Session I: 3R Business Trends

Trends of 3R Businesses in Japan

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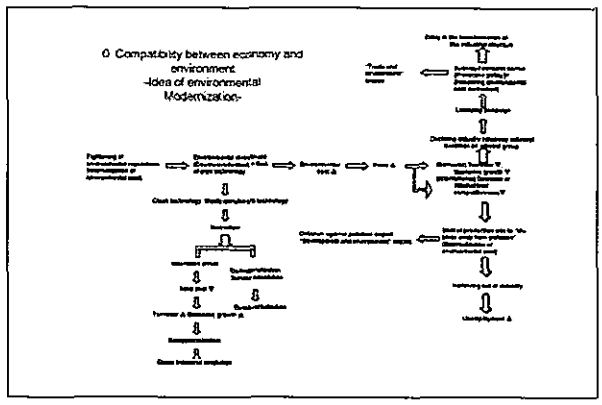
I would like to report today on the status and trends of the 3R business in Japan.

1 New trends in the 3R business

Currently, the Ministry for the Environment and the Ministry of Economy, Trade and Industry are conducting a market survey for the eco-business. In March this year, a committee meeting was held to decide upon the basic concepts for conducting this survey. As usual, interviews in line with OECD categories will be the core of forecasts, but the first point to be raised here is that globalization of the eco-business is moving in a new direction. What this means is that recycling in Japan is globalizing because of growing economic relationship with China. Moreover, the Chinese economy is growing dynamically and environmental limitations are gradually emerging. Japan's eco-business can prove useful in China, so it is predicted that the eco-business will grow further.

The second point concerns the 3R business. Untill now, the "3Rs" have been grasped as something static that appears in the basic environmental plans only. But the 3R business is becoming dynamic unto itself. That is because of the emergence of dematerialization that replaces goods with services, as is the case with servicizing and PSS (Product Service Systems). We should only begin to think about the eco-business after properly understanding the way the eco-business got started. The secretariat will watch the directions in which the eco-business goes as they conduct their market survey, which they plan to wind up before the end of this financial year.

2 Compatibility between economy and environment



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The background to the formation of the 3R business and eco-business is shown here. Until now, "economics and the environment were not compatible" and "raising economic profits and protecting the environment were a trade-off", but around the mid 1980s the idea of targeting "compatibility between economy and the environment" was conceived.

In Europe, the idea pops up in the debate over "ecological modernization". Moreover, Europe has seen a trend towards not only "compatibility between economy and the environment" but also "integration of the environment, economy and society".

The concept of ecological modernization goes like this. Business must invest more in the environment as

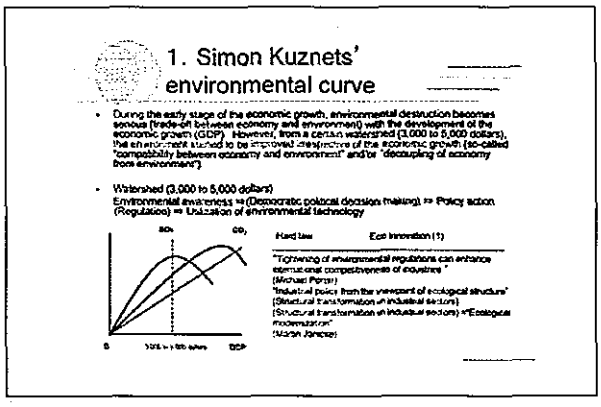
environmental costs is getting more and more internalized because of stronger environmental regulations. If they respond with end-of-the-pipe technology, that kind of environmental investment is non-productive. Under that scenario, if environmental costs rise and cannot be absorbed by internal efforts, the blame will be shifted to prices causing sales to drop, which slows economic growth on the domestic front and lowers competitiveness in international markets. One way to deal with this is, if domestic regulations are stiffened, to move production centers to a country or so-called "pollution heaven" where regulations are more relaxed or non-existent. This equates to the export of pollution. The business survives, but the pollution was moved from the country to abroad, which effectively externalizes environmental costs and postpones the efforts to find solutions to the problem to a later date. In consequence, domestic industry hollows and unemployment increases.

Another way to deal with increasing environmental costs is the lobbying activities of the steel industries, though they are in decline today. The steel industry was regulated heavily during its heydays of the 1960s through 1970s. In the industrial structures of the time, the steel industry carried a lot of influence, so they pooled their assets and started lobbying for subsidies. And, they tried protecting themselves by calling for non-tariff barriers. These lobbying activities emasculated environmental costs. This greatly delayed the conversion of industrial structure. Though the export of pollution and lobbying activities may help a business to survive, the macro-view of finding compatibility between economics and the environment becomes difficult.

In contrast to this, "eco-innovation" has become a recent trend. Instead of adopting non-productive end-of-the-pipe technologies, there are towards, preventative type "clean technologies" and "waste enrichment technologies" that make rich use of untapped resources.

By stirring eco-innovation, the costs that were spent on ex post facto end-of-the-pipe measures can be offset elsewhere, even if investment is required, to bring down the overall cost. And, by addressing the environment, economic profits rise and industry can be reactivated via reindustrialization and become more eco-friendly.

Another approach is to conserve resources and switch to services to promote "dematerialization". Because of servicizing and PSS (Product Service Systems), "deindustrialization" and "service economy" are growing.

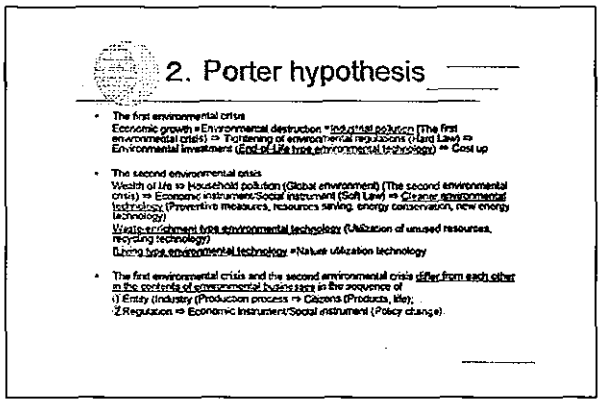


This describes Simon Kuznet's environmental curve. Kuznet's curve does not indicate the environment per se, as Kuznet himself argued that "in the early staged of economic development, the difference in income level is great, but the gap closes as a certain level of income is attained". Nonetheless, when expressed in terms of environmental problems, though environmental destruction becomes severe alongside economic growth, at a certain point (GDP$3,000 to 5,000), the environment improves despite economic growth. The economy and the environment become compatible or decoupled. There are various explanations as to why Kuznet's environmental curve works. One is that, if the economy develops, the environmental awareness of the people increases to some degree. If there is a democratic process for making decisions, policies are formulated to counter the problems and basic regulations are set. Business then technically responds to the environ-

ment by means such as eco-innovation, making compatibility between economics and the environment possible. This can be seen in Japan's environmental policy. Based on that, Michael Porter of Harvard University claimed that "tightening of environmental regulations can enhance international competitiveness of industries". Later, Porter rephrased himself to say "appropriate regulations", but he still advocates that "appropriate regulations spur eco-innovation and lead to corporate profits".

Martin Janicke of Berlin University said something similar. He grabs the situation from both sides by advocating two policies, one that converts industry to a low environmental load structure by the "structural transformation between industrial sectors" and one that reduces use of resources and energy on a source basis, as "structural transformation within industrial sectors". This, as he puts it, would promote ecological modernization and convert industry to a structure that exist in harmony with the environment.

The Kuznet's curve phenomenon concerning environmental pollution measured in ppm such as air and water pollution takes effect roughly in the GDP $3,000 to 5,000 range. By the way, with CO_2 and waste, GDP offers an even better position. Owing to international conventions, the CO_2 gap has finally started to close little by little. Accordingly, for what regards pollutants, there is correspondence in the first and second environmental crises. As a recycle-oriented society and carbon-neutral society develop, Kuznet's curve is expected to gradually lower because of waste



and global warming measures.

In Porter's theory, the first environmental crisis was met with end-of-the-pipe technologies, but the second has brought out cleaner technologies, waste enrichment technologies and living technologies.

Cleaner technologies are not the conventional therapeutic approach to pollution outbreaks; they are preventive technologies that conserve resources and energy. Waste enrichment technologies look at waste as an untapped resource and renewable resource. Living technologies use the natural environment itself. They smartly use natural elements in what is known as "bio-mimicry".

For example, there are technologies that develop biodiesel fuels (BDF) as alternative fuels by using oil from vegetable flowers or palm oil. Also, the wax from scale insects, which are harmful to agriculture, is being used as a raw material for the shiny side of thermal paper. Also, the fats- in natural chocolate separated when chocolate solidified, is being used as an emulsifier.

New energies such as solar power and wind power qualify as living energies. These technologies both support the environment and help reduce costs.

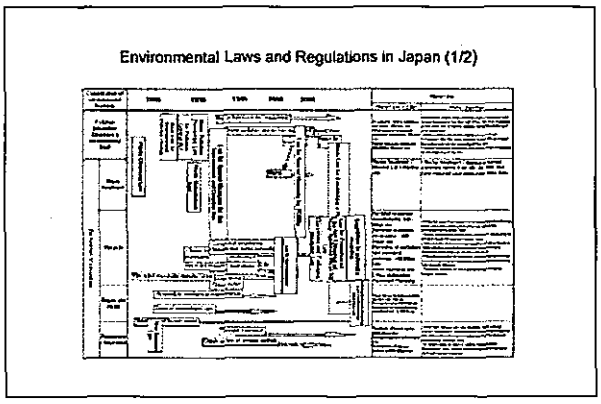
Whereas industry took action to reduce environmental load in production processes in the first environmental crisis of the 1960s and 1970s, the second environmental crisis changed to action aimed at reducing environmental load in the way people live. Moreover, regarding policy, not only regulations (hard law) but social instruments such as economic measures and volunteer action (soft law) were also introduced, converting the essence of the eco-business.

Along this line of development, not only do the economy and the environment become compatible but also the eco-business increases jobs. Some welfare states today are converting from welfare to workfare by changing their policy of helping the unemployed ex post facto to a preventative policy that prevents unemployment. Scandinavia has started to "integrate the environment, economy and society"

to protect the environment and secure new jobs. They are promoting the conversion to an industrial structure that will foster businesses of low environmental load, by shifting the tax base from goods that increase jobs to the bads that destroy the environment.

3 Background to Japan's eco-business

The development of the eco-business in Japan is related to the country's environmental laws and regulations. In the 1970s, the Air Pollution Control Law and the Water Pollution Prevention Law came out, stirring business in the pollution prevention systems to support that.



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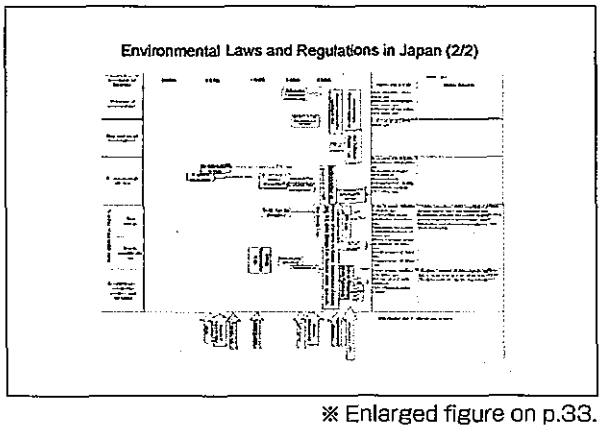

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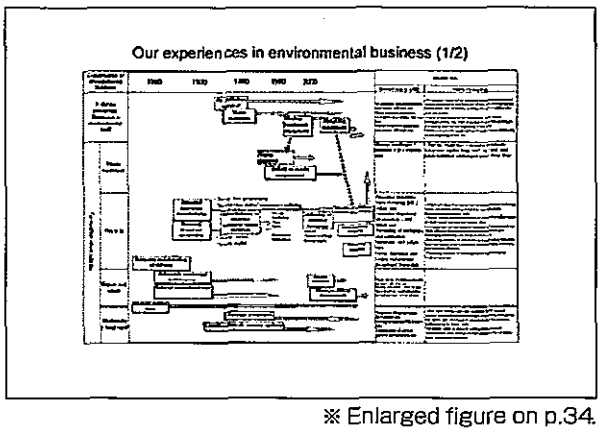

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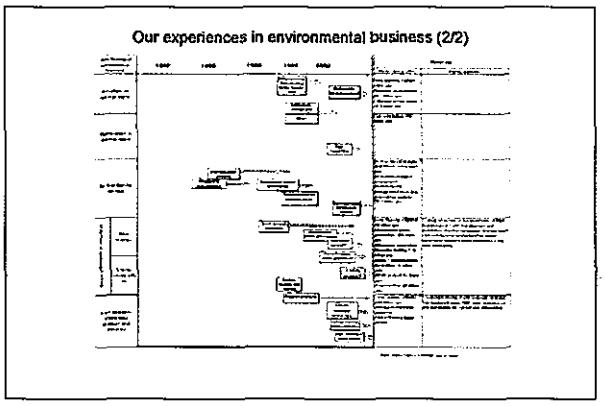

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In the year 2000, the Fundamental Law for Establishing a Sound Material-Cycle Society, which supports the 3R business, the theme of today's conference, was established. Also, in and around 2000, several laws were passed to address global warming. If you compare this to the following slides on "Our Experiences in Environmental Business", you can see how the eco-business emerged alongside regulations.

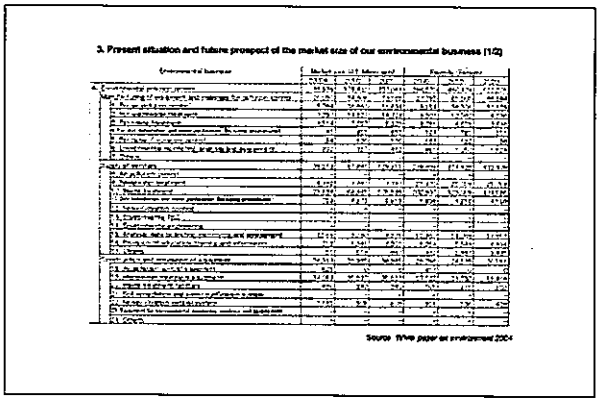
In particular, a number of recycling laws related to the 3R business came out in the mid 1990s. The Containers and Packaging Recycle Law, Home Appliance Recycling Law, End-of-Life Vehicle Recycling Law, Food Recycling Law and Construction Material Recycling Law were established. These laws were all significant in the development of the eco-business. For example, after the establishment of the Containers and Packaging Recycle Law, the development of monomerization technology for PET bottles progressed and technological development picked up for high temperature furnace reducing agents (chemical recycling) and gasification for plastics.

Regarding home appliances, after the oil crisis of 1973, energy conservation technology progressed and, following later amendments to the Energy Con-

servation Law, the "top runner" system further pushed energy conservation with home appliances. Also, material recycling technology progressed because of the Home Appliance Recycling Law.

With regards to vehicles, emissions regulations and the End-of-Life Vehicle Recycling Law promoted the development of fuel conservation and recycle technology, and led to the development of internationally competitive vehicles.

With the Food Recycling Law, technologies were developed for composting, fertilizer production and methane gas fermentation as a biomass strategy. However, biomass has not gone well, therefore biodegradable plastics were developed using the poly lactic acid in raw waste.



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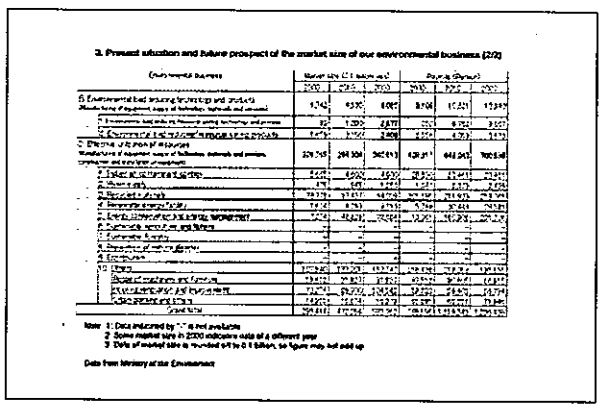

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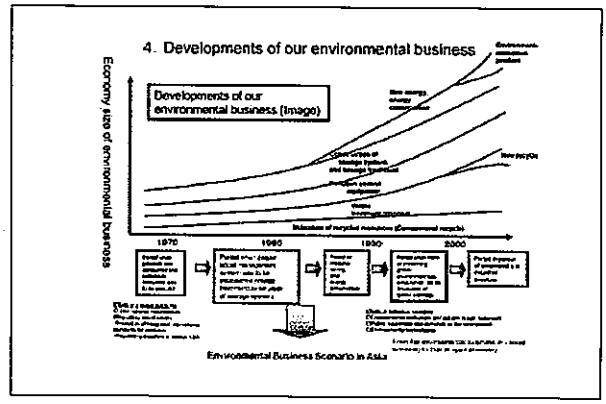
This table summarizes the current and forecasted size of Japan's eco-business market in the year 2010 and 2020. It can be understood that business involved with the effective utilization of resources (C) is growing against the businesses of environmental pollution control (A) and environmental load reducing technologies and products (B). If looked at individually, the market size for renewable energies and eco-friendly products is growing over technology for preventing air pollution and treating wastewater. The environmental pollution control business (A) in Japan is already matured, but these technologies are expected to develop in Asia and particularly in China. In contrast, what is important to Japan is the global warm-



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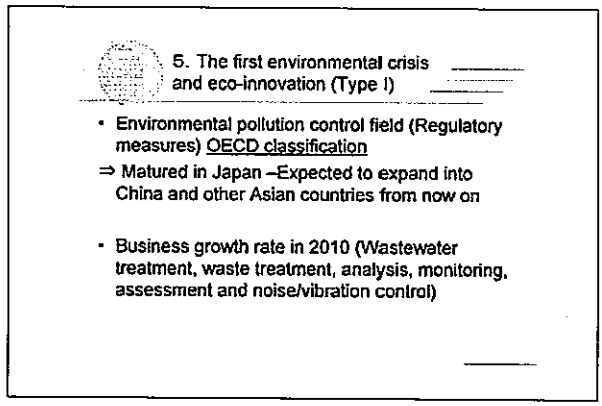
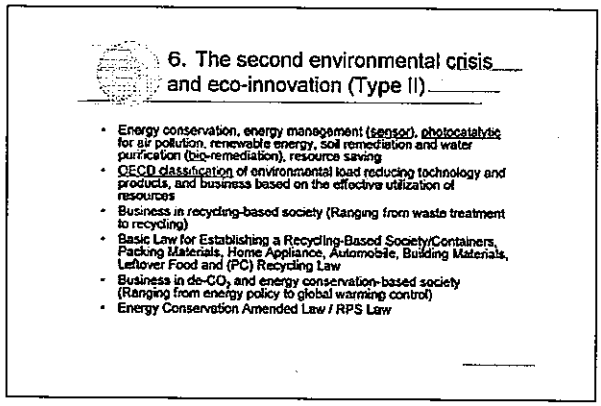
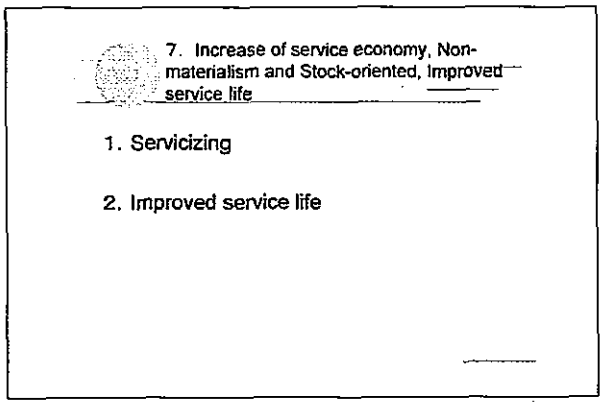


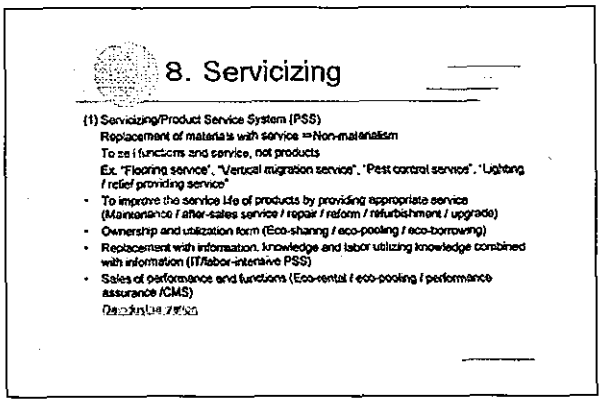


ing prevention business and 3R business.

4 "Servicizing" and "improved service life"



Two important aspects of the 3R business are "servicizing" and "improved service life".



Servicizing and PSS (Product Service System) sell services as opposed to products. Business is converting from eco-friendly products that reduce environmental load to reducing environmental load in the processes that make those products and "dematerialization" via innovation in how things are sold and purchased and service-based alternatives. For that reason, services and functions are sold instead of products. Various kinds of business have emerged because of servicizing and PSS.

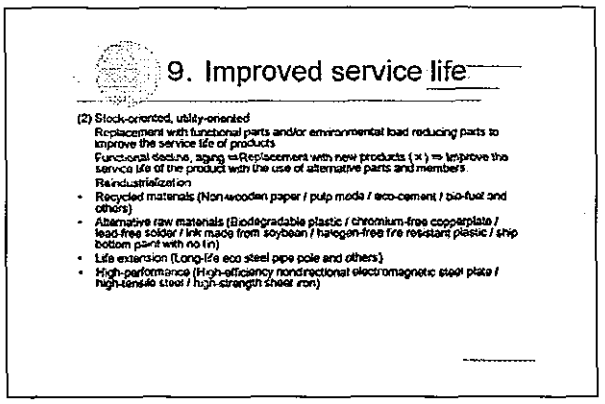
For example, instead of selling agrochemicals, insect removal services eradicate insects using minimal chemicals and, instead of selling fluorescent bulbs, the lighting/relief providing service provides lighting.

As services that improve the service life of products, there are maintenance, after-sales services, repairs, renovation, refurbishing, upgrades, etc.

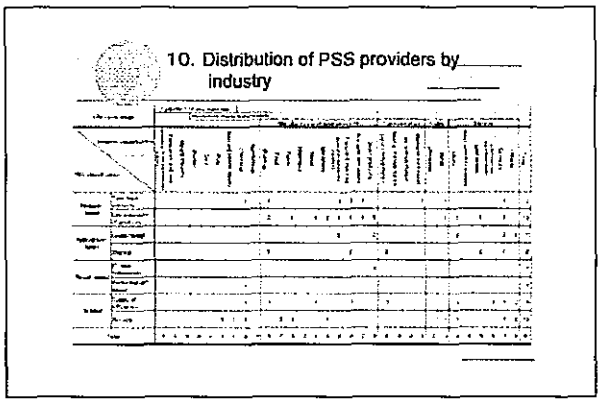
As ownership and usage type businesses, there are car-sharing, car-pooling, car-borrowing and so forth. There area also IT and labor intensive PSS as well.

As examples of servicizing, there are services that sell performance and functions such as car-rental, car-pooling, performance assurance and CMS (Chemical Management Systems).

Because of servicizing, a 3R business that aims at deindustrialization is likely to progress.



Another idea is "improved service life": prolonging the service life of products. With it, product usage is prolonged with recycled materials and alternative materials of low environmental load. Also, long-life (i.e., long-life eco-steel pipe pillars, etc.) and sophisticated products are emerging.



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In our BSS Project at IGES, we are currently doing case studies of PSS development in Japan. The vertical axis in this figure represents the PSS in Japan, while the horizontal axis is the industries throughout

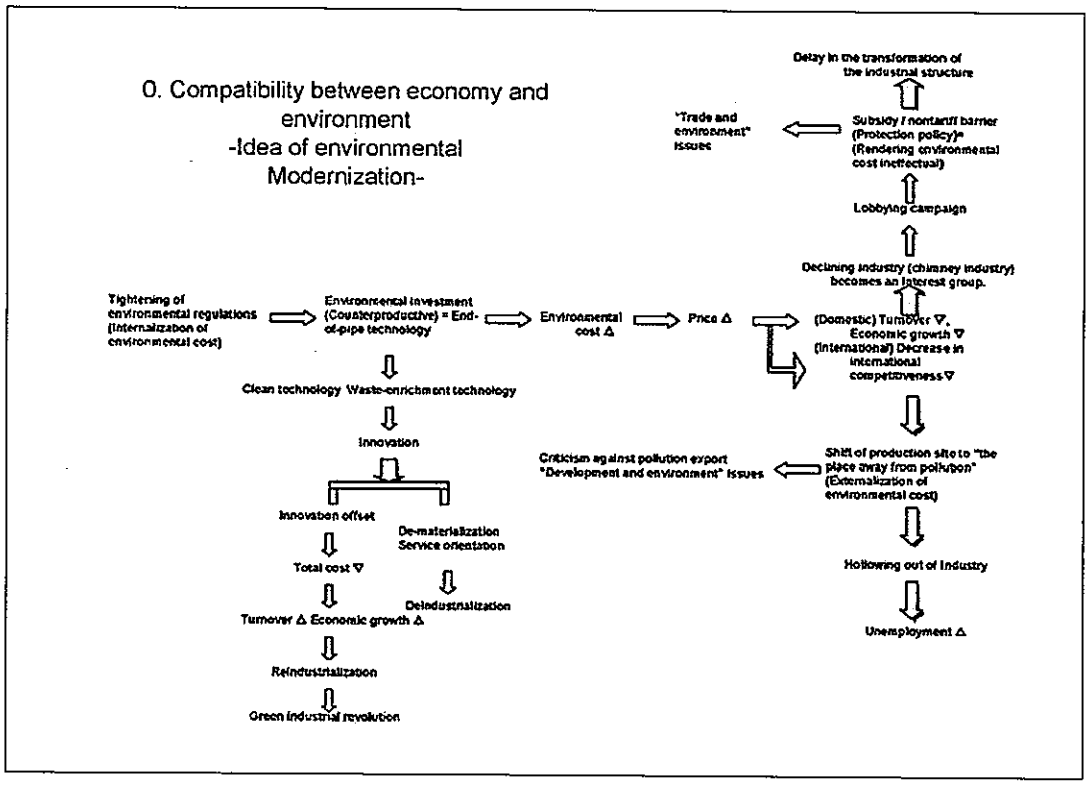
the lifecycle of a product. Here, PSS is overwhelmingly strong in sales and services areas, which have little upstream materials.

An innovative material-based PSS would be material leasing, which leases raw and processed materials. Material leasing leads to the ultimate 3R in services. Nevertheless, cascade recycling is done in Japan because the quality of the materials worsens. Via this cascade recycling, the sphere of recycling has gone beyond Japan to the entire world with materials going everywhere. Accordingly, the material industry is not recycling along horizontal lines as before but in a cascade form, therefore few PSS cases are found in the materials industry.

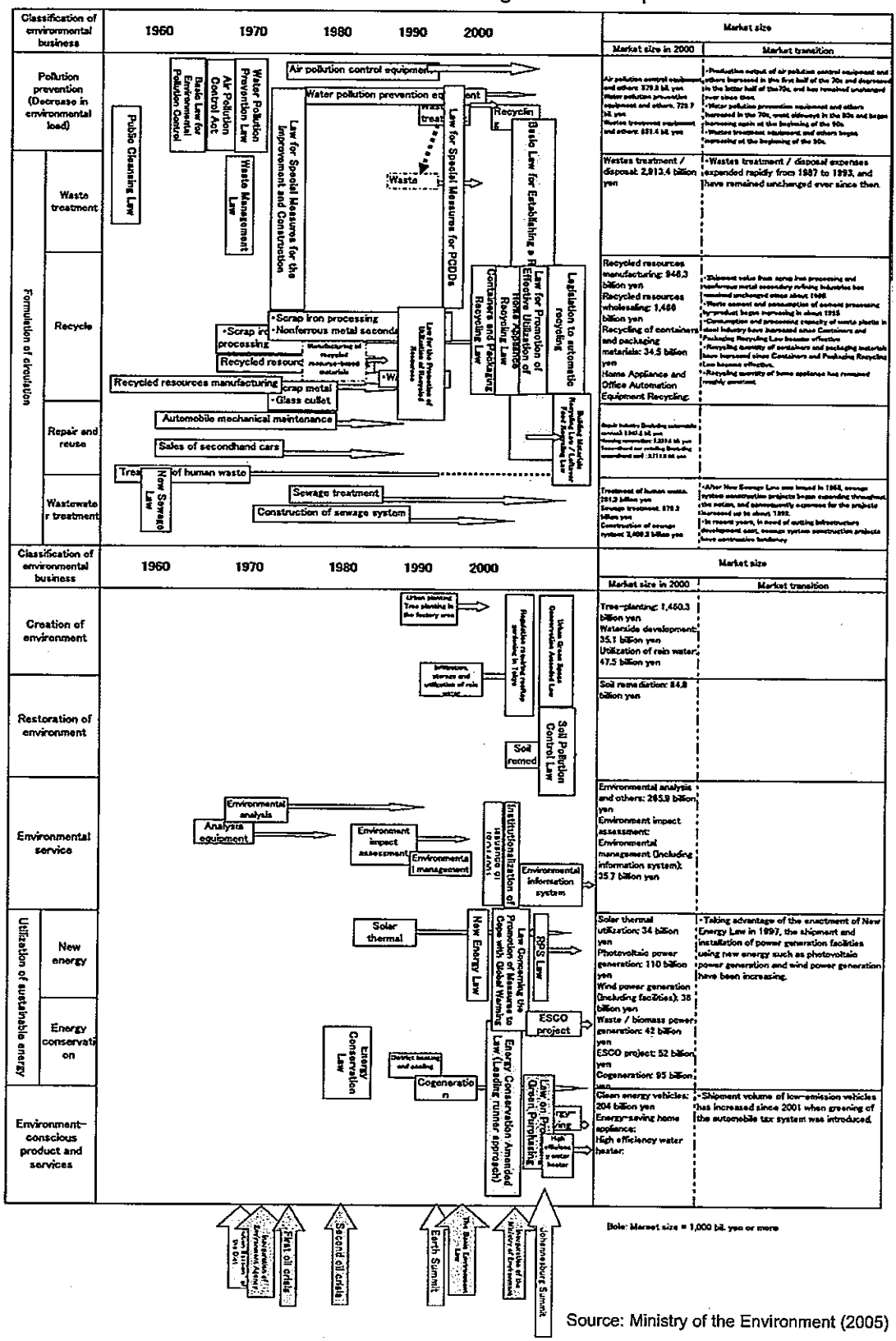
However, it is not completely zero; in ceramics producing areas, waste ceramic is being recycled into new ceramics. A community business has been launched to collect broken ceramic ware and mix it with clay to create recycled ceramic works.

The reason why there are so few cases of PSS in the materials industry is that the search for alternative materials, such as functional materials that prolong service life and recyclable materials of biological origin, is being promoted as an industry.

In the recycle-oriented society of the future, servicizing will likely be developed as a business and industries that enhance the functioning of materials and prolong the service life of materials of low environmental load will likely emerge. By looking at the eco-business dynamically rather than statically, the next direction of the 3R business will likely become clear.

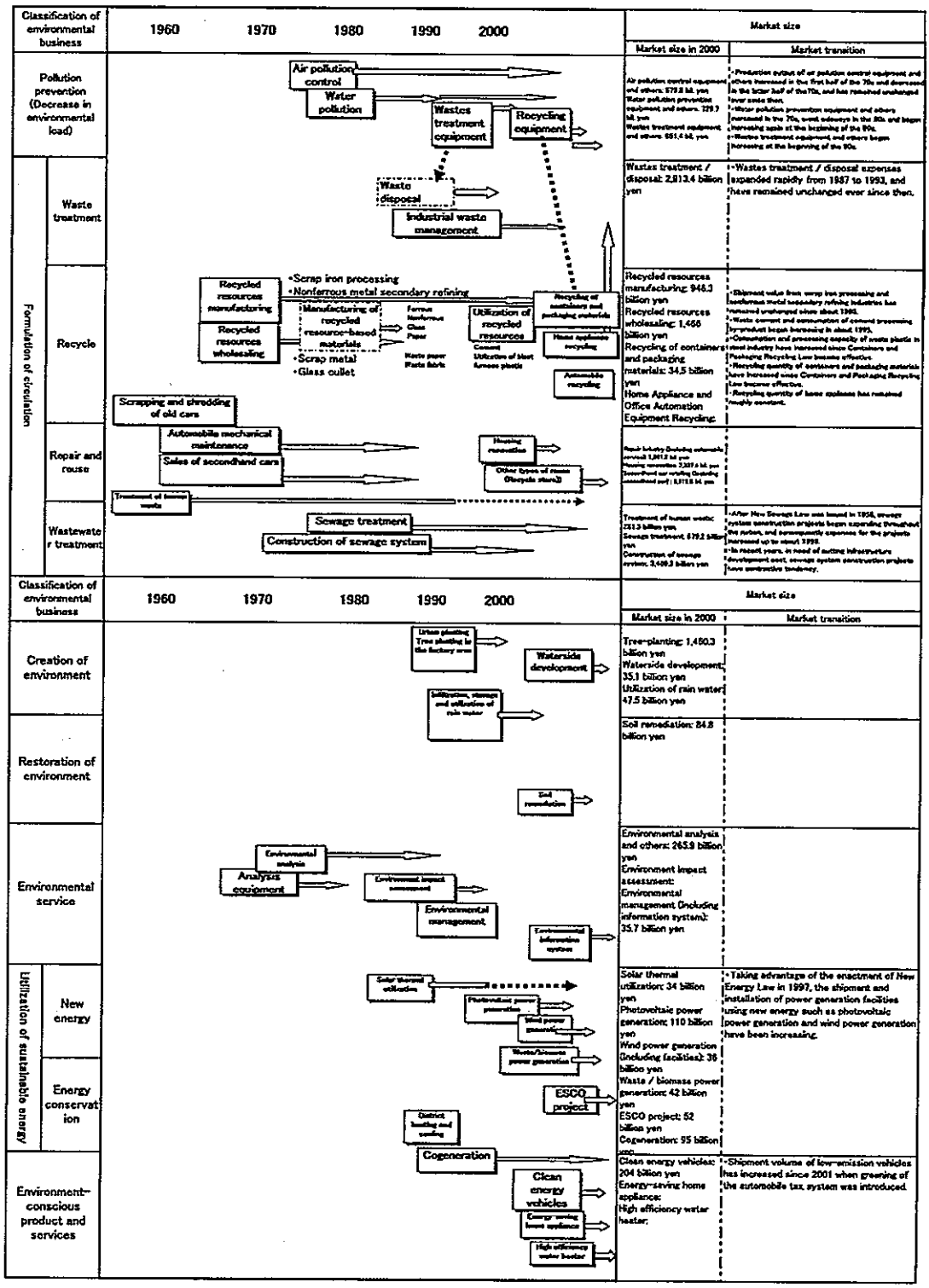

0. Compatibility between economy and environment
-Idea of environmental Modernization-
Tightening of environmental regulations (Internalization of environmental cost)
Environmental investment (Counterproductive) = End-of-pipe technology
Environmental cost Δ
Price Δ
(Domestic) Turnover ▽, Economic growth ▽
(International) Decrease in international competitiveness ▽
Delay in the transformation of the industrial structure
Subsidy / nontariff barrier (Protection policy)= (Rendering environmental cost ineffectual)
"Trade and environment" issues
Lobbying campaign
Declining industry (chimney industry) becomes an interest group.
Clean technology Waste-enrichment technology
Innovation
Innovation offset
De-materialization
Service orientation
Total cost ▽
Deindustrialization
Turnover Δ Economic growth Δ
Reindustrialization
Green industrial revolution
Criticism against pollution export "Development and environment" issues
Shift of production site to "the place away from pollution" (Externalization of environmental cost)
Hollowing out of industry
Unemployment Δ

Environmental Laws and Regulations in Japan



Source: Ministry of the Environment (2005)

Japanese Experiences in Environmental Business



Bold: Market size = 1,000 bil. yen or more

Source: Ministry of the Environment (2005)

3. Present situation and future prospect of the market size of our environmental business (1/2)

Environmental business	Market size (0.1 billion yen)			Payrolls (Person)		
	2000*	2010	2020	2000	2010	2020
A. Environmental pollution control	95,936	179,432	237,064	296,570	460,479	522,201
Manufacturing of equipment and materials for pollution control	20,030	54,606	73,168	27,785	61,501	68,684
1. For air pollution control	5,788	31,660	51,694	8,154	39,306	53,579
2. For wastewater treatment	7,297	14,627	14,728	9,607	13,562	9,696
3. For waste treatment	6,514	7,037	5,329	8,751	6,676	3,646
4. For soil remediation and water purification (including groundwater)	95	855	855	124	785	551
5. For noise / vibration control	94	100	100	168	122	88
6. Environmental monitoring, analysis and assessment	232	327	462	981	1,050	1,124
7. Others	-	-	-	-	-	-
Supply of services	39,513	87,841	126,911	238,889	374,439	433,406
8. Air pollution control	-	-	-	-	-	-
9. Wastewater treatment	6,792	7,747	7,747	21,970	25,059	25,059
10. Waste treatment	29,134	69,991	105,586	202,607	323,059	374,185
11. Soil remediation and water purification (including groundwater)	753	4,973	5,918	1,856	4,218	4,169
12. Noise/vibration control	-	-	-	-	-	-
13. Environmental R&D	-	-	-	-	-	-
14. Environmental engineering	-	-	-	-	-	-
15. Analysis, data collecting, monitoring and assessment	2,566	3,280	4,371	10,960	14,068	17,617
16. Provision of education, training and information	218	1,341	2,303	1,264	5,548	8,894
17. Others	50	519	987	332	2,487	3,481
Construction and installation of equipment	36,393	36,985	36,985	29,796	24,539	20,111
18. Air pollution control equipment	625	0	0	817	0	0
19. Wastewater treatment equipment	34,093	35,837	35,837	27,522	23,732	19,469
20. Waste treatment facilities	490	340	340	501	271	203
21. Soil remediation and water purification system	-	-	-	-	-	-
22. Noise/vibration control system	1,185	809	809	956	536	439
23. Equipment for environmental monitoring, analysis and assessment	-	-	-	-	-	-
24. Others	-	-	-	-	-	-

Source: *White paper on environment 2004*

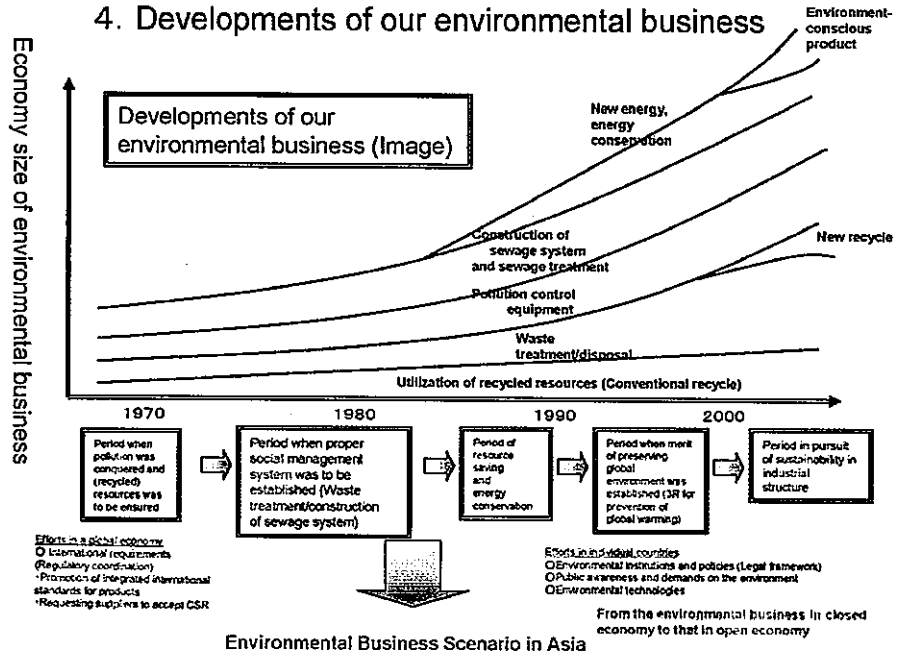
3. Present situation and future prospect of the market size of our environmental business (2/2)

Environmental business	Market size (0.1 billion yen)			Payrolls (Person)		
	2000	2010	2020	2000	2010	2020
B. Environmental load reducing technology and products (Manufacturing of equipment, supply of technology, materials and services)	1,742	4,530	6,085	3,108	10,821	13,340
1. Environmental load reducing/resource saving technology and process	83	1,380	2,677	552	6,762	9,667
2. Environmental load reducing/resource saving products	1,659	3,150	3,408	2,556	4,059	3,673
C. Effective utilization of resources (Manufacturing of equipment, supply of technology, materials and services, construction and installation of equipment)	201,765	288,304	340,613	468,917	648,043	700,698
1. Indoor air contaminant control	5,665	4,600	4,600	28,890	23,461	23,461
2. Water supply	475	945	1,250	1,040	2,329	2,439
3. Recycled materials	78,778	87,437	94,039	201,691	211,939	219,061
4. Renewable energy facility	1,634	9,293	9,293	5,789	30,449	28,581
5. Energy conservation and energy management	7,274	48,829	78,684	13,061	160,806	231,701
6. Sustainable agriculture and fishery	-	-	-	-	-	-
7. Sustainable forestry	-	-	-	-	-	-
8. Prevention of natural disaster	-	-	-	-	-	-
9. Eco-tourism	-	-	-	-	-	-
10. Others	107,940	137,201	152,747	218,436	219,059	195,655
Repair of machinery and furniture	19,612	31,827	31,827	93,512	90,805	66,915
Housing renovation and improvement	73,374	88,700	104,542	59,233	59,403	56,794
Urban planting and others	14,955	15,674	16,379	65,691	68,851	71,946
Grand total	299,444	472,266	583,762	768,595	1,119,343	1,236,439

Note 1: Data indicated by "-" is not available.
2: Some market size in 2000 indicates data of a different year.
3. Data of market size is rounded off to 0.1 billion, so figure may not add up.

Data from Ministry of the Environment

4. Developments of our environmental business



Environmental Business Scenario in Asia

10. Distribution of PSS providers by industry

Life cycle stage		Collection of raw materials	Manufacturing of end-products																			Transportation			Sales		Service							Total
Industry classification / PSS classification		Agriculture, forestry and fishery	Petroleum and coal	Mining industry	Rubber	Iron	Pulp	Glass and ceramic industry	Chemical	Nonferrous	Building	Food	Fabric	Pharmacy	Metal	Machinery	Transport machine	Precision instruments	Other products	Land transportation	Marine transportation	Air transportation	Warehouse and transport	Wholesale	Retail	Library	Real estate	Services	Others					
Product-based	Take back products								1		1						3	3	1				1		1				1					12
	Life extension of products										2		1		1	3	1	1	1	5					1	1		1		1				19
Application-based	Lease/rental																2			2						2			2	2			10
	Sharing										1							2			2							2		1				8
Result-based	IT, non materialism																			1														1
	Performance-based									1																								1
Related	Supply of efficiency									1	1					1			3		3							1		3	1	2		16
	Recycle							1	1	1		2	2			1									1			1			1	2		13
Total		0	0	0	0	0	1	1	4	0	5	2	3	0	2	4	6	9	2	8	5	0	0	1	0	3	5	0	3	3	7	6		80