Institute for Global Environmental Strategies (IGES)
Kansai Research Centre

IGES Kansai

Proceedings from
International Symposium 2004 on
"Business and the Environment"

Prospective Directions of Sustainable Society
—Roles and Possibilities of Industry, Technology and Community

Date : November 17, 2004 1:00p.m.—5:00p.m.
Venue : International Conference Center Kobe
(International Conference Room, 3rd Floor)

Organizer : Institute for Global Environmental Strategies (IGES)
Sponsors : Ministry of the Environment (Japan), Hyogo Prefecture, Kobe City, Asia-Pacific Network for Global Change Research (APN), International EMECS Center, Hyogo Prefecture Liaison Conference for Air Environment Conservation, Hyogo Prefecture Liaison Conference for Environmental Conservation in the Seto Island Sea, 10 organizations of the Advisory Board of IGES Kansai Research Center:
[Global Environment Forum-KANSAI, Kansai Council, Kansai Economic Federation, The Osaka Chamber of Commerce and Industry, The Federation of Chamber of Commerce and Industry in Hyogo Prefecture, Hyogo Prefectural Federation of Societies of Commerce and Industry, The Hyogo Industrial Association, Hyogo Environmental Advancement Association, Hyogo Prefecture Association for Corporate Environmental Conservation, The New Industry Research Organization]

Inaugural International Symposium 2004 on
"Business and the Environment" at IGES Kansai Research Centre

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Prospective Directions of Sustainable Society

－Roles and Possibilities of Industry, Technology and Community

The Business for Sustainable Society (BSS) Project organised the international symposium and workshop at the International Conference Center Kobe on 16-17 November 2004 to celebrate its inauguration.

At the international symposium (17 November), Dr. Peter Harper (Centre for Alternative Technology: CAT) gave a keynote speech on environmentally sound technology and regional systems prior to Prof. Ryoichi Yamamoto (University of Tokyo) on the environmentally sound business model. Then the research trends in Japan, the US and Europe, as well as the issues to be challenged by the project were examined. Reflecting the attracting topics and expectation for the new project, about 200 people participated in the symposium and workshop which explored the common challenges among developed and developing countries against the global environmental constraints, the best practices for the different goals, and the mid to long term scenario for industry and the region. It was a valuable opportunity for the newly established project to strengthen its network of researchers internationally.

13:00－13:15	*Opening Remarks*	
	Akio Morishima	Chair, Board of Directors, Institute for Global Environmental Strategies (IGES)
	Akira Harada	Director General, Environmental Bureau, Hyogo Prefectural Government
13:15－13:45	*Introduction*	
	"Prospective Directions of Environmentally-sound Local Development & Local Technology Systems"	
	Masaaki Naito	Project Leader, IGES Kansai Research Center (Professor Emeritus, Kyoto University)
	"Prospective Directions of Environmental Business and the Potential of PSS (Product Service Systems)"	
	Takashi Gunjima	Sub-Project Leader, IGES Kansai Research Center (Professor, Doshisha University)
13:45－15:05	*Keynote Speeches*	
	"The Social Economy and Community Development: A Case Study of the Center for Alternative Technology (CAT)"	
	Peter Harper	Head of Research and Innovation Center for Alternative Technology (CAT), UK
	"Sustainable Companies and Eco-service - Current Situation and Future Prospects in Western Nations and Japan"	
	Ryoichi Yamamoto	Professor, Institute of Industrial Science, Tokyo University
15:20－16:55	*Panel Discussion*	
	Coordinator: Masaaki Naito, Takashi Gunjima	
	Panelists:	
	Yang Yufang	General Manager, Water Treatment Research Laboratories, Toray Fibers & Tetiles Research Laboratories (China) Co., Ltd. Shanghai Branch
	Masaki Kojima	Director/Vice-President, Zero Emission Support Club for Green Society
	Mark Stoughton	Senior Scientist, Tellus Institute, USA Visiting Researcher, IGES Kansai Research Centre
	Oksana Mont	Research Associate, International Institute for Industrial Environmental Economics (IIIEE), Lund University, Sweden
	Raimund Bleischwitz	Co-Director, "Material Flows and Resource Management", Wuppertal Institute, Germany
16:55－17:00	*Closing*	
	Akihiro Amano	Director of IGES Kansai Research Centre

Profile

Masaaki Naito

Project Leader,
IGES Kansai Research Center
(Professor Emeritus, Kyoto University)

Born in Osaka in 1939, Professor Naito graduated with a doctorate from the Department of Engineering at Kyoto University, where he subsequently taught and became Professor of Global Environmental Engineering (in the Graduate School of Engineering) and Dean of the Graduate School of Global Environmental Studies. Presently he is the representative of the NPO "Kyoto Institute for Eco-Sound Social Systems" and Professor in the Department of Public Policy at Bukkyo University. His expertise relates to "Environmental Systems Synthesis," and his main concern is to work out the principle of an "eco-sound society" and to work toward its realization through teaching and various types of citizen activities.

Takashi Gunjima

Sub-Project Leader,
IGES Kansai Research Center
(Professor, Doshisha University)

(1947) Born in Fukuoka. (1969) Graduated in Economics, Department of Economics, Doshisha Univ. (1974) M.A. Graduate School of Economics, Doshisha Univ. Research Associate in Economics, Dept. of Economics, Doshisha Univ. (1976) Lecturer. (1979) Associate Professor (1984-present) Professor (1994-1996) Dean, Member of the board of trustees of Association of Environmental Economics and Policy, Former Vice-President of Japanese Association of Economic Policy, Councilor of Association of Experts of Solid Waste Management. Main books are following: "Challenge to Throw-away Society" (Gyousei), "Institution and Policy in Eco-sound Material Flow Society" (Iwanami Shoten).

Peter Harper

Head of Research and Innovation
Center for Alternative
Technology (CAT), UK

Peter Harper is Head of Research and Innovation at the Centre for Alternative Technology in Wales, UK, where he has worked for 20 years. He is also visiting Professor at Ritsumeikan University in Kyoto, Japan, and visiting research fellow of the UK Open University and the University College of Wales, Lampeter. He has also worked in universities in Iran, the USA, and Australia; and for UNESCO in France. His research interests have covered a wide range, including energy policy, the philosophical basis of sustainability, ecovillages and environmental demonstration centres, alternative sanitation systems, composting, landscape design, and organic horticulture. His publications include *Radical Technology*, an early textbook of technical alternatives (of which there was a Japanese edition in 1978), *The Natural Garden Book* (also published in Japanese, in 1996) and *Lifting the Lid* (2000). The work of the Centre for Alternative Technology can be accessed at www.cat.org.uk. There is also a Japanese version of the site.

Ryoichi Yamamoto

Professor, Tokyo University

Dr. Ryoichi Yamamoto is the Professor at the Institute of Industrial Science, University of Tokyo. He received his Ph.D. in Engineering from University of Tokyo in 1974. He is considered to be an expert in environmentally conscious materials and design, as well as in Life-Cycle Assessment. He is currently the Steering Committee Chairman for the National Project of Life-Cycle Assessment which is supported by the Ministry of Economy, Trade and Industry of Japan. In addition, Dr. Yamamoto is the President of the Ecomaterials Forum of Japan. He has also lectured as a guest professor at 31 universities in China, including Beijing and Qinhua Universities.

Yang Yufang

General Manager, Water Treatment Research Laboratories, Toray Fibers & Textiles Research Laboratories (China) Co., Ltd. Shanghai Branch

Graduated from Tongji University of Shanghai in 1986, then became an Assistant Lecturer and Lecturer of Tongji university until 1993. Since 1994, studied in Japan and got Master degree of Agriculture from Shimane University in 1996, then doctor degree of engineering from Kyoto University in 2000. After graduation, worked as an fellow researcher in National Institute for Environment Studies, Japan, specially on the project for Water Environment Renovation of Lake Kasumigaura, the Science and Technology Promotion Foundation of Ibaraki, Japan. Since 2004, was appointed as General Manager of Water Treatment Research Laboratories, Toray Fibers & Textiles Research Laboratories (China) Co., Ltd. Shanghai Branch.

Masaki Kojima

Director/Vice-President, Zero Emission Support Club for Green Society

Born in Kobe, Hyogo, Japan, in 1947. Resident of Takarazuka, Hyogo.
Completed doctoral research at the Kyoto University Graduate School of Agriculture with a major in rural planning.
Involved in urban development, landscape design and local area zero emissions for Environmental Systems Planning, Kobe Institute of Urban & Local Problems.
Has served as Vice Chairman and Secretary for the Zero Emission Support Club for Green Society (registered as NPO in 2002) since 2000.
Licensed engineer (construction, urban and regional design), surveyor and class 1 biotope planner.

Mark Stoughton

Senior Scientist, Tellus Institute
Visiting Researcher,
IGES Kansai Research Centre

Dr. Stoughton conducts applied research and strategy development for environmental issues at the interface between the public and private sectors. This includes the application of performance-based contracting and environmental accounting to supply chain management, facility-level sustainability reporting, and compliance strategies for regulatory agencies. Dr. Stoughton is also Associate Director of Tellus' Capacity for Impact Assessment and Management Program, which assists international development organizations with environmentally sound project design. At IGES, he focuses on research design for the business models research project of IGES-KRC.
Dr. Stoughton holds a doctorate in Technology, Management and Policy (2000) and a Masters • degree in Civil and Environmental Engineering (1995), both from MIT.

Oksana Mont

Research Associate, International Institute for Industrial Environmental Economics (IIIEE), Lund University, Sweden

Dr. Oksana Mont is a research associate at the International Institute of Industrial Environmental Economics at Lund University. She has a PhD in Technology, M.Sc. in Environmental Management and Policy and M.Sc. in Biology and Chemistry. She is involved in projects that study environmental and economic potential of product-service systems, as well as regulatory frameworks for introducing the product-service system concept to companies. Her particular interest lies at the crossroads of consumers' and companies' involvement in developing more sustainable business models. Besides PSS, she is involved in projects on product policy, environmental management systems, cleaner production and waste management. She teaches post-graduate courses in Lund University and other universities of Europe and Latin America, and is involved in educate the educators programmes.

Raimund Bleischwitz

Co-Director, "Material Flows and Resource Management", Wuppertal Institute (Germany)

Economist (PhD), Policy Advisor, Research Manager. Since November 2003 Co-Director of the Research Group 'Material Flows and Resource Management' at the Wuppertal Institute in Germany as well as 'Toyota Chair for Industry and Sustainability' at the College of Europe in Bruges, Belgium. Previous positions have been hold at the Max Planck Project Group on the Law of Common Goods in Bonn, at the Wuppertal Institute, at the Institute for European Environmental Policy and in the German Bundestag. Coordination of a governance study on behalf of the Japanese Government since 2000. Fellowships in Japan, Seoul/Korea, USA, and London/UK. Main fields of expertise: Governance of sustainable development, resource productivity (Factor 4), institutional economics.

Opening Remarks

Chair, Board of Directors
Institute of Global Environmental Strategies (IGES)
Akio Morishima

Ladies and gentlemen, I would like to thank you for coming all this way on a weekday.

We do not particularly mind but the name of our foundation, the Institute of Global Environmental Strategies (IGES) contains the word "strategy" and our research aims at making policy proposals. Our institute began six years ago in 1998 as an initiative of the Japanese government. The Kansai Research Centre was opened three years ago in 2001 in Kobe under a unified theme of "Business and the Environment", with the support of the Hyogo Prefecture and business world of Kansai area. This is the fourth annual international symposium since the Kansai Research Centre opened. On the theme of "Prospective Directions of Sustainable Society - Roles and Possibilities of Industry, Technology and Community", we will first be hearing presentations by Dr. Peter Harper and Prof. Ryoichi Yamamoto followed by a panel discussion with our invited panelists.

I would like to talk briefly about why IGES was founded and "Business and the Environment" was selected as the theme of the Kansai Research Centre.

Needless to say, global environmental problems, particularly global warming, are major issues of the 21st century. Asia in particular is faced with global environmental problems what with rapid industrial and economic development and growing populations in China, India and other places, global warming and other problems, and poverty still an issue in many developing nations. Since it is urgent that global environmental problems in Asia be resolved, the Japanese government created IGES in 1998 to develop strategies for doing this after the Rio Summit of 1992. Currently, several projects are underway in cooperation with researchers and institutes of international, especially of Asia. The headquarters are in Hayama, Kanagawa. The Kansai Research Centre was opened three years later, in 2001 in Hyogo, and just before that, another office was opened in Kitakyushu. At present,

there is also an office in Bangkok, which is working with the local UNEP office, ESCAP and the various nations of Asia in identifying problems and devising strategies.

Moreover, the economy and industry of the Kansai, needless to say, play an important role in the Japanese economy. In launching the Kansai Research Centre, tremendous support was provided by the business world of the Kansai. Therefore, as the theme, it seemed suitable to research the roles played by primary factors of sustainable development, namely "economics" or "industry", and the "environment". It was decided to put the search for "business and environmental" strategies at the core of the Kansai Research Centre, on the belief that sustainable technologies, business systems and concepts found within the industrial technologies and systems of Japan could be shared not only with Asia but developing nations everywhere. Today's International Symposium on "Business and the Environment" is a part of that.

Recently, the concept of sustainable consumption appeared in UN circles. I believe Dr. Harper and Prof. Yamamoto will be talking about this today, but mankind will not survive unless we do something to efficiently and effectively use limited energies and resources. The Kansai Research Centre wants to think about this problem, too. Of course, other IGES projects such as the Climate Policy Project that researches global warming, the Freshwater Resources Management Project, and the Urban Environmental Management Project underway in Kitakyushu, will delve into this problem, as well.

The Kansai Research Centre focuses the core theme on "business" and searches for directions in sustainable development. Our guest speakers and panelists today are all doing leading research in this field, therefore I expect there will be much to learn despite the limited amount of time. I hope this symposium serves as a good opportunity to think about the kind of lifestyle needed now for the next generation of the entire world, including not only Asia, but Europe and the USA.

Before closing, let me express my gratitude to Dr. Harper, Prof. Yamamoto and all of our panelists who have traveled so far to be here today. I am very grateful for your presence. I expect the discussions today will prove very meaningful. Please, everyone, expect the same. Thank you very much.

Opening Remarks

Director General, Environment Bureau,
Hyogo Prefectural Government
Akira Harada

Ladies and gentlemen, as you just heard me introduced, I am Akira Harada of the Hyogo Prefecture Environment Bureau. On behalf of Hyogo Prefecture, let me welcome everyone to Hyogo and this International Symposium on "Business and the Environment" organized by IGES.

As you may well aware, dealing with global warming and the formation of a sound material-cycle society are urgent issues of environmental administration today. In regards to global warming, Hyogo Prefecture is comprehensively promoting action with the "Plan for Promoting the Prevention of Global Warming" devised in 1996 and later revised in July 2000. Also, in order to promote energy conservation and new energy sources, Hyogo Prefecture is promoting action, which includes new hardware, in all governmental offices. Just to give you an example, we have been installing solar panels in governmental offices across the prefecture since 2002. In fact, the largest solar panels in scale to be installed in any governmental office in all Japan were in Nishiharima Office of the Hyogo Prefectural Government, which is now generating 506 kilowatts of power. The second ones were installed in our main office and those are generating 209 kilowatts of power.

As for the formation of a sound material-cycle society, Hyogo Prefecture drafted "Hyogo Vision for a Sound Material-Cycle Society" in May 2001, based on Japan's "The Basic Law for Establishing the Sound Material-Cycle Society". In order to develop a sustainable society, harmony between the environment and business has been raised as a specific target and we are thus promoting strategies for developing the eco business.

One of those strategies is to build wide-area recycle centers. In that regard, we adopted the "Hyogo Eco Town Scheme" in March 2003 and are currently building a system that will enable industry, government and the academics to act as one. While many other eco town schemes target specific industrial areas, ours aims at

material recycling, eco business promotion and urban development that involves the participation of all residents in Hyogo Prefecture.

I believe we can safely say that the current society and economy of mass production, mass consumption and mass disposal have reached the point that we need to convert them to a sustainable ones. Given the situation, it is very significant and opportune that the IGES Kansai Research Centre has turned their attention to local community models and business models, and launched projects with the prospects of finding directions in sustainability. The IGES Kansai Research Centre is involved in policy research for the Asian-Pacific region, but I would like to see them operate additionally as an advisor to local communities as well.

It is my sincere hope that the Business and Sustainable Society Projects proceeds on track and ultimately contribute to the formation of a sustainable society in the Kansai area, Japan and other corners of the Asian-Pacific region.

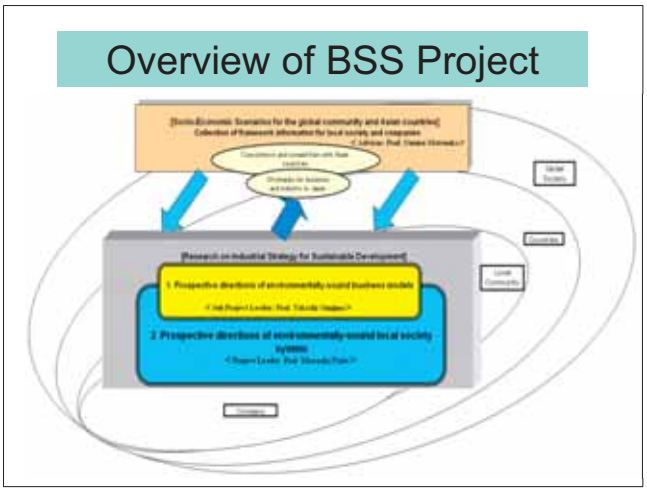
Thanks you for your attention.

Introduction

Prospective Directions of Environmentally-sound Local Society Systems & Local Development

Project Leader, Business for Sustainable Society Project
IGES Kansai Research Centre
Masaaki Naito

Ladies and gentlemen, I am Masaaki Naito, leader of this very important project. I will today be giving you a brief introduction to the project. Let me begin by saying that the overall project stands on two big pillars (Slide 1).



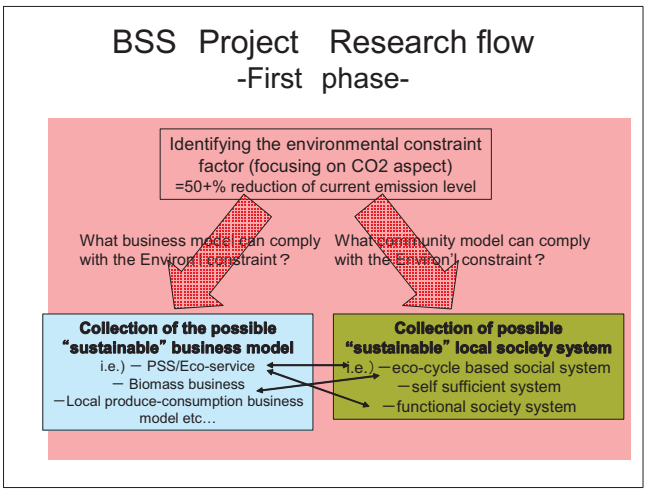
(Slide 1)

I would like to start with a general image of the overall project. As you can see in this slide, the main area is in the bottom half of this picture, if you would. We are directly involved with the area of "Research on strategy for sustainable society and industry". This is subdivided into two parts. One is research into environmentally-sound business models that is looking for new business models built on "software" schemes for society. The other delves more into hardware and is searching for new technologies and how to develop local communities to use these technologies. You may have heard terms such as *eco town, eco city* and *eco village*. This aspect of our research is looking at how to build such kinds of things. Also, in addition to those two research themes, other long-term research is going on into verifying an outlook on the future. This element is here because, when thinking of comprehensive strategies for the eco business or local systems, various external and surrounding circumstances must be taken into consideration. We all know that the reason why research is needed into global

environment strategies is because the global environment is in danger. Nevertheless, if we barreled ahead without knowing how endangered the planet is, things would not go well and it could even put us in a situation where we cannot take effective measures for stopping a catastrophe. This is the reality we live in. Therefore, it is important that we accurately understand the state of environmental limitations as an external condition when we go forward with our work. With this kind of recognition as a backdrop, our sub theme is how to grasp "long-term outlooks and long-term policies".

The general structure is as you see here (Slide 2). As for the research flow, the objective is as shown in the slide. The essence of our strategy research is in building a vision of an environmentally sound society and how to attain that vision. We want to be as specific as possible in projecting this strategy. We debated at great length over the scope, but since our research is based in the Kansai, although we of course want to project a vision of the entire country, we decided to set the scale on the local community. What we are doing is looking at the relations of industry and business activities to the local community. The main outcome, which cannot be considered specific at this present time, is as shown in the slide. For example, one general idea is a "guidebook on eco-friendly systems".

(Slide 2)



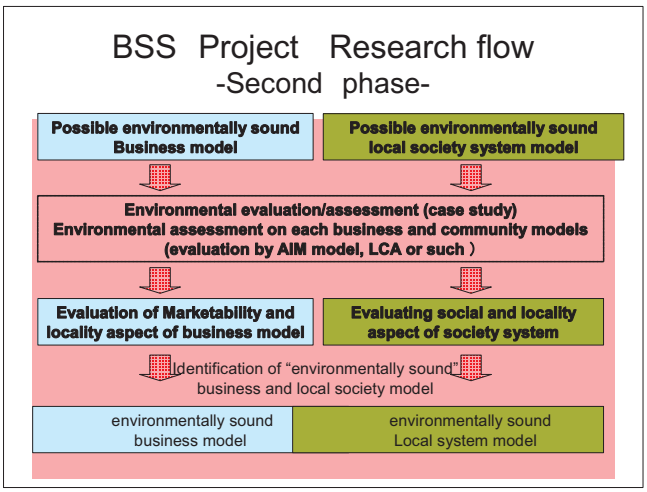
(Slide 3)

This slide shows how we divided up research plans into phases (Slide 3). I won't go into great detail, but let me

just say a word on each phase. First phase will quantitatively identify as best possible how environmental constraints will be imposed in particular as global environmental limitations. To help us go about this new field of research with targets in mind, we decided to begin by identifying concrete numerical targets for "reducing CO_2 emissions by 50% or more of the 1990 level by the year 2050." There are certainly other choices than this, but we started with this figure for various reasons.

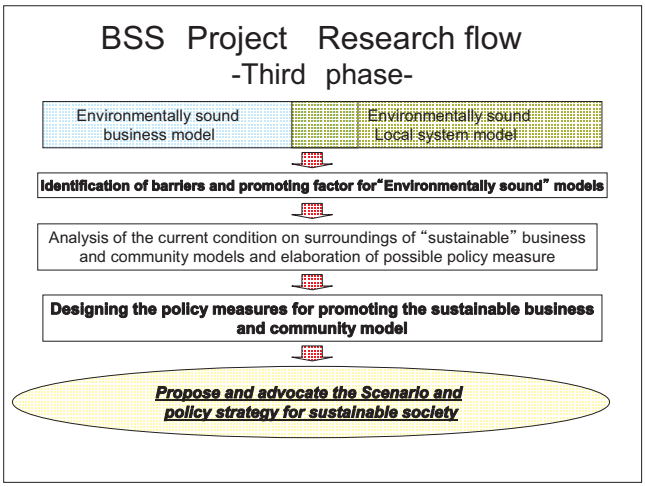
In any case, there is a lot talk about doing good for the environment and there is a lot of research and debates going on, but with that kind of approach, it is extremely hard to know when and what magnitude of improvement should be achieved. We see this as the most significant problem of current research approaches. This research of ours will first announce this pretext, namely environmental limitations and magnitude of required improvement, and share it as a basis for debate. So, even if there is criticism and arguments about environmental limitations, it's all right. In the very least, we want to clearly set our targets. To attain this target, we will break up into groups to discover sustainable business models, technologies and local development. Within all that, there are some very strong relationships.

As for the second phase (Slide 4), unless the quantitative analysis, it is not known how well the numerical target I mentioned earlier will be attained by environmental business models or technologies, therefore the first step in second phase is to verify to what point environmental load has been reduced by identified promising business models or local technologies. Fortunately, since we are tied up with a group that has an Asian environmental model called AIM, which is one of the best models on the world, we would be able to conduct quantitative analyses which may not be possible in other projects. Then, after the environmental assessment, analysis must be conducted with marketability in mind because being good for the environment is one thing, but if it is not marketable or is unaccepted by the local area,



(Slide 4)

it's pointless. So, we want to look at the total of the environment, market and local appropriateness, and seek out a harmony between the community and business.

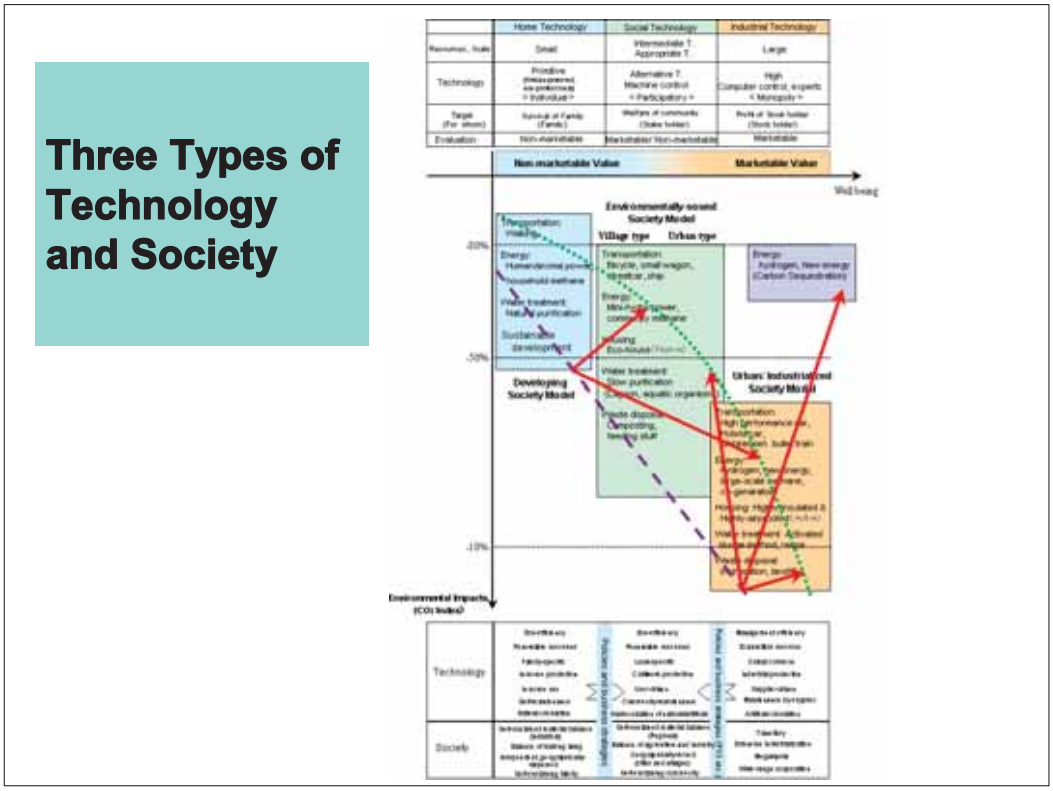


(Slide 5)

In the third phase, we want to incorporate all of these things into an actual community (Slide 5). It would be great if we could actually materialize these business models and local systems, but given the limited amount of time and other restrictions, this is unlikely. Therefore, plans are to select a target area and run simulations there. We have received tentative offers to host the project from various communities. We will select from them the place that is best suited for modeling and work with them to get the project rolling.

This figure categorizes some technologies for an eco-friendly society (Slide 6). It is kind of small and hard to see, so I will break down the content and talk about it a bit later. It suffices to look at this now for the close linkage of the three categories.

In a nutshell, this table shows how to categorize the technologies are categorized (Slide 7). On the far right of this table is that which Japan, America and other industrially advanced nations have today. It is big, advanced and businesses wield it via market principles. In contrast to this, that on the left side of the table takes the form of family labor in developing nations and any of the areas around the world that are even less developed than that, of which there are many. The reason why we raise both of these here is that we see a new harmonic society with technology that is either in-between these two technological realms or a union of both. (This in-between technology could be called "intermediate technology".) We call it "locally appropriate technology" here in the table. However, in fact, we discussed a name for this technology the other day with several experts from overseas, but there is still more we need to think about. It seems wise not to use terms like *intermediate technology* or *alternative technology* without careful consideration, but whatever the case, that technology does not exist unto itself, as it is created within a tight



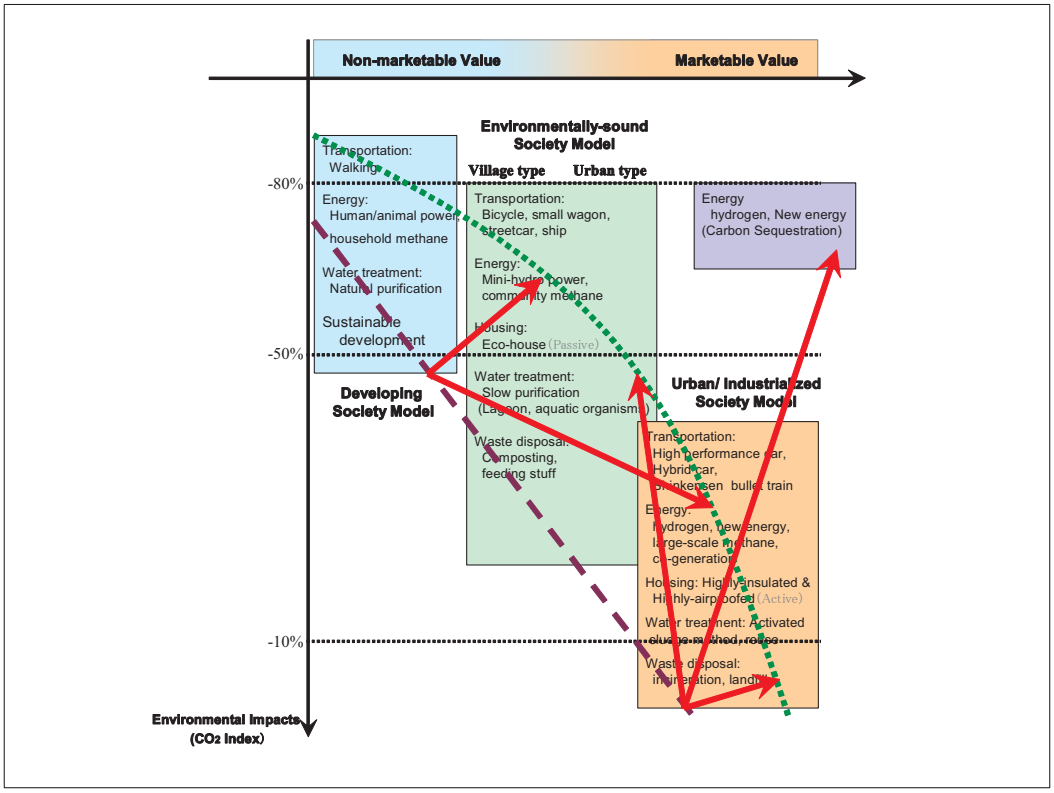
(Slide 6)

relationship to the local society. In contrast to that, the technology on the far right is not like this as it generally has universal qualities to it.

	Home Technology	Social Technology	Industrial Technology
Resources, Scale	Small	Intermediate T. Appropriate T.	Large
Technology	Primitive (Human-powered, non-professional) ＜Individual＞	Alternative T. Machine control ＜Participatory＞	High Computer control, experts ＜Monopoly＞
Target (For whom)	Survival of Family (Family)	Welfare of community (Stake holder)	Profit of Stock holder (Stock holder)
Evaluation	Non-marketable	Marketable/ Non-marketable	Marketable

(Slide 7)

By the way, Japan is at present on the far right of the figure (Slide 8). Here, there are three arrows. The short one that points to the right indicates the direction of solving problems with incremental technological advances or the so-called "business as usual" approach. As already recognized by government or the like, It is very hard to solve environmental problems in this way. The arrow that rises strongly to the right marks the direction of a complete switch to a hydrogen-fueled society. I have heard that there are efforts with this to cut CO_2 emissions by 80%. Although what we are proposing does not necessarily negate these two approaches, we are of the thinking that it is important to search for a new direction, that indicated by the arrow that points



(Slide 8)

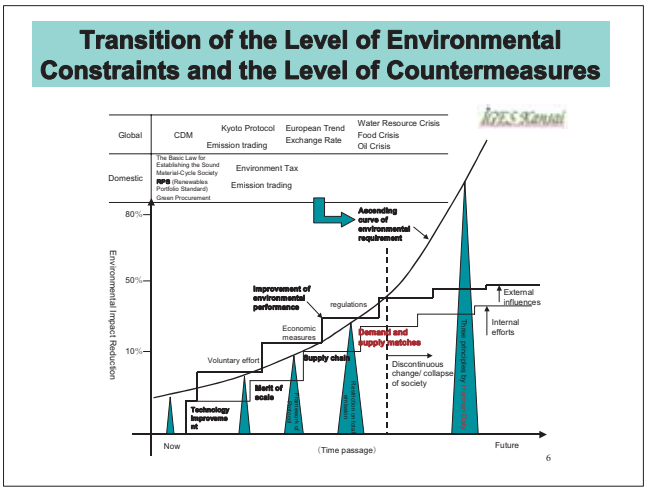
to the upper left of the figure or, in other words, grows towards locally appropriate technology. Incidentally, there are two red arrows coming from the far left on up-side. These suggest, not to aim for a quick jump from developing nation to indus-trialized society or urban development model, but to head towards the center model, the environmentally sounds model. In short, our intention is to strategically propose moving from both directions. This is how we have conceived the three categories. Because of the time restriction, I will forgo the details of each.

This table uses some of the keywords to organize the whole picture of how the software and hardware are related in the previously mentioned business model and how to move towards the "desired, environmentally sound society" in the middle (Slide 9). We will spend the next three years studying whether this will go well or not.

Lastly, one thing I want to say is that, particularly for businesspeople, the greatest point of interest is how to look squarely at the eco business and make money in a market economy. But, I must admit that, in its present state, that is very difficult. Why is that? This slide attempts to explain that (Slide 10). Without a

Technology	Eco-efficiency Renewable resources Family-specific In-house production In-house use Self-maintenance Natural circulation	Policies and business strategies	Eco-efficiency Renewable resources Local-specific Craftwork production User-driven Community-maintenance Harmonization of natural/artificial	Policies and business strategies (PSS etc.)	Management efficiency Exhaustible resource Global common Industrial production Supplier-driven Maintenance by supplier Artificial circulation
Society	Self-contained material balance (Individual) Balance of making living Independent, geographically-dispersed Self-sustaining family		Self-contained material balance (Regional) Balance of agriculture and industry Geographically-mixed (cities and villages) Self-sustaining community		Transitory Extensive industrialization Megalopolis Wide-range cooperation

(Slide 9)



(Slide 10)

doubt, our society is the result of continuous technological improvement and internal efforts. In business, if the technical, structural and, as an external factor, economic systems change, that marketability changes as well. For example, the debate over an environment tax has to do with the changes to this economic system. It is important to know when and how the economic system will change. Moreover, in the face of changes to the economic system, direct environmental regulations will likely become stiffer. It is foreseen that a CO_2 reduction of certain percent could have sufficient legal strength to be imposed in the future. Within all of that, we want to accurately predict when and where the eco business will establish an economic base and start moving as a market. If this prediction is accurate, I could instantly start up in some business and make a lot of money before telling everyone, but needless to say, the task is difficult. But, without it, most of our research would be meaningless. This prediction of long-range outlook is a complimentary theme in which we will search for a correct understanding of what, when and in what form external changes will occur and how the resulting legal and economic restrictions will be imposed on business and industry, by fully utilizing the global model AIM I spoke of earlier.

So, this is what our research looks like as a whole. I myself am in charge of the hardware side research. The software side, that is to say, the business systems will be presented by Sub-Project Leader Prof. Gunjima.

Thank you for your kind attention.

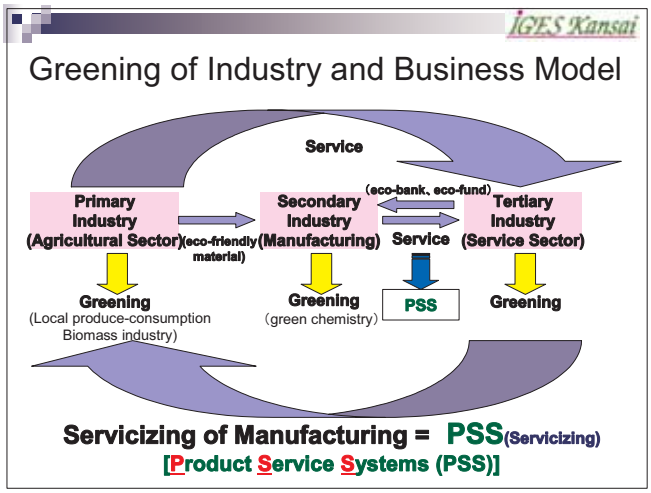
Introduction

Prospective Directions of Environmental Business and the Potential of PSS (Product Service Systems)

Sub Project Leader, Business for Sustainable Society Project (BSS)
IGES Kansai Research Centre
Takashi Gunjima

Professor Naito has already spoken about the project as a whole. And, the project has only just begun, therefore rather than report on results, I would like to talk about the research we plan to do from here out.

The business world stresses the environment by its economic activities, yet it is necessary for the business world and the individual companies that comprise it to start thinking now about what sort of role they should play in building a sustainable society (Slide 1). What have caught the attention of many who come underneath this demand are the various forms of eco-business. The eco-business has emerged in many corners of the primary, secondary and tertiary industries in order to reduce their own environmental loads as well as to jointly reduce environmental load between them. Particularly, secondary industry or manufacturing generates a heavy environmental load in the production and consumption of materials and products, which is why our research focuses on recent efforts in the secondary industry to reduce this environmental load via changes to sales systems, that is to say product service systems (PPS) or, as they say in the USA, "servicizing". We want to assess these product service systems. In our work, we will study PSS models that reduce environmental

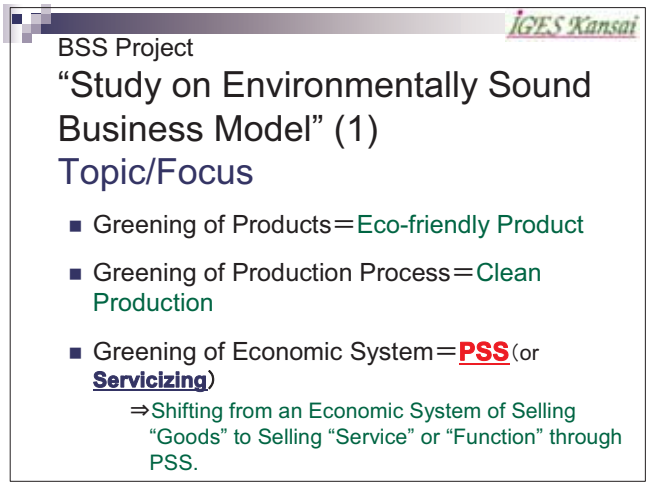


(Slide 1)

load and PSS models that promote local sustainability within a framework of regional development. Though noteworthy PSS models are likely to come up in the panel discussion, the models that appeared during new socio-economic structural changes basically do not target a reduction in environmental load into itself. Accordingly, PSS is not just a bunch of business models that reduce a reduction in environmental load. Therefore, we must screen a lot of PSS models out there and select those that in fact reduce environmental load. Also, we have recently been screening PSS models for those that enhance local sustainability. Let me reiterate that a business does not introduce a PSS model in order to reduce its environmental load or enhance the sustainability of the local community. Put differently, since PSS models are applied for other reasons than the environmental load of a business, we have to identify those that reduce environmental load or contribute to local sustainability so that we can go ahead with our research.

The reason that PSS models are of interest is that a lot of precursor research has come from an environmental perspective. Though much will be added to this later in the panel discussion, PSS model research was pioneered in the EU by Oksana Mont and Raimund Bleischwitz and has produced marvelous results. Also, on the USA stage, Mark Stoughton has produced forerunning results in "servicizing". In Japan, forward-looking research is being done by Ryoichi Yamamoto, who will be speaking today, and the first case studies into servicizing and PSS in the Kansai area are being conducted by the Global Environment Forum-KANSAI.

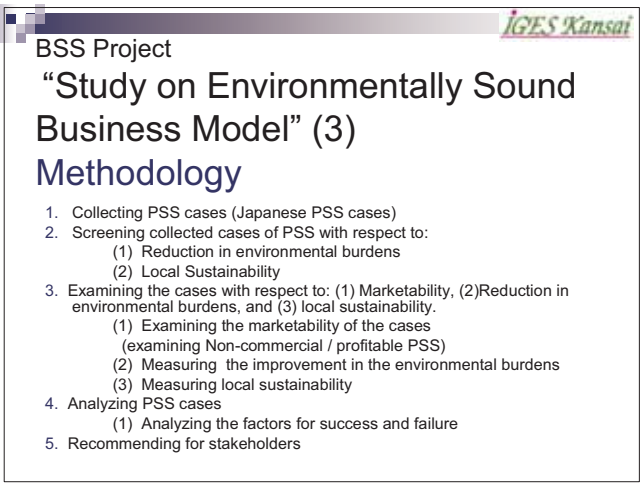
These researches into PSS have produced very important results. The actual environmental business models that resulted from prior research first led to eco products, namely products with lower environmental load (Slide 2). Undertakings that followed looked not at products but production processes to reduce environmental load. Research led to applications in clean production, cleaner production, closed systems



(Slide 2)

and closed production. Though all of these efforts helped to reduce environmental load, a new supply-demand system is needed to make further reduction. One such possibility is a new transaction scheme for purchases and sales, which could greatly reduce environmental load even more. This is where PSS is being proposed. Basically, our research is delving into system innovation that aims to reduce environmental load and enhance local sustainability by using PSS to convert economic systems based on selling products into models that sell services and functions.

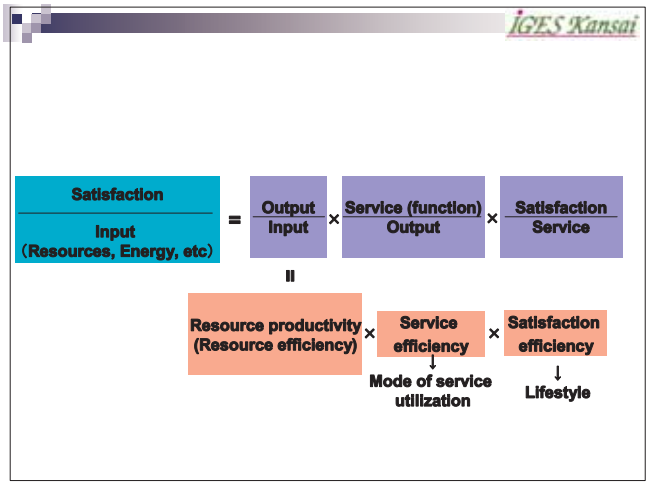
In the EU and USA, several PSS models have been reported to reduce environmental load, whereas here in Japan, we have not even begun to screen to see what kind of models might reduce environmental load or enhance local sustainability, so we are still somewhat unorganized (Slide 3). Therefore, in going about our research, we plan to refer to the forerunner case studies of Professor Yamamoto as well as other literature, collect information on PSS models in Japan and screen these models to identify which reduce environmental load or enhance local sustainability. After that, we will quantitatively analyze the selected PSS models for marketability problems, whether they in fact reduce environmental load or not, and whether they enhance local sustainability or not. What we have realized here is that, though PSS models must be studied for their marketability as a business model, they could be viable as a project even without great earnings by perhaps changing the market scheme or social scheme or doing something via governmental support. In other words, there are surely PSS models that can be promoted without going into the red. Accordingly, in our research, we want to look at PSS models that can be established within market economics as well as PSS models that can be established within the social economics that Peter Harper will be talking about later. Then, we want to measure these PSS models to see whether or not they actually reduce environmental load or enhance local sustainability. Through this process of screening and analysis, we want to assess several selected PSS as case studies of industries or businesses that have



(Slide 3)

introduced PSS. We will also focus on factors that promote and obstruct PSS. We will examine the social infrastructure for establishing PSS by analyzing the factors that favor PSS aimed at reducing environmental load and enhancing local sustainability as well as the impediment factors that prevent cases of excellent environmental load reduction but little chance of market launch from coming to fruition. By identifying the promotional and impediment factors in the hardware of social infrastructure and the software of networks, partnerships and cooperation, we want to propose which PSS models are actually useful towards reducing environmental load and enhancing local sustainability.

By assessing services and functions rather than the sale of something, the idea of a PSS is basically to increase user satisfaction (Slide 4). However, in this picture, there are several items on the right side, of which resource efficiency on the left has been researched to some degree. But, how do we increase the service per output, called "service efficiency" here in the second item? One way is to increase the mode of service utilization or usage rate. In such case, we need to examine ways of usage that increase usage rate such as sharing, leasing and rental. By the way, one sticky thing that is often overlooked with service rate is a rebound effect that occurs by efficiency improvement. Usage amount would be doubled when environmental load is reduced. Therefore, something must be done to prevent this rebound effect from occurring. The key is perhaps service satisfaction (satisfaction efficiency). In other words, what people consider sufficient, their lifestyles and daily behavior influence satisfaction efficiency and this in turn greatly affects service efficiency. Consequently, it is necessary to study the acceptability of PSS and lifestyles of consumers within social and regulatory structures to some degree. If demographic factors come into play, we must study not only the economic efficiency but also the demographics.



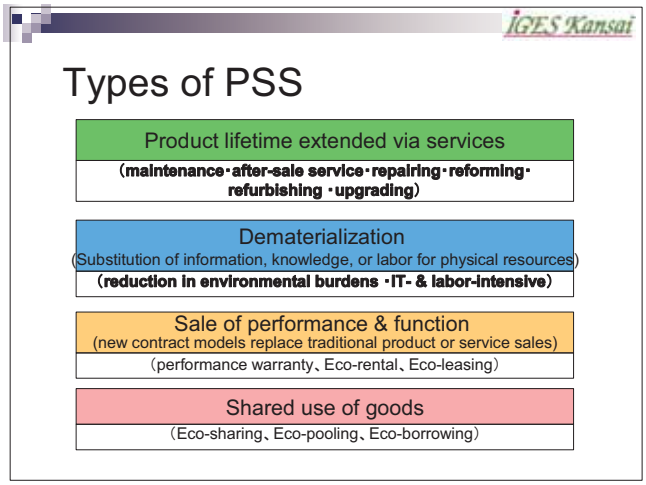
(Slide 4)

These kinds of PSS models can be grouped into several categories (Slide 5). As

best possible, we want to study PSS models in Japan that fall into these categories. Several representative cases, including some from overseas, that fit these categories have already appeared, so we want to look at as many as possible with the core of them being Japanese. Research into Japanese PSS models has only just begun, but we see it as our duty to introduce them overseas.

So, let me summarize our research (Slide 6-7). First of all, our topic of research is to examine the balance between the environmental load reduction (and local sustainability enhancement) and profitability of PSS, or in other words examine the environmental and economic connotations of PSS. If a PSS model is marketable, we will examine the success and failure factors on the demand and supply sides. Of course, even PSS models that are not profitable will be studied, if they have any social significance, as integrated models of environment, economics and culture.

Our second interest is, as



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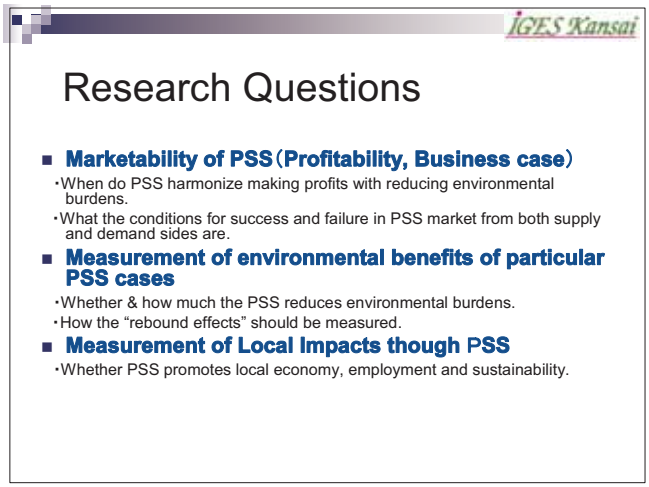

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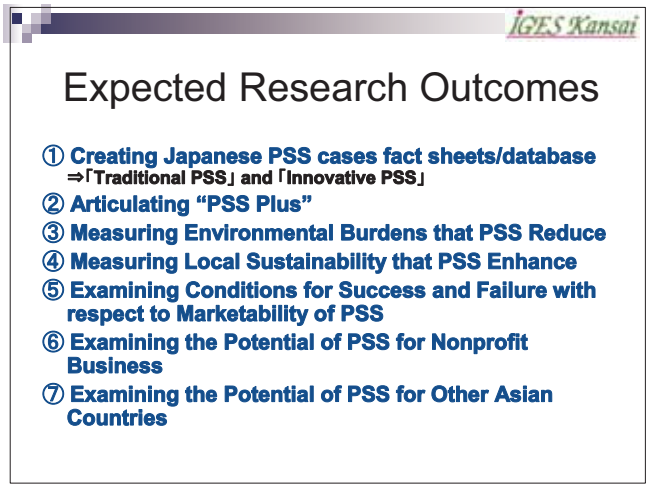


(Slide 7)

I said before, to measure the environmental load reducing effect in order to get a quantitative understanding of just how much of a reduction effect there is. What needs to be watched carefully here is a rebound effect, so the question here is how to measure this.

Another area of interest is to enhance the local sustainability of an area. Put differently, we want to see how much of the resources that depend on outside supply can be switched to internal resources and how this boost in self-sufficiency can improve people's living in the area as well as positively affect local employment. The reduction in environmental load does not just benefit the business; for example, a large reduction in waste would minimize the impact on local waste incinerators. This would have the effect of enhancing local sustainability, therefore we want to try measuring that. Through this research, we want to first of all identify what kinds of PSS models are used in Japan and secondly redefine what constitutes a PSS model because, in our gathering of PSS cases, there will be those that differ however slightly from the conventional definition but which are nevertheless extremely important subcategories in terms of environmental load reduction and local sustainability enhancement, as well as those to which the definition does not apply at all. Plus, as I mentioned earlier, we will also study PSS models that exhibit social validity even without being marketed, so as to identify acceptability as a social PSS via establishing of partnerships or networks. We will look at these as issues of social governance. Mr. Bleischwitz will be talking about this later, but there are many examples of this kind of PSS in Europe. The question is whether they can be applied in Japan or not, which we will investigate. Also within our scope of research, we want to examine whether they can be applied in Asia or not.

With the ultimate goal of enhancing the sustainability not only of businesses but societies and communities through our research, we want to expand our sights to also unmarketable PSS models. We want to study PSS models that cannot work in the market economics of Asia but which can be explored from within socio-economic directions. Mr. Harper's presentation will be very useful in this regard. And, we want to offer proposals on public policies and action for supporting PSS that promote this.

So, this is how we want to research ways that PSS and servicizing can support businesses in their efforts to reduce environmental load and enhance local sustainability from within the Business for Sustainable Social Project. Because the environment and economics are basically a trade-off, research has been done into

decoupling the two so that a harmony that does not pivot on a trade-off relationship can be struck between them. We look at this kind of PSS model not just for the environmental and economic values of it, but position it as a social system that integrates the environment, economics and culture and as a direction in regional development.

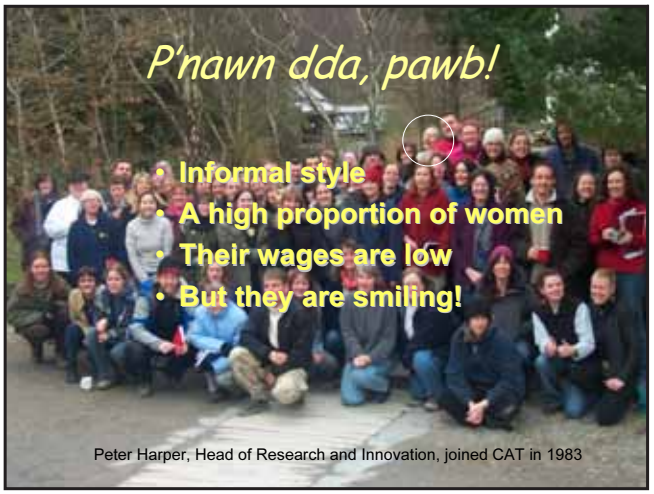
Thank you for your attention.

Keynote Speech 1

The Social Economy and Community Development: A Case Study of the Centre for Alternative Technology (CAT)

Center for Alternative Technology (CAT), UK
Peter Harper

Good afternoon, everybody. I would first like to express my gratitude to the organizers for inviting me. It is lovely to have an excuse to come back to Japan, which I like very much-and I always meet with such wonderful, interesting people.



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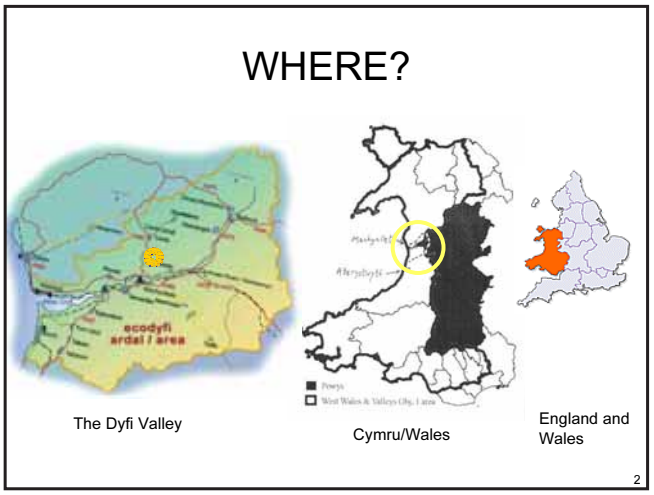
I am going to talk about the organization that I work for and the effects it has had on the surrounding community in the course of 30 years. It is not a story of instant success. It is a story of very slow success, but it is important that if you persist in doing the right thing, good results come out in the end.



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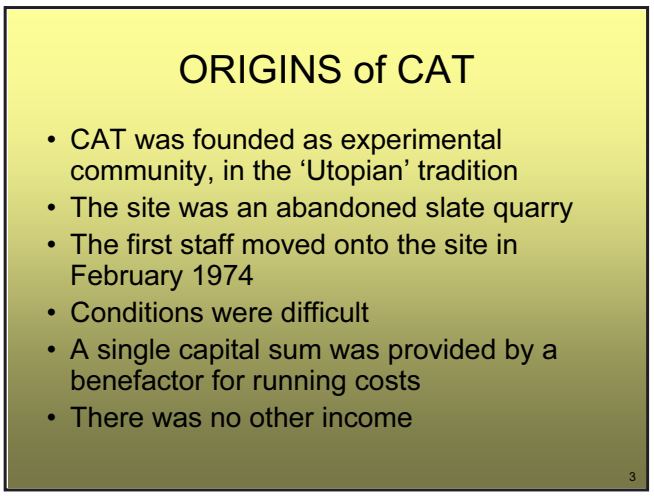
These are pictures of some of my colleagues and "P'nawn dda, pawb", this is Welsh for 'Good Afternoon', 'Konnichiwa Minasan' (Slide 1). And you can see it is a sociable organization, with a

very informal style, a lot of women. We also have very low wages! You might think that is not very sustainable, but, everybody is smiling.

Where is CAT? (Slide 2) Here you can see a picture of England and Wales on the right. Wales is the red part. In the centre you see the whole of Wales, with the Dyfi Valley marked with a yellow ring. On the left is the Dyfi Valley, with CAT and the local town, called Machynlleth. The Dyfi Valley is an area with about 12,000 people living in it, not very heavily populated.

How did CAT begin? (Slide 3-4) It starts off as a community, or what we might these days call an eco-village. The site is an abandoned slate quarry, not an ideal piece of ground: in fact it is a piece of industrial dereliction. In 1974, a few 'pioneers' moved onto the site. Very difficult conditions at the beginning. And very little money, just a single capital sum provided by a benefactor, which does not pay wages, just pays running costs. No other income.

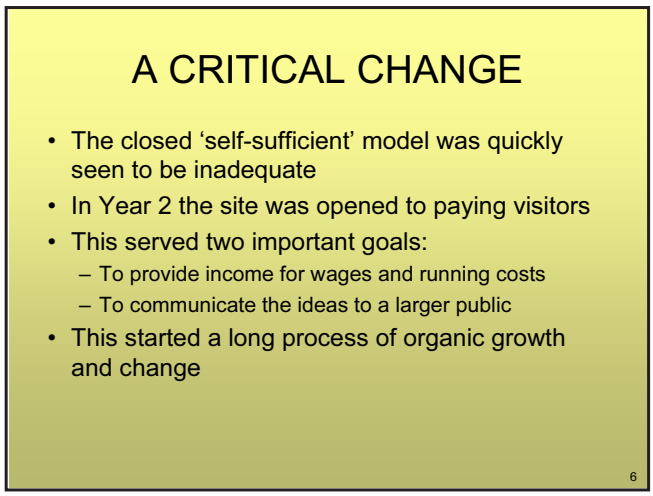


(Slide 3)

(Slide 4)

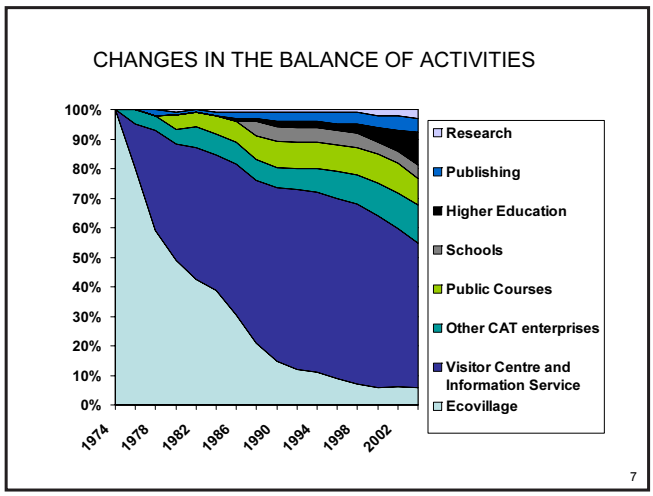
(Slide 5)

But the dream is self-sufficiency, a very common dream in the early 70's, of a pleasant, agreeable small community, growing vegetables and milking cows, bringing up children, working together to create a different kind of life, without too much worry about money. And then it changed very drastically (Slide 5).



(Slide 6)

In the second year, it was forced to change (Slide 6). Anybody who tries to organize a strictly self-sufficient community soon finds out that it is very difficult, and probably impossible. You do need some money, and CAT had none. So, the self-sufficient idea was more or less abandoned. And the site was opened up to the paying visitors. That was a good idea because suddenly it generates income and at the same time it communicates ideas. That is what we want to do. We want not only to generate the correct ideas, but we need to communicate them. So this crisis actually initiated a completely different style in the organization: not inward-looking but outward-of-looking. It started the process of continuous growth that has been maintained ever since.

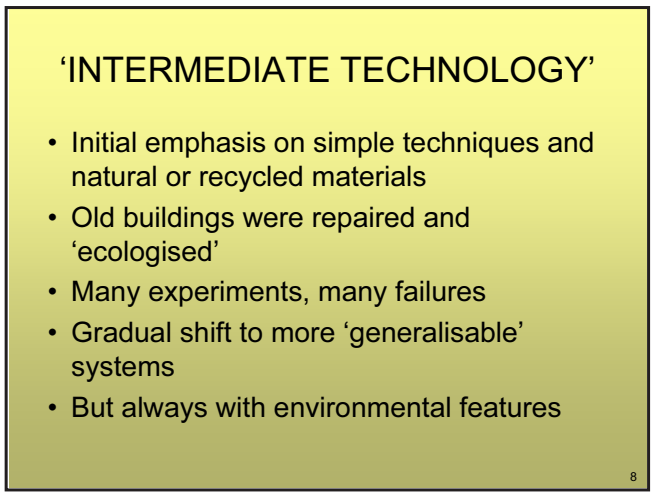


(Slide 7)

This diagram is to give you some idea of change in the patterns of activities (Slide 7). At the beginning, it was an eco-village, the light blue part of the picture. The eco-village very quickly declined as a proportion of the whole, to be replaced by the factor coloured in dark blue the visitor centre, tourism, and education of general public. And then, gradually other activities intruded until today, we have quite a wide spread of different activities. The eco-village side still exists in a small

proportion of the total activities. Tourism is still important, but increasingly it is other activities that are growing most quickly.

The story I am telling you is about an organization that has experienced very dynamic changes over time (Slide 8). It responds to market conditions, just like a conventional enterprise has to do. It was of course always interested in technology, in particular environmental technology, or to use Professor Naito's terminology, *intermediate* technology. The original idea was that you should try to use very simple materials, eco-materials, if possible, local ones, natural ones, things you could readily find, things that have already been used before. Old buildings were gradually improved, and 'ecologised', we might say. There were lots of experiments. I have to say most of them were failures, but failures are useful for learning as well as successes. And gradually you see a movement from very primitive kinds of technologies to more sophisticated ones, but-we hope-still very environmentally sound and probably more generalisable.



(Slide 8)

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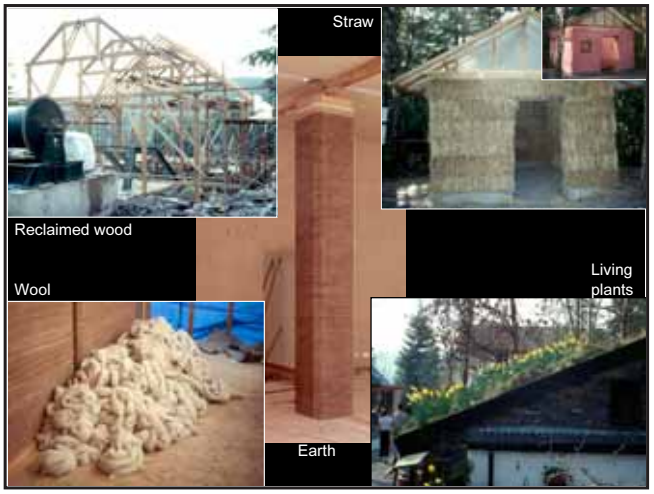
For example, here is a ruined building gradually being repaired and becoming a highly insulated building with a solar wall and solar water heating features, but still retaining a certain amount of a traditional charm (Slide 9).

Here are examples of natural and traditional materials used in various ways (Slide 10). Wood is excellent material for buildings, and you have used it wonderfully here in Japan over many centuries. That has been replaced by your present

love affair with concrete. I hope this will prove to be a passing fad!

We also have used straw as you see in the top right hand corner. And the wool, sheep's wool. This is an interesting story, because here we are trying to develop an industrial product. You might think that our underlying purpose is to *de*-industrialize things, but that is not the case. Wool is a local natural product: we are trying to make it into a *commercial* product so that it could be much more widely used. And we also have earth, which in this example forms a column in the middle holding up the roof of the building. And finally, living plants have lots of application for buildings.



(Slide 10)

(Slide 11)

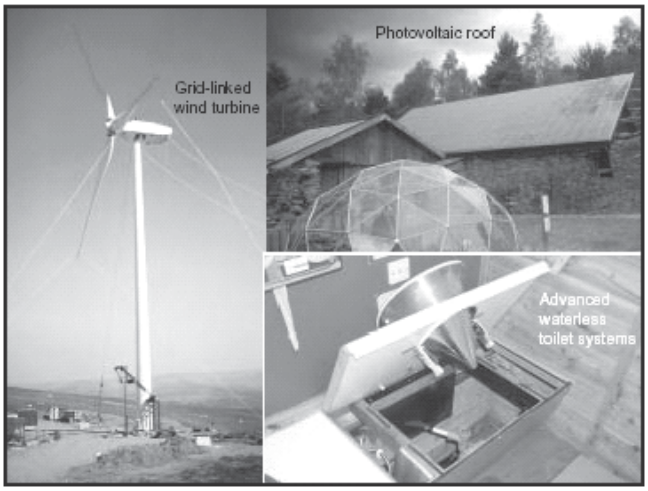
As far as solar energy is concerned, at the beginning, it was very primitive and used rather simple technologies (Slide 11). It was good to try all these things out to see how they all worked, but, generally speaking, it was not very successful. I mean these things do work, but you have to put in a lot of energy to get out a rather small amount of energy, and eventually you become tired of that. You eventually try to create systems that are more efficient and more automated. This is the kind of things you see at CAT today.

Things have moved along. Nowadays you would have much larger wind machines that are connected to the grid system (Slide 12). You do not necessarily produce electricity for your own use, you produce electricity which goes into the grid, and then you buy electricity from the grid, if you need to. And the same is

true of photovoltaic electricity. A similar pattern of development from the elementary to the more sophisticated form of eco-technology applies also to toilet systems Waterless toilets moved from very primitive systems to something much more user-friendly with special devices for separating urine, such as the system shown in the bottom right picture,

Then this is the main way that visitors arrive at the Centre (Slide 13). We have a water-balanced cable railway to bring visitors up to the main part of the site. Again, this is using a renewable energy source, but a rather interesting combination of Victorian technology and modern computer controls. We often like to use such hybrid systems combining something rather old and something more modern.

A district heating system can be a sensible solution for bringing heat to lots of scattered buildings (Slide 14). At CAT we use solar energy in the spring and autumn, and in the deep winter when there is



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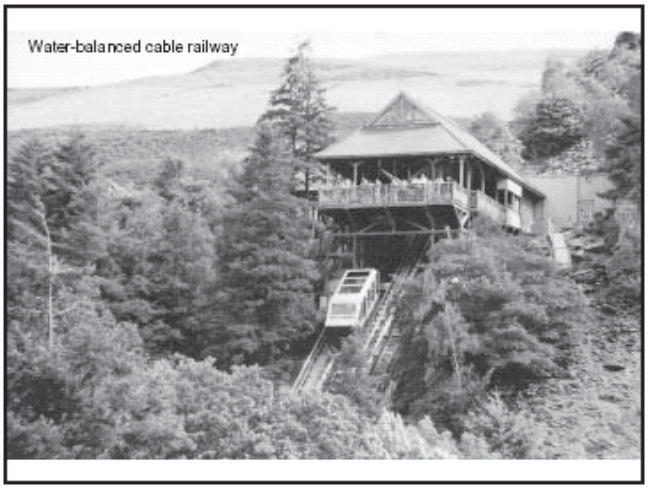

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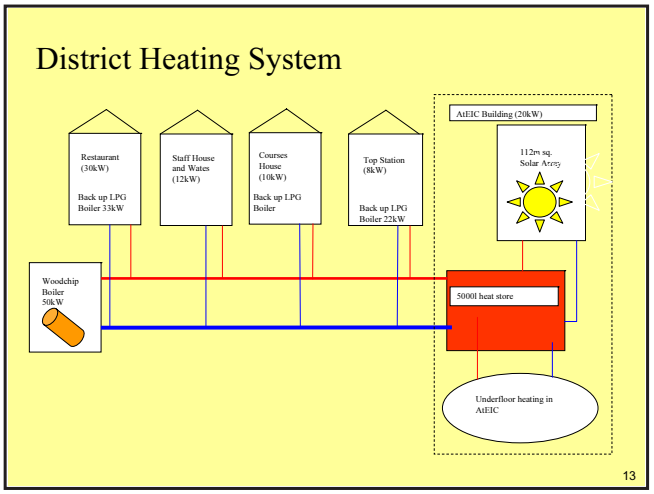


(Slide 14)

not much sun we use wood, which of course is a sort of congealed solar energy, and that goes into the district heating system to heat all the different buildings. So, it is more or less 95 percent renewable energy to provide heating for the buildings.

(Slide 15)

Other activities that we pursue are also important because we needed to diversify our activities for economic reasons (Slide 15). Of course, we practice organic land management. There are also lots of facilities for the visiting public. Remember, it is a 'drop-in' visitor centre. People can just come and visit all year around. And then we have displays in order to communicate the environmental ideas to the public. We run residential courses. We have different media for communicating ideas: print media, Website and so on. We do research-in fact I am head of the Research Department myself-and have a consultancy service. So CAT undertakes lots of different activities with different income streams to try to produce a robust economy for the organization. It has got support itself, and does not depend on subsidies from outside.

(Slide 16)

In this frame there are the some examples of the environmental landscaping that we are trying to in order to maximize habitat creation (Slide 16). It is totally organic now. No agricultural chemicals are used in the maintenance.

These are the facilities for the visitors (Slide 17). Top left you can see the restaurant, a 'green' restaurant serving vegetarian food, whole-food, and lot of local produce. Bottom left is our Shop that sells green products. Bottom right is a

playground for children made of local recyclable materials.

At the top left is display to explain solar, electricity (Slide 18). At top right, small gardens without any soil, but with edible plants growing in compost. On the far right, a slightly 'jokey' display with as 'photo-opportunity'. At CAT we create displays like these in order to make green ideas accessible, and perhaps amusing, to the ordinary public.

We run courses at different levels (Slide 19). People can come to stay up the Centre usually just a few days, or maybe several weeks. We have courses for schools, and for the public, and also for undergraduate students from universities-not just British. At the bottom right you see students from Ritsumeikan University in Kyoto. Ritsumeikan students come and stay for five weeks every year in a hands-on course. They stay in the 'Eco-cabins' pictured in the centre here. We also have postgraduate courses. We run master's course in

(Slide 17)

(Slide 18)

(Slide 19)

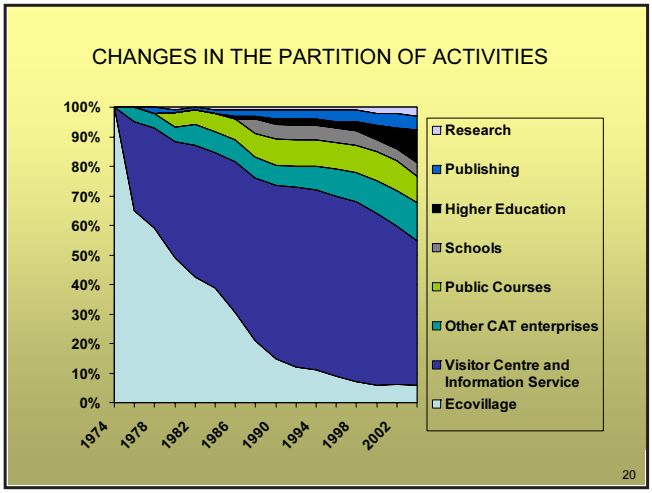
Environmental Building and Energy Management (see the picture at bottom left. And of course, we also teach outside CAT. The picture at bottom centre is of my graduate students at Ritsumeikan that I have been teaching this year. I teach a course in Sustainable Futures every September at Ritsumeikan University.

Media: At the back you can see the Website home page (Slide 20). The URL is www.cat.org.uk. We also have print publication, lots of books on various green subjects, also CDs, videotapes, and so on.

You can see the change of activities gradually taking place (Slide 21). We gradually diversified into a much wider range of different activities. The fastest growing area at the moment is higher education.

The next big project has actually embraced that new market in higher education (Slide 22). This is typical of the way we operate. We see a new market coming. We start to prepare for it. So, now we are starting quite a

(Slide 20)



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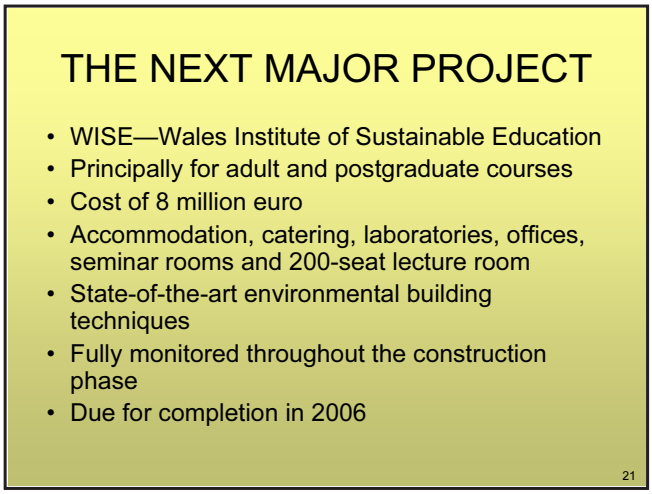
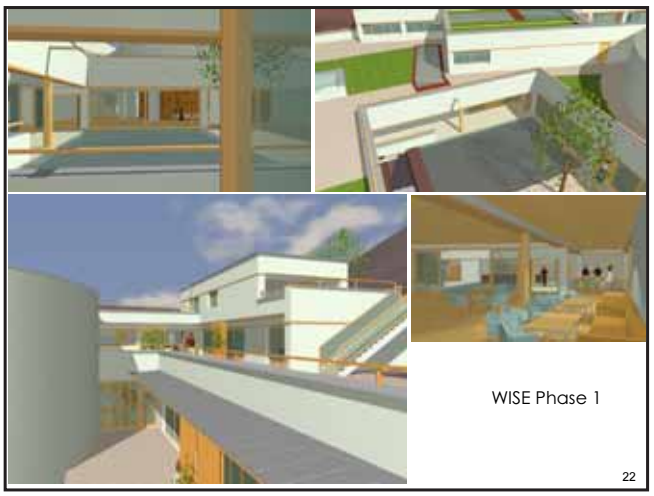


(Slide 22)

big project. It is known as the Wales Institute of Sustainable Education (WISE) and it aims at adults and the postgraduate level. The main thing about it is that it will be fully monitored. The full process for building it will be monitored in such a way that when it is finally completed, we will know what its environmentally costs have been. And then of course we can monitor its performance once it is complete, and we are hoping that we can gain a lot of information about how to build truly green buildings.



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(Slide 24)

Here are some further computer-generated images of the WISE building (Slide 23). The architect is an admirer of Japanese architecture, and has specified a Japanese garden in the middle of the complex. I myself an admirer of Japanese gardens, and as a former garden designer, I am hoping to design this little garden myself.

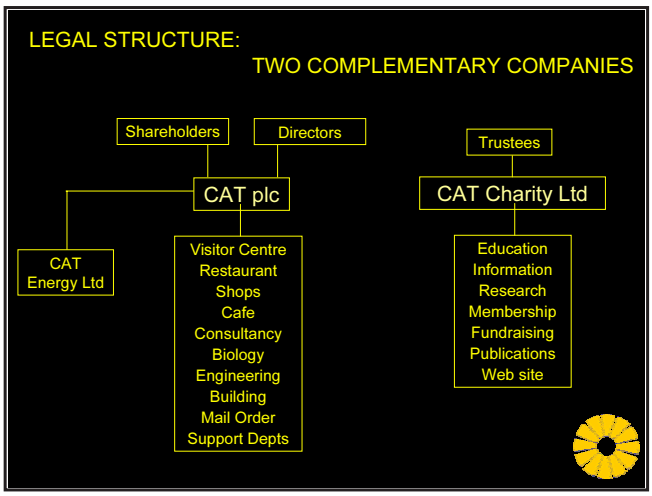
This is a cut-away view (Slide 24). It shows a 200-seat lecture room using the rammed-earth construction.

Just to say a few things about the structure of the organization, because it is rather unusual as a social enterprise (Slide 25). It has two parts. One part is an ordinary company structure, a public limited company; the other part is a non-profit charity. If you have two different kinds of legal structures within the same framework, it is quite flexible, and it allows you to do something you could not do if you are simply non-profit, or simply conventional business enterprise.

As far as business management is concerned, CAT is very democratic (Slide

26). We, the staff, are the final decision making body. But in practice, most high-level decisions are made by the Elected Management Committee. There is no permanent board of directors. It is a collective management system. There are many different departments and about 100 permanent staff at the moment. And a very flat wage structure, very little differential in wages between the top pay and the bottom pay. Businesspeople would say it is not a very sustainable system in an ordinary market terms. But it is something we have managed and maintained for quite a long time, and it worked for us.

Now I want to look at the effects of this rather strange organization on the surrounding community (Slide 27). And I want to observe that cultural regeneration is as important as economic stimulation. Usually economists and politicians are looking for *economic* regeneration, something we can measure, and we get a clap on the back from the government authority if



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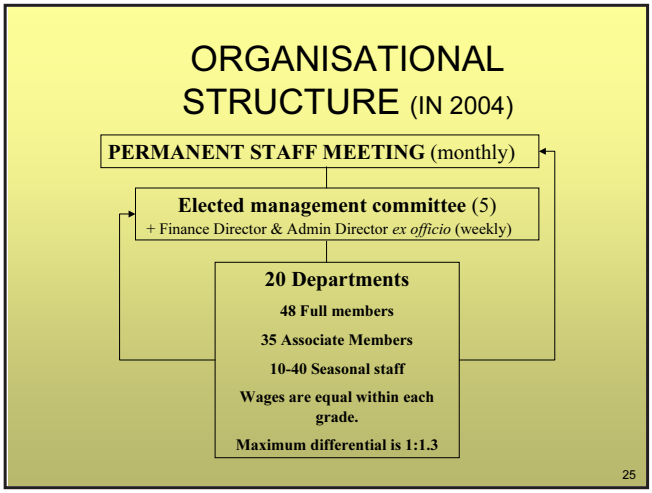

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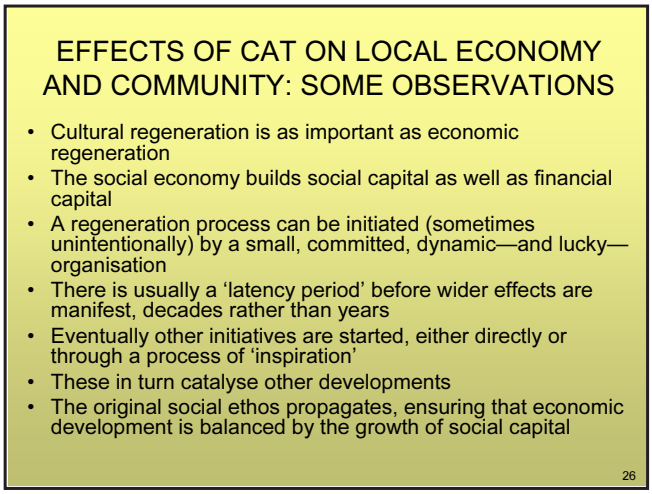

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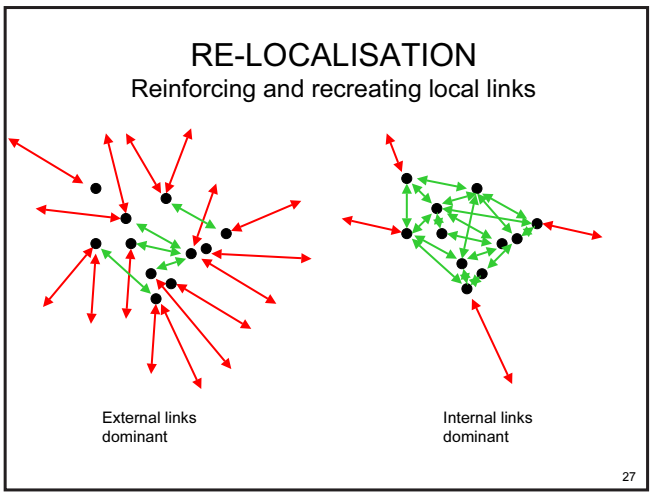
we manage to do that. Actually, *culture* is also in decline in some areas. It needs special attention of its own. So, the social economy builds *social* capital as well as *financial* capital. You can start a regeneration process by a small group. It can start very small. But you do need time. Of course, it does not always work. You do need a certain amount of luck, I think. There is a rather long latency period while the organization builds its structure and overcomes local resistance and inertia, and gradually it starts to bear fruit, then it inspires other activity. So, it is not that the original seed organization does everything itself. It does what it can, then it inspires other things and those in turn spark other activities. It is a kind of 'social cascade'.



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What we are trying to do is to move from a situation where local entities-whether they are households or businesses or local organizations of any kind-are mainly connected to the outside world (Slide 28). We are trying to move to a situation where the *internal* connections in the local community are much stronger than the *outside* connections. Of course, we do not want to abandon outside connections altogether. You cannot cut off completely. But we are trying to get away from the pathological overdependence on the outside with weak internal connections, and seek a greater strengthening of the internal links.

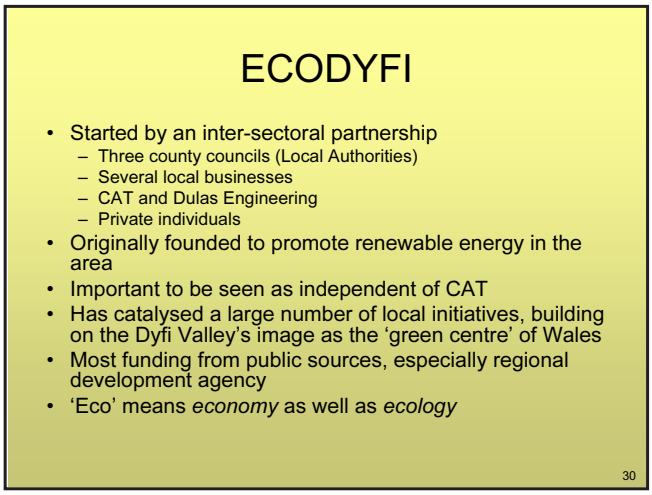
We sometimes call this strengthening of local links *relocalization*. How did the process happen in the Dyfi Valley? (Slide 29) CAT started some businesses itself

within the organization and then they later became independent enterprises. That is one mechanism. Another one is the members of CAT who left and started their own businesses using the skills and perhaps contacts and other resources that they acquired while they were at CAT. They can stimulate new start-up companies in-directly, partly by creating markets locally for products where there was no market before. You can *inspire* shifts in behaviour and enterprise. It means that certain things, which were unthinkable in the former context suddenly become thinkable and they can happen.

Here is an example of directly created new enterprises (Slide 30): Top right shows one of a couple of shops in the nearby town of Machynlleth. On the left you see the headquarters of a company (on the business park in Machynlleth) that was once a department of CAT, which is now quite a large business, creating renewable energy systems for developing countries. Bottom left is a device that was invented at CAT, and now made by another independent company founded by CAT, Aber Instruments. This is en electronic method of measuring the volume of live cells in a solution. It is very useful to the brewing and pharmaceutical industries, and is used all over the world. In Japan Kirin beer is all brewed with the help of these machines.

(Slide 30)

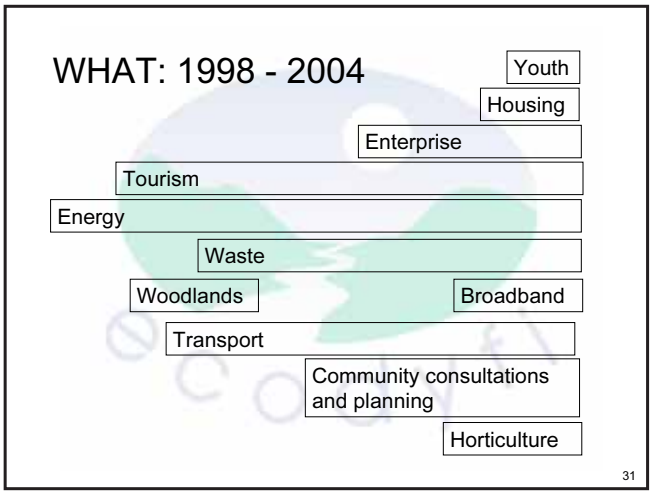
ECODYFI is the name of the local development organization, which has grown out of all these other initiatives in the town (Slide 31). It has focused and coordinated many



(Slide 31)

of these activities. And people now look to ECODYFI as the catalyst for a lot of local development. It is not a part of CAT. It is quite independent of CAT, but that is what we might call 'inspiration'. Something having being inspired by CAT. ECODYFI itself now starts to spin out lots of different initiatives and in turn they can start spin-out things themselves.

The ECODYFI was started by an inter-sectional partnership. That is quite important. Local authority, businesses, and local NGOs and private individuals started off with the idea of promoting renewable energies, because of CAT, and because this had become a well-known idea in the area. Incidentally, it is important that ECODYFI be seen as independent of CAT, because in the eyes of many local people CAT is a little bit too associated with wild experiments and cultural dissidence. But ECODYFI has catalysed of a lot of initiatives and we have got a situation now, that the Valley is regarded as the Green Capital of Wales.



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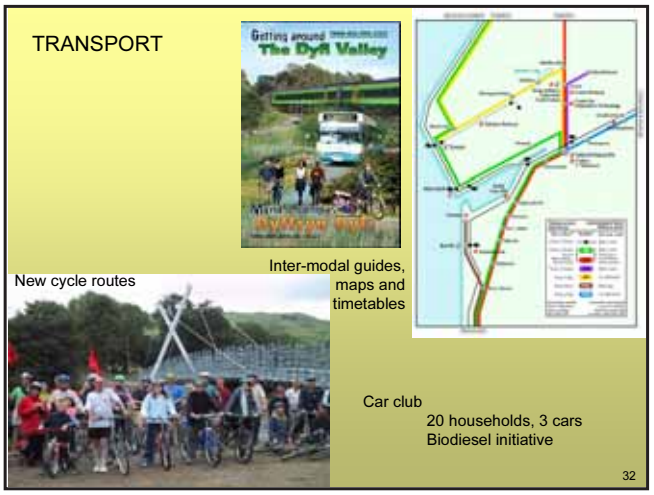
Local development still needs funds from outside but it is quite good getting hold of the grants that do exist. And this is important. 'ECO' does just not mean eco: green, ecology. It means ECOnomy. ECODYFI started with energy, then addressed tourism, transport; all those things necessary for holistic sustainability policy (Slide 32). More will come. So, one thing needs another.

Looking at transport, for example, it is quite often a simple matter of organisation, not necessarily, a new technology (Slide 33). For



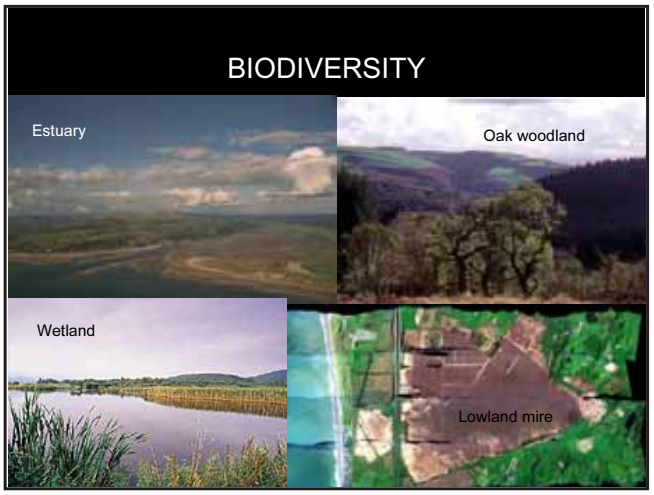
(Slide 33)

example if you want to encourage people not to use private cars, you need to improve the public transportation system. But usually there is a bus timetable, and a separate railway timetable. There might be several different bus companies operating each with its own timetable. You can make a significant improvement simply by bringing all different timetables together, and links between the different modes of travel, railways and buses and so on. At bottom left you can see an initiative to encourage new bicycle routes, including a bridge across the river to avoid a dangerous traffic crossing.

There is also a car club with 20 households sharing three cars, which means those particular households do not have to have car each. They can use bicycle and public transportation most of the time and then use cars when car travel is absolutely necessary. They are now starting to create a Biodiesel initiative in which they will use Biodiesel for their cars. And then gradually other people in the district will get used to the idea that you can use Biodiesel fuel instead of conventional diesel fuel.

(Slide 34)

Ecotourism, these are lots of activity holidays, but particularly bicycles and local hotels and guesthouses, a lot of them have interests in local foods, organic food, and that becomes something that tourists know about (Slide 34). In the Dyfi Valley, they find places that serve very distinctive, local organic food.



(Slide 35)

On the biodiversity side, there are lots of different habitats in the Dyfi Valley,

and we are trying both to conserve those habitats but also to help people to understand and appreciate them (Slide 35). We want to show how you can have lots of human activities and still preserve important habitats. It is often thought there is a total distinction between people and nature. But it not necessary to keep them separate. You can actually find ways of living together very well while maintaining habitats.

Fair trade is another important part of the ethos (Slide 36). We do not want just think about ourselves, because a part of global sustainability is to do with the relationship between the rich north and the poor south. So ECODYFI has campaigned for fair trade goods. At top left is the window stickers that we have created, and bottom left is a friendly demonstration in favour of Fair Trade: everybody is dressed up as bananas to try to persuade the local supermarkets to stock fair trade bananas, and other fair-trade goods. We also have a kind of twinning arrangement with a village in Tanzania of similar size where we exchange small items, and of course ideas, trippers, visitors in order to try to help everybody understand how it is in developing countries and what things we can do to help.

(Slide 36)

On the waste side, there are lots of different initiatives, leaflets for householders telling them how to sort their rubbish out and what can be done with it (Slide 37). We have initiated a curbside collection and projects on reusable diapers, home composting, and doing

(Slide 37)

research on new methods on composting.

On the energy front, the important thing has been working with farmers to develop the energy resources on farms, because lots of small farms are struggling economically (Slide 38). It is difficult for farmers everywhere in the world. But, for farmers in Wales, it has been especially difficult. So, we are trying to show farmers how they can diversify into energy production. It is very often a waterpower project or sometimes using forestry wastes for biofuels.

(Slide 38)

We have Solar Club where people get together to buy equipment which is cheaper when it is bought jointly; and we run training courses to show and tell people how to assemble and install solar water heating equipment. The most interesting thing recently is starting up a new enterprise to develop wind power in the area. We think it is very important, because our area should be a net exporter of energy. Any region can actually do this, and should do it if possible. It is no good just being energy neutral, because we have got to do more than that. If you have energy of any kind, you should try to work out ways in which you can actually export more than you use. We are interested in doing that, we do not want give the job away to companies outside area, because we have the skills and motivation to do it ourselves. So, a new company has been started called Bro Ddyfi Community Renewables. It has 59 shareholders.

Bro Ddyfi Community Renewables bought a second hand 75 kilowatt Danish wind turbine, installed it itself, and sells electricity to CAT (Slide 39). And there is a new machine about to be purchased, much larger at 500kW. This is the next development. You can start off small to see whether you can do it. If you succeed, go up to something bigger, so that after that you can carry on, but always stay in the area. And the profits from this new enterprise do not leave the area.

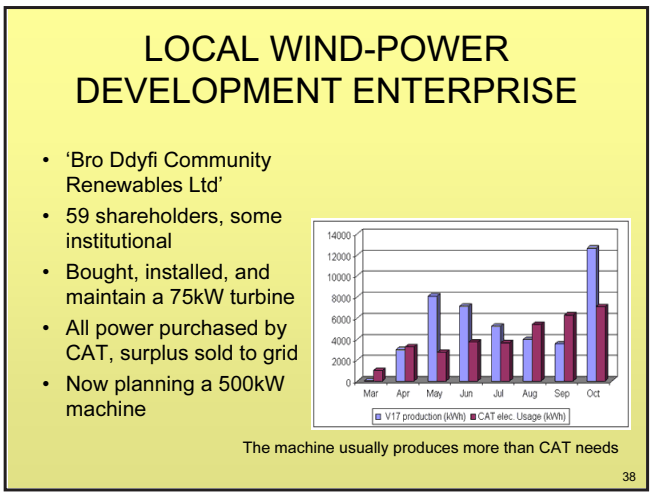
This is the 75kW machine (Slide 40). There was a great festival to celebrate its commissioning. Local children painted the tower. They painted the windmill

well, I think. On the bottom left you see the name of the machine. "Pwer Pobl" means 'people's power.'

Hereon the right are the shareholders waving their share certificates. They are not just wild-eyed radicals from the cities. It is everybody, local farmers, shopkeepers, officials, retired people. It is a complete cross-section of the community who own this machine now.

My conclusions are that in the right conditions social enterprises can out-perform conventional ones (Slide 41). CAT, for example, is the largest enterprise in the area by a very large margin. And a successful social enterprise can stimulate further activities in the surrounding community. What is surprising in these cases is that *culture* comes first, and economic development follows. The cultural changes probably have the greatest long-term significance.

Thank you very much.



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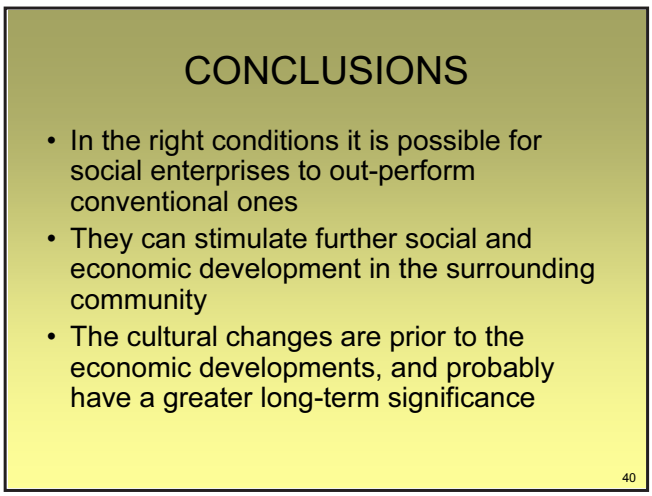

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Keynote Speech 2

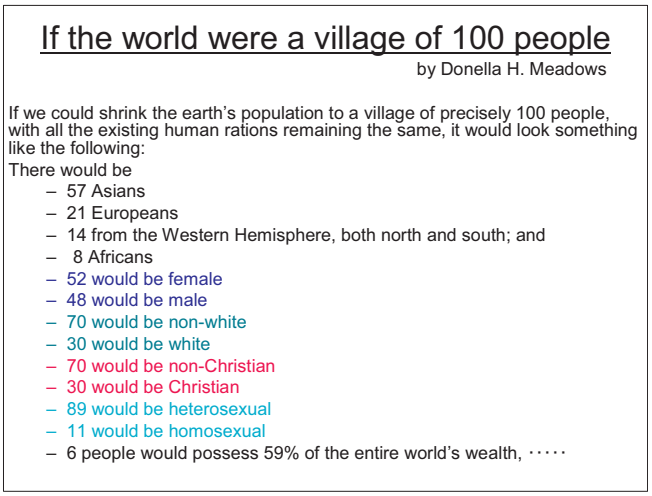
Businesses and Eco Services of a Sustainable Society
–Present State and Future Outlook in Europe, USA and Japan–

Institute of Industrial Science, University of Tokyo
Ryoichi Yamamoto

As you just heard, I am Ryoichi Yamamoto of the University of Tokyo. Since we already heard about how eco services and PSS should develop in the future from Prof. Gunjima, I will be talking about how to solve the problems we face under the theme of "Businesses and Eco Services in a Sustainable Society".

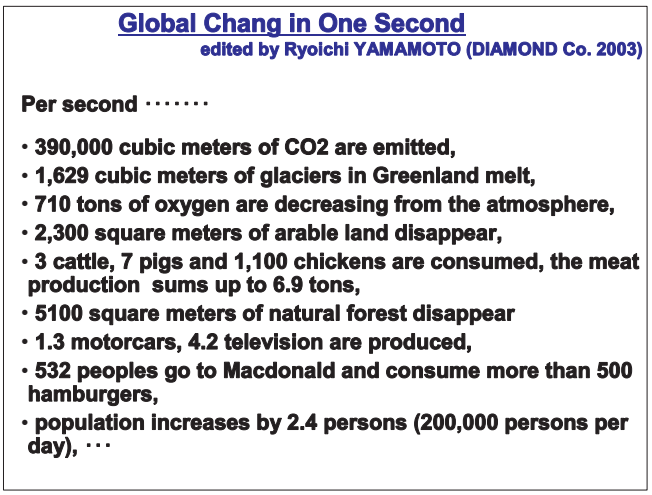
Let me begin by saying, as Prof. Naito emphasized, correct strategies and policies are the most important factors for gaining a comprehensive understanding of the present state of the planet and completely resolving problems.

I would first like to introduce two books. One is "State of the Village Report" (Slide 1). It gives a static view of the world as if the world were a village of 100 people. In this 100-person village, 57 people are Asian, but the 6 Americans own 59% of all wealth, which tells of the frightening disparity between the rich and the poor. It also shines light on the fact that within the poor, there are a large number of people who are on the edge of starvation.



(Slide 1)

Over time, this planet we live on has gone through great changes. Last year, I edited a book entitled "Global Change in One Second", which was published by Diamond, Inc. (Slide 2). It introduces 60 instances, for example, in 60 seconds, 390,000 m^2 or 760 ton of coal gas, which is equivalent to about 32 gymnasiums,



(Slide 2)

is released from the combustion of fossil fuels. Right now, there are 3 trillion ton of carbon gas in the atmosphere, but 12 billion tons are added every year. At the same time, the amount of oxygen in the atmosphere decreases by 710 tons every second. Population increases by 2.4 people every second or 200,000 a day. Put simply, the air is gradually getting heavier. This is because oxygen is decreasing and carbon gas is increasing, which lead to increasing in air pressure. Moreover, because oxygen levels are decreasing, it is gradually getting harder to breathe. In addition, because of global warming, it is gradually getting warmer.

This is the state of our planet. We are living in very changing times. Let me illustrate this a little bit. World super power, the USA, does not listen to the rest of the world and continues to consume large quantities of resources and energy as they place priority on economic growth. China and India also have begun an unstoppable onslaught that prioritizes economic growth, as they want to be more and more like the USA.

I have been to China 32 times in the past 21 years and served as a visiting professor at 30 universities including Lanzhou University. In places where economic growth is prioritized, it is prioritized on all levels from the scholars and politicians to the people. Even renowned economist and advisor to Chinese President Hu Jintao, Lin Inin of Peking University, says China's current annual growth of 9% will continue on after the Beijing Olympics and the Shanghai Expo. That means massive amounts of energy and resources will be consumed.

Amidst all of this, the problem is how to persuade these environmental emitting giants, the USA and China. As we question Japan's national strategy and vision, what I believe the importance is not to aim at being just an economic power but an ecological economic power. And that, by becoming an ecological super power, Japan could convey its vision and message to the world. As Samuel Huntington says, Japan is not an isolated civilization and should strive to be an ecological

economic power that the entire world would support.

In that sense, it is a wonderful blessing that the IGES Kansai Research Center has taken up this theme. I hope they can develop a strategy that can persuade the USA and China, and turn Japan into an ecological economic super power that does not live in isolation but which has the sympathy and support of the world. For example, as soon as you walk into the lobby of the hotel next door, you see written there "Let's go to Universal Studios Japan", but that is precisely what the trouble is. Dr. Harper's Centre for Alternative Technology (CAT) is more like the Ecological Studio Wales. Since I heard that, I have been wishing that they would build an Ecological Studios Japan in the Kansai.

Now for my strategy. Here, I think it is important to know the history. If you read your history, you will find that Japan's religious revolution took place 700 years before Europe's. This was written in the book "Buddhism and Capitalism" by Hideo Osabe. In construction of Todai-ji Temple, a monk named Gyoki, who rose to the highest position later, moved mass of soil and material. I see this "moving of the masses" as massive ecological action. As long as we do not start an ecological movement, we cannot solve the problems we face. The reason why Gyoki was successfully was, according to Osabe, that he thoroughly developed the argument of Heaven and Hell in Japan. We should learn from this example. In other words, residents and business leaders should tell and talk with the politicians in real, clear and scientific terms that today's business-as-usual business model and our technologies and lifestyles are sending us to Hell. We need to speak clearly based on scientific evidence.

I tried making a picture of global warming Hell (Slide 3-5). It paints the Hell as it was conceived by Buddhism in ancient Japan, but all of these pictures can be found on the internet. This is proof of the serious disasters caused by climate changes that are raging the globe.

(Slide 3)

Whichever photo you look at, you can tell

something unusual has happened. We must look straight at the situation and conduct studies and research, and devise policies and strategies.

(Slide 4)

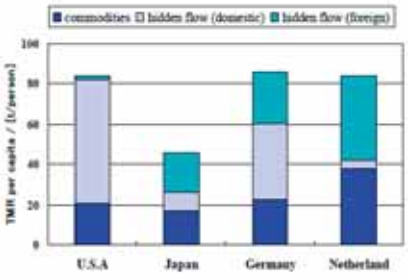
(Slide 5)

In just one month, from February to March 2002, a large piece of the Larsen B Ice Shelf in the Antarctica broke off. It was 3,250 km^2 in area. A scientist from the British polar research station predicted 5 years earlier that a large piece would break off. The ice broke because global warming is progressing rapidly over Antarctica. Because of this, other sudden breaks are predicted in glaciers there because of lost support. According to an article in last month's *Science* magazine, the predictions of researchers are gradually coming true or, in other words, the migration speed of glaciers will increase 10-fold in a few years. Based on the massive amounts of evidence, I fear that mankind has entered global warming hell. Given that global warming is not a theoretical prediction but the reality of the world, we need to reexamine our industrial, economic and social systems.

The problems here can be understood by looking at the Japanese economy. Japan has an annual GDP of ¥500 trillion. To generate this ¥500 trillion, it takes approximately 2 billion tons of resources and results in the release of 1.32 billion ton of carbon gas and 450 million ton of waste (Slide 6). Accordingly, anyone can figure out that there are only two strategies for sustaining this situation. One is to keep GDP at ¥500 trillion while reducing resource consumption, waste generation

and carbon gas emissions. This means to increase either resource productivity or eco efficiency. The second strategy is to reduce GDP. Fortunately, GDP is not a true indicator of progress. It is GPI. One person calculated this GPI said it should be about ¥120 trillion, therefore this apparent ¥500 trillion can be lowered to about ¥120 trillion. The way to lower GDP is a "slow life strategy" with which only real affluence is kept while everything unnecessary is eliminated. So, if GDP is lowered, the amount of energy and resources consumed in generating this GDP will naturally decrease and consequently so will the amount of pollutants emitted. These are the two strategies. One is to develop an eco-efficient society while the other is to develop a slow paced society. I believe the biggest issue is the reduction of resource input.

Japan consumes 45 tons of material per capita annually, while the USA consumes 85 ton. If China and India consume as much as the USA, the destruction of global eco-systems is inevitable.



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Environmental Effect of Materials (Up till material production)

Eco-indicator 99 (Pre, Holland) (milli-point/kg)		MI (Woppertal institute, Germany) (Kg/kg)	
Iron ore	100		7
Aluminum (Virgin)	790		85
Aluminum (Recycled)	74		3.5
Copper (Virgin)	1,400		500
Copper (Recycled)	–		10
Lead (50% recycled)	580		16
Platinum (Virgin)	3,700,000		320,000
Zn (Virgin)	3,100		23
HDPE	350		5.4
LDPE	390		–
PVC	300		8
EPDM rubber	380		5
Paper (Wrapping paper)	96		15
PET	480		–
		Cement	3.2
		Flat glass	3
		Ti	1,000
		Ag	7,500
		Au	540,000

(Slide 7)

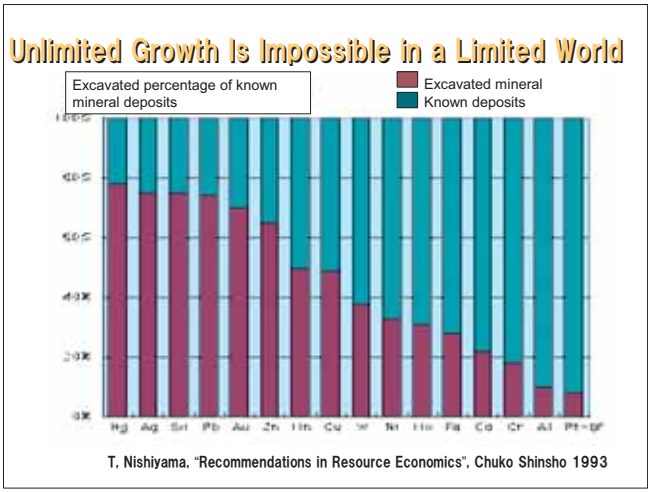
Here, a question is how to indicate the effects that materials have on the environment. One method is analysis based on LCA, while another is the Ecological Rucksack advocated by the Wuppertal Institute (Slide 7). It is known that resource input comes far more as indirect input than direct input. I believe we, scientific engineers, should increase resource productivity and eco efficiency.

In particular, we must reduce our dependency on non-renewable resources. Many nonferrous and ferrous metals such as high-grade iron ore may be completely depleted during this century. In particular, the depleted state of zinc and copper is

progressing (Slide 8). At an international conference in Shanghai two weeks before, Prof. Graedel of Yale University concluded that zinc could be depleted as early as 30 years from now.

On this point, decoupling is a global topic (Slide 9). It is the prime target of the social and natural sciences to decouple economic growth from the increase in environmental load. Nonetheless, the report of the Swedish Environmental Advisors Council concluded that there is not a single country that has been successful with decoupling in the true meaning of the word. Though there have been limited successes in some places, it has gone only as far as improving emission factors, so if the economy grows, the effect on the environment increases.

So, what kind of economy should we aim for? We must change from the old industrial economy of mass-production, mass-consumption and mass-generation of waste to a new knowledge-intensive service economy (Slide 10).



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Decoupling

Report of the Swedish Environmental Advisors Council (2002.2)

Conclusions

(1) CO_2 emissions increased in most countries in the survey period.
At US 225 MtonC/yr (1998), this is roughly equivalent to the emissions of all of Africa.
Emissions in Brazil, China and India increased 325 MtonC/yr in the survey period.

(2) A slight decoupling of CO_2 emissions from GDP was noticed. (1970～1998)
EU: 2.1%/yr, Japan and USA: 1.8%/yr, China: 3.2%/yr
CO_2 emissions in India increased 1.4%/yr of GDP.

(3) Obvious decoupling with regards to materials was not observed.
Plastic and aluminum rose more rapidly than GDP. Other materials, such as paper, increased at same rate as GDP.
However, iron increased slower than GDP.

(4) Materials that accumulate in society continue to increase in quantity.

(5) SO_2, designated CFCs and other substances rapidly decreased in industrially advanced nations.

(6) No clear tendency towards decrease was seen with toxic chemicals and waste.

(7) Policy-makers should prioritize the dematerialization on problematic substances.

(Slide 9)

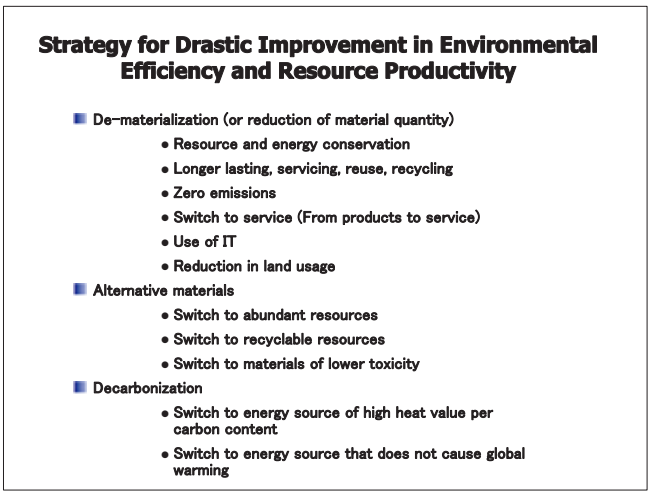
From an Industrial Economy to Service Economy

- Emphasize the usage value of products more than the exchange value.
- Emphasize the maximized effective use of products.
- Maximize system functions over the long-term.
- Change manufacturers business models from selling products to selling functionality, performance and benefits.
- Products are an opportunity to provide service. Service is the ultimate luxury.
- From ownership to service benefits, from ownership to usage.
- From an economy that emphasizes "commodity" consumption to one that emphasizes "service" consumption.
- Reduce environmental load using IT (Information Technology). Develop high quality digital assets.
- Build high quality public assets (education, medical care, security, parks, recreation, etc.).
- Greening the taxes and .

(Slide 10)

This idea has gained worldwide consensus. So, what can be done to attain this? One way is, as Prof. Gunjima already mentioned, to complete revamp the way products are designed, produced and distributed into environment-friendly systems and practices. A second way is to go the servicizing route of utilizing services rather than products. A third way is to use IT, information technology. A fourth way is to diffuse high quality public assets or, in other words, to manage things everyone uses to note education, medical care, security, parks, recreation, etc. Then, we must reduce the amount of resources, energy and land we use on the whole. Lastly, taxes and funding must be thoroughly reexamined from an ecological perspective. The entire world is pretty much agreed with these approaches.

So, what kind of strategies are there? In scientific engineering, there are three thinkable strategies: dematerialization, use of alternative materials, and decarbonization (Slide 11).



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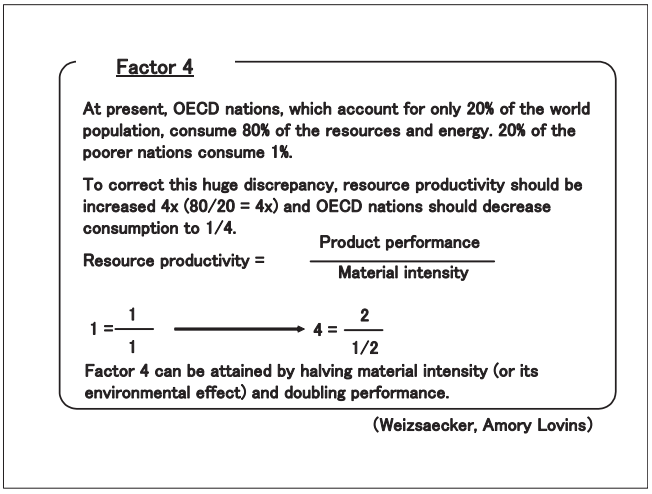

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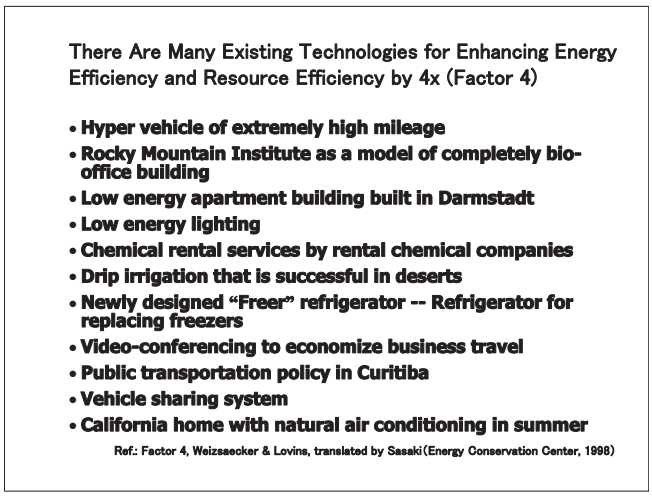
Eco efficiency is a new concept that was advocated at the Rio Summit of 1992 (Slide 12). It means "ecological economic efficiency". No one is against an increase in eco efficiency.

The problem is by how much should it increases. An easy way to look at this is the "Factor 4" concept advocated by Ernst von Weizsaecker and Amory Lovins (Slide 13). The idea is to halve resource and energy consumption, while doubling product performance, to create a factor 4. The industrialized nations should be making a concerted effort to enhance productivity by a factor 4.

There are many examples of development of this concept (Slide 14).

However, Professor Schmidt-Bleek advocates a factor 10, meaning to enhance the effective use of resources 10-fold across all of society, because a factor 4 will be insufficient by the year 2050 (Slide 15).

There have been other ideas after that as well. One was factor 16 which says we



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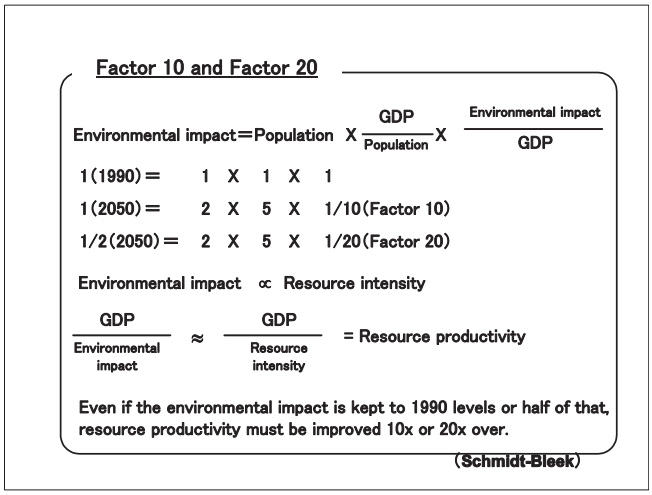

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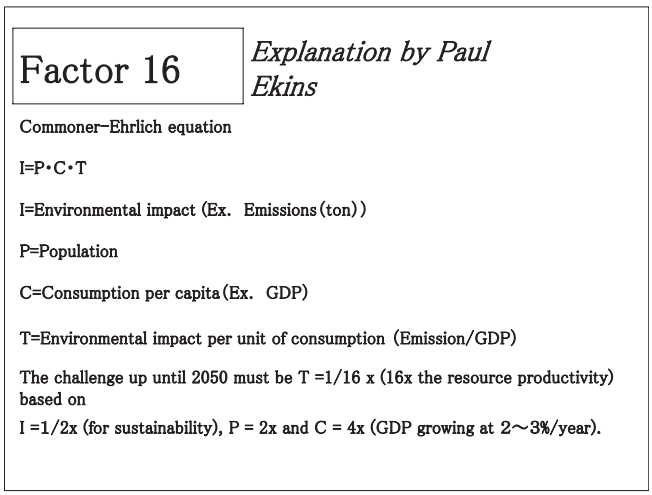


(Slide 16)

must increase the effective use of resources 16 times over (Slide 16). Using I=P•C•T of the Commoner-Ehrlich equation, it is necessary to enhance resource productivity 16-fold for the reasons shown in the slide.

The same 16 times results when we use statistical data (Slide 17).

However, European researchers have not even touched upon how China and India should prolong their resource consumption. In contrast, I proposed five years ago a shift to a sustainable economy by having industrialized nations decreasing consumption to one-eighth and developing nations double their resource consumption, based on the thought that the advanced industrialized world is 40% over the sustainable level of consumption (Slide 18).

Incidentally, the latest data from ecological footprint analysis was announced this year (Slide 19). This ecological footprint or required biological productive area was calculated for 138 countries,

Factor 16

J.M. Crawer and A.c
Product Innovation and Eco-efficiency (Kluwer Academic Publishers, 1998)

Environmental impact
= (Population) × (Consumption per capita [$]) × (Impact per unit of consumption)

In a comparison of 1990 and 2040, if we assume the estimated population in 2040 and the consumption per capita (GDP) to be US$35,000, and the impact per unit of consumption to be 1, the total environmental impact for 1990 and 2040 will be 20.75 and 329.18, respectively. Accordingly, to maintain the total environmental impact at that same level, it will be necessary to increase the impact per unit of consumption in 2040 by 0.06x or increase GDP per unit of impact (resource productivity) by 16x (Factor 16).
Some believe that a GDP of US$13,000 is sufficient (increases above this would not improve social well-being). If all countries had a GDP per capita of US$13,000 in 2040, the target can be attained by improving resource productivity by Factor 6.

(Slide 17)

Calculation of magnitude of dematerialization by Yamamoto

B/A=16 Current ratio of annual resource consumption per capita of developing nations A and industrialized nations (Ref.: Data that indicates industrialized nations have 20% of world population yet consume 80% of the world's energy resources)

At present, the economy cannot be sustained. **48A+12B=1.4S** **Resource consumption of all mankind exceeds the sustainable level by 40%.**

(Ref.: Ecological footprint analysis, sustainable energy analysis)

Enable economic sustainability by 2050. **78C+12C=S** **The population in developing nations is predicted to grow by 3billion. Annual resource consumption (C) is presumed to be the same between the northern and southern hemispheres in 2050 based on the principle of equality.**

C／A ＝ 240／126 ～2 **By increasing consumption 2x, developing nations can switch to a sustainable economy.**

C／B ＝ 15／126 ～1／8 **By reducing consumption to 1/8, industrially advanced nations can switch to a sustainable economy.**

(Slide 18)

Factor 5 *Ryoichi Yamamoto、2004*

EF=Ecological Footprint in 2000

A Ecological footprint per capita in non-OECD nation (1.4 ha)

B Ecological footprint per capita in OECD nation (5.5 ha)

C Ecological footprint per capita in 2050 (Assuming the same level in non-OECD and OECD nations)

B=4A……OECD nations use 4x the "environmental area" per capita of non-OECD nations.

$$\frac{C}{A} = \frac{91}{105.6} = 0.86, \quad \frac{C}{B} = 0.21 \sim \frac{1}{5}$$

47A+11B=1.2S……20% over at present

77C+11C=S……Reduce to sustainable level by 2050.

Non-OECD nations must reduce their EF by 24%. (It is necessary to increase resource productivity and environmental efficiency greater than OECD nations.)
OECD nations must reduce their EF to 1/5. (Factor 5 increase in resource productivity required.)

ref.Ecological Footprint of Nations(2004)
Dr.J.Ventoulis, D.Chazan and C.Gaudet
Redefining Progress(WWW.Redefining Progress.org)

(Slide 19)

but the results of secondary calculations done with the latest data are frightening. Assuming the same ecological footprint per person or, in other words, when calculated on equal terms, by the year 2050, China and India must reduce their ecological footprint by 14% and advanced industrialized nations must reduce theirs by 80%. So, a factor of 5 would be good. What this simple calculation means is that developing nations such as China and India are using massive amounts of energy and resources inefficiently. Furthermore, if the population of Asia grows to 3 billion or more, for these two reasons, developing nations and non-OECD nations will have absolutely no room to increase their ecological footprint; instead, they will have to reduce it.

Here, the dematerialization of the industrialized world is very important, but as long as the resource productivity and eco efficiency of developing nations like China and India is not greatly improved, sustainable development on the global scale will be no more than a pie in the sky (Slide 20).

"Industrialized Nations Must Greatly Reduce Material Consumption"

Researcher	Environmental efficiency and resource efficiency factor	Industrially advanced nation	Developing nation
Welzsäker	4	1/4	Not disclosed
Schmidt-Bleek	10	1/10	Not disclosed
Cramer&Tukker	16	1/16	Not disclosed
Weterings& Opshchoor	20	1/20	Not disclosed
Yamamoto	**8**	**1/8**	**2**

Statement: On the pretext that annual resource consumption per capita is the same between industrialized nations and developing nations (principle of equality), environmental efficiency must be improved about 10x (Factor 10) at least in order to sustain the world.
Targeting factor 10 in technology and system development would not be a mistake as an international competition strategy.

(Slide 20)

Sweden analyzed the possibility of a factor 10 by industries and concluded that it was sufficiently possible in many industrial sectors (Slide 21).

"The Possibility of a Factor 10 in Swedish Industry Was Investigated"

Industrial sector	Factor 10 possibility
Forestry	Low
Agriculture, food	High
Chemical, medicine	Very high
Steel	Low
Semiconductor	Extremely high
Machine	Sufficient
Energy, land, water supply	High
Transport , communication	Low
Waste	Sufficient

Ref.: Johanna Jones

Statement … Japan should also investigate the possibility of improving environmental efficiency and resource productivity by industry and reflect findings in policy.

(Slide 21)

In a nutshell, we must shift from a disposable economy to a recycle-oriented economy and further yet to a sustainable economy (Slide 22). In the process, all society in OECD nations in particular must set improvement targets of a factor 10 by 2010 and a factor 20 by 2050, over 1990

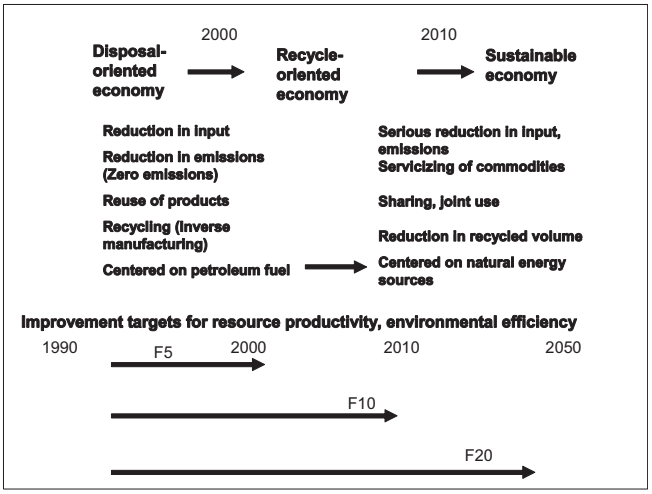
levels, for resource productivity and eco efficiency. However, the previous calculations gave a factor of 5 by 2050, therefore it will not be necessary to attain a factor of 10.

Here, the keyword is eco design, that is to say, how much ecological design is applied (Slide 23).

Eco design looks at the entire life cycle of a product, therefore it is also known as "Life Cycle Design" and "Life Cycle Engineering" (Slide 24).

Eco design is developed in four stages (Slide 25). Put simply, it is divided into two stages: that which improves eco efficiency and that which changes social systems. Technology is developed to improve eco efficiency, but the next stage requires sustainable technology. PSS and eco services are amongst the main targets of this sustainable technology.

Many eco products have been developed in Japan (Slide 26). Those related to functional innovation and system innovation in particular including the PSS and eco



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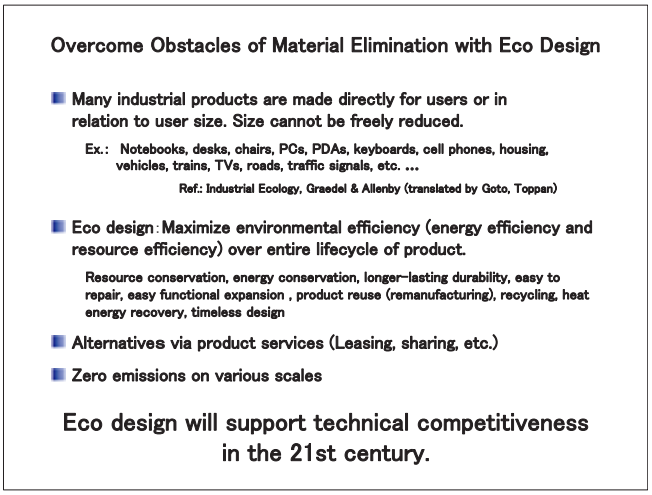

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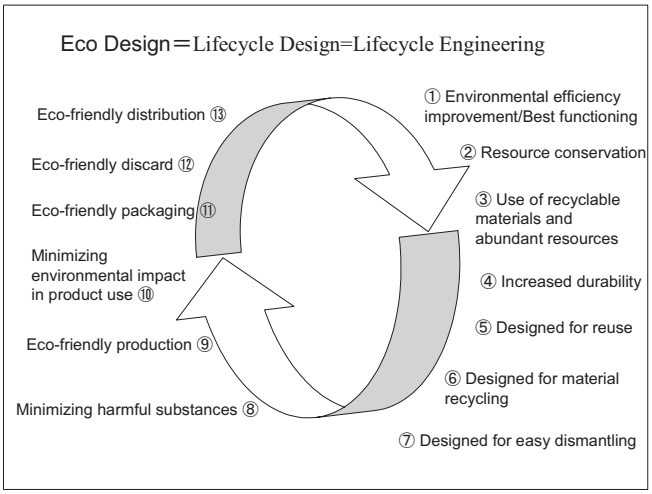
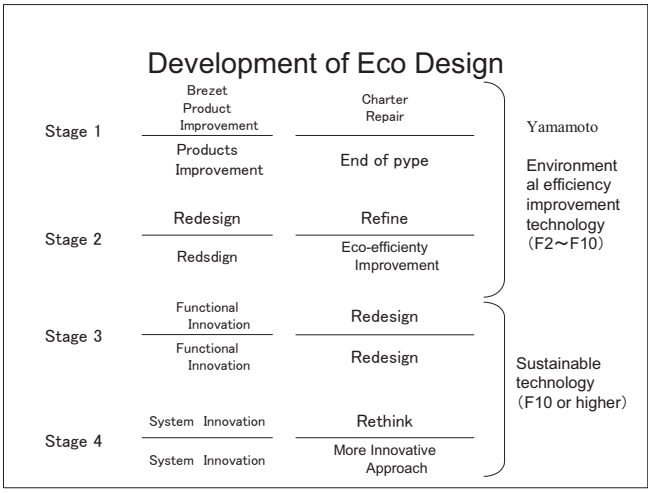


(Slide 24)

services were introduced at the international workshop yesterday.

Why is it good for society to spread eco products and eco services? A home appliance manufacturer in Sweden named Electrolux developed a software program called "Eco Eco Savings" that calculates the benefit (Slide 27). In short, diffusing eco efficient services throughout society generates large financial profits and reduces environmental burdens at the same time. For example, in London, EUR 2.2 billion can be saved every year, while reducing carbon gas emissions by 12.07 million ton. Moreover, it was calculated that water-savings equal to one day and six hours of flow off Niagara Falls are possible.

Now, I would like to talk about one of today's topics, business model innovation using PSS (Slide 28). I specialize in metals and the biggest surprise I ever had was the rental molecular business of the Dow Chemical Company. The idea is not to rent out cars but molecules.



(Slide 25)

Already Many Eco Products Have Been Developed in Japan

- **Product improvement**
  Mg alloy TV, green cabling,, centrifugal washing machine, Eco Ice mini, TULC 700 Series Nozomi, 209 Series Commuter Train, energy-saving long-life fluorescent lamp, energy-saving notebook computer, high insulation vacuum glass BJ printer, EcoKaratto, halogen-free printed board, chrome-free galvanized steel, TSOP, super long-life printer
- **Redesign**
  LCD TV, hand-powered radio, hybrid vehicle, eco cement, heat-powered wristwatch, auto-powered wristwatch, high productivity copier, natural heating system for future communal housing, light bulb-size fluorescent lamp
- **Functional innovation**
  Paper recycle system, super smooth no-stick toilet, portable foot-pumped generator, eco fund, wind power
- **System innovation**
  Rental electric vacuum cleaner, zero emission beer brewery, local transport system (ICVS), package-free music transmission system

These eco products must diffuse rapidly in the society.

(Slide 26)

EcoEco Savings

(Comparison of annual environmental savings potential assuming best environmental efficiency product by Electrolux and current situation www.electrolux.com)

	Economic savings (・1 billion)	Energy savings (TWh)	CO_2 emissions (10,000 ton)	Water conservation (1 million ton) (Flow rate of Niagara Falls)	
London	2.2	17	1207	216.7	1 day 6 hr
Greece	0.2	1.9	213	52.9	7 hr 21 min
Spain	1.3	7.1	386	241.6	1 day 9 hr
Czech	0.068	1.1	65	56.9	7 hr 55 min

(Slide 27)

With metals, they will have to go as far as the atomic level to the rental atom business.

There are still other developments. First al all, Pré of the Netherlands classified PSS into four categories: (1) adding services to products, (2) adding products to services, (3) fulfilling needs with an equal balance of products and services, and (4) system change (Slide 29).

In contrast, Ezio Manzini of the Politechnico di Milano classified PSS into (1) services providing added value to products, (2) services providing final result, and (3) services providing enabling platforms (Slide 30). This last one is an original idea of Manzini's. I don't have enough time to go in details, but releasing and enabling are very important concepts. Before, products were developed to eliminate the hardships of life, but that placed a serious load on the environment. Here, Manzini's idea does not completely eradicate the hardships; instead, it proposes product design and service design as the means for solving

Innovate Business Models to Build Sustainable Service Systems

- Rental molecular business by Dow Chemical/BioSafe (Rental of organic substances)
- Oil quality management of Exxon Mobil
- Washing machine leasing by Electrolux **(Pay per Wash)**
- Copier rebuilding using used copier parts by Xerox (Remanufacturing)
- Quality control service for ceramic valves in rolling system by Vulcan
- Carpet leasing by Interface
- Chemical quality management by Ashland
- Lubricant management by Castrol
- ESCO by Eastern Energy (Turnkey services for energy conservation)
- Furniture package leasing by Gispen
- Furniture remanufacture by Renew
- Car sharing by Stattauto (Berlin)

(Slide 28)

Categories of Product - Service Systems (Pre Project, Holland)

Ps (Products that come with added service)

Service is provided when the product is delivered.
① Reserved purchasing of organic vegetables by ODIN

Services provided at the end of product life are determined in the product specifications.
② Layout planning, estimates and recovery services for EPS building insulation by Stybenex

Services provided at the end of product life are determined in the product specifications.
③ Hotel office services and general furnishing service that includes office furniture by Gispen

Sp (Services that come with added products)

Products provided by service providers
④ GMS cell phone service by Liberter. Cell phones are provided free to subscribers.

PS (When products and services are equally weighted in order to satisfy specific needs)

That which provides products, auxiliary equipment, content and services in order to completely satisfy the client
⑤ Coffee System International by Douwe Egberts ⑥ Modern washing machine leasing service by Electrolux

Part-time use, part-time ownership of products Part-time use of products, product sharing
⑦ Car sharing service by Greenwheels ⑧ Time-share of luxury yachts

Functional use of products, non-ownership
⑨ Coin laundry (self-service) by Electrolux

SC (System changes)

From coin-based to electronic distribution ⑩ Chipper Card by Postbank

From agrochemical sales to sales of disease/insect-free guarantees
⑪ Biological disease and insect extermination management by Koppert

(Slide 29)

Ezio Manzini Politechnico di Milano

PSS Categories

(1) Services that add value to products

Ex. S.A.T.E. mobile chemical lab by Kluber
Changed from simple sales of lubricants to system sales of quality maintenance, plant management, etc.

Ex. Casa Quick by Allegrini
Detergent sale by weight service that periodically visits home by mobile van

(2) Services that provide final result

Ex. Solar Heat Service by AMG
Service that provides hot water using solar power or methane. Billed according to consumption of hot water (kWh).

(3) Services that provide enabling platforms

Ex. Digodream (textile flooring) by Diddi&Gori
Provides complete services --design, equipment supply, recovery and recycling -- for textile flooring via tradeshows. Users purchase the benefit (utility).

(Slide 30)

problems. Take an earthquake for example. We could design and build a house to withstand any size of earthquake, but it would require a tremendous amount of money, resources and energy. Therefore, the idea is to build a home to withstand the first ten minutes of a magnitude 8 quake, during which time the homeowner can flee. This saves resources and energy.

This is a "Pay per Wash" project (Slide 31).

Last year, UNEP published a report on PSS. The idea is spreading around the world (Slide 32).

Let me say something about eco services in Japan (Slide 33). Research and development in this area have been active over the past four or five years. I myself published a book entitled *"Sustainable Company"* in which I classify and present 76 examples of sustainable business practices in Japan. However, Japan's eco services have not yet been analyzed in terms of profitability, social importance and the improvement in environmental

"Pay per Wash" Project

Electrolux, Sweden

Rather than sell washing machines, Electrolux sells wash time.

10 SEK／wash, ~ 1 kWh ／ wash

7,000 washing machines were lent free-of-charge to families in Gotland.

The washing machine's "Smart Energy Meter" is linked to the company's central database over the internet.

Families know how much they used the washing machine by electronic billing.

After 1,000 wash cycles (about 4 ~ 5 years for the average family), washing machines are upgraded or replaced. As a result, many families reported that their washing became highly efficient.

(Slide 31)

Features of Product Sales and Function Sales

(Source: PSS Report, UNEP)

Traditional product sales (Sales of tangible products)	Innovative alternative: Product Service System (Sales of function)	
The consumer purchases a vacuum cleaner to clean the home or office.	The consumer rents a vacuum cleaner.	The consumer purchases a service from a company that cleans houses. (The company determines machines and methods according to consumer demands.)
The consumer owns, uses and stores the vacuum cleaner. The consumer is responsible for vacuum cleaner maintenance and cleaning quality.	The company owns the vacuum cleaner and is responsible for maintenance. The consumer cleans the house and is responsible for cleaning quality.	The company owns, maintains and stores all cleaning equipment including the vacuum cleaner. The company is responsible for cleaning quality.
Initial costs are rather high for the consumer.	Consumer costs are spaced out over time.	Consumer costs are spaced out over time.
The consumer eventually discards the vacuum cleaner and purchases another.	Because the company is responsible for discarding the vacuum cleaner, there is incentive to pursue a long-lasting or recyclable design.	Because the company is responsible for discarding the vacuum cleaner, there is incentive to pursue a long-lasting or recyclable design.

(Slide 32)

Example Eco Services in Japan

Komatsu Forklift	Servicing of used forklifts
Citizen	Free servicing of natural trouble for 10 years from purchase
Osaka-Nishikawa	Reforming of down futons
Fuji Photo Film	Reuse and recycling of Utsurundesu
Fuji Xerox	Product reuse , global asset management
Kokuyo	OSC (Centralized management of ecological office supplies)
Am/pm Japan	Buy-back of electric products
Catalog House	Servicing, reuse and recycling
Odyssey Technos	Electronic trading in industrial waste in West Japan
Duskin	Leasing of mops, mats and electric vacuum cleaners
Hibiya Kadan	Leasing of natural and artificial plants
Itoki	Leasing and refurbishing of furniture

Big Wave	Information system of recycled parts for vehicle servicing
FootCall	Sales of "Call a Car"
Sumitomo Realty & Development	Shinchiku Sokkurisan (Home renovation)
Misawa	Order-made renovation
Toli	Carpet cleaning
Hitachi	ESCO
Japan Natural Energy	Green power certification system
Tokio Marine & Fire Insurance	Business package insurance, green fire insurance, etc.
Sompo Japan	ESCO general insurance
E-Square	Eco City 21 (Electronic trading of eco products)
Nippon Express	Effective collection and delivery by truck-mounted terminal
Fujita	Photo Road method
Kobe Ecopascal Research Institute	Leasing of eco vehicles

(Slide 33)

burdens. Because of that, my lab gained the cooperation of many businesses so that we could do life cycle assessments on several PSS.

My conclusions are the same as Professor Gunjima's. Ultimately we must develop a sustainable society, or a sustainable economy. The question is: in order to achieve that, how these PSS should be utilized? As I mentioned earlier, the Japanese economy consumes 2 billion tons of resources, releases 1.32 billion tons of carbon gas and generates 450 million tons of waste in producing a GDP of ¥500 trillion. This is a far cry from an ecological super power. How well eco services, PSS, zero emissions and the similar concepts are used will be important.

I would like to say something about the CAT that Dr. Harper talked about earlier. I think it is an excellent example and offers much for us to learn from. It needs to be analyzed from both sides. One thing is that no one would agree to a simple way of life or an ecological way of life that keeps them in poor living conditions. In the end, CAT transformed a poor way of life into an affluent society, therefore most activities turned into education. In this regards, though there may be strategies to increase CAT on the local level, I think we need to resolve problems on the macro level. What needed is massive ecological action. Unless billions of people around the world take action, the problem will never be solved. In short, it would be insufficient if just one or two million people in Japan did something; the problem will not be solved unless tens of millions of people take action. To do this, I like to think that this picture of Heaven and Hell is important.

This concludes my presentation. Thank you for your attention.

Panel Discussion

Coordinator

Masaaki Naito, Takashi Gunjima

Panelists

Yufang Yang

General Manager, Water Treatment Research Laboratories,
Toray Fibers & Tetiles Research Laboratories (China) Co., Ltd. Shanghai Branch

Masaki Kojima

Director/Vice-President, Zero Emission Support Club for Green Society

Mark Stoughton

Senior Scientist, Tellus Institute, USA
Visiting Researcher, IGES Kansai Research Centre

Oksana Mont

Research Associate, International Institute for
Industrial Environmental Economics (IIIEE), Lund University, Sweden

Raimund Bleischwitz

Co-Director, "Material Flows and Resource Management",
Wuppertal Institute, Germany

（以下、敬称略）

Naito:

I would like to get started with the panel discussion now. I would like each panelist to take about 10 minutes and express his/her thoughts for us. The Business for Sustainable Society Project has worked on two critical sets of issues regarding the relationship between business and a sustainable society: "Research on environmentally-sound local systems" and "Research on environmental business model". Of the five panelists, Ms. Yang and Mr. Kojima are specialists in technology and regional development. Three panelists from overseas, Dr. Stoughton, Dr. Mont and Prof. Dr. Bleischwitz are specialists in PSS. I'd like us to discuss the two themes and also, since the presentations by Dr. Harper and Prof. Yamamoto were very closely related to our project and full of some very thought-provoking content, I like you panelists to include some of that in your talk. I am making this second request because, between the two research groups, one that deals with hardware and the

other that deals with services or more specifically PSS, to put it frankly, there has not been enough common points. I'd like you to speak, if possible, about the possibilities, significance and future in that area. So, let us hear first from Ms. Yang.

The Eco-area Preservation and Local Economy Construction in China

TFRC Water Treatment Research Laboratories
Yufang Yang

As you've just heard, I am Yufang Yang. Let me start by expressing my heartfelt appreciation to Professor Naito and many others present today for this rare opportunity. Thank you very much. Today, I will be talking about preservation of an eco-area and building a local economy and industry in China, with the aid of VCD.

This scene is from a program broadcast by CCTV in China, which is comparable to NHK in Japan. The title translates as "Man and Nature", which depicts a case in Yun Nan province. Yun Nan is the southernmost province in China and has yet to be developed. The area is beautiful and retains much of the original natural state.

This is "Shangri-La", a name we gave to this location in De Qin county in Yun Nan. Shangri-La is known for its picturesque views and splendid landscape.

The core of my presentation starts from here. Shangri-La is surrounded by snow-capped mountains and seems like a utopia (Slide 1).

(Slide 1)

However, if you take a closer look at how the Tibetans there live, you will immediately discover that their lifestyle is completely different from what the traveler sees. This village is named Shusong. This is the home of Nan Ji, one of the villagers. Nan Ji is 52 years old. His five family members live amongst nature, cultivating a local vegetable known as Qin Ke for a living (Slide 2-3).

On this day, director Chen and a team of staff from the South-North Institute for Sustainable Development (SNISD) in Beijing are paying a visit to Nan Ji. Two

years ago, Nan Ji built the first methane fermentation tank ever in his village with help from director Chen. Over these two years, Nan Ji's life has changed greatly.

On this day, Nan Ji showed them something. It is a "4-in-1" system consisting of a toilet, pig enclosure, methane fermentation tank and greenhouse.

Human and pig excrements are loaded into a pit underneath the greenhouse and the methane gas produced by it is used as a fuel for cooking (Slide 4). And, the biogas fluid and sediment produced in the methane generation process function as an organic fertilizer that Nan Ji uses to grow vegetables with.

It's evening and they are starting to prepare supper (Slide 5-7). Shusong is at an elevation of 3,000 m. They have used the heating system about half a year. Before that, a typical household used between 5 and 10 ton of firewood as heating fuel a year. But, the switch to methane gas has greatly reduced wood consumption.

This is helping to protect the natural forests. Moreover, the lung and eye ailments caused by cooking smoke have been reduced.

De Qin county has a vast

(Slide 2)

(Slide 3)

(Slide 4)

forested area. This area is very hilly. This is the convergence point of the Mekong, Jin Sha and Salween Rivers. Here live some rare species of animal.

In the 21st century, lumbering had become the primary source of income because of the population increase and loss of farmland. Deforestation is devastating (Slide 8). In 1988, a natural preserve of 280,000 hectare was created by the national government and a deforestation law was enacted to protect the area. Despite that, the locals must burn roughly 100 kg of wood a day to survive.

If it continues, the natural forest resources will not last 40 years. Therefore, in 1999, a farming technique used widely in Liao Ning Province was introduced to Shusong. It was not easy to help the Tibetans with this technique. Reason being, it was hard to persuade them to change their habits. It was even hard just to talk to them. Moreover, the Tibetans live in the forest. They had never seen technology like the methane tank, so the SNISD built a model tank and greenhouse in Shusong.

Nan Ji showed the most interest in the technology. After consulting with his family, Nan Ji

(Slide 5)

(Slide 6)

(Slide 7)

took out a 10,000 yuan loan and built the methane fermentation tank on the only piece of land he owned. SNISD guaranteed the loan from the local agriculture bank so that Nan Ji could borrow the money. However, Nan Ji failed five times because of technical issues and hard rains.

After three months of trials and tribulations, Nan Ji's family started cooking with methane gas (Slide 9). At the same time, they started growing vegetables that they had never eaten or seen before, in the greenhouse.

The reason for this is that the village is located at too high of an elevation to grow these vegetables. However, thanks to their efforts, now they can, to some extent. Moreover, vegetables are in high demand, so Nan Ji is selling both meat and vegetables. Vegetables cost roughly double as in Northern China. With the money he made, Nan Ji paid back his loan in two years and still had a 2,000 yuan of stable income a year on top of that. Ever since then, Nan Ji has been telling others how great the greenhouse is every chance he gets (Slide 10-11). SNISD's 4-in-1 system spreads in the village from there with now 50 homes equipped

(Slide 8)

(Slide 9)

(Slide 10)

with their own methane fermentation tank. The result of this four-year experiment has been an improvement to the standard of living in the village and the Tibetan environment, made possible by local technology.

To this date, ecological industry and the local economy have been growing stably. This is what I want to say. Thank you.

(Slide 11)

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Naito:

This example was very easy to understand. I think Dr. Harper and Prof. Yamamoto will also evaluate it highly. Nevertheless, it would be rather difficult to get involved with that kind of regional development in Japan. Few people would readily say "yes" to installing a methane fermentation tank for human and pig excrements under their house. Not far from here, however, is a magnificent methane fermentation system built with several hundreds of millions of yen and operated with government subsidies. Yet, as magnificent as it may be, actually using it is the most difficult aspect for the Japanese society. That kind of social system worked well in the mountainous area of Yun Nan, but it is not guaranteed to work well in Japan. The methane technology is not the problem; we would have to study the social system for making it work. This is one issue everyone must. With that, we shall now hear about what is happening in Japan from Mr. Kojima.

Roles of NPOs for Creating Sustainable Society

Zero Emission Support Club for Green Society
Masaki Kojima

The title of my presentation today is the "Roles of NPOs for Creating a Sustainable Society". This theme includes some expectations for NPOs, which I will touch upon later.

To begin with, I would like to give a brief introduction of our NPO (Slide 1-2). Our real objective at the start of operations was to provide technical counseling, cooperation and support using the technical know-how and track records of member businesses.

In 1999, Hyogo Prefecture adopted a "Basic Concept of Hyogo Pref. Zero Emission for Green Society". Instead of the zero emissions by industrial clusters concept that was advocated by Gunter Pauli, Hyogo's Basic Vision is characterized by area-based zero emissions.

Existing initially as a volunteer organization, our NPO was later established to diffuse and support this Vision. It was launched predominantly by the businesses that had been involved since the start, with Prof. Naito, who served as the Head of the Basic Vision Committee,

NPO Overview ① Objectives

- "Work with municipalities, residents, businesses and organizations to effectively use local resources and build a recycling-oriented society, and contribute to the formation of eco-friendly society." (Articles of Association)
- Provide technical counseling, cooperation and support, using the technical know-how and experience of member businesses, in order to develop a recycling-oriented society from the perspective of zero emissions in the comprehensive application of "agriculture". (Real objective at beginning)

(Slide 1)

NPO Overview ② Background

- March 1999: Adopted "Basic Concept of Hyogo Pref. Zero Emission for Green Society".
- June 2000: Established "Zero Emission Support Club for Green Society".
- Nov. 2002: Registered as NPO following approval by Hyogo Pref.

(Slide 2)

as the Chairperson. Incidentally, we were fortunate to have Prof. Gunjima on the committee, as well.

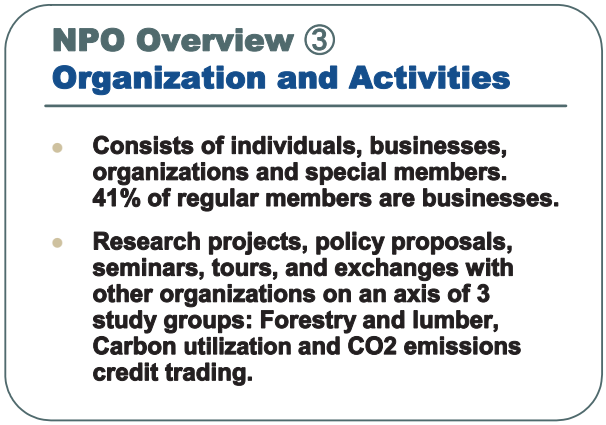
In our organization, 40% of our regular members are businesses, while about half of the individual members including some directors are businesspeople (Slide 3).

Currently, we promote research activities, policy proposal activities, seminars and tours, and exchanges with other organizations through three core study groups. Until now, member training and interaction were our main activities, but in the future, we will be placing emphasis on research and policy proposal activities.

As for current issues that we are dealing with, since we became an NPO in 2002, it gave us an opportunity to think about what our missions as an NPO are (Slide 4). We are still trying even now to confirm our principles as an NPO.

As I mentioned when speaking about our background, because the organization was formed passively with governmental leadership, we somehow lacked autonomy. Initially, we thought of returning to the "Basic Concept of Zero Emission for Green Society" that was the starting point for creating an NPO, but our thoughts are slightly different today.

We changed our minds after we heard Prof. Naito speak of an "Eco Village" and we became involved with the BSS Project. Prompted by Prof. Naito and several persons involved with the Eco Village, we began studying the genealogy of environmental thought. We came to think that the term "sustainable society" had a stronger impact and was more suitable as a comprehensive concept of the



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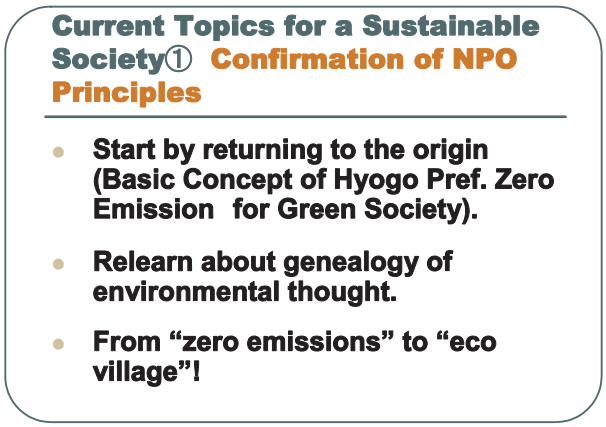

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environment than the term "recycling-oriented society". Little by little, our missions as an NPO are becoming clearer.

Recently, Junko Nakanishi's book *Environmental Risk Studies* has made a big impression on us. Though our position is different from that of a university researcher, it is duly important for NPOs to conduct full-fledged research in order to pursue the facts. We see this as the basis for our policy proposal activities, which include public comments on environmental conservation taxes and environmental policy proposals that draw on the fruits of a carbon sequestration project that is currently underway (Slide 5).

Though this may deviate from the concept of "intermediate technology", one of our topics is to identify the possibilities of future general-purpose technologies of member businesses and study ways to apply them to the local area (Slide 6). We are to hold a technology assembly on the theme of biomass vehicle fuel in three separate locations in Hyogo Prefecture next month. Why we take up vehicle fuel is that, in terms of marketability and influence, it seems to have an extraordinary effect on use of renewable carbon-neutral resources, substitution of fossil fuels and promotion of agriculture and forestry.

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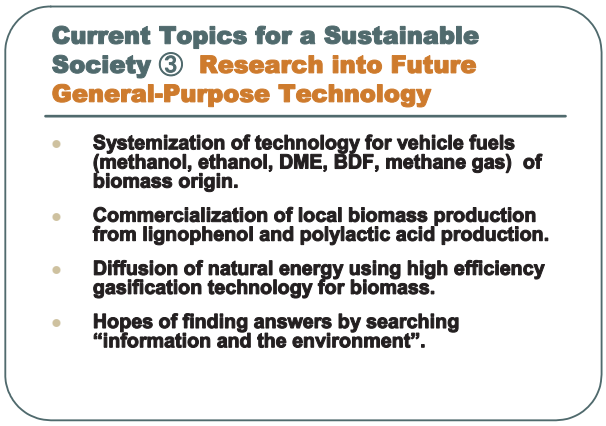

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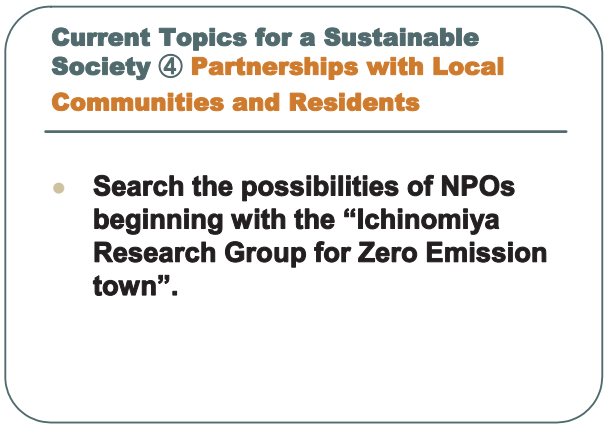
We have a dream of starting up the rural biomass production business using technology for separating lignin and cellulose. Outside of waste building materials, the main sources of wood-based biomass come from rural areas.

Regarding gasification of wood-based biomass, we see some possibilities following verification testing and research in

Ichinomiya, Hyogo, on a high efficiency system that may very well be the breakthrough everyone is waiting for. No other gasification plant is more efficient in gasification than the gasification plant that works by an externally heated steam reforming method developed by Prof. Sakai of the Nagasaki Institute of Applied Science, which is unfortunately not a member business.

We're going to talk about significance of "information" in the environment, our future research topic, for the first time at the seminar in January next year.

"Partnerships with the local communities and residents" are a big issue that concerns the mission of our NPO (Slide 7). Amongst the businesses and governmental people of our NPO, there is always someone who does not recognize this as an issue in materializing our NPO. Because a complete consensus is never gained, it is a question of internal restructuring of the NPO. I will talk for a minute about concrete efforts later.



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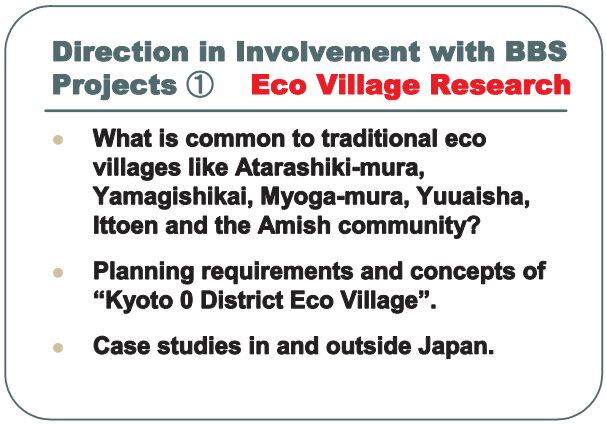

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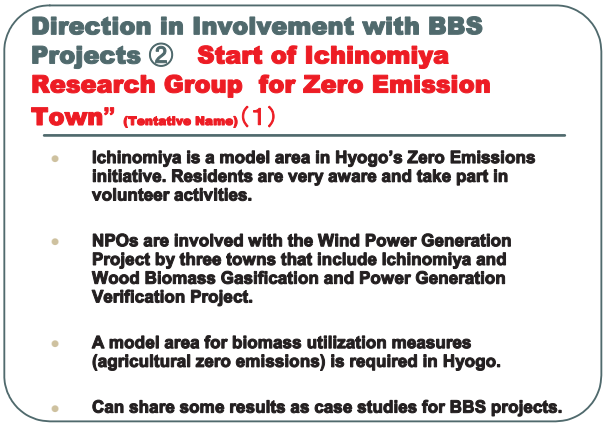
Two activities related to the BSS Project are our "Eco Village Research" and the "Ichinomiya Research Group for Zero Emission town" (Slide 8). If I start talking about the "Eco Village Research", I will cut into the presentation time of the other panelists, so I will limit myself to saying one thing. In developing a traditional eco village, determination, ideas and dreams play a very important role as an engine for motivating the community. We might even call it "faith". It has the power to drive mountains into the sea. It is so hard to express this in tangible form that it is not readily understood by people, but it is the key to "controlling one's desires", which assures sustainability.

Unfortunately, I have no time to talk about the Kyoto O District Eco Village.

Lastly, I want to say something about the "Ichinomiya Research Group for Zero Emission Town" (Slide 9-10). With the approval of the Board of Directors, preparations are currently underway to launch the study group. We would like to have the first seminar in January next year. If you would like to know why Ichinomiya was selected, please see the resume I wrote.

I suppose that, through what I said so far, we could get a little closer to the theme I mentioned at the beginning. Thank you for your attention.



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Naito:

Thank you very much, Mr. Kojima. Your presentation was rather interesting and posed a new theme in who should take a leading role in promoting a project. This is a very important point. By chance, our structure constitutes a slight mismatch in that a coalition of businesses has formed an NPO. In that sense, it is something great; while organizational management is difficult on the one hand there is great potential for future development on the other. If things can work out, the results should be very interesting. The results seen in Yun Nan are so interesting that they should be on TV, but Japan, because of the trouble it has had in this area, can easily be taken as the antithesis of this. The presentation was very close to the research I myself am involved in. I would like to now call upon Prof. Gunjima.

Gunjima:

The point was raised in the workshop yesterday that PSS (Product Service System) was not originally developed to create a sustainable society or reduce environmental load. PSS is no more than a business model that emerged during today's socio-economic changes, therefore some plans increase environmental load, and others decrease it. We have to choose those that are significant from an environmental perspective. In that same workshop, we discussed and improved our understanding of what in the social backdrop to PSS acted the driving force behind it.

In recent years, a technological revolution has rapidly advanced in Japan and many other societies around the world. The new products we buy become functionally obsolete before we know it. Moreover, parts and supplies procurement is going global alongside everything else and further fueling the mega-competition we see today even more so. In this scenario, it will become harder and harder to procure parts and supplies through conventional supply chains. Dr. Harper used the word "relocalization" in his presentation today; if service can be added to parts and supplies procurement within a local area by building a network in that area, then PSS models that combine services and products will naturally emerge as schemes for beating out the mega-competition.

Amidst the environmental legal bindings and particularly the problem of waste, EPR (Extended Producer Responsibility) came to the forefront giving manufacturers the ultimate responsibility of picking up their waste. If this is the case, then obviously rentals and leasing would be the better option when it comes to recovering products. So, that is how PSS models come about. As Dr. Mont pointed out, IT is only a means. Basically, because of cost-savings here and there and e-commerce, IT effectively cuts costs by eliminating the middleman. Environmental load is reduced as a result of that. With car sharing, one PSS model has come up by introducing IT to make booking and scheduling more efficient. I can also imagine models that reduce the environmental load of traveling by using TV conferencing. On the issue of food safety, there could be PSS models that employ IT to add traceability services to vegetable sales. Or, with society aging, home care services are likely. Within that, I can see development of PSS models as a means for providing new welfare services that combine the "assets" of human services, renting and leasing by dispatching human resources rather than simply renting something.

Also, public economics have failed. As Mr. Kojima and Dr. Harper pointed out earlier, these kinds of PSS models are developing not only within markets but

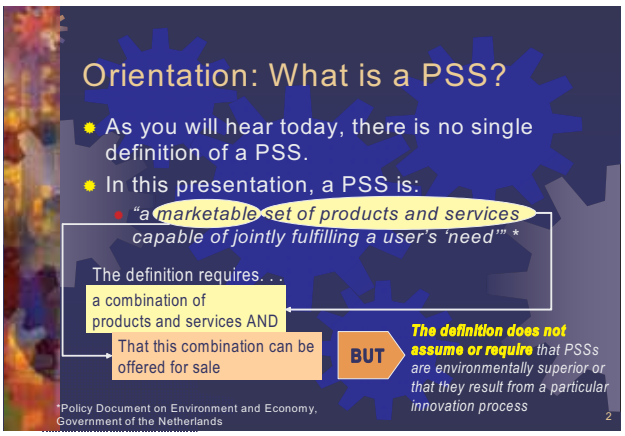
within social economies. In that sense, a PSS model is being implemented underneath a cloak of change in society and the economy, therefore it is not solely for the purpose of reducing environmental load. Taking that as the driving force, there are diverse PSS models out already. Dr. Stoughton will talk first about that directivity by reporting the PSS trends in the USA, and after that Dr. Mont will fill us in on the PSS trends and research trends in the EU. I'd also like to hear from Dr. Bleischwitz about who is going to run the organization, as governance is a very big issue. So, to begin with, I'd like Dr. Stoughton to tell us about the servicizing trends in the USA. Dr. Stoughton, would you please.

Product Service Systems and "Servicizing" in the US: BtoB evolution and prospects

Tellus Institute, USA
Mark Stoughton

First of all, thank you for the opportunity to speak. I will be presenting a condensed and shortened version of the presentation that is in the participant materials. A detailed abstract of the whole presentation is also available from IGES.

So, I am talking about the history and evolution of product service systems in the U.S with a focus on business to business markets. Before I get started, it is useful for me to state the definition of Product Service System (PSS) used in this presentation (Slide 1). There is no single, accepted PSS definition. I take the PSS to be a "marketable set of products and services that together fulfill user's need." So, under this definition, a product and a service are marketed (sold and purchased) together, and together they fulfill the need in the market.



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This definition does not require that the PSSs are environmentally superior. It does not require that they result from some environment motivation on the part of a company.

Now, if I am talking about where PSSs are going in the US context, I really need to talk about where they have been.

Five years ago, Tellus Institute looked at emerging trends in business to business PSS (Slide 2). This was before the term product service system entered everyday use.

We looked at seven companies (Slide 3). They were developing, pioneering

PSS businesses. The logos of those companies are on the screen, most of them are probably familiar. I will not discuss the businesses in detail. All are traditional product companies. And all were experimenting with using their products as the basis to sell services.

Since 1998, we have also been engaged in applied research in piloting of one BtoB PSS model. This is performance-based chemical management services.

Now, why we began these two types of research is the same reason we are interested in these issues now: *There is a fundamental structural change underway in all the wealthy industrial economies. Services continue to grow in importance and they are the economic lead sectors. This transformation is not and will not automatically result in green economy* (Slide 4).

This is for two reasons. The first is that when you consume a service, there is a large manufacturing and transport infrastructure that support the service. This is the case of medical services, transport services,

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communication services. These are the service sectors that are growing most rapidly and depend on environmentally problematic products. The second reason is that the environmental regulatory systems are strongly oriented towards regulating products and manufacturing processes. To a significant degree, services are a "blind spot" in regulation and environmental policy.

This means that services present a clear challenge. We must find a way to make a service- and information-led economy a green economy. We must find ways that services can change the ways that products are made, used and disposed of. The appeal of the *product service systems* is that in principle they can do exactly this.

So, what did we find in our research? (Slide 5-6)

1. In the U.S. context, we found that business goals (like profit) were the major driver for PSS development, not environmental values or not regulatory considerations.
2. We found that PSS concept has more promise in business to business market than to business to consumer markets. This is partly because businesses are more likely to make strictly economic and rational decisions and partly because, at least in the U.S., management trends (like outsourcing, the focus on core competency, strategic partnership, and supply chain management) are quite aligned with PSS concepts.
3. We found that products that demand specialized knowledge to procure and use them are well-suited for servicizing or PSS approaches. Examples are chemicals and information

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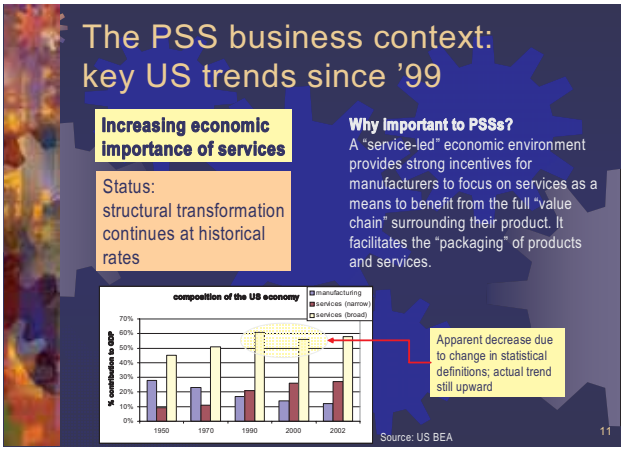
technology.

4. We found that the service systems or servicizing present challenges to traditional manufacturers, because for a traditional manufacturer who "servicizes" a traditional product, they find that the profit from the service-based business unit is no longer be linked to how many products they sell or manufacture. This can create a tension between the service side & the manufacturing sides of the business.

5. Finally, we found that environmental benefits are not automatic. If the PSS broke the link between the amount of product sold and the amount of profit made, environmental benefits were more reliable.



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So, as we look at the situation now, what do we see? This is best answered by looking at how the factors that influence business environment for product service systems have changed or how then have remained?

I will go through the various factors quite quickly.

1. In the U.S., services continue to increase in economic importance. This creates strong incentives for businesses to look to services as a way to extract more of the profit or value added that is attached or associated with the products (Slide 7).

2. Supply chains and markets continue to globalize (Slide 8). This creates a strong market for services like logistics management. And globalization also means that companies look at services as a way to defend home markets against new outside competitors.

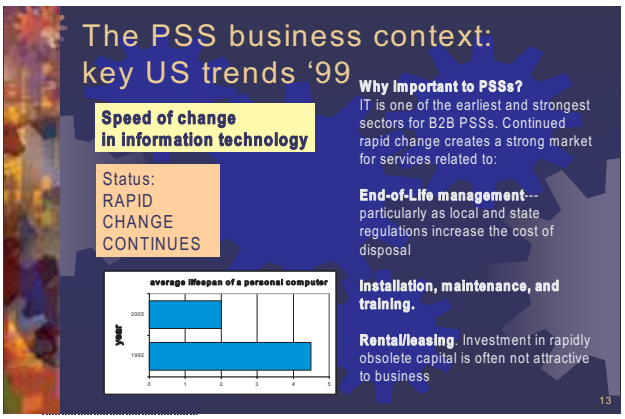
Part of globalization is outsourcing. And if you outsource, you are generally more willing to procure products and services bundled together.

However, many PSSs require close collaboration between suppliers and customers. This is more difficult when your supply chain is global.

3. Information technology continues to become obsolete very quickly (Slide 9).

IT is one of the strongest and earliest PSS sectors. This means that computers and servers are attached to the services like installation, maintenance, training, upgrade and take-back at the end of life. So, continued to rapid change in information technology will tend to create strong PSS markets.

4. Environmental regulation can be a key driver of PSS demand (Slide 10); Environmental regulation can create markets for product service systems in the areas such as energy-efficient services, chemical services, and waste management.



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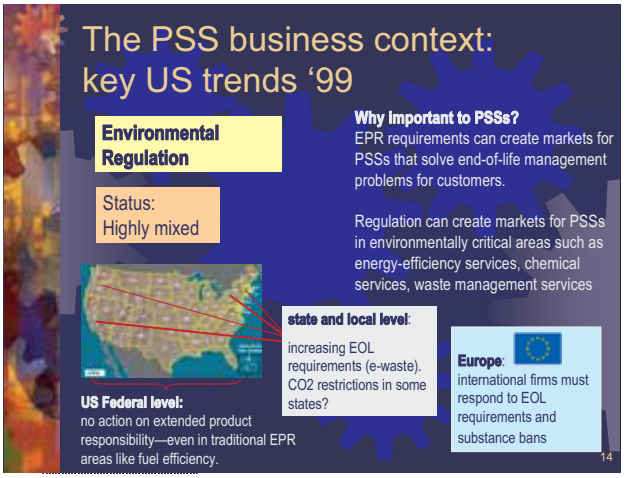

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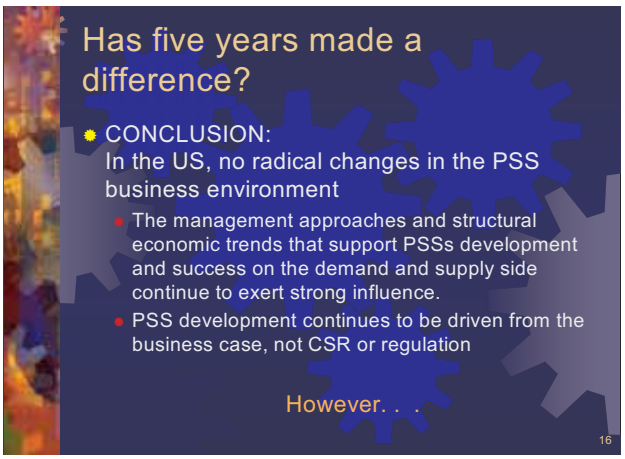
However, the environmental regulation situation in the U.S. is highly mixed. There is no action at the federal level and under current administration there will not be. There are many end of life requirements being imposed at state and local level. Some states are considering CO2 restrictions. And international firms must respond to European environmental directives.

5 . The final trend of interest is consumer demand for green products (Slide 11). Again, this is highly mixed. It is easy to find evidence that consumers are willing to pay for green products. It is also very easy to find evidence that they are unwilling to pay extra product that are green to adopt or employ changes of lifestyles. Green demand can create markets for business to consumer PSSs that are focused on delivering greener solutions. It can also create demand for corporate social responsibility.

So, given these trends in the overall economy, has the past five years made a difference? (Slide 12) I think the conclusion is that there are no radical changes in the PSS business environment. Structural changes in the economy and management trends continue to help PSSs development. PSSs continue to be driven by the business case. Also, there are some regulatory incentives for handling electronic waste.



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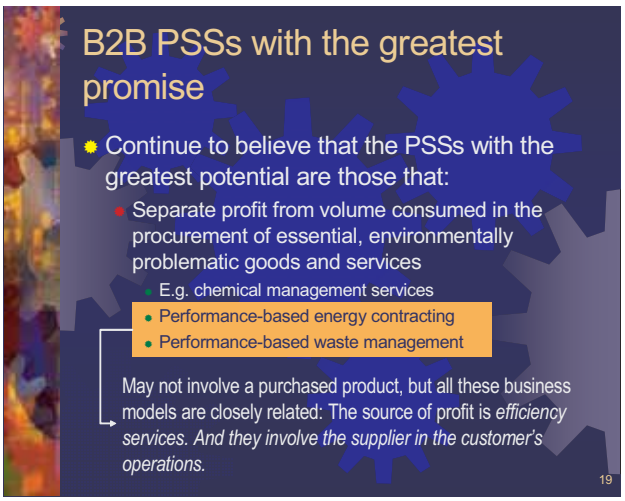
Business to consumer applications remains limited. There are certain specialized business to consumer PSSs that are experiencing growth in certain niche markets. I continue to believe that the PSSs with greatest potential are those that separate profit from volume of product



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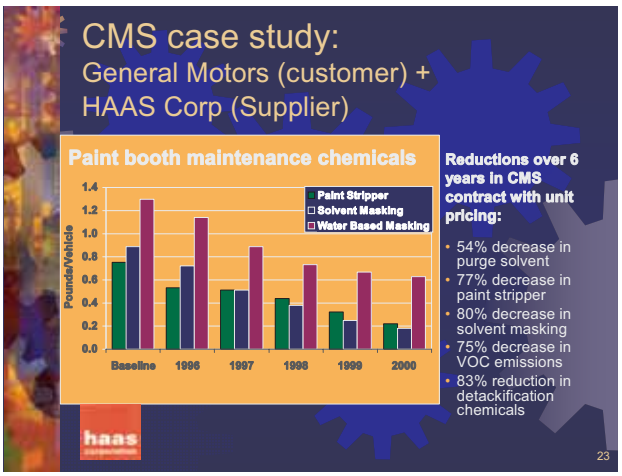
consumed in the procurement of essential environmentally problematic goods and services (Slide 13). Examples are chemical management services, energy services, and waste management.

In these models, you are no longer paying to procure the product. You procure the service provided by the product. For example, an electric manufacturer might no longer pay per liter of cleaning solvent, might pay per circuit board cleaned. In general, we refer to these models as *function- or performance-based procurement.*

Function or performance-based procurement can yield very significant environmental results, as illustrated by this graph of chemical use reduction in an automotive painting operation (Slide 14).

The prospects for performance-based procurement seem generally good (Slide 15). However, globalized supply chains can make these partnerships more difficult and consumers often do not have the total cost awareness necessary to evaluate performance-based procurement models properly.

In conclusion, business to



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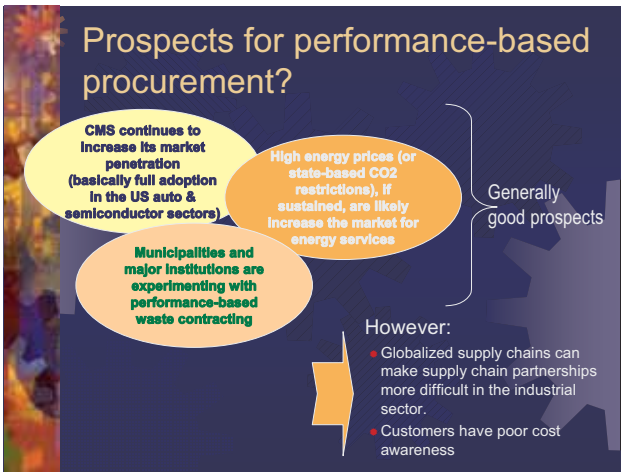

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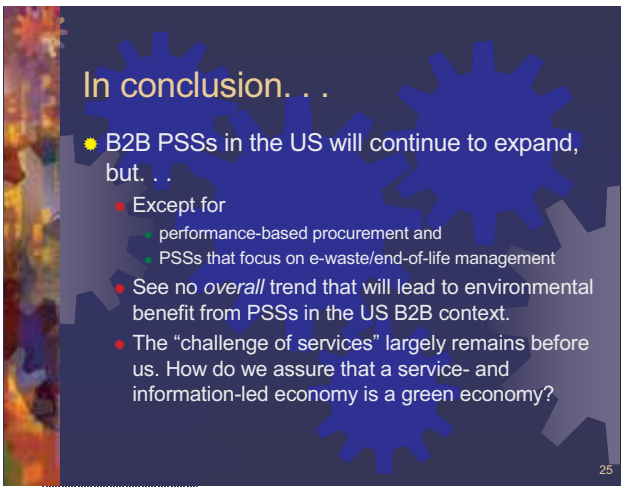

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business product service systems in the U.S. will continue to expand (Slide 16). But I see no overall trend that will lead to environmental benefit with two important exceptions. (1) performance-based procurement and (2) product service systems that focus on electronic waste and end of life management.

In short, for the U.S. economy, the challenge of services largely remains. How do we assure that a service- and information-led economy is a green economy?

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Gunjima:

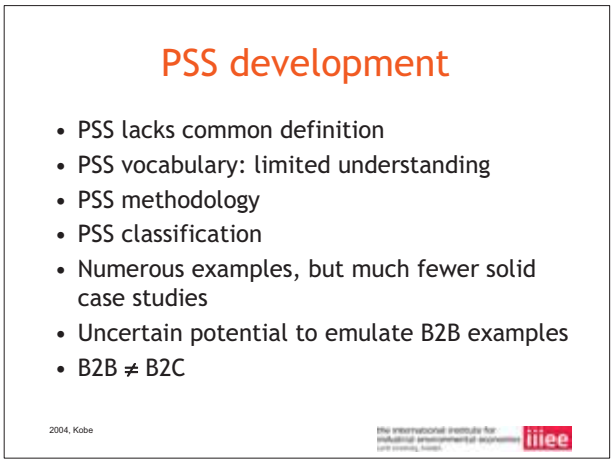
Thank you, Dr. Stoughton. It would seem that, amidst PSS development in the USA, B-to-B models of PSS are growing in particular. One important topic that comes to mind with regard to Japan is how service can be added to current green purchasing practices by which businesses use recycled products, or in other words, how chemical management based on PSS will be recognized in green purchasing. Another thing has to do with EPR (Extended Producer Responsibility); I get the feeling that a little more consideration should be given to business models as real corporate activities. Moving along, I'd like to call upon Dr. Mont who will be talking about research and PSS development directions in the EU. Dr. Mont, would you please.

Trends in PSS field in European Union

International Institute for Industrial Environmental Economics
at Lund University
Oksana Mont

Good afternoon. Thank you very much for the opportunity to present the recent trends in product service systems in European Union.

I will also start from defining product service systems, which has been a long and painful debate in European Union (Slide 1). Some people accept the definition mentioned by Dr. Stoughton, but in Lund we define the product service systems more from system's perspective. We define PSS as a system of products, services, networks of actors, and supporting infrastructure that strive to be viable from the business perspective, accepted by customers, and have lower environmental impact than traditional business models. From the beginning, we have a goal of the systems to be first of all developed consciously by targeted strategies in companies and by inter-company networks. And they should also strive to have lower environment impact. This means that when we do research, we evaluate existing studies and cases of business models, which we believe can be further developed into product service systems.



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After the evaluation we provide suggestions on how existing business models can be converted into more sustainable ones.

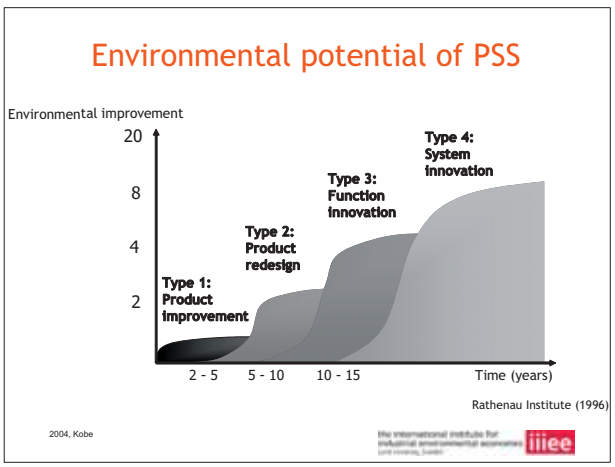
Supporting this development is also a trend in European Union on developing a methodology for how to evaluate existing business systems, which might or might not result in environmental improvement. A number of methodologies have been

developed so that we can ensure if environmental impact is reduced or not by certain business models.

And other trend in European Union is that product service systems have been started from business to business cases. Reflecting this situation, recently, a large number of research projects have been conducted that study and evaluate fewer existing business to consumer cases. A new research direction is emerging that investigates models where businesses provide PSS to communities. Speaking about hardware and software in product service systems, what we find important is the institutional theory. The institutional theory brings a new perspective into the study of PSS. Institutions in society include cultural context and accepted norms, as well as cognitive and learning processes of people, their acceptance of new ideas and persuasion of the new ways of living.

What we also see is that in order to learn, emulate and disseminate PSSs to a larger number of sectors and companies, we need much deeper and may be longer studies to see how new business models historically evolved and how actors within companies and stakeholders as well as institutional framework can affect the development of product service systems.

We would like to believe that product service systems have an environmental potential (Slide 2). But in order to reach Factor 20, it is important that the system is improved at all levels. It is not enough to improve products to make cars more efficient because the number of cars is increasing and environmental gains from efficiency improvements are negated. So, we need to look at the lifecycle environmental impacts and also at the total aggregate consumption levels. And therefore together with product improvement, we need to think how to design services and systems - something, which we currently lack knowledge about.



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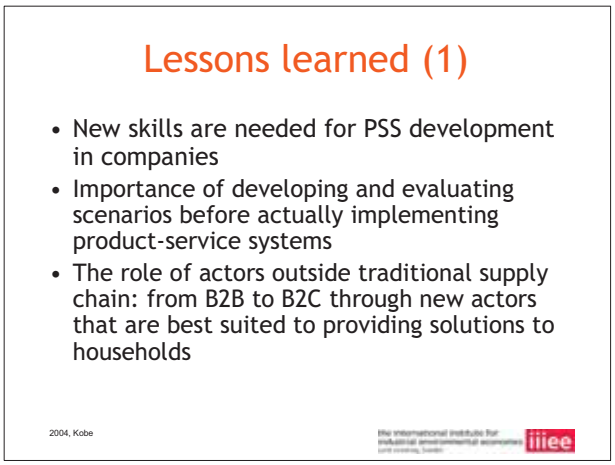
In addition changes in infrastructure need to be done in order to reach systems level innovation.

What we learned so far is that many companies lack skills for how to develop services and for how to incorporate environmental considerations into their everyday routine (Slide 3). We found it important not to rush into developing new business models, but first try to develop scenarios, visions for how customer's needs can be satisfied. Then evaluate those scenarios from economic, environmental and social perspective. The balance found in this analysis could indicate which way the company should go.



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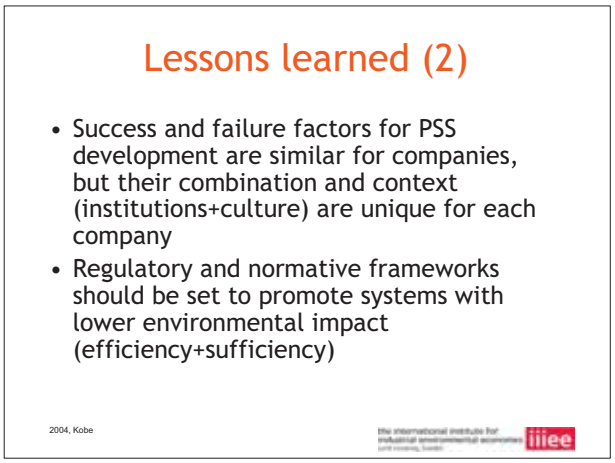

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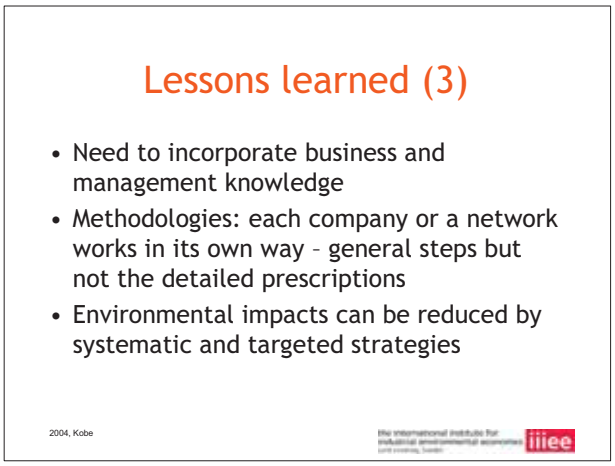
We also find it important the emerging roles of new actors, which are traditionally not considered as part of traditional supply chain. Now, totally new actors are emerging as potential partners for companies for provision of product service systems to final consumers.

What we also see is that we already know what kind of factors influence the success of PSS business model (Slide 4). We know the top management commitment is important. We know that involvement of employees is important. But in each case, these factors are combined in a unique way, reflecting company's organizational structure and culture. So, it is important for any study not just to go in and out the company with quick interviews, but to truly understand processes behind evolvement of new business models. It is also not enough to just think about PSSs at the company level. As I mentioned before, regulatory and institutional frameworks in society create a situation for innovative business models to be accepted by consumers. It is very difficult to ask companies not to sell more products, but sell

services instead when customers are not ready to accept this new way of living due to the message the advertising industry is promoting: throw away society and increasing consumption. So, while it is important to work from bottom-up, it is also vital to develop sound top-down approaches.

Speaking to companies, it is important to find common language and not to speak about only environmental or altruistic ideas, but clearly link these to economic benefits (Slide 5). At the European level, we also see now proliferation of different methodologies for how environmental ideas can be incorporated and how products and services can be developed. At the same time, the details should be left to the companies due to the unique nature of each of them. Coming back to the PSS definition, if you will not define PSSs as more environmentally sound, we will not see reduction of environmental impacts. Only systematic and targeted strategies towards reducing environmental impacts can produce tangible results.

In a European research, the



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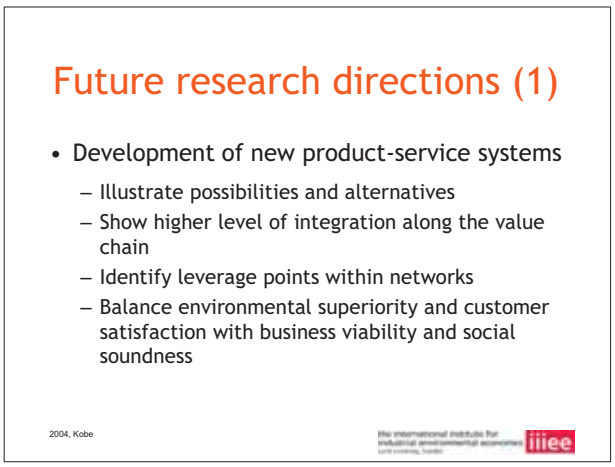

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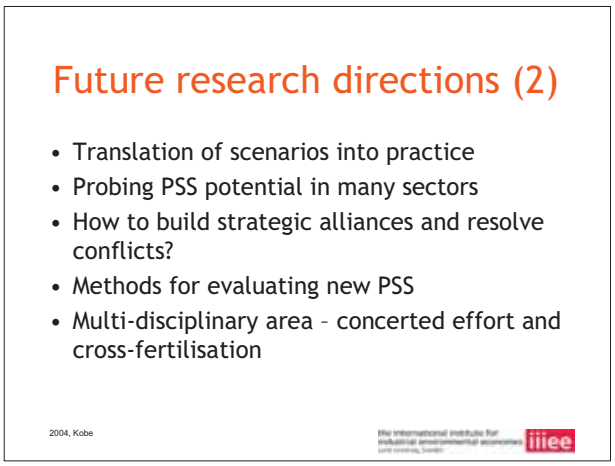

(Slide 7)

future directions are indicated for new PSSs (Slide 6-7). We are trying to diversify existing models of chemical management services, energy efficiency services towards a large number of sectors. However, how to evaluate environmental impact of product service systems is still an open question. We have lifecycle assessments for evaluating impacts of products, but with services and function, rebound effects and setting system's boundaries is always problematic. What has been realized is that it is important to bring in expertise in psychology and sociology disciplines if you want that new business models are accepted by a broader customer base.

Thus, it is important not only to develop new product service systems, but at the same time test customer acceptance and satisfaction with the provided new models and to adjust them (Slide 8). In order to support the development of product service systems, it is important to also introduce policy measures like pilot project and support for research, information dissemination. Since the area is still young, we do not yet have direct answers as to under what circumstances PSSs become sustainable business models. Therefore, it is too early to develop targeted direct policy measures.

(Slide 8)

I will stop here, thank you.

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Gunjima:

Thank you, Dr. Mont. Dr. Mont reported on PSS research in the EU and within that what was understood, the direction of future research and what must be looked at in developing PSS models. As Dr. Mont pointed out and as Prof. Naito and Dr. Stoughton also raised in their presentations, no matter how successful B-to-B models may be with their orientation around big corporations and a considerable market, many issues still require studying with regard to B-to-C. Social infrastructure issues, the service-oriented lifestyles that would accept that, the social capital that will

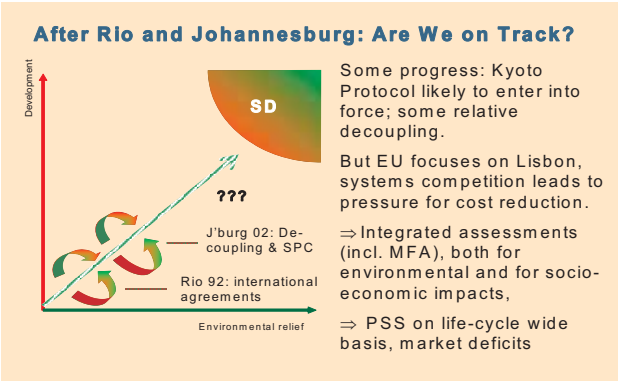
enable consumers to consume services rather than own something and the social matrix that deals not with hardware but with the nonmaterial, must all be considered. Doing that will give rise to the need for B-to-Community PSS models. PSS models are very important in terms of reducing environmental load. The issue still remains with regard to implementing PSS of who will organize and govern it, but that is what Dr. Bleischwitz will be telling us. Dr. Bleischwitz, would you please.

Trends of Governance for Sustainability

Wuppertal Institute
Raimund Bleischwitz

Thank you very much indeed, Prof. Naito and Prof. Gunjima for inviting me. It is a pleasure to share some thoughts with you. The issue of my talk is about trends of governance for sustainable development. As you will see this trend of governance coincides with what is called a sustainable society and sustainable business models.

I may firstly draw your attention to what has been labored at the Rio process and Johannesburg process (Slide 1). Some people say that Rio conference has been quite success, because it has led to large international agreements whereas Johannesburg summit has not led to these kinds of international agreements. But my view on these conferences is more positive. Johannesburg conference serves as complimentary conference to Rio, because it is broken down the issues to the people and it has brought the whole process of sustainable development down to earth. The agenda on sustainable production and consumption which has been formulated in Johannesburg helps local communities and business makers in that they now have a concrete agenda on what can be done. The question is "are we on track?" Looking on these policies, we can indeed be very happy that Kyoto Protocol is now very likely to enter into force and also we can observe that some decoupling has taken place between energy and resource use on the one hand and GDP growth on the other hand as has been mentioned by Professor Yamamoto.

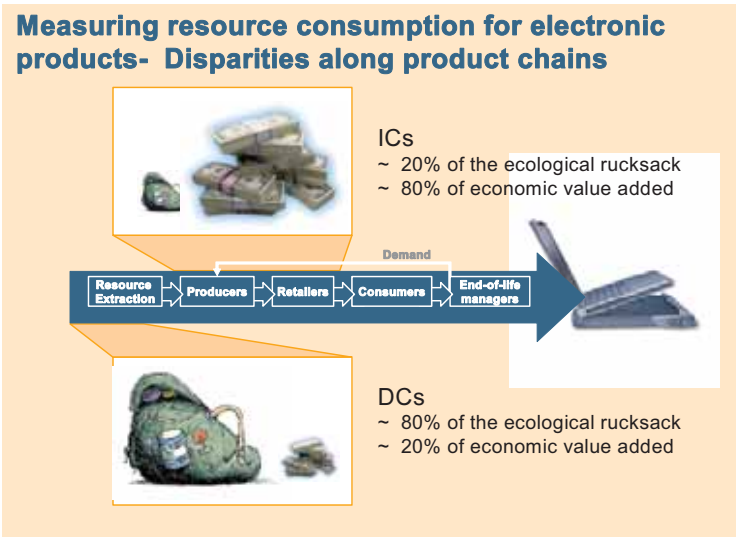


(Slide 1)

Looking at Europe, however, we see that the European Union policy makers' agenda largely focuses on what is called Lisbon agenda on how to increase

European competitiveness position in the world. Also the whole process of enlargement has raised the issue of competitiveness with EU because the ten new member states have much lower wages and, hence, more favorable production conditions. This is what daily business operations and daily local community now have to struggle with. After all, I would conclude that some progress is indeed visible, but it is slow.

We did some research on how overall levels of resource consumption can be translated at the level of concrete products. We have tried to calculate the impact of IT and electric products (Slide 2). Here the picture is interesting because the industrial countries largely have the economic advantages, whereas various ecological disadvantages resulting from resource extraction processes prior to IT production occur in developing countries. This means that there is not only a digital gap regarding the products but also an ecological gap between the developing world and industrial world. Similar picture arises when one takes a closer look at the decoupling process.

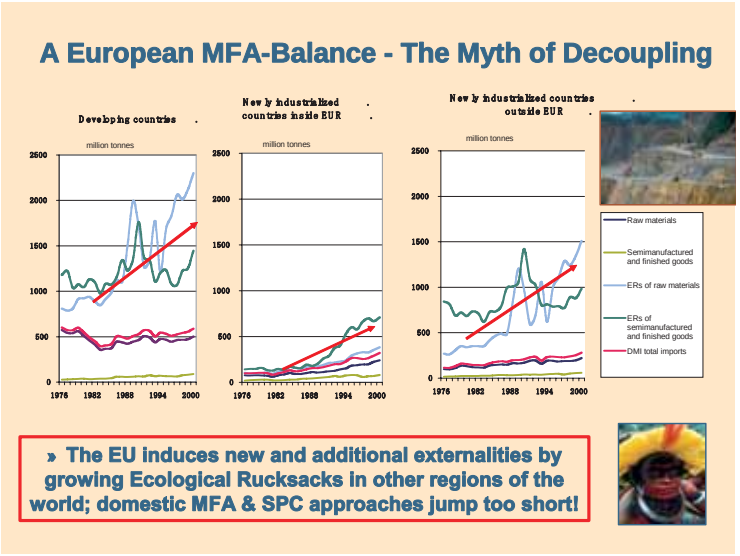


(Slide 2)

At the bottom-lines of that figure you clearly see that energy use and resource use is decoupled (Slide 3). But when you look at what is called the "ecological rucksacks", i.e. large earth masses move during the extractions processes, you see that these hidden flows in fact are surging indicating that resources increasingly become scarce, and sensitive ecosystems have to be explored for this extraction process. One may say that some progress is visible, at least for some countries. But for any conclusion one has to undertake integrated impact assessment taking into account different ecological impacts arising from production process over the whole lifecycle in different regions of the world.

Let us now perhaps switch to what can be done at the level of nation's environment policies. I am pleased to share the information that German government

is now exploring a program for resource productivity at the level of the Ministry for the Economy. This is indeed good news, because active measures should be taken and possible pilot projects have to and will include action at regional level: that's the essence of innovation policy spurring action at the level of individual companies as well as know-how transfer via agencies of networks. This is designed to activate the private actors at the regional level. Such policy will become an important part of any program.



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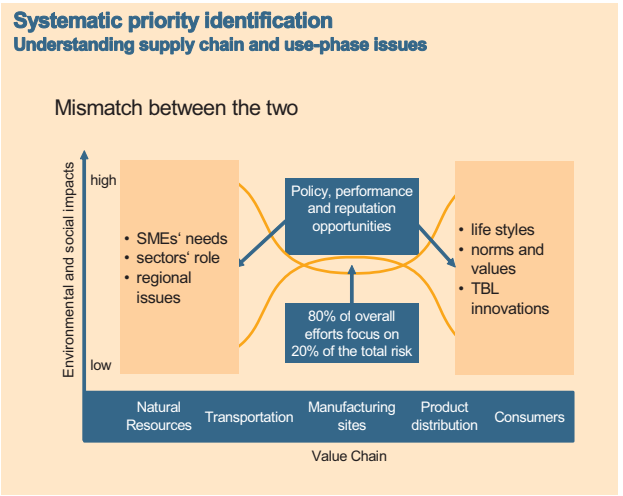


(Slide 4)

When we now look onto what regional actors and companies undertake, one observes progress mainly in the area of the manufacturing processes (Slide 4). Less attention is paid to the extraction process of natural resources and to what has been labelled as life styles, i.e. the area of product service systems (PSS). The challenge to PSS in that context is to include downstream and upstream activities, that is including the resource extraction process and activating cultural change at the level of consumers.

Being economist myself, may draw your attention to market deficits which are important for any analysis on economic change (Slide 5). Market deficits with regard to PSS, as well as with regard to regional innovation seem to me as follows: information deficits, and split incentives between different actors. Consumers often

have a short, biased calculation and do not take into the account "rational" pay-back times. Market power indeed is also quite relevant factor because in a monopolistic or oligopolistics market once you try to start up a new company, then you run into trouble. In addition, customs and routines are quite relevant not only at the level of consumers but also at the level of firms which keep routines for sake of efficiency. So the question is how these routine can be changed and when the new PSSs can be introduced.

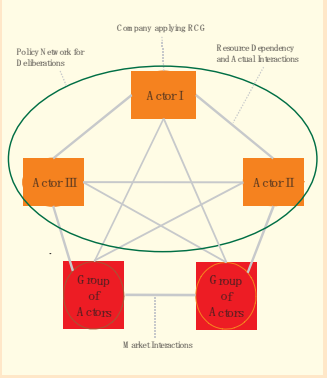
Market Deficits need to be tackled

- *Information deficits:* attention is scarce, search is costly, quality difficult to assess.
- *Split incentives:* owner, designer and user of any technology are not identical. Coordination costs are high.
- *Biased calculation:* payback times used by either firms or consumers in savings calculation are too short.
- *Market power*: established companies guard their market position and market share. Newcomers need to establish a critical mass of supply at emerging markets.
- *Customs and routines*: humans keep to their customs and routines. New ones need to be established, leading to high cost for any pioneer.

(Slide 5)

Networks are important in that regard as new tools which are not only essential for supply of information but for the whole process of learning and knowledge generation (Slide 6).

Information and Knowledge Generation Crucial - Regions and Networks as Laboratories



- New networks among companies and civil groups
- Agencies can help to overcome information deficits

» Network of PSS agencies

» Databank with MFA data, public access

» Reporting & accounting requirements a useful tool

»» integrated analysis of law, economics, society

(Slide 6)

Networks among different actors including private societal and public actors serve as laboratories for processes of change at the level of regions. Later on, such change diffuses onto the level of nations and at the level of international processes of change.

We have undertaken some analysis on case studies of which I would like to highlight two. The ProKlima Fund has been introduced by the City of Hanover, primarily by a local energy utility (Slide 7). They have shared the financing source of that fund with the local municipality, thereby financing a fund which by and large promotes energy efficiency and climate protection at the level of small and medium size enterprises and private households. This fund has been designed to the deregulated energy market through the promotion of regional responsibility and innovation, and leadership at those firms. So what you see here is a high involvement

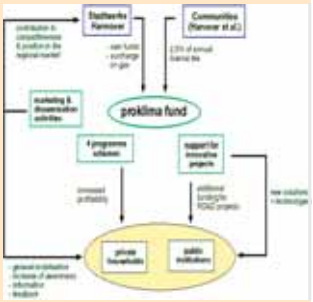
of an energy utility, with tight competition pressure and funding mechanism providing for relatively low transaction cost and decision making.

The second case study which I would like to share with you is called EcoProfit (Slide 8), which is a local platform for action undertaken at the level of quite a number of Mid-European cities not only driven by citizens but also driven by companies - largely by small and medium sized enterprises because that process offers those enterprises consulted for support, innovation and learning processes. It strengthens companies by cost reduction through minimization of waste etcetera. And it creates social environmental of qualification for where in fact investment decision can be taken easier in favor of certain environment relief. In the figure right hand is the city of Wuppertal experience where some investments towards sustainability have been undertaken jointly - with a positive "benefit to cost" ratio. Those examples might not be as radical as eco village on which we learned from Peter Harper and Mr. Kojima. But I would claim that these incremental steps are also quite important. They highlight the importance of transforming existing processes, existing enterprises, and existing communities into more sustainable ones.

"*ProKlima*": Cooperative Climate Protection Funding on a local Level (Hanover)

- Combines management interests (utility), consumer needs, & public local interests in the region of Hanover
- Promotes energy efficiency & climate protection
- Designed to a deregulated energy market through promotion of regional responsibility & innovation leadership
- Implements the declaration of German corporate sector on global warming prevention on a regional level.

=> High involvement of energy utility, funding mechanism at low transaction costs

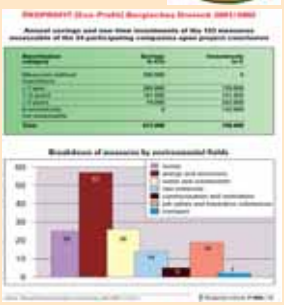


(Slide 7)

***Ecoprofit* - A Local Public Private Partnership Programme for Sustainable Development**

- Offers SME's consultative support
- Strengthens companies by cost reduction through minimisation of waste, emissions, etc.
- Creates social environment of qualification, innovation and trust via stakeholder dialogues

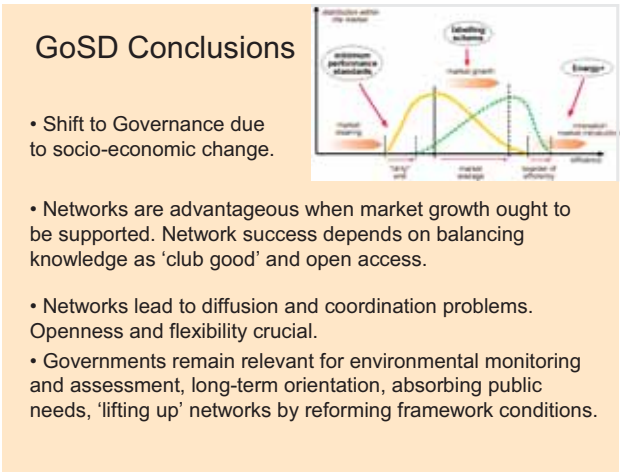
=> High flexibility, high involvement of SME's, horizontal diffusion



(Slide 8)

Let me now draw some conclusions on the governance issue (Slide 9). The overall shift to governance which is observed is mainly due to socioeconomic change. This is quite in parallel to what we learned from Mr. Stoughton on the shift to product service systems. It is not driven by sustainability issues. But governance processes become quite relevant when you look at emerging networks of

different actors. Governance via networks is beneficial when markets are in their infancy and any growth ought to be supported from, let's say, a niche market with two or three percent market share onto a larger market share of 10 or 20 percent. Such network success is depending on balancing knowledge between small minorities of people and open access. Open access sometimes is too costly. These networks are better advised to form a club offering advantages to what can be called club members. Energy+ schemes for electrical appliances may serve as an example where the market share has already been increased.



(Slide 9)

Nevertheless, over time those networks lead to new diffusion and coordination problems. The question is at the table: Who coordinates a variety of networks? How can openness and flexibility of networks be maintained, bearing in mind that networks might become sluggish and inert over time. For both reasons I would like to conclude that governments and public policies remain relevant for sustainable business in sustainable society. In particular purposes of environmental monitoring and assessment as well as long term orientation of society are public tasks. This reminds us indeed that federal level and international cooperation will always be important. But it should and can be driven by local activities and small and medium-sized enterprise.

(Slide 10)

I would like to close my short speech with this wonderful painting drawn from the "stations of Kisokaido" where it is said that ahead of us, above the hills is Kyoto and Kobe (Slide

10) - thank you very much for your attention.

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Gunjima:

Dr. Bleischwitz, thank you very much.

Naito:

I was hoping to get in some discussion at this point, but we are running out of time. In any case, our panelists have dropped us several hints as to how the hardware and service schemes will be related. It is our duty at IGES to come up with single solid working project over the next three years using the ideas we have been given today.

If we could, I would like each Prof. Yamamoto and Dr. Harper to give us their comments on the presentations we have heard today. Also, for Prof. Yamamoto, we have a question from the floor wanting to know what data is used for his estimate of energy resources drying up, which we heard earlier. So, if Prof. Yamamoto would be so kind.

Yamamoto:

Of our fossil fuels (energy), it is said that we have about 40 years of oil left, about 270 years of coal left and 100 years or more of natural gas. Well, my field of specialty is the exhaustion of metals. And, two weeks back, at the World Engineer Conference in Shanghai, which was held to the tune of some 3,000 participants, I heard Prof. Thomas Graedel of Yale University, USA and the founder of the academic society of industrial ecology, present recent data and talk about particularly zinc and copper. Prof. Graedel has researched the depletion of resources for many years. I can recall the various scenarios he painted for us, but one in particular was the depletion of zinc in 30 years time. In other words, high quality ore is gradually disappearing. Resource problems are, in a certain sense, energy problems and environmental problems. There is plenty of low quality resources, but to refine them, as Dr, Bleischwitz said, means serious environmental problems for resource rich nations. Relying on fossil fuels (energy) to refine the resources would accelerate and aggravate global warming. Accordingly, because no digging is actually done, depletion has already started. So, several metals will vanish in the mid 21st century

and, as I see it, society will have no choice but to switch to recycling of what already exists.

Naito:

Thank you, Prof. Yamamoto. Now, Dr, Harper, how about you please.

Harper:

I have been very impressed and rather inspired by the PSS discussions. And it seems to me that they have talked about protective niches which comes up over and over again. I think this is the place where new things can start. Traditional economists tend to look at them not realistic. But this is where new thing starts, they have to be grown, they have to learn, and they have to learn how to stand on their own feet.

I think that we could start looking for where the protective niches might be starting and it's probably where you get a combination over enlightened look authority and enlightened or progressive university department or institution as whom seen not to be examples around here, and maybe some important social enterprises are in the area. And in those places, you might start to find the B to B process actually happening in social enterprises. So may be transaction costs are lower there between social enterprises. So you could get some interesting models developing. I think also the B to C, business to consumers, also the transaction cost might be lower in the special circumstances. So we might be able to do some very interesting experimental dummy runs here I think in order to show how these things could work. It suggests interesting alliance between official parts of society and unofficial, sort of ideologically motivated parts of society. Thank you.

Yamamoto:

I will get to make the last comment about today's impression, so let me say this: it is simply impossible to resolve everything with a single solution. The method introduced by Ms. Yang seems rather effective in most part of China, but it is not likely to be applied to Shanghai or Guangzhou. What we are asked to do is to suitably combine various types of environmental solutions into one big project. Mr. Bjorn Stigson of the WBCSD was at the Shanghai meeting I talked about earlier. What caught my attention of things he said was that the capture and storage of carbonic gases such as CO2 -- and the same can be said of energy-saving

technologies - should be considered as a big project equivalent to the Apollo Project. If we don't do them, we're in trouble. It can be said of Lester Brown's Plan B and the themes of today's discussion; what I strongly believe that each of us has to do is to solidify our resolve with the willpower of the Apollo Project and political creativity, and undertake the tasks at hand across all of society.

Naito:

Thank you to both of you.

Imaginably, everyone is a little frustrated about the little amount of time for discussion despite the number of panelists today. Our hopes of fomenting a good discussion seemed to have backfired a bit and revealed just how stressing our schedule was. Please forgive our intentions. With that, I would like to now call an end to this session. Thank you, everyone.

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