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(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)



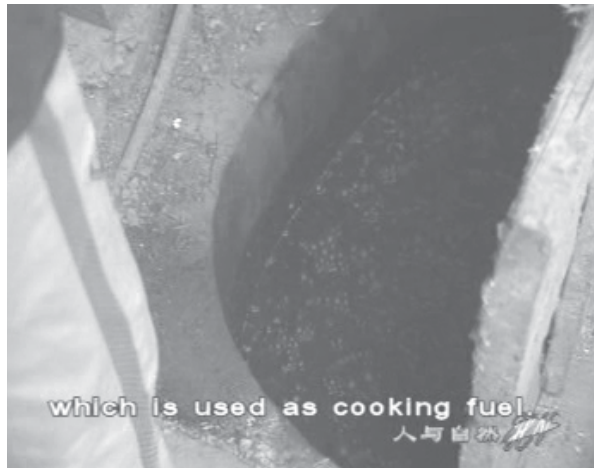
took out a 10,000 yuan loan and built the methane fermentation tank on the only piece of land he owned. SNISD guaranteed the loan from the local agriculture bank so that Nan Ji could borrow the money. However, Nan Ji failed five times because of technical issues and hard rains.

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)

\* \* \* \* \*

**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 counselling, 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

### **NPO Overview ③ Organization and Activities**

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- **Consists of individuals, businesses, organizations and special members. 41% of regular members are businesses.**
- **Research projects, policy proposals, seminars, tours, and exchanges with other organizations on an axis of 3 study groups: Forestry and lumber, Carbon utilization and CO2 emissions credit trading.**

(Slide 3)

### **Current Topics for a Sustainable Society① Confirmation of NPO Principles**

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- **Start by returning to the origin (Basic Concept of Hyogo Pref. Zero Emission for Green Society).**
- **Relearn about genealogy of environmental thought.**
- **From "zero emissions" to "eco village"!**

(Slide 4)

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.

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

**Current Topics for a Sustainable Society ② Policy Proposals**

- **Propose policies on global warming prevention, forest conservation and forestry promotion. (Public comment on taxes for environmental conservation, etc.)**
- **Propose policies that utilize the results of carbon utilization projects using food waste, etc. (Evaluation of effectiveness of soil improving agents and carbon sequestration effect, etc.)**

(Slide 5)

**Current Topics for a Sustainable Society ③ Research into Future General-Purpose Technology**

- **Systemization of technology for vehicle fuels (methanol, ethanol, DME, BDF, methane gas) of biomass origin.**
- **Commercialization of local biomass production from lignophenol and polylactic acid production.**
- **Diffusion of natural energy using high efficiency gasification technology for biomass.**
- **Hopes of finding answers by searching "Information and the environment".**

(Slide 6)

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.

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.

**Current Topics for a Sustainable Society ④ Partnerships with Local Communities and Residents**

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- **Search the possibilities of NPOs beginning with the "Ichinomiya Research Group for Zero Emission town".**

(Slide 7)

**Direction in Involvement with BBS Projects ① Eco Village Research**

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- **What is common to traditional eco villages like Atarashiki-mura, Yamagishikai, Myoga-mura, Yuuasha, Ittoen and the Amish community?**
- **Planning requirements and concepts of "Kyoto 0 District Eco Village".**
- **Case studies in and outside Japan.**

(Slide 8)

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.

\* \* \* \* \*

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.

**Direction in Involvement with BBS Projects ②**  
**Start of Ichinomiya Research Group for Zero Emission Town"** (Tentative Name) (1)

- Ichinomiya is a model area in Hyogo's Zero Emissions Initiative. Residents are very aware and take part in volunteer activities.
- NPOs are involved with the Wind Power Generation Project by three towns that include Ichinomiya and Wood Biomass Gasification and Power Generation Verification Project.
- A model area for biomass utilization measures (agricultural zero emissions) is required in Hyogo.
- Can share some results as case studies for BBS projects.

(Slide 9)

**Direction in Involvement with BBS Projects ②**  
**Start of Ichinomiya Research Group for Zero Emission Town"** (Tentative Name) (2)

- Set up research secretariat in NPO consisting of NPO, Ichinomiya, Ichinomiya Zero Emission Club for Green Society, Federation of Residents' Association, Forestry Cooperative, Hyogo Prefecture, etc. Add external members as necessary.
- Presently, the overall target is to build an agricultural area model and do planning simulations for the formation of a sustainable society by 2050.
- Launch study group after December 2004 and extend into next year. Ichinomiya will merge into Shiso City, therefore how to operate after the merger will be discussed separately.

(Slide 10)

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 "market-

**Orientation: What is a PSS?**

- As you will hear today, there is no single definition of a PSS.
- In this presentation, a PSS is:
  - "a marketable set of products and services capable of jointly fulfilling a user's 'need'"\*

The definition requires...

- a combination of products and services AND
- That this combination can be offered for sale

**BUT** The definition does not assume or require that PSSs are environmentally superior or that they result from a particular innovation process

\*Policy Document on Environment and Economy, Government of the Netherlands

(Slide 1)

able 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.

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,

**Where we were. . .**

- The US situation 5 years ago. . .
  - Tellus Institute assessed emergent trends in B2B PSSs. . .
  - Our focus was "servicizing," which we defined as:
    - The emergence of a class of product-based services; **manufacturers who traditionally delivered "products in a box" are increasingly viewing products as a vehicle or platform to deliver service or function.**
    - Today, we recognize "servicizing" as an important class of PSSs.

3

(Slide 2)

**Where we looked. . .**

- Case studies of 7 "early movers,"
  - focused on the servicing business case: motivation, challenges & implementation

|  |                                  |   |   |
|--|----------------------------------|---|---|
|  | White goods (Appliances)         | → | <b>Functional appliance sales</b>         |
|  | Lubricants; metal-working fluids | → | <b>Chemical management services</b>       |
|  | Chemicals & chemical products    | → | <b>Chemical management services</b>       |
|  | Chemicals & chemical products    | → | <b>Car-painting &amp; carpet services</b> |
|  | (Coro, Inc.) Office furniture    | → | <b>Post-occupancy services</b>            |
|  | Computer hardware & software     | → | <b>"Information solutions"</b>            |
|  | Document storage & reproduction  | → | <b>"Document services"</b>                |

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(Slide 3)

**Why we cared then. . . And now.**

- Fundamental structural change in wealthy economies is underway.
  - Services continue to grow in importance.
  - This structural transformation **will not** automatically result in a green economy. Why?

The service economy depends on the industrial economy.

Many of the fastest-growing, services sectors require corresponding growth in the most environmentally problematic products

e.g. IT hardware, vehicles, fuels

&

Environmental regulatory systems are strongly oriented towards *products and manufacturing processes*

Services are a "blind spot"

4

(Slide 4)

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)

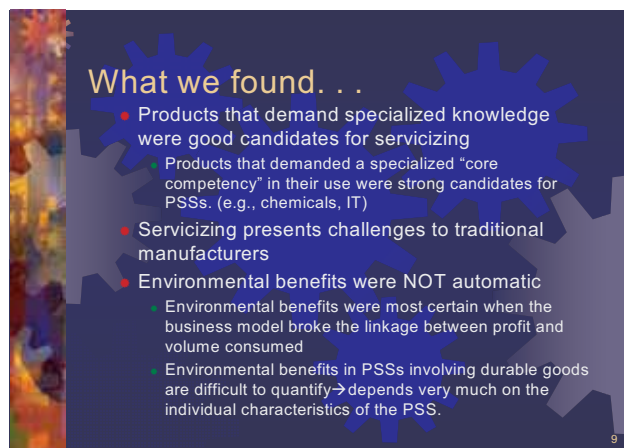
1. In the U.S. context, we found that business goals (like profit) were the major driver for PSS development, not environmental values or not regulatory considerations.

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 servicing or PSS approaches. Examples are chemicals and information



(Slide 5)

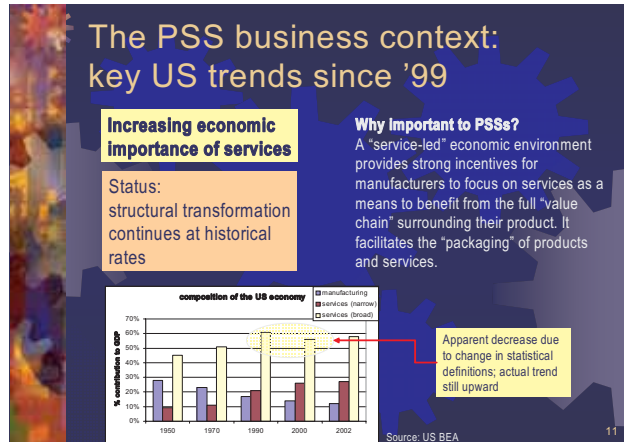


(Slide 6)

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.



(Slide 7)



(Slide 8)

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.

**The PSS business context: key US trends '99**

**Speed of change in information technology**

Status: **RAPID CHANGE CONTINUES**

**Why important to PSSs?**  
IT is one of the earliest and strongest sectors for B2B PSSs. Continued rapid change creates a strong market for services related to:

- End-of-Life management**—particularly as local and state regulations increase the cost of disposal
- Installation, maintenance, and training.**
- Rental/leasing.** Investment in rapidly obsolete capital is often not attractive to business

average lifespan of a personal computer

| Year | Average lifespan (years) |
|------|--------------------------|
| 2005 | ~3.5                     |
| 1990 | ~4.5                     |

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(Slide 9)

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.

**The PSS business context: key US trends '99**

**Environmental Regulation**

Status: **Highly mixed**

**Why important to PSSs?**  
EPR requirements can create markets for PSSs that solve end-of-life management problems for customers.

Regulation can create markets for PSSs in environmentally critical areas such as energy-efficiency services, chemical services, waste management services

**US Federal level:**  
no action on extended product responsibility—even in traditional EPR areas like fuel efficiency.

**state and local level:**  
increasing EOL requirements (e-waste). CO2 restrictions in some states?

**Europe:**  
international firms must respond to EOL requirements and substance bans

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(Slide 10)

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.

**The PSS business context: key US trends since '99**

**Consumer demand for green products**

Status: **HIGHLY MIXED**

**Why important to PSSs?**  
"green demand" can create markets for B2C PSSs explicitly focused on providing "greener solutions" (e.g., EOL management, car-sharing, etc.)

Green consumer preferences likely to translate into demand for corporate social responsibility (CSR)

**BUT...**

- Dominance of SUV sales
- lowest cost basis for retail competition
- focus on financial corporate responsibility, not CSR
- low-density suburban development

Organic foods industry records 20% sales growth in 2003; forecasts 18% growth over 2004-2008\*

carsharing organizations experience exponential membership growth.\*\*\*

SRI portfolios grow 50% faster than conventional portfolios over 1995 to 2003\*\*\*\*

"green-e certified renewable electricity sales up 86% in 2003\*\*"

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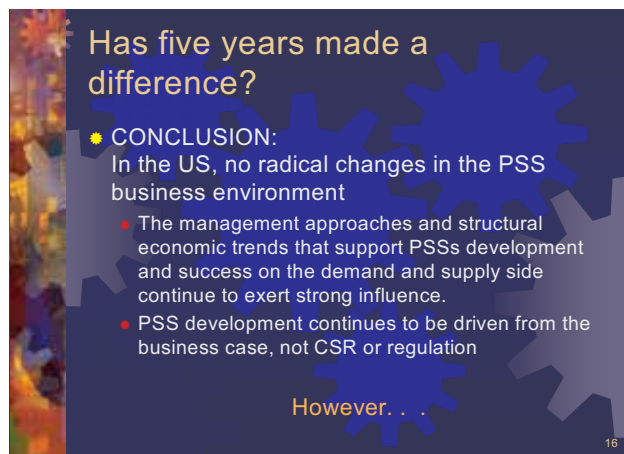
(Slide 11)

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.

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



**Has five years made a difference?**

- ★ **CONCLUSION:**  
 In the US, no radical changes in the PSS business environment
  - The management approaches and structural economic trends that support PSSs development and success on the demand and supply side continue to exert strong influence.
  - PSS development continues to be driven from the business case, not CSR or regulation

However. . .

16

(Slide 12)



**B2B PSSs with the greatest promise**

- ★ Continue to believe that the PSSs with the greatest potential are those that:
  - Separate profit from volume consumed in the procurement of essential, environmentally problematic goods and services
    - E.g. chemical management services
    - Performance-based energy contracting
    - Performance-based waste management

May not involve a purchased product, but all these business models are closely related: The source of profit is *efficiency services*. And they involve the *supplier in the customer's operations*.

19

(Slide 13)

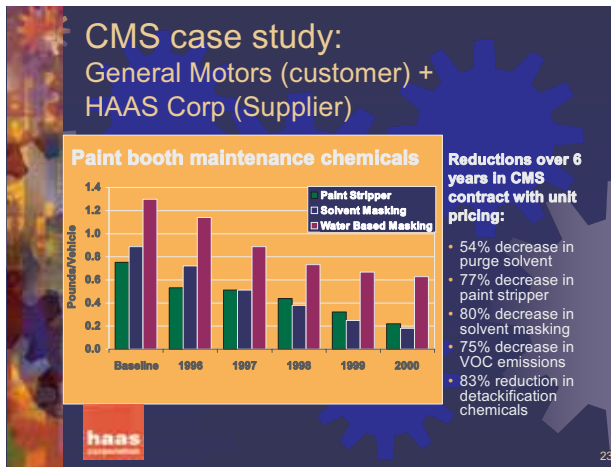
consumed in the procurement of essential environmentally problematic goods and services (Slide 13). Examples are chemical management services, energy services, and waste management.

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*.

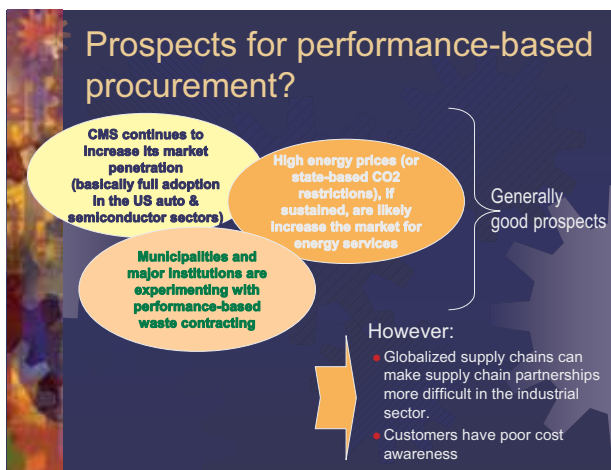
Function or performance-based procurement can yield very significant environmental results, as illustrated by this graph of chemical use reduction in an automotive painting operation (Slide 14).

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



(Slide 14)



(Slide 15)

**In conclusion. . .**

- B2B PSSs in the US will continue to expand, but. . .
  - Except for
    - performance-based procurement and
    - PSSs that focus on e-waste/end-of-life management
  - See no overall trend that will lead to environmental benefit from PSSs in the US B2B context.
  - The "challenge of services" largely remains before us. How do we assure that a service- and information-led economy is a green economy?

25

(Slide 16)

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?

\* \* \* \* \*

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

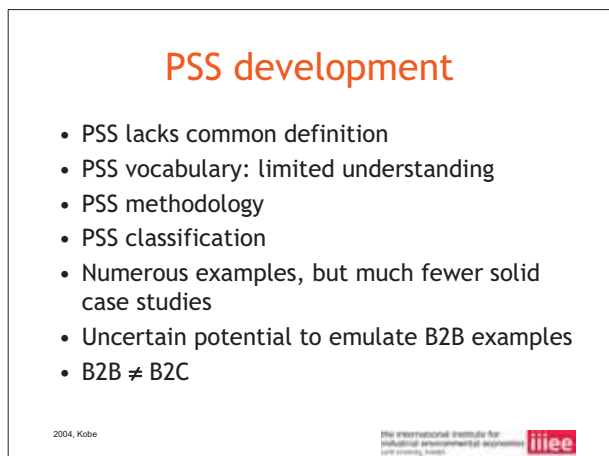
Good afternoon. Thank you very much for the opportunity to present the recent trends in product service systems in European Union.

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.

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



**PSS development**

- PSS lacks common definition
- PSS vocabulary: limited understanding
- PSS methodology
- PSS classification
- Numerous examples, but much fewer solid case studies
- Uncertain potential to emulate B2B examples
- B2B ≠ B2C

2004, Kobe

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2004, Kobe, Sweden

(Slide 1)

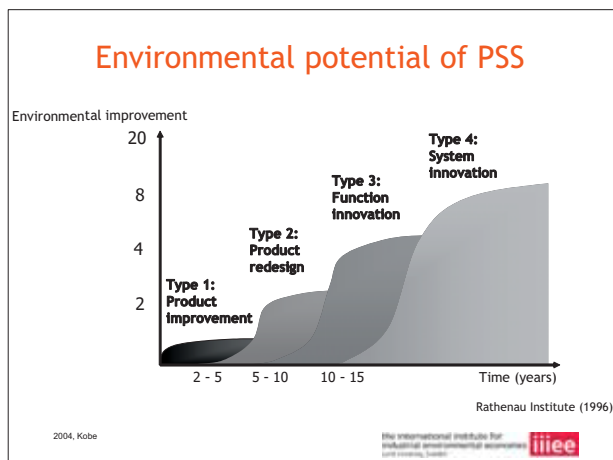


developed so that we can ensure if environmental impact is reduced or not by certain business models.

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.



(Slide 2)

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.

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.


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 evolution 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

### Lessons learned (1)

- New skills are needed for PSS development in companies
- Importance of developing and evaluating scenarios before actually implementing product-service systems
- The role of actors outside traditional supply chain: from B2B to B2C through new actors that are best suited to providing solutions to households

2004, Kobe




(Slide 3)

### Lessons learned (2)

- Success and failure factors for PSS development are similar for companies, but their combination and context (institutions+culture) are unique for each company
- Regulatory and normative frameworks should be set to promote systems with lower environmental impact (efficiency+sufficiency)

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(Slide 4)

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

### Lessons learned (3)

- Need to incorporate business and management knowledge
- Methodologies: each company or a network works in its own way - general steps but not the detailed prescriptions
- Environmental impacts can be reduced by systematic and targeted strategies

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(Slide 5)

### Future research directions (1)

- Development of new product-service systems
  - Illustrate possibilities and alternatives
  - Show higher level of integration along the value chain
  - Identify leverage points within networks
  - Balance environmental superiority and customer satisfaction with business viability and social soundness

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(Slide 6)

### Future research directions (2)

- Translation of scenarios into practice
- Probing PSS potential in many sectors
- How to build strategic alliances and resolve conflicts?
- Methods for evaluating new PSS
- Multi-disciplinary area - concerted effort and cross-fertilisation

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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.

### Future research directions (3)

- Research on customer satisfaction and social value systems
- Measure customer satisfaction with alternative solutions supported by cost-benefit evaluation
- Information dissemination about PSS
- Policy measures to promote PSS

2004, Kobe the international institute for industrial environmental economics **iiiee**

(Slide 8)

I will stop here, thank you.

\* \* \* \* \*

**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.

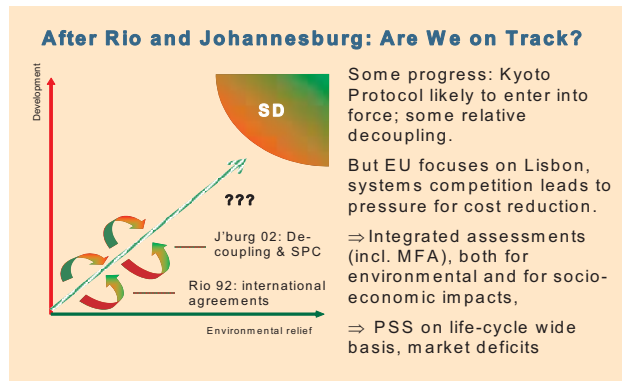


# Trends of Governance for Sustainability

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



(Slide 1)

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.

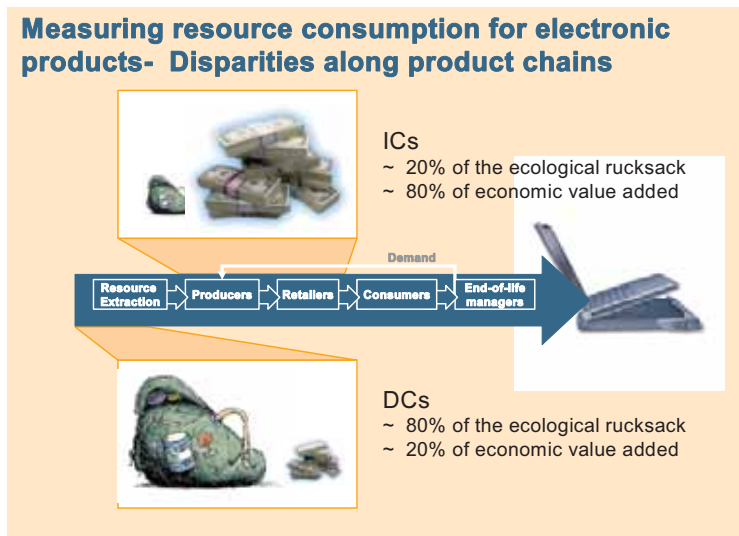
Looking at Europe, however, we see that the European Union policy makers' agenda largely focuses on what is called Lisbon agenda on how to increase

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



(Slide 2)

when one takes a closer look at the decoupling process.

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.

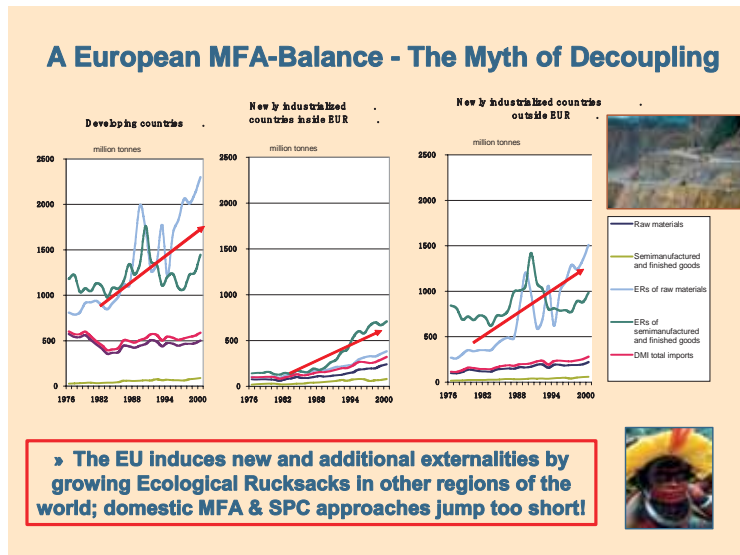
Let us now perhaps switch to what can be done at the level of nation's environment policies. I am pleased to share the information that German government

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.

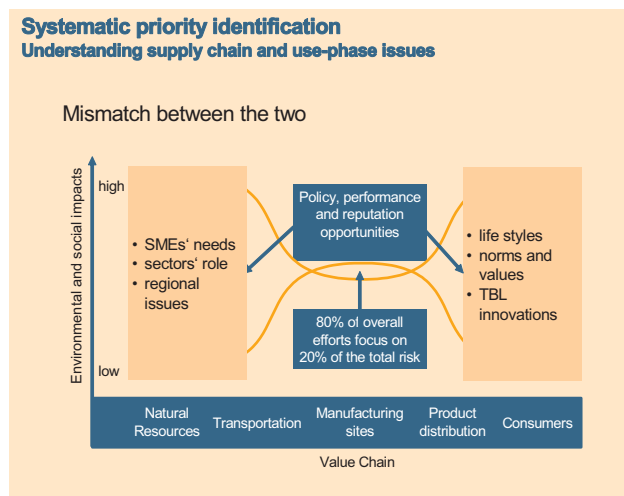
When we now look onto what regional actors and companies undertake, one observes progress mainly in the area of the manufacturing processes

(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



(Slide 3)



(Slide 4)

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.

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).

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

**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)

**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)

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

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

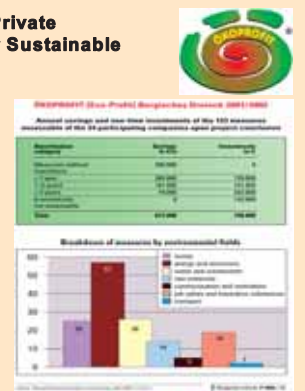
- Combines management interests (utility), consumer needs, & public local interests in the region of Hanover
  - Promotes energy efficiency & climate protection
  - Designed to a deregulated energy market through promotion of regional responsibility & innovation leadership
  - Implements the declaration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

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.

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

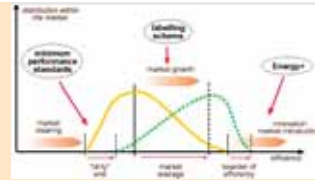
different actors. Governance via networks is beneficial when markets are in their infancy and any growth ought to be supported from, let's say, a niche market with two or three percent market share onto a larger market share of 10 or 20 percent. Such network success is depending on balancing knowledge 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.

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.

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

### GoSD Conclusions

- Shift to Governance due to socio-economic change.



- Networks are advantageous when market growth ought to be supported. Network success depends on balancing knowledge as 'club good' and open access.

- Networks lead to diffusion and coordination problems. Openness and flexibility crucial.

- Governments remain relevant for environmental monitoring and assessment, long-term orientation, absorbing public needs, 'lifting up' networks by reforming framework conditions.

(Slide 9)



(Slide 10)



10) - thank you very much for your attention.

\* \* \* \* \*

**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 CO<sub>2</sub> -- 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.