

Japan's Challenges in Managing Resources and Implementing Strategies toward Sustainability

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Abstract—Japan's strategy is based on improving the current resources and productivity by identifying the environmental challenges to progress further in many areas. For example, it will help in understanding the competitive challenges in the industry, emerging innovation, and other progresses. The present study seeks to examine the characteristics of sustainable practices using materials that will last longer and following environmental policies. There has been a major emphasis since 1990s and onwards about recycling and preserving the environment. Furthermore, the present paper analyses and argues how national interest in policy increases resource productivity. It is a universal law, but these actions may be different based on the unique situation of the country. In addition, the present study explains some of the strategies developed by the Environmental Agency of Japan in the last few years. There are a few resources reviewed involving 'Strategy for an Environmental Nation in the 21st Century' from 2001, 'Clean Asia Initiative' from 2008, and 'New Growth Strategy' from 2010. The present paper also highlights the emphasis on increasing efficiency, as it is an important part of sustainability. We finally conclude by providing reasoning on the impact and positivity of reducing production and consumption on the environment, resulting in a productive and progressive Japan for the near and long term future.

Keywords—Green innovation, sustainable development, resource productivity, sound material-cycle society, waste management.

I. INTRODUCTION

JAPAN is considered as the world's 3rd largest economy although it has insufficient natural resources to fulfill the need of its expanding economy and large population, where depending on importing raw materials and manufacturing variety of large developed industries including auto mobiles, electronics, iron, steel, petrochemicals, medicines and curative products, bio-industry, aerospace, textiles, all these industries influenced the economic success of Japan. Moreover, Japan exports \$787 billion of its industrialization to the world [2]. All these factors raise the question of how Japan could, a country with limited resources, improve its economy and could be able to deal and manage its environmental challenges that are affected by this huge expansion of industries and manufactures.

In this paper, several strategies that were implemented through the past ten years have been reviewed and compared to show the contribution and results of each strategy on sustainable levels and to achieve the best resources management frame work.

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II. ECOLOGICAL TRENDS IN JAPAN

After the 1990s, Japan's initiative for the best environmental management system is characterized as conservative and provides an economic competitiveness by creating the market for eco-friendly usage of resources and productivity. The concept of Japan's environmental policy can be best explained through Ecological Modernization (EM) by experts in the field such as Barrett [4].

The concept of EM is defined as having a financial development and environmental protection work cohesively [5]. From the above, it is obvious that Japan's environmental strategies focused on achieving an eco-efficiency cycle, high performance, and productivity starting from the early 1990s till 2010. However, Revell was unconvinced and he criticized considering Japan as an "ecological leader community", where he alerted that the environmental policies scenario is controlled by technological repair and the reign of business pioneers in addition to political authorities [18]. In fact, EM is a strategy that is improved and maximized by getting the positivity of new technologies and management concepts in addition to environmental problems that encourage a positive improvement and innovation of such strategies. Considering that this strategy is an application of some results of pollution reduction strategy that was applied during the 70s in Japan, EM cannot be considered as a trend that will fade with the changes of environment and human activities. Moreover, many manufacturers concerned with energy saving products and technologies, considering energy modernization conditions in Japan during the 1970s and 1980s.

In the past, Japanese dealt with the energy crisis through automobile industry wisely through considering energy efficiency and resources, while competing with global market, without even knowing its environmental benefit. The differences and changes between industrial sectors, which seem to be independent, resulted in an interchange variation in the cost layout of energy achievements and resources used. For that, the need for energy saving was required to control and reduce the energy crisis that happened during the 70s and 80s. This resulted in conducting a strategy that is based on eco-efficiency, saving not only Japan but the globe.

III. WASTE REDUCTION AND TREATMENT

Japan's waste management and recycling policies from the 1990s are descriptive protocols from the concept of Sound Material-Cycle Society. Obtaining a good disposal site has been a major challenge as the people are against that idea. Hence, the action from the people has emphasized the issue that the government has to take into consideration changes in

waste management which involve socio-economic structural changes. In order to create some form of resolution, the government has created recycling mechanisms such as:

- Increasing awareness and liability of waste emissions facilities;
- Introduce the extended producers' responsibility (EPR) principle;
- Encouraging the collaboration between the recycling industries;
- Create new rules for recycling of certain chosen resources and products.

In 2000, the environmental agency in Japan was promoted to become a ministry, Ministry of Environment in Japan (MOEJ). By this upgrade, the ministry changed its strategy of waste management and recycling focusing on resource performance rather than waste preservation and disposal. In 2003, the "Fundamental Law for Establishing a Sound Material-Cycle Society" was established aiming to create a society classifying certain rules and regulations for involved parties and organizations, in addition to controlling and creating a strategic plan in a way that it serves the whole community through the restrictions that are applied on individuals.

The Fundamental Law for Sound Material-Cycle Society is the place where the consumption of natural resources is limited. There is less of an environmental load to prevent such products to become waste and encourages proper waste disposal ways for recyclable materials which are not recycled. This would be described as "Sound Material-Cycle Society," a set standard for recycling and sustainable living [19] as shown in Fig. 1.

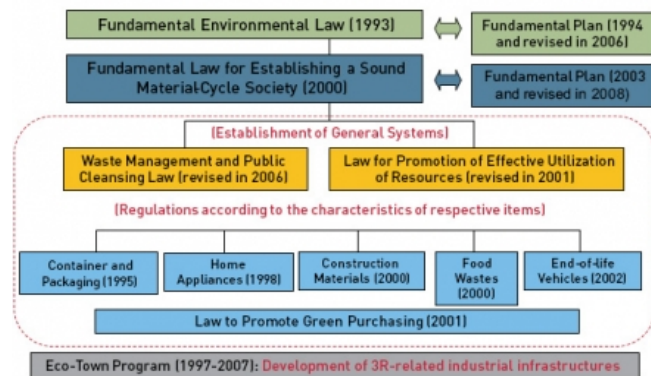


Fig. 1 Sound Material-Cycle Society structure

In 2003, Japan launched Material Flow Accounting (MFA) to detect the growth of applying the sound material-cycle society policy as a future plan for 2010 to achieve resources efficiency in the country. According to the achievements appeared and results, the fundamental plan was revised in 2008 and upgraded for the future plan of 2015.

Fig. 2 indicates the progress of resources productivity and efficiency, the improvement in process is obvious where the productivity and value of resources increased with less waste.

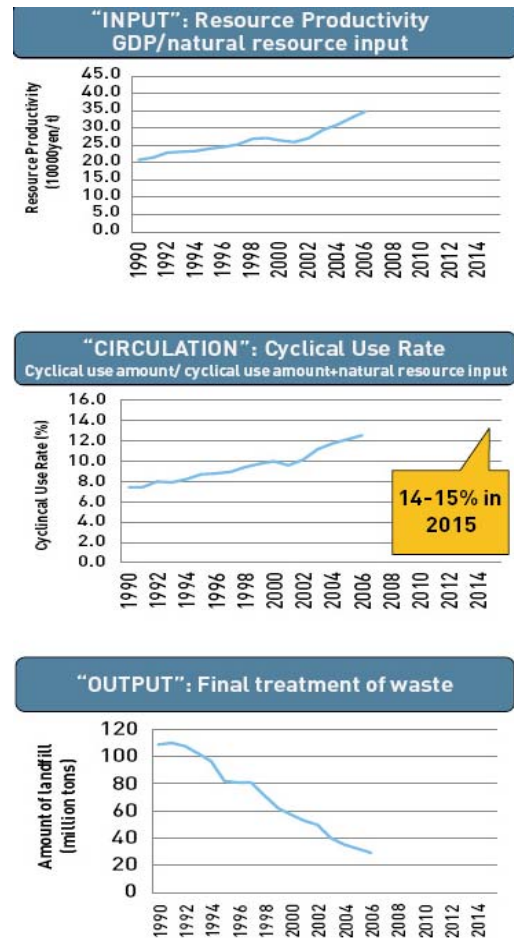


Fig. 2 Resource productivity process

IV. CASES OF SOUND MATERIAL-CYCLE POLICIES IMPLEMENTATIONS AND RESULTS

Japan's sustainable plan from the 1990s till the 2000s emphasized on environmental natural protection while considering national economic competition through ensuring productivity and efficiency, which is one of the main objectives of Japan's Sound Material-Cycle Society. Below is a summary showing some of the most important methods used for Sound Material-Cycle Society that were introduced and applied during the same period.

A. Eco-Town Program

In 1997, the Eco-Town program was introduced in Japan to fabricate a bond between metropolitan waste management and recycling business in the country aiming for a zero net emission, by reusing waste in other forms and industries, recycling waste, and in this way reducing the amount of waste to the maximum. The Ministry of Economy, Trade and Industry (METI) declared that the new system will encourage environmental and technological business that will promote a connected balanced social system that will allow having environmental sustainable developments [7].

The Eco-Town program searched for a local government that can sponsor competitions to encourage environmental management programs, and the programs require local

governments to develop strategies with environmental industries owners applying the eco-term concept, where the winner plan will be sponsored by METI and MOEJ. Both theoretical programs such as feasibility studies and programs and practical programs including recycling facilities and renewable energy industry are sponsored by the Eco-Town program. During the period from 1997 till 2007, a total of 26 projects were introduced on different towns in Japan [17].

In general, the Eco-Town program was not successful in terms of the reduction in the core materials production and weakness that resulted on the local economy. On the other hand, it helped in creating a huge chain among a wide area in the country that responds and coordinates in the recycling and waste management plan [14].

Taking Japan as an instance, the Eco-Town program flourished the recycling management program efficiency and productivity all over the area by grouping the recycling sectors and business sectors in one area. By providing financial allowances to the evolved sectors and supporting the coordination between central, local government and business sectors, the expanses on the stakeholders became less and encouraged them for this cooperation.

The Eco-Town policies were supposed to lead for creating an efficient recycling facilities that can contribute to an effective recycling capacity and to fill the missing of these facilities in the nation through the creating a network for the related field. However, these policies do not meet the requirement for financial intensives to change the flow of recycling from an unplanned small scale to an appropriate recycling system on a wider scale and boundary, where the cost of recycling facilities in Eco-Towns is higher than unofficial type of recycling. The cost does not end at the operation of the machines only; also the method of collecting and transporting the recyclable materials adds extra expanses that have to be considered. For that, it is essential to initiate legal regulations and financial programs to motivate recycling programs and to highlight the importance of cooperation among the related facilities and end users in order to allow this policy to perform effectively.

B. Extended Producer Responsibility (EPR) Recycling Policy

Combining and adding Extended Producer Responsibility (EPR) to the waste management policies is a major issue concerning the sound material-cycle society when it was introduced. EPR is the main concept of increasing performance to reduce amount of waste that requires a large area of landfill. And it also relays the control of daily household waste on the products producers instead of putting all the responsibility on the government [3].

Hereby, the consumer is committed to handle the cost of waste treatment, and the traders are responsible to collect the consumed unwanted products and return it back to the manufacturer or suppliers, and the supplier has to collect the old products from the market and recycle it. Subsequently, the amount of money spent on of recycling will reflect back in the manufacturer's process of recycling the items the produced.

And this will encourage the manufacturers to consider higher recycling specifications in their products in order to minimize the cost of products recycling [19]. By transferring the responsibility of recycling from the consumer to the producer, it is assumed that the recycling ability will be considered more than before, and as a result, waste amount will decrease. Apparently, it seems to be as a rule or a law that increases the regulations on the producers; however, the main objective of this policy is to encourage the producers to increase the efficiency of their products and to consider recycling ability as a positive feature in their products rather than a requirement and to promote advanced technologies in the field of eco-efficiency and environmental designs [6].

Fig. 3 shows that applying the EPR policy helped in reducing the expanses of recycling and achieved its main objective. Moreover, expanses sharing transformed from the local bodies to the private district effectively and positively.

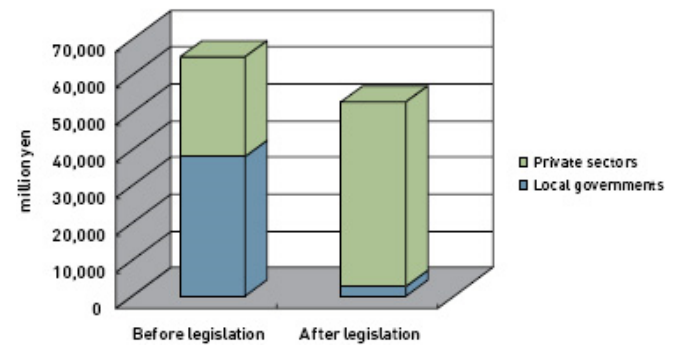


Fig. 3 Change in expanses of recycling after applying EPR policy

Fig. 4 illustrates a case study for personal computers, where it shows that used computers, that are exported, outline a gap in the mechanisms of local recycling and resources management [16]. Also, the EPR policy does not deal with controlling pollution caused by recycling and does not rely on a certain waste management program.

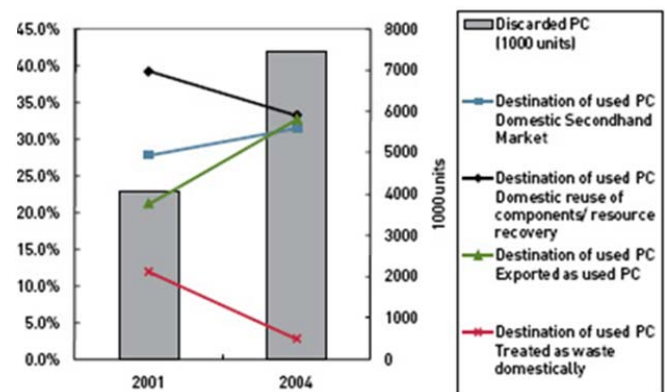


Fig. 4 Destination of Used Personal Computers (PCs)

C. Resource Productivity Policy in an International Framework

On a large-scale, governments are aware with the importance of resources efficiency policies, for that reason

IGES carried a study comparing the application of Material Flow Analysis (MFA) and resources efficiency upon the OECD countries during 2007 and 2008 [1].

Fig. 5 illustrates that countries that apply resource productivity targets and MFA, are the countries that have excess in resources imported like in the case of Germany, Japan, and Italy. Fig. 6 presents that these countries have a comprehensive exporting manufacturing line. On the other hand, countries like Australia and Canada that have plenty of natural resources are not interested in applying resource productivity programs and regulations. Therefore, this study concludes that countries that are aware and interested in applying the MFA in improving their resources productivity are considered as having a higher economic performance (GDP/capita), a higher depending on imported natural resources due to the lack of natural resources in the country and a high level of exporting manufacturing and products [11].

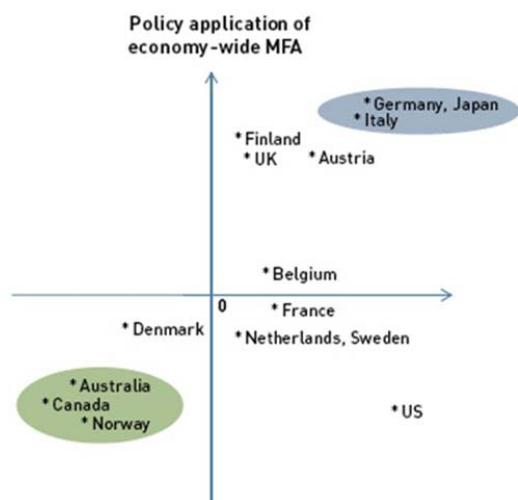


Fig. 5 Resource Imports and MFA Application in OECD countries

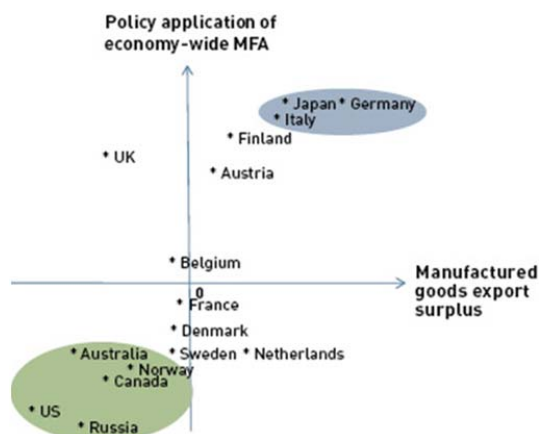


Fig. 6 Contribution of the Export-Oriented Manufacturing and Industrial Sector and the MFA Application

Perhaps, advanced or updated strategies have to be taken into account to the concept of resources productivity that Japan mostly considers and relays on, this is due to the clear results from the above discussions indicating that some other factors

may affect and change the importance of the sustainable policies applied including the national, industrial and economic framework of the country.

V. JAPAN'S SUSTAINABLE POLICIES IN THE EARLIEST OF THE 21ST CENTURY

There are recent studies that have been taken into consideration as solutions for the ongoing problem for waste. It was developed by Ministry of the Environment of Japan in the 2000s to drive an increase in efficiency [10]. Those sources are derived from "Strategy for an Environmental Nation in the 21st Century" from 2007, "Clean Asia Initiative" from 2008, and "New Growth Strategy" from 2010.

A. Strategy for an Environmental Nation in the 21st Century of Japan (Strategy 1)

The action for creating a better strategy for a better environment was taken in June 2007; it created a guideline for environmental policies. The strategy was set by the Environmental Nation in the 21st century. It took about two years to get this approval by the Cabinet. This created a national vision and strategy for a sustainable practice by integrating activities such creating a low carbon society and handle energy related concerns which may arise, and providing equilibrium in biodiversity in nature in relation to the natural environment [7].

1) Low-Carbon Society

This strategy considers a new community with less carbon emissions and a wealthy lifestyle [8]. By promoting awareness among the society and promoting technology to serve sustainability and achieving a healthier lifestyle, economic development and conserving natural environment. This strategy emphasizes on producing a more efficient and sustainable product like non fuel cars, LED lamps and many other products that have environmental concerns in the industrial field.

2) Sound Material-Cycle Society

Based on the Environmental Nation in the 21st Century strategy significance coordination with the Asian countries, it was undertaken to encourage for a sound material-cycle society according to the challenges that is facing the Asian countries. To achieve this goal, the strategy implicates the coordination between the develop cities and the shareholders in the industrial, technological and economic sectors [8].

3) Society in Harmony with Nature

Thinking from a different direction unlike the above discussed strategies, this strategy is based on the concept of natural conservation and the harmonious relation between environment and society. The whole idea is based on creating a conservation program that is concerned with bio-diversity and economy that does not conflict or effect negatively on nature aiming to provide a natural atmosphere for the current and future generation. This includes sustainable nature, agriculture, fish farms, forest and gardens [8]. Encouraging people to participate in this program was based on connecting

it to the lifestyle of the Japanese and the conservation of landscape design and the nature around them; however, the concept was very basic and needed a propped application method rather than being just a concept or idea, it needed an extra concern from the local and governmental sectors to be applicable in the country [13].

B. Clean Asia Initiative (Strategy 2)

In important part of a sustainable strategy for the 21st century in Japan is by having collaborative effort with the developing countries in Japan. The Ministry of the Environment of Japan in 2008 launched The Clean Asia Initiative (CAI) which was supposed to help with the overgrowing waste issues. As a result, the developing countries would be able to utilize the technology that Japan uses and institutions where they originate from. It would be a start for an environmental management system.

The CAI has the same consideration of the Environmental Nation strategy in the 21st Century of Japan, it is calling for a reduction of carbon foot print, a sound material-cycle society in addition to creating a harmonious natural social lifestyle.

Regional cooperation would be an integrated part of the CAI in relation to the economic changes which would occur during this development with those countries [9]. On the other Japan, which would be considered developed, has had a recent interest in the 3R Initiative. It will help with the domestic promotion by “the possible hollowing out of the domestic recycling industry under globalization” and “how to establish an environmentally-sound and economically-efficient trade of recyclables.” [15]. In addition, there would be an expansion in the divisions of the labor among countries within a globalized economy. It is challenging to recognize the affect locally without understanding the stream of recyclables in an established environmentally sound set up [12]. However, the strategy of “society in harmony with nature” is not related to the dialogue of increasing the eco-efficiency. Therefore, it is connected to the other ideas like the sound material cycle and it can be considered as a prospective idea for the future of sustainability in Japan. Nevertheless, there is no clear strategy and idea how to assist biodiversity conservation among Asian countries.

C. New Growth Strategy (Strategy 3)

Finally, the new growth strategy was embraced by the new government in 2010, aiming for economical and natural growth throw focusing on innovative ideas among different sectors of japan industry and economy. The strategy has seven main ideas; the principle idea is relaid on green innovation believing that green innovation produces green energy and power. The target of the new growth strategy is to invest in the environmental market targeting for more than ¥50 trillion in addition to more than 1.5 million new job opportunities in the sustainable and environmental sector.

Another target is to reduce around 1.5 billion tons of CO₂ and gas emissions by green technology, focusing on preserving new technological brilliance in the benefit of environment, and competing worldwide new technologies with the strength of japans technological sector.

VI. CONCLUSION

Although Japan’s government was aware of the importance of creating a new image for the sustainable economic development, they were unable to design a complete vision until now due to the continuous industrial and economic collapse that faced the country in the last few years. From the discussions in this review paper, sustainable strategies that were implemented during the period of 1990s till the 2000s, a future vision for Japan’s sustainable program cannot be determined, while the main focus is on resources efficiency and using the support of technology. Moreover, calling for the collaboration between Asian countries, the study cannot extract any other strategies or ideas, and therefore any clear vision for the future program of sustainability cannot be determined. Although the above mentioned strategies was workable passed on the concept of increasing productivity and efficiency, we cannot consider it as a true strategy for the 21st century unless a clear strong strategy that includes many perspectives for a sustainable society is created.

As a result of the enlargement of resources consuming, which leads to extra production of waste and materials, it is highly required to establish an international program to preserve these material and to increase productivity and to manage waste generation. Japan can be an idol that can be followed internationally in terms of dealing with resources and productivity based on their long experience in the field and can promote for a collaborative Asian program for resources management.

Speaking economically, it is important for Japan to show a clear plan for reducing resources consumption and increasing productivity in coordination with Asian countries. Likewise, it is important to look at a smaller scale not forgetting the importance of landscaping conservation, sustainable methods of building, consider biodiversity, and sustainable lifestyle that will have effect on the economy of the country.

Mostly important is the intensive coordination toward sustainable approach between the strategies and programs to avoid clashes of aims and goals. Finally, green revolution and designs is not enough for a sustainable approach, also to consider restoring existing substructure and designs toward a sustainable one. And this can be seen in the action that was taken after the many natural disasters that faced Japan in 2011 like the tsunami and Fukushima nuclear incident, which gave a chance for modifying the strategies from resources efficiency to reduction in materials use and coordination with Asian countries toward sustainability.

REFERENCES

- [1] C. Aoki-Suzuki, Y. Hotta and M. Bengtsson, Tailoring EW-MFA (Economy-Wide Material Flow Accounting/Analysis) information and indicators to developing Asia: Increasing research capacity and stimulating policy demand for resource productivity. Paper presented at ISIE Asia-Pacific Meeting and ISIE MFA-ConAccount Meeting, 7-9 November 2010, Tokyo, Japan.
- [2] R. Ayres, Towards zero emissions: Is there a feasible path? - Introduction to ZERI Phase II (working paper). Tokyo: UNU/IAS, 1997.
- [3] R. Ayres, Resource scarcity, technology, and growth. In R. Simpson, Toman, M.A., Ayres, R. (Ed.). Scarcity and Growth Revisited: Natural Resources and the Environment in the New Millennium. Washington,

- D.C.: RFF Press Books, 2005.
- [4] B. Barrett, *Ecological modernization and Japan*. London: Routledge, 2005.
- [5] J. S. Dryzek, *The politics of the Earth – environmental discourses*. Oxford: Oxford University Press, 1997.
- [6] Environment Agency Japan, Showa 56 nen-do Kankyo Hakusyo. (Environmental White Paper of Japan, 1981). Tokyo: Ministry of the Environment of Japan. (Japanese)
URL:<http://www.biodic.go.jp/reports/1-1/u000.html>. Accessed on 02/04/2016.
- [7] Environmental Agency Japan, Heisei 4 nendo-ban Kankyo Hakusho. (Environmental White Paper, 1992). Tokyo: Ministry of the Environment of Japan. (Japanese)
URL:<http://www.env.go.jp/policy/hakusyo/hakusyo.php3?kid=204>. Accessed on 08/04/2016.
- [8] Government of Japan, 21 seikikankyourikkokusenryaku. (Becoming a leading environmental nation in the 21st Century: Japan's strategy for a sustainable society). Tokyo, Japan: Cabinet Meeting Decision, June 1st, 2007.
- [9] Government of Japan, Shin-seichosenryaku. (New growth strategy). Tokyo, Japan: Cabinet Meeting Decision, June 18th, 2010.
- [10] F. Grosse, Is recycling “part of the solution”? The role of recycling in an expanding society and a world of finite resources”, 2010.
- [11] K. Halada, Future demands of metal resources. Paper presented at the Workshop on Supply and Demand of Resources and Low Carbon Development in Asia-Pacific Region, February 12, 2010, Tokyo, Japan.
- [12] H. Herring (2008). Rebound Effect. In: *Encyclopedia of Earth*. Ed. C.J. Cleveland. Washington, D.C.: Environmental Information Coalition, ational Council for Science and the Environment. Retrieved from http://www.eoearth.org/article/Rebound_effect. Accessed on 05/03/2016.
- [13] K. Holzinger, C. Knill and T. Sommerer, Is there convergence of national environmental policies? An analysis of policy outputs in 24 OECD countries, 2011.
- [14] Y. Hotta, The transnational politics of ecological modernisation, An analysis of the formation of transnational authority in global environmental and industrial governance, with special reference to the Zero Emissions Initiative in Japan. Sussex, UK: University of Sussex, 2004.
- [15] Y. Hotta, Comment on Makiya et al. (2006): Cooperation between developed and developing countries in promotion of 3R. *Regional Development Dialogue*, 2006, 27(1): 183-186.
- [16] Y. Hotta, S. Hayashi, M. Bengtsson and H. Mori (eds.) (2009). *Extended Producer Responsibility in East Asia – in consideration of international resource circulation*. Hayama: IGES. URL: <http://enviroscope.iges.or.jp/modules/envirolib/view.php?docid=260719>. Accessed on 28/03/2016.
- [17] Y. Hotta Is Resource Efficiency a Solution for Sustainability Challenges?. *Japan's Sustainable Strategy and Resource Productivity Policy in the 21st Century In-text: (Hotta, 2011) Bibliography: Hotta, Y. (2011). Is Resource Efficiency a Solution for Sustainability Challenges?. Japan's Sustainable Strategy and Resource Productivity Policy in the 21st Century. SAPI EN. S. Surveys and Perspectives Integrating Environment and Society, (4.2).*
- [18] A. Revell, Ecological modernization in the UK: rhetoric or reality?. *European Environment*, 2005, 15(6), 344-361. <http://dx.doi.org/10.1002/eet.399>.
- [19] M. Yamaguchi, *Chikyu Kankyo Mondai to Kigyou*. (Global Environmental Issues and Business Actors). Tokyo: Iwanami Shoten, 2000.