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Is Resource Efficiency a Solution for Sustainability Challenges?

Japan's Sustainable Strategy and Resource Productivity Policy in the 21st Century

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Surveys

Is Resource Efficiency a Solution for Sustainability Challenges? –Japan’s Sustainable Strategy and Resource Productivity Policy in the 21st Century–

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Abstract *After the earthquake, tsunami and Fukushima nuclear incident in North East Japan in March 2011, there is increasing discussion of reconstructing the damaged areas in an environmentally sustainable manner in Japan. The politicians are beginning to argue that this is an opportunity to reconstruct Japanese society in a more sustainable manner. This paper attempts to examine whether there are potential visions of a sustainable Japan in the future in Japan’s strategy for sustainability and environmental management in the 1990s to the 2000s. The paper argues that Japan’s sustainability strategy can be characterized by its emphasis on improving resource productivity by recognizing environmental challenges as opportunities for further technical progress, innovation, and industrial competitiveness. Then, the paper seeks to further clarify such characteristics of the strategy for sustainability by examination of Japan’s sound material-cycle policy since the 1990s until 2010, with particular attention given to recycling policies that are based on the concept of Extended Producer Responsibility (EPR) and the eco-town program for establishing a recycling infrastructure. After arguing that national interest on policy for increasing resource productivity may not be universal but may depend on difference in industrial structure of the country, the paper overviews and analyzes three recent sustainability strategies developed by the Ministry of the Environment of Japan and the Government of Japan in the past few years. They are “Strategy for an Environmental Nation in the 21st Century” in 2007, “Clean Asia Initiative” in 2008, and “New Growth Strategy” in 2010. By doing so, the paper argues that Japan’s sustainable strategy continues to emphasize “increasing efficiency”. It then concludes that it is a time to give greater emphasis to total reduction of the environmental impact of production and consumption to achieve the next step of sustainability for Japan and elsewhere in the world.*

Keywords: Japan, National strategy for sustainable development, Resource productivity, Green innovation, Sound material-cycle society.

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1. ECOLOGICAL MODERNIZATION AND JAPAN

Japan's strategy for environmental management and sustainability after the 1990s can be characterized as the harmonization of environmental conservation and economic competitiveness by the pursuit of eco-efficiency (in other words, energy efficiency and resource productivity). This is in keeping with the concept of Ecological Modernization, a conceptualization of a shift in environmental policy and management from the 1980s to the 1990s in Western Europe and Japan. There are several attempts to explain the characteristics of Japan's environmental policy and sustainable strategy after the 1990s by the concept of Ecological Modernization, such as those by Barrett (2005) and Hotta (2004).

Ecological Modernization (EM) provides the idea that economic growth and environmental protection are essentially complementary (Dryzek, 1997). In a discourse of ecological modernization, environmental problems are considered to be opportunities rather than troubles to "a restructuring of the capitalist political economy along more environmentally sound lines." (Dryzek, 1997, p. 141)

The concept of efficiency is a crucial and most significant notion for businesses and advocates of EM-type policy discourse. Robert Ayres, one of the earlier developers of the concept of eco-efficiency, defined eco-efficiency as "the objective of maximizing value added per unit of resource input" (Ayres, 1997, p. 6).

Japan's environmental policy and sustainable strategy in the 1990s until 2010 can be characterized as the pursuit of

eco-efficiency (energy efficiency and resource productivity) as mentioned above. In relation to this point, one of the criticisms of the argument that Japan is an 'ecological frontrunner nation' was made by Revell (2003). Revell pointed out that Japan's environmental policy discourse is dominated by technological fixes and influence of big business leaders and political elites. Indeed, EM is a policy strategy that is based on a belief in the capacity of technological and managerial innovation and the positive aspects of environment problems as a driving force for such innovation. It is difficult to see EM-policy discourse as a fundamental critique of the *status quo* rather than as a proposal for reform and restructuring of a modern project for increasing efficiency.

This is not a trend that arose suddenly, but is based on a lesson learned through pollution prevention activities during the 1970s in Japan.

Indeed, during the 1970s and the 1980s, energy-saving and technological innovation by every manufacturer had developed the conditions for ecological modernization in Japan. Historically, the response to the energy crisis, which was seen in the Japanese automobile industry, for example, was a successful story of combining energy and resource concerns (later found to be an environmental benefit) with competitiveness in global market. As Jänicke *et al.* (2000) suggested, such a shift in the industrial structure with less environmental impact per unit (importantly not overall, but "per unit") was mainly "caused by (primarily technological) changes that took place within sectors and enterprises. Intrasectoral change... seem for the most part to be autonomous, triggered especially by alternations in price patterns [of energy and resources]" (p. 148). Thus, the story of the energy crisis and energy saving during the 1970s and 1980s has contributed to the idea of eco-efficiency as an efficient strategy with which to tackle global environmental issues.

2. JAPAN'S SOUND MATERIAL-CYCLE SOCIETY POLICY FOR IMPROVING NATIONAL RESOURCE EFFICIENCY

Through the concept of Sound Material-Cycle Society, the idea of increasing efficiency and productivity was highlighted in Japan's waste management and recycling policies in the 1990s.

During the 1990s, Japanese society experienced several waste-related social problems. These included a great amount of waste generated each year, difficulty in securing final disposal sites due to the rising opposition from citizens, and an increase in the number of cases of illegal dumping due to increasing disposal costs and concerns about dioxin emissions from waste incineration facilities.

Thus, the Japanese government has realized that the waste issue involves difficult socio-economic structural challenges.

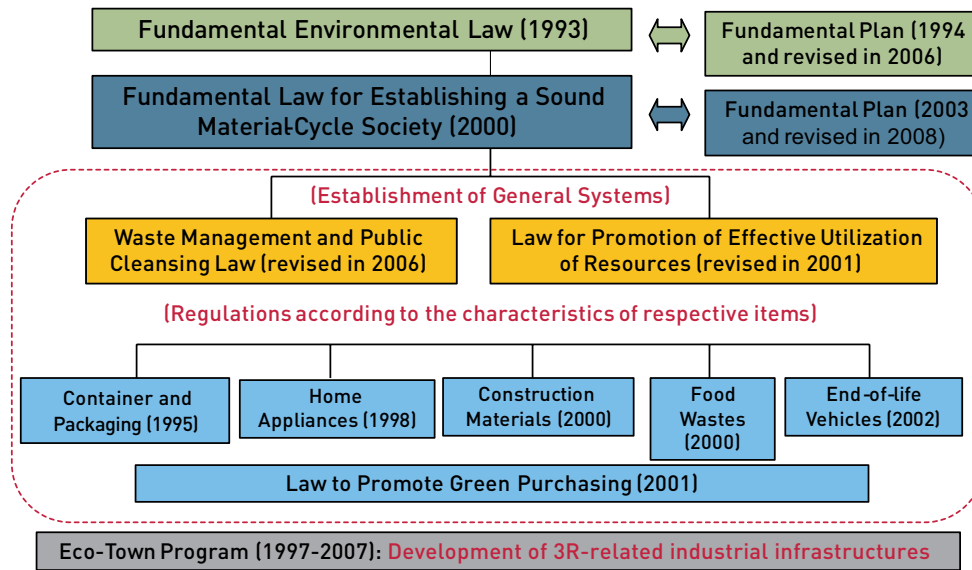


Figure 1 Japan's Policy Framework for a Sound Material-Cycle Society
 Source: Reprint from Y. Moriguchi (2006), "Establishing a Sound Material-Cycle Society in Asia" a presentation at Asia 3R Conference, October 30th-November 1st, 2006, Tokyo, Japan. The Eco-town Program and the years in which the laws were established were added by the authors.

Japan has developed a comprehensive waste minimization and recycling policy and set of mechanisms. These include:

- increased responsibility of waste emitters;
- introduction of the EPR (Extended Producers Responsibility) principle;
- eco-town program to promote the clustering of recycling industries; and
- laws for the recycling of certain designated materials and products.

For example: Law for Promotion of Sorted Collection and Recycling of Containers and Packaging (1995)¹, Law for the Recycling of Specified Kinds of Home Appliances (Home Appliance Recycling Law) (1998)², Law for the Recycling of Construction Materials (2000)³, Law for the Recycling of Food Waste (2000)⁴, Law for the Recycling of End-of-Life Vehicles (2002)⁵.

When the Environmental Agency was upgraded to a ministry (the Ministry of the Environment, MOEJ) in 2000, the focus of its waste management and recycling policy shifted from sanitation and disposal to resource utilization. A variety of existing and new measures were placed within the framework of the "Fundamental Law for Establishing a Sound Material-Cycle Society" (2000)⁶. Also, the Fundamental Plan for Establishing a Sound Material-Cycle Society (2003) establishes numerical targets, designates particular roles for stakeholders, and provides directions so that individual efforts will be consistent with the national goal of establishing a "sound material-cycle society".

"Sound material-cycle society" is defined under the Fundamental Law for Sound Material-Cycle Society as "a society in which the consumption of natural resources is minimized and the environmental load is reduced as much as possible by preventing products, etc., from becoming wastes, etc., promoting appropriate recycling of products, etc., when they have become recyclable resources, and securing appropriate disposal (as wastes) those recyclable resources that are not recycled."⁷

Through this Fundamental Law and Fundamental Plan, increasing resource productivity was expressed as a key policy objective in Japan's waste management and recycling policy. Through the 1990s to 2000s, a series of recycling policies are introduced under the slogan of better utilization of resources. Figure 1 shows the overall framework of Japan's major laws, regulations and programme of waste management and recycling.

To monitor the progress of the implementation of the sound material-cycle society policy in the pursuit of national resource efficiency, Japan introduced in 2003 Material Flow Accounting (MFA)-based indicators and policy targets for 2010. Based on the progress of implementation, Japan revised the basic plan in 2008 and set new targets for 2015. For the progress of national resource efficiency and its targets for 2015 specified in its 2nd Fundamental Plan for Establishing a Sound Material-Cycle Society in 2008, see Figure 2 below. One of the key indicators was resource productivity, with constant improvement, which represents Japan's emphasis on maximizing value added per unit resource price.

1 URL: <http://www.meti.go.jp/english/information/downloadfiles/cReCont02e.pdf>. Accessed: 2011-08-08. [Archived by WebCite® at <http://www.webcitation.org/60mqCq53k>]
 2 URL: <http://www.meti.go.jp/english/information/data/cReHAppre.html>. Accessed: 2011-08-08. [Archived by WebCite® at <http://www.webcitation.org/60mqJrs3H>]
 3 URL: <http://www.env.go.jp/en/laws/recycle/09.pdf>. Accessed: 2011-08-08. [Archived by WebCite® at <http://www.webcitation.org/60mqRSXMd>]
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 7 URL: <http://www.env.go.jp/en/laws/recycle/12.pdf> [Archived by WebCite® at <http://www.webcitation.org/5v8DxW0hY>]

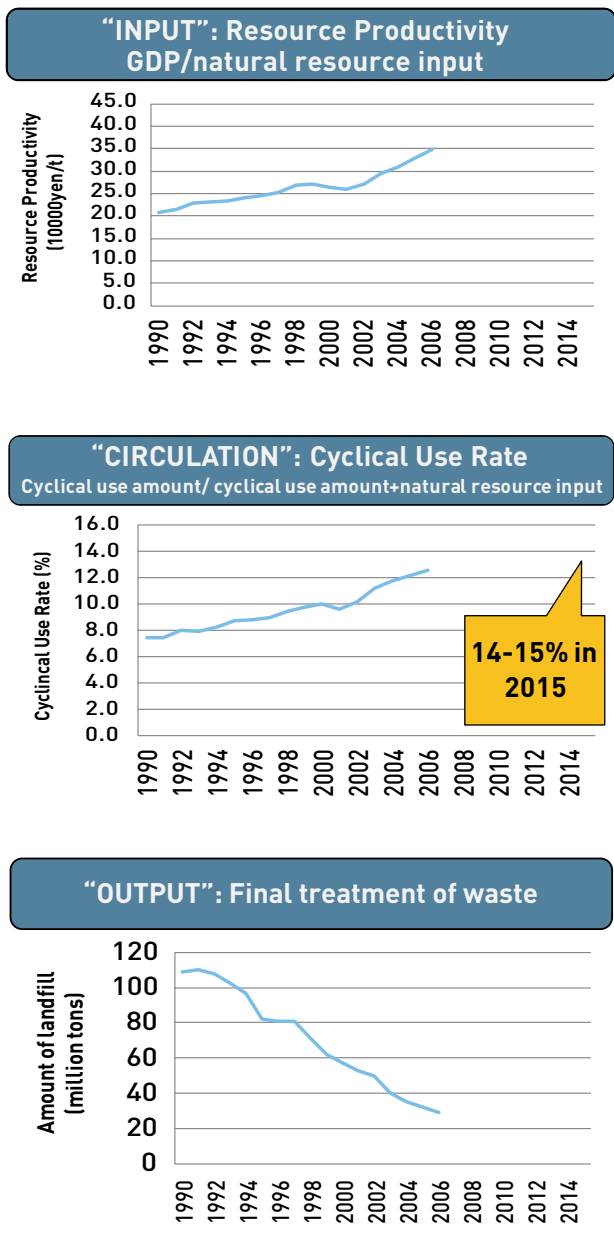


Figure 2 Progress of Japan’s Resource Productivity
Source: The 2nd Fundamental Plan for Establishing a Sound Material-Cycle Society (2008) of Japan.

3. EFFECTS OF JAPAN’S SOUND MATERIAL-CYCLE SOCIETY POLICY: CASES OF THE ECO-TOWN PROGRAM AND EPR-BASED RECYCLING POLICIES

As discussed earlier, Japan’s approach to sustainability in the 1990s to 2000s can be characterized by an emphasis on the harmonization of environmental conservation and economic competitiveness by the pursuit of efficiency. This is no exception for Japan’s sound material-cycle society. The following section describes, evaluates, and attempts to draw general

lessons from two of the prominent approaches for sound material-cycle society in Japan—the “eco-town program” and “EPR-based legislation” that were introduced in the 1990s to early 2000s.

3.1 ECO-TOWN PROGRAM

The eco-town program was established in Japan in 1997 to create synergies between urban waste management and the promotion of recycling industries. One of its main goals was to realize “zero emissions”. This means to minimize waste by recycling all waste and by-products into materials and using those in other industries. Another goal was to help to revitalize the economies of local areas. Aiming at environmentally-sustainable local development, the Ministry of Economy, Trade and Industry (METI) claimed that this program would promote environmental industry, industrial and technological accumulation, and an environmentally-harmonized social system. The eco-town program sought to promote competition among local governments to promote environmental management projects. Under the plan, local governments would develop plans in conjunction with other stakeholders and apply for recognition as an eco-town. The accepted plans would be subsidized jointly by METI and MOEJ. The eco-town program subsidized both “hardware” projects, such as product recycling or renewable energy facilities, and “software” projects, such as feasibility studies and awareness building. Although the applicant should be a local government, the project proposals would not be approved unless they included cooperative efforts of both business and local government. The 26 eco-town projects (1997 to 2007) include Kawasaki City and Kita-Kyushu City, which were approved in 1997.

According to METI’s ex-post evaluation of the eco-town program in March 2006, the total cost to the Government of Japan to implement this policy was JPY 94.75 billion (about USD 1.1 billion) (subsidies between 1997-2004 plus tax reduction and policy finance between 2000 and 2004). METI estimated that a recycling capacity of 5.89 million tons was generated by the eco-town program. Further, METI estimates this policy contributed around 20% of the average annual increase in national recycling capacity. As shown in Table 1, the direct economic effects such as employment generation were relatively limited. On the other hand, the constant private investment as seen in the number of business start-ups and number of visitors suggests that it was successful as a demonstration project and also in attracting private investment for recycling businesses.

Overall, it can be concluded that this policy was not very successful as a response to a decline in the base materials industry and a revitalization of the local economy, but was very successful in developing a nation-wide role sharing for wide area recycling to respond to the waste management and recycling policy⁸ reform.

⁸ Personal communication with Mr. Hideto Yoshida, Former Director General of Waste Management and Recycling Bureau, Ministry of the Environment of Japan (July 2006).

Table 1 Economic and Social Results of the Eco-town Program

Fiscal year	1997	1998	1999	2000	2001	2002	2003	2004	Total
Number of approved areas	4	3	2	4	2	2	3	3	23
Private investment in the approved areas (billiom JPY)	0,53	17,25	11,79	12,38	13,07	10,95	2,34	5,74	74,05
Recycling facilities in the approved areas	1	8	8	8	5	5	2	10	47
Number of business start-ups related to the approved facilities	1	6	5	4	0	3	1	2	22
Employees in the approved areas	20	190	95	205	85	132	18	281	1026
Amount of recycled waste (1000t/year) in the approved areas	8	209	25,9	195,7	105,6	52,3	16,4	119	731,9
Visitors to an Eco-town area (case of Kitakyushu)		10,000	28,600	43,600	76,400	93,300	88,000	82,204	422,104

Source: Minister of Economy, Trade and Industry (METI), Japan

This policy could be an important step in developing national recycling capabilities, along with 3R-related national policies and legislation. By comparing 26 eco-town projects existing in Japan, Van Berkal *et al.* (2009) emphasized that one of the success factors of this programme is its linkage to “the evolving legislation for a recycling-oriented society” providing “legal certainty that recycling facilities are a national priority” (p. 1555). In Japan’s case, the eco-town program succeeded in increasing recycling capability and efficiency by clustering recycling facilities and business actors in the same area. A system of subsidies contributed to the reduction of the financial burden for many stakeholders and encouraged collaboration between the central government, local governments and the business sector. In addition, many of Japan’s eco-towns are located in coastal industrial zones with ports. Thus, it can be seen that eco-towns were established not only as local infrastructures for recycling of locally-generated wastes, but also as possible hubs for a national network of recycling.

National eco-town policies were expected to contribute to the establishment of proper recycling capacity by constructing recycling facilities and to provide a solution to the shortage of recyclables by promoting networks of recyclers. However, they do not address the need for economic incentives to shift the flow of recyclables from the small-scale informal sector to more proper recycling facilities, because recycling facilities in eco-towns can be more costly than informal recycling. Higher costs are due not only to the direct operational costs of formal facilities, but also to the costs of collection mechanisms and transportation of the recyclable materials. Thus, a major challenge in realizing this policy idea is to establish legislative and financial mechanisms to encourage proper recycling and to promote local awareness and cooperation among stakehold-

ers, especially in relation to source separation. Also, in Japan, the eco-town/eco-industrial park policy was developed on the basis of infrastructure and technology that were developed by its heavy industries, which are important as both sources and users of recyclable materials.

3.2 EPR-BASED RECYCLING POLICY

One of the most important concepts behind policies to establish a sound material-cycle society is to incorporate the Extended Producer Responsibility (EPR) into environmental policy on waste issues. EPR is the policy principle of reducing waste and increasing resource productivity in response to the lack of landfill. It shifts the responsibility of processing general household waste from local governments to producers of products. For example, the Law for Recycling of Specified Kinds of Home Appliances (home appliance recycling law) asserts that the responsibility to take back and recycle four home appliances—old fridges, washing machines, televisions and air conditioners—belongs to the producers of these products and not the local government. Under this law, the consumer has an obligation to pay for waste treatment, retailers have an obligation to take back the waste products and deliver or return them to the producers, and producers have a responsibility to take back old products from shops and to recycle them. Therefore, the cost of recycling will be reflected in the producers’ recycle processing cost of the products. This will provide an incentive to producers to reduce the cost of recycle processing and increase their competitiveness by increasing the recyclability of the products (Yamaguchi, 2000). In securing this shift in responsibility from local autonomy to the producers, it is expected that minimization of waste generation and recyclability of the products will be achieved. At

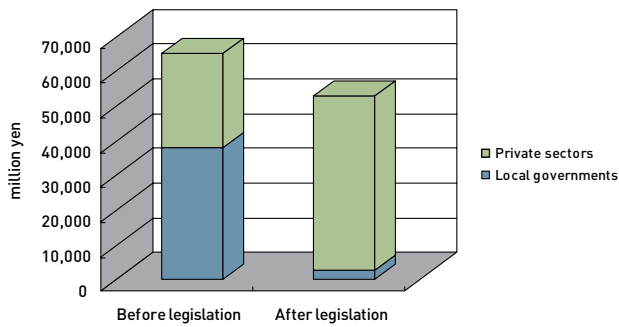


Figure 3 Shift in the Cost of Recycling after the Introduction of the Home Appliance Recycling Law
 Source: Compiled by IGES using data from the 2nd working group of the waste and recycling small committee, Industrial Structure Committee, September 10, 2001⁹.

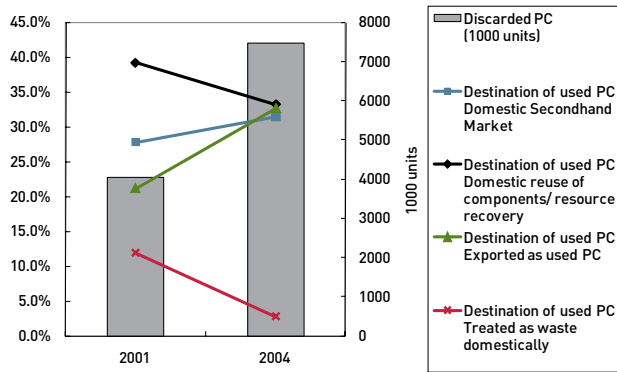


Figure 4 Destination of Used Personal Computers (PCs)
 Resource Productivity Policy in an International Context

first glance, it would seem to be a form of command-and-control type of regulation. However, one of the original aims of EPR was to be much more a regulation that is involved in giving incentives to the producers to engage in “voluntary action” to achieve technological breakthroughs to increase “eco-efficiency”, especially to promote design for the environment.

As shown in Figure 3, the case of Japan’s home appliance recycling law suggests that the EPR-based recycling mechanism is cost-effective in promoting recycling. Also, the responsibility of cost sharing has shifted from local government to the private sector in an effective manner. However, the Personal Computers (PCs)’ case in Figure 4 shows that the used PCs that are exported as secondhand goods can be a loophole for domestic recycling resource utilization mechanisms (Hotta *et al.*, 2009). Also, we should note that EPR does not necessarily contribute to the prevention of pollution from recycling and requires many supporting mechanisms based on proper waste management legislation and systems.

Japan’s Sound Material-Cycle Society Policy and the experience of the Eco-town Program and EPR in Japan suggest

that Japan’s effort for sustainability has continued to focus on increasing resource productivity as well as harmonization of economic competitiveness and environmental concerns by maximizing national effort for recycling throughout the 1990s to mid 2000s.

3.3 RESOURCE PRODUCTIVITY POLICY IN AN INTERNATIONAL CONTEXT

At a macro-level, what drives governmental interest in resource productivity policy? To answer this question, IGES conducted a comparative study of the utilization of MFA indicators and the application of resource productivity targets in OECD countries during 2007 and 2008 (IGES, 2008; Aoki-Suzuki *et al.*, 2010).

Figure 5 shows that countries with a high resource import surplus, such as Germany, Japan, and Italy, tend to apply economy-wide MFA and resource productivity targets. In contrast, the countries that have rich natural resources, such as Australia and Canada, are not so active in resource productivity policy. Also, Figure 6 shows that countries that have strong export-oriented manufacturing sectors, such as Japan, Germany and Italy, tend to be active in MFA application and resource productivity policy. Thus, the study concludes that the countries that are especially active in developing MFA and using MFA data for policy development are typically characterized by: (1) high GDP/capita, (2) high import dependency in natural resources, and (3) a large exporting-oriented manufacturing sector. The study found Germany, Italy and Japan to be the three countries that had most strongly integrated MFA and resource productivity targets in governmental policies.

Also, according to IGES’s interview survey of G8 countries, the perception of MFA-based indicators on resource productivity and target setting based on resource productivity seems to be significantly influenced by the difference in industrial and economic structure as well as political systems. The interview survey confirmed that the economies with relatively large manufacturing industrial sectors are interested in reduction of materials inputs as well as showing clearly the economies’ dependence on resources extracted in other countries (IGES, 2008; Aoki-Suzuki *et al.*, 2010).

This implies that a policy approach of increasing resource productivity is not a universal policy priority even among industrialized countries. Differences in national context, industrial structure, and stage of economic development, give different policy priorities for sustainability. Thus we may need to reconsider Japan’s sustainable strategy which currently gives high priority in increasing resource productivity and efficiency.

4. JAPAN’S STRATEGY FOR SUSTAINABILITY IN THE BEGINNING OF THE 21ST CENTURY

The paper will now give an overview and analysis of three recent sustainability strategies developed by Ministry of

⁹ URL: <http://www.meti.go.jp/kohosys/committee/summary/0000400/0001.html> (Archived by WebCite® at <http://www.webcitation.org/5uzCiW0p4>)



Policy application of economy-wide MFA

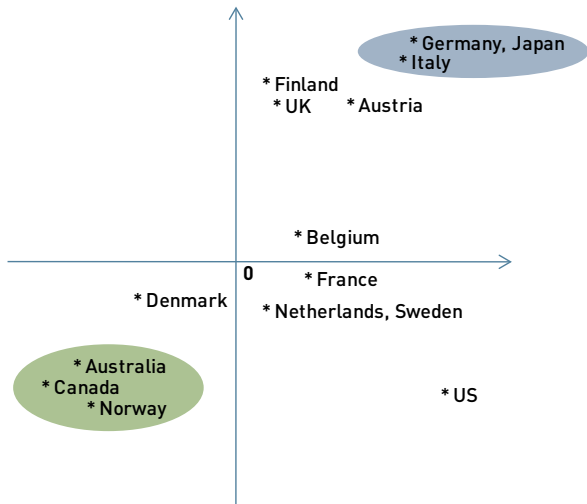


Figure 5 Resource Imports and MFA Application
 Source: A literature survey based on a report of the OECD (2007) with a combination of on-line data surveys officially available from governmental websites.
 Note: This study defines a country as very active on MFA if it conducts EW-MFA at a national level regularly as governmental activities, and has developed indicators and set targets and deadlines for policy development purposes.

the Environment of Japan and the Government of Japan in the 2000s; “Strategy for an Environmental Nation in the 21st Century” in 2007, “Clean Asia Initiative” in 2008, and “New Growth Strategy” in 2010. By doing so, the paper tries to show that Japan’s sustainable strategy continues to emphasize “increasing efficiency”.

4.1 STRATEGY FOR AN ENVIRONMENTAL NATION IN THE 21ST CENTURY OF JAPAN

In June 2007, Strategy for an Environmental Nation in the 21st Century¹⁰; a guideline of environmental policy and actions to be taken for the next one or two years, was approved by a Cabinet Meeting. This called for the establishment of a national vision and strategy for sustainability through the integration of activities for a low-carbon society on climate change and energy-related challenges, a sound material-cycle society on waste management and resource-related challenges, and a society that is in harmony with nature on biodiversity and natural-environment-related challenges. Although this strategy was integrated in the New Growth Strategy in 2010¹¹ (described below), the current Japan strategy for sustainability, or at least that of Ministry of the Environment of Japan, still follows the approach of integrating the following three visions.

4.1.1 LOW-CARBON SOCIETY

In the strategy, the Japanese government described a low-carbon society as “a society that has achieved an affluent lifestyle with a reduction in CO₂ emissions (*author’s translation*)” (Government of Japan, 2007, p. 9). In this concept, “widespread environmental consciousness and technologies throughout all society, by dissemination of conventional and new, innovative technologies (*author’s translation*)” (p. 9) is considered to be the key to achieve a rich lifestyle and economic growth that is in harmony with environmental conservation. This concept emphasizes social reform through a techno-centric solution and continues economic growth rather than redefining prosperity. The concept reflects an emphasis on high-energy efficiency of each product, such as hybrid cars, efficient air conditioning systems, or LED lamps in Japan, as well as a voluntary approach and technical solutions from the industrial sector.

4.1.2 SOUND MATERIAL-CYCLE SOCIETY

In the Fundamental Plan for Sound Material-Cycle Society, which was launched in 2003 and revised in 2008, this concept for material recycling and resource saving had generally developed more concrete visions for the role of stakeholders, interaction of legislation and strategies, concrete quantitative targets to be achieved, and constant follow-up processes. In the late 2000s, Japan launched an international initiative based on the concept of the Sound Material-Cycle Society at an international level called the 3R Initiative. The ministers

Policy application of economy-wide MFA

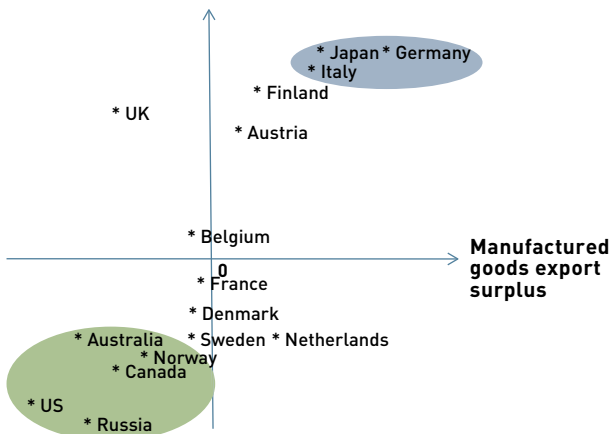


Figure 6 Contribution of the Export-Oriented Manufacturing & Industrial Sector and the MFA Application
 Source: A literature survey based on a report of the OECD (2007) with a combination of on-line data surveys officially available from governmental websites.
 Note: This study defines a country as very active on MFA if it conducts EW-MFA at a national level regularly as governmental activities, and has developed indicators and set targets and deadlines for policy development purposes.

10 URL: http://www.env.go.jp/guide/info/21c_ens/21c_strategy_070601.pdf [Archived by WebCite® at <http://www.webcitation.org/5v9yKj4v7>]
 11 E-mail communication with an official of Ministry of the Environment of Japan in November 26, 2010.

who attended the G8 Sea Island Summit in June 2004 agreed to it as a new G8 initiative and agreed to a G8 action plan to promote the 3R policy: *Kobe 3R Action Plan* at G8 Environmental Ministers Meeting in May 2008 in Kobe, Japan.

With the Strategy for an Environmental Nation in the 21st Century of Japan, the collaboration with a developing Asia was emphasized to promote the vision of a sound material-cycle society in accordance with different challenges faced by Asian countries. To this end, the strategy involves the transfer of institutional mechanisms, technological systems, and experience in multi-stakeholders collaboration by supporting national strategy development and city development (Government of Japan, 2007, p. 14).

4.1.3 SOCIETY IN HARMONY WITH NATURE

In contrast to the two preceding concepts, this strategy refers to conservation of the natural environment and biodiversity under the concept of Society in Harmony with Nature. This concept was described as “a society in which the benefits of nature will be enjoyed by the current generation and the coming generations with the proper conservation of biodiversity and socio-economic activities that are in harmony with nature, such as sustainable agriculture, forestry, and fishery, and the enjoyment of natural environments (*author’s translation*)” (Government of Japan, 2007, pp. 3-4). This concept was characterized by linkages among biodiversity conservation, natural landscape conservation, Japan’s traditional lifestyle, and landscape. Although this part of the strategy needs close collaboration among central governmental agencies as well as with local governments, the concept did not provide a clear policy goal to achieve other than at the idea/philosophical level.

4.2 CLEAN ASIA INITIATIVE¹²

Another important character of Japan’s sustainable strategy for the 21st Century is the emphasis on collaboration with developing Asia. The Clean Asia Initiative (CAI), launched by the Ministry of the Environment of Japan in 2008, features this characteristic strongly. This initiative is intended to form an umbrella strategy for Japan’s international cooperation in sustainable and environmental management areas by transferring Japan’s experience, technology and institutions in a packaged form.

The CAI emphasizes the same subjects as the Strategy for an Environmental Nation in the 21st Century of Japan, namely a low-carbon society, a sound material-cycle society and a society in harmony with nature as mentioned above.

Under CAI, promoting a low-carbon/low-pollution society is listed as a top activity among the five priority areas of CAI. The transfer of Japan’s experience and technology for achieving energy-efficient and low-pollution industrial activities is

considered to be a top priority for Japan. Also, CAI re-emphasizes the story-line that was documented earlier in this paper that Japan’s experience in achieving energy efficiency and low pollution at the unit level of industrial activities should be a model for a global transition to sustainability.

Emphasis of regional cooperation for a sound material-cycle society under CAI should be understood in the context of the economic relations among developed and developing countries. From the viewpoint of developed countries, such as Japan, the recent interest in the 3R Initiative not only concerns domestic promotion of the 3Rs, but also “the possible hollowing out of the domestic recycling industry under globalization” and “how to establish an environmentally-sound and economically-efficient trade of recyclables.” (Hotta, 2006) With the expanding division of labor among countries within a globalized economy, the establishment of an environmentally-sound downstream material flow is difficult to realize domestically without considering the international flow of recyclables. This is one of the reasons why developed countries, such as Japan, which already have the capacity for domestic recycling, need to promote resource circulation and waste management policy in collaboration with the developing countries in Asia. In this sense, sustainability issues are now internationalized even for waste management, which typically was considered to be a domestic issue.

Among these, the promotion of a “society in harmony with nature” does not directly reflect the policy discourse of “increasing eco-efficiency”. Thus, if this concept is linked with other concepts, such as a sound material-cycle society, the concept has the potential to be a key for Japan’s sustainable strategy in Asia. For example, the idea of the Satoyama Initiative is related to traditional landscape conservation, lifestyle, and preservation of the commons. For example, increasing resource demand in Asia results in the need for increasing resource conservation and circulation to be represented in the concept of the sound material-cycle society. At the same time, there are rising concerns about environmental degradation and loss of biodiversity from increasing and expanding mining activities. Yet, how to facilitate international cooperation for biodiversity conservation or natural landscape conservation in Asia through this concept has not been made clear.

4.3 NEW GROWTH STRATEGY¹³

Since the late 2000s, environmental and sustainability issues have received more and more attention from the media and citizens as important strategic policy issues by which Japan may regain its industrial and technical competitiveness in the world market. An increasing number of key policymakers and other leaders hold the view that the economic well-being of future generations will be supported not by the conventional notion of economic growth based on labour productivity increases and the unlimited use of natural and energy resources, but by “eco-industrial development”. It is becoming

12 URL: <http://www.env.go.jp/earth/coop/coop/english/cai/about.html> [Archived by WebCite® at <http://www.webcitation.org/5v8azUo1F>]

13 URL: http://www.npu.go.jp/policy/policy04/pdf/04/06/20100917_shinseityousenryaku_honbun.pdf [Archived by WebCite® at <http://www.webcitation.org/5v9xTmfFF>]



increasingly recognized that policies that are formulated to motivate the widespread use of more energy-efficient products, infrastructure development and the introduction of environmental technologies, such as those represented by concepts like “Green Growth”, “Eco-innovation” and “Green New Deal”, should be promoted in order to foster a transformation of our economic and social structures to more sustainable ones. This will serve as a key economic growth strategy for future generations.

In June 2010, under a new government, the New Growth Strategy was adopted. This new strategy is a national strategy for new economic growth. It emphasizes innovation strategy in several different sectors to revitalize the Japanese economy. Of the seven major pillars of this strategy, green innovation is featured among the foremost under the banner of “Strategy for becoming an environment and energy power through green innovation”. In contrast to the two strategies above, the New Growth Strategy (Government of Japan, 2010) sets a target to “create more than ¥50 trillion in new environment-related markets and 1.4 million new environmental sector jobs. Reduce worldwide greenhouse gas emissions by at least 1.3 billion tons of CO₂ equivalent (equivalent to the total emissions of Japan) using Japanese private-sector technology” (p. 15, author’s translation). The strategy emphasizes “technological excellence in the environmental field” (p. 16), “putting Japan’s strength in technologies into international competitiveness” (p. 16), and situating recycling policies in the context of securing critical materials for low-carbon technologies. Tetsunari Iida, an influential renewable energy expert in Japan, recently criticized the New Growth Strategy as a step back from the environmental and energy policy with a simplistic belief in a technical fix caused by a lack of true political leadership from the new government (Iida, 2011). It strongly embodies the techno-centric vision of Japan’s sustainable strategy.

5. DISCUSSION

Japan’s recent strategies for sustainability emphasize the realization of a low-carbon society and sound material-cycle society both in Japan and in Asia. When one looks at these strategies more carefully, although they recognize the need for socio-economic transition to sustainability, the concrete approaches suggested in the strategies are those depending on technical innovation and resource intensiveness. The New Growth Strategy in particular advocates green innovation and emphasizes EM-type policy discourse. The New Growth Strategy strongly emphasizes innovation for increasing energy efficiency that would lead to a low-carbon society. Although technological innovation is a key to maintaining social welfare for a low-carbon society, which has a less energy-intensive economy, a wise mix of policy options, including economic instruments, is necessary (Matsushashi *et al.*, 2010). However, a discussion of policy options and economic incentives are generally lacking in these strategies. In the strategy, sound

material-cycle society is discussed in terms of securing rare metals needed for low-carbon technologies. Another characteristic is a strong emphasis in collaboration with Asia as well as promoting Japan’s environmental cooperation. This implies that Japan is interested in promoting more energy- and resource-efficient products and technologies and using them to its competitive advantage in the world market. However, these strategies are based on Japan’s past success of the strategy for resource productivity and efficiency. This would not give a breakthrough from the environmental policy paradigm of resource efficiency and productivity or a front-runner position for Japan in the reform towards sustainability. For example, Holzinger *et al.* (2011) point out that the regulatory strictness and scope of Japan’s environmental policy has gradually fallen behind those of OECD countries since 1990.

Indeed, there are several reasons for reconsidering the environmental policy paradigm of resource efficiency and productivity. Firstly, limitations of the eco-efficiency/resource productivity approach for sustainable resource management are becoming apparent. Pursuit of efficiency in the industrial sector and products would minimize the environmental impact at unit-level of production and consumption activities. However, increasing efficiency cannot be the ultimate approach for the breakthrough for reduction in the total impact of industrial/production/consumption activities. It is known that efficiency gains either in energy use or material use are offset by higher demand in such resources (Ayres, 2005; Herring, 2008). By comparing 65 countries from 1960 to 2003, Jorgenson and Clark (2011) concluded that there is no evidence of a relative decoupling of ecological footprint and economic development. Jorgenson and Clark (2011) suggest that we cannot assume that “improvements in ecoefficiency equate to environmental sustainability when it corresponds with increases in the scale and intensification of production” (p. 240). Also, on the concept of resource productivity, some argue that improvement in resource productivity is the flip-side of economic growth and not representing decoupling of material use and economic development (Steinberger and Krausmann, 2011).

More practically, there is an increasing recognition for a limitation on recycling to fulfil increasing resource demands. There is a continuous growth in resource demands from emerging economies. Also, there are new demands for rare-metals and rare-earths for low-carbon technologies (Halada, 2010). Because of these increasing demands, even for metals, which are ideal materials for recycling, some suggest that it is necessary to maintain less than 1% annual growth in metal demands to make metal recycling functional in the near future (Grosse, 2010).

While the more direct pollution incidents have been observed less frequently, the continuous pressure of national land development, infrastructure building, and population growth results in continuous degradation of natural environment. For example, the submergence of the countryside for the

Table 2 Ratio of Coverage by Artificial Structure in Japanese Coastline and Riverbanks

	1973	1990s
Natural coast line of Japan	59.6%	44.8%
Artificial or partly artificial coast line of Japan	40.4%	53.9%
Riverbank covered with artificial structure	19.2%	23.5%

Source: These figures on the coastline in the 1990s are based on the 4th national natural environment conservation basic research that was conducted by the Environmental Agency in 1990-1992. See Ministry of the Environment of Japan 2003. For the figures in 1973, see Environment Agency Japan 1973. The figures for riverbanks are based on research on rivers conducted by the Ministry of the Environment in 1979 and 1998¹⁴.

development of a large-scale dam or the loss of wetlands or natural coastal areas to large-scale land reclamation projects has been observed all over Japan. Although there have been particular reasons for this, such as flood prevention and protection against tsunamis, this national driving force for land development has changed completely the face of the Japanese landscape over a period of 50 years. The change in the Japanese coastline and riverbanks is a good example of this, as shown in Table 2.

Another example is the reduction of seagrass in the coastal area. Seagrass is believed to purify water quality and to provide protection for spawning and young fish. According to the Japan Fisheries Agency, excessive landfill and environmental pollution in the Setonaikai Sea resulted in a 70% reduction in the area of seagrass from 1960 to 1990 (Japan Fisheries Agency Webpage)¹⁵.

Thus, from the perspective of sustainable resource management, Japan needs to reconstruct effective policy intervention and international strategies to reduce material use in addition to promoting resource productivity and circulation in collaboration with developing Asia. Japan also needs to develop and enhance its new sustainable vision by integrating landscape conservation and natural value such as removing unsustainable/old artificial infrastructure and to recover natural landscape. This is also true of Japan's role in global sustainability. In terms of ecological footprint in global resource use, Japan has been one of only a few countries in the world that uses more land and resources than those available domestically (van Vuuren and Bouwman, 2005). WWF and Global Footprint Network (2010) also pointed out Japan's large dependence on resources abroad and large carbon footprint (two thirds of the ecological footprint). Considering the increasing global resource demands on one hand and the decreasing population and maturing economy on the other, Japan needs to demonstrate that it can achieve a decrease in its resource demands in a significant manner. In addition,

after the earthquake, the tsunami and the Fukushima nuclear incident in March 2011, Japan is facing a new challenge to reduce its domestic energy consumption in the short term and to construct a new vision for sustainable development in the long term. In other words, Japan's Sustainable Strategy needs to be a transition from a resource productivity/innovation-oriented one to one that considers total environmental impact, infrastructure reduction/transformation, more sustainable lifestyle, and the way society consumes resources.

6. CONCLUSIONS

Through a case study of Japan's Sound Material-Cycle Society Policy, this paper attempted to show that the ideology behind Japan's sustainable strategy emphasizes increasing efficiency in industrial sectors and products, leading to international competitiveness and environmental sustainability. The promotion of environmental policy in terms of efficiency is intended to include business and industry in the efforts to achieve sustainability by using a familiar logic and language for businesses. This approach has indeed improved environmental performance at the unit level (the level of each individual industrial facility, industrial park, and product) to a remarkable degree. For developing economies with increasing resource demands, Japan's effort for sustainability by improving resource efficiency can provide a good model to harmonize environmental and economic considerations. It is along the globally advocated policy agenda of green growth, green innovation, or green economy towards the Rio+20 process. However, it is increasingly pointed out that pursuit of resource efficiency cannot reduce the total environmental impact from industrial/production/consumption activities. In this sense, as seen in the case of the Clean Asia Initiative, it is natural for Japanese government to shift the emphasis of its sustainable strategy from domestic efforts to engagement with developing Asia.

Although it is necessary to design a new national vision for socio-economic development based on the concept of sustainability, the continuing recession has made it difficult for the Japanese government to design such a comprehensive vision and strategy until very recently. Unfortunately, from the overview of Japan's strategy for sustainability and environmental management in the 1990s to the 2000s presented in this paper, we could extract no potential vision for a sustainable Japan in the future, other than increasing resource efficiency and technical fixes. Except for increasing resource efficiency, as well as engaging the developing Asia, the next step for socio-economic reform for sustainability is not yet clear in Japan's existing strategies towards sustainability. For this much-demanded new vision, it is necessary to overcome the past success in sustainable strategy based on increasing efficiency. When a clear and concrete vision of sustainable society is established, we will be able to say that Japan has a true strategy and model for sustainability in the 21st century.

14 http://www.biodic.go.jp/kiso/23/23_kasen.html (Archived by WebCite® RLINK "http://www.webcitation.org/5uzTYynVc" <http://www.webcitation.org/5uzTYynVc>)
 15 http://www.jfa.maff.go.jp/j/kikaku/tamenteki/kaisetu/moba/moba_genjou/index.html (Archived by WebCite® at <http://www.webcitation.org/5uzTlIA60>)

In view of the ongoing trend toward increased resource consumption, increased waste generation and international circulation of materials, serious thought should be given to creating innovative approaches to international collaboration to achieve higher productivity in the use of resources, sounder international material circulation and a lower total environmental impact of resource utilization. Considering its long experience in resource efficiency strategy, Japan can play a significant role in shifting international policy collaboration in Asia to a higher level. This should not be pursued at the initiative of Japan alone. Instead, it should be achieved through policy coordination and collaborative program support with other countries.

At the same time as a maturing economy, it is a time for Japan's strategy to show bold direction and clear policy incentives for reducing material use in addition to promoting resource productivity and circulation in collaboration with developing Asia. Also, aiming at material de-growth, it is necessary to place more emphasis on national landscape conservation, including less resource-intensive infrastructure, recovering biodiversity and sustainable infrastructure building, as well as incentive mechanisms towards a sustainable lifestyle to be a new model for other economies. For this, it is necessary to generate a strong policy incentive to reduce material use in the upstream material lifecycle, in addition to a sound material-cycle societal policy for the downstream material lifecycle. For this purpose, a more coordinated approach to sustainability is needed to avoid conflicts of policy objectives as, for example, seen in the recent emphasis on strong GHG reduction goals and a free toll road policy. What is needed for a new sustainable vision is not only green innovation but renovation of existing infrastructure and a landscape towards sustainability. In this sense, the earthquake, the tsunami and the Fukushima nuclear incident in North East Japan in March 2011 may have provided a good opportunity to shift Japan's sustainable strategy from a resource efficiency approach to material de-growth and widen collaboration with developing Asia.

Editor's note

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