Asian Social Science
www.ccsenet.org/journal.html
Vol. 5, No. 9
September 2009

Air Pollution Prevention Alliance between Japan and China: The Possibility and Problems

Lin Sun (Corresponding author)
Institute of National Economy, Shanghai Academy of Social Sciences
7/622, Huaihai Zhonglu, Shanghai 200020, China
Tel: 86-21-5306-1696 E-mail: sunlin@sass.org.cn

Zhuyezi Sun
Xiangming High School
151 Ruijing Yilu, Shanghai 200020, China
Tel: 86-21-6418-5350 E-mail: zhuyezi@gmail.com

Abstract

The air environmental pollutants exhausted by China have attracted the attention from the world, especially the neighboring countries including Japan. Japan has put forward a conceived model named *Air Pollution Prevention Alliance between Japan and China*. This article analyzes the background and causations of air environmental pollution problems in China, and the efforts that Chinese government has made in energy conservation and lessening the pollutants exhaust of car. On this basis, we analyze the mutual interests and stance of the governments and car manufacturers in the aspect of establishing *Air Pollution Prevention Alliance between Japan and China*, and consider that there will be further cooperation between Japan and China on air pollution problems in the governmental levels, and the operation can be expanded to be a multilateral frame which is among Korea, Japan, China and other East Asian countries. But at this stage, as for the aspect of car manufacturers in Japan and China, the bifurcation between these two countries decides that there is just a little possibility of establishing an alliance which focuses on solving the air pollution problems in China.

Keywords: Air pollution, Automobile, Japan and China

1. Introduction

In the process of rapid developing economy in China, the total amount of air pollution exhaust is increasing continually; moreover, because of the liquidity character of air, the air environmental pollutants have spanned national boundaries and become a problem affecting both domestic and its neighboring countries' environments simultaneously. Therefore, the air pollution problem in China is now becoming a subject cared by its neighboring countries, especially Japan.

Air environmental pollution problems include two aspects: green house gas emission such as CO_2 in majority and harmful gas emission such as SO_2, NO_X, CO, HC and PM10. Air pollution caused by harmful gas can be mainly reflected in the atmosphere aspect, acid rain having been caused by SO_2 and NO_2, and reflected in the city air aspect, pollution problems in cities having been caused by pollutants which mainly contain NO_X, CO, HC and PM10. This article is emphasized on harmful gas emission, especially the problems of automobile exhaust emission and the green house gas emission is not involved.

There have been many researches paying more attention to air pollution problems and automobile exhaust emission in China, many of which are making effort to research in policy-oriented perspective for lessening air pollution exhaust and automobile exhaust emission. Wu (2005) has achieved a qualitative analysis to the automobile exhaust problems in Chinese traffic field, and pointed out the importance of multi-barrel policy method of implementing the laws and regulations, limitation, tax system and so on. There are also many researches carried on quantitative study using econometric model by Zhang et al. (2007), Zhang (2007), Xi and Chen (2006) and so on. These researches mainly analyze the related policies that can accelerate the replacement between of traffic tools, and achieve energy saving and

lessen pollution exhaust emission. Sun et al. (2006), Sun (2007), with a CGE model, analyzes the tax policies and technologic limitation policies of promoting energy conservation, widespread lower exhaust automobile, then achieves a beneficial conclusion, that is, under the premise of gradually enhancing fuel consumption limitation and technical standard of emission limit, increasing automobile running cost is the efficient approach to carry out energy conservation and exhaust reduction for automobile.

Different from researches mentioned above, this article is a qualitative discussion on pollution problems caused by automobile traffic fuel consumption in the aerosphere and city air from the aspect of automobile exhaust emission, and exploration of the possibility to establish *Air Pollution Prevention Alliance between Japan and China*, which offered by Japan, in Chinese and Japanese government and car manufacturer level. This article is composed of several parts as follows: Firstly, it analyzes the background and the causations of air pollution exhaust problems in China, especially the more and more serious automobile exhaust problem; secondly, it introduces governmental efforts having been taken in the aspects of laws and regulations, technical policies, technical standards, financial and tax encouragement and punishment policies for car energy conservation and lessening the car exhaust emission in China; thirdly, it analyzes where the mutual interests and stance of Chinese, Japanese government and car manufacturers is laid for air pollution exhaust and city air pollution problem; fourthly, on the basis of above-mentioned analysis, it discusses the possibility and other problems of establishing *Air Pollution Prevention Alliance between Japan and China*.

2. The background of air pollution problems and continuously worsening causations in China

2.1 The background of air pollution problems in China

Since the 1980s, it is common to use the production modes of high devotion, high exhaust and low output in the economic transformation and industrialization process, which is the main causation bringing about the environment worsening problems in China nowadays. Simultaneously, the environmental problems are also related with the globalization and the Chinese manufacturing's position in the international division of labor.

Although the progress of environmental related technology is the main factor to achieve the decrease of domestic energy consumption and total exhaust amount in developed countries including Japan, we mustn't forget the factor that the manufacturing of developed countries have moved into other countries. Most of them have been transferred into China, especially the manufacturing of Japan. That is to say, in the process of globalization, China and other developing countries provide cheap commodities which need great number of resources and energy sources and produce a great deal of exhaust. Accordingly, the air pollution problems in China and other East Asian countries is not an isolated problem, and to improve this problem should not be the obligation and responsibility only for China

Naturally, China, as a rapid economic growth and developing country, is inevitable to bear the obligation and responsibility for improving global or regional atmospheric environment. At one time, China is also the biggest victim of the atmospheric environmental pollution. Presently, nearly half of cities' air qualities in China are lower than the National Environment Standard II, and 30 per cent of the country has been attacked by acid rain which does greatly harm to the agriculture, forestry, buildings and ecological situation of China. Automobile exhaust emission causes photochemical smog and other pollution in cities which can directly endanger urban inhabitants' health. Therefore, Chinese government has began to fully consider the environmental cost for developing economy and gradually amends the stratagem of the past excess pursuit for economic gross expansion, and gropes and implements the sustainable development strategies in recent years.

2.2 The causations for continuously worsening atmospheric environmental problems in China

The history of developed countries has proven that relying on vast fossil fuel will inevitably lead to a mass of harmful gas exhaust in the process of industrialization. China, in recent two or three decades, can not avoid the same old disastrous road that first polluting and then governing, which the developed countries have experienced in their economic development. Moreover, in China, there are also many objective and man-made factors that could further exacerbated environmental problems which are always hard to avoid.

In the aspect of objective factors, one is structural factor, and the other is technical factor. Structural factor is a fact that coal accounts for more than 70 per cent of China's primary energy. Moreover, the sulfur content of coal in China is higher. In addition, in recent years, the proportion of high-sulfur crude oil in the increasingly expanding amount of imported crude oil is higher. Technical factor is reflected in the level of desulfurization technology of enterprises, and the total amount of SO_2 exhaust emission is further affected by the rather behindhand desulfurization technology level of power generation factories and oil refining enterprises in China. Thus, if they produce equal scale of power and consume the same amount of fuel, there will be more SO_2 and other harmful gases exhausting in China than that of the developed countries.

Man-made factor mainly refers to the action that the local governments, which have right to supply and dominate production factors, unilaterally seek for high GDP and increase the environment costs factitiously. Besides, in the aspect of enterprise, illegal exhaust emission actions can be detected from time to time. And some enterprises not only take no

efforts to improve desulfurization technology immediately, but also violate the exhaust limitation laws and regulations established by governments, evading the surveillance of state environmental protection departments, even turning off desulfurization equipment and making bold to exhaust air pollutants with the purpose of cutting down the costs.

In the Chinese cities, especially the big cities, besides the SO_2, dusts from coal-fired industries, and dusts from urban construction, air pollution also include the automobile exhaust emission which is increasing year by year because the increase in automobile ownership. In big cities, automobile exhaust emissions with CO, NO_X, HC and others harmful gases have become the No.1 air pollution sources and the share rate of automobile exhaust emissions in urban air pollution trends to increase rapidly. The continuously increasing amount of automobile exhaust emissions can not only cause photochemical smog pollution, but also lead to structural change of the urban air pollution. At present, most cities have transformed pollution caused by coal combustion in the past into mixed pollution caused by coal combustion and automobile emission.

The rapid increase of the urban air pollution in China is related with the features of Chinese automobile market and the fuel consumption. Firstly, the automobile industry develops rapidly in recent years, and the automobile ownership increases year by year. From the year 1990 to 2006, the car ownership has risen from 5.514 million to 35.86 million, not including 13.99 million low-speed diesel automobiles using in the country. Estimated by researches (Zhang, 2007) that the car sales will be more than ten million and the ownership will reach 54.5 million by 2010, and by the year 2020, the car sales volume will exceed 20 million and the ownership will reach 120 million. The great increase in car ownership will be substantially more obvious in the city. By June 2007, the car ownership in Beijing has exceeded three million, and with a 14 per cent annual increase rate. According to the forecast of *Outline for the Development of the Beijing Municipal Traffic*, the civil car ownership in Beijing will reach 3.8 million or so by 2010, and five to six million by 2020.

Secondly, the great increase of car ownership lead to a rapid increase of fuel consumption in China year after year, and the fuel consumption has increased from 24.3 million tons in 1990 into 60.5 million tons in 2003 (Li, 2005). If the consumption of gasoline has 6.8 per cent average growth rate annually and diesel oil has 6 per cent average growth rate annually, it is estimated that the fuel consumption of car will exceed 200 million tons, and the gasoline and diesel oil consumption can respectively exceed 134.3 million and 66 million tons (Zhang, 2007).

Thirdly, the automotive fuel consumption and exhaust emission technology level is rather behindhand in China, and the fuel consumption of single car is higher than that of developed countries. For the fuel consumption, the annual average fuel consumption of single car is 2.5 tons in China, and respectively 31.6 per cent, 108.3 per cent and 133.6 per cent higher than that of America's 1.9 tons, Germany's 1.2 tons and Japan's 1.07. According to the automobile ownership in 2005, comparing with American, German and Japanese annual fuel consumption, Chinese consumption is 14.47 million tons, 31.36 million tons and 34.49 million tons more than that of these three countries respectively (Li, 2005). In the aspect of car exhaust emission, the standard of car exhaust emission in China is about six to eight years behind the developed countries of Europe, Japan and so on. The passenger cars' average emission level of CO, NO_X and HC in Beijing and Guangzhou is respectively about four times, two times and three times more than that in America (Zhang, 2007).

2.3 The present situation of urban air pollution in China

It's said by the European Space Agency (ESA, 2005) that the data displayed by environmental monitoring satellite images have shown that during the past ten years, the amount of pollutants emitted by factories, power plants and automobiles in the air space of China has risen by about 50 per cent. In addition, the images have also shown that NO_2 pollution in Beijing and the northeast region are the most serious, and the NO_2 is almost from the unfiltered automobile exhaust.

In China, automobile exhaust emission has become the main reason for air quality's exacerbation in large cities; moreover, the urban environment is getting worse because the total amount of exhaust emission trends to increase year by year. In recent years, among the main air pollutants in Beijing, Shanghai, Guangzhou and other large cities, the number of CO, HC, PM10 and other pollutants which are from automobile exhaust emission is yearly increasing. At present, automobile exhaust emission has become one of the main sources of air pollution exhaust in Beijing, and the share of HC, NO_X, CO, PM_{10} are emitted by automobiles, is 51 per cent, 64 per cent, 92 per cent and 23.3 per cent respectively in the emission sources (*Beijing Evening News*, 12 August 2007).

Most of the cities in China are in early stage of family motorization, if we do not take some powerful measures, with the rapid increase of automobiles in urban areas, the air pollution problem caused by automobile exhaust emission will become more and more serious. How to reduce unit energy consumption and emission of air pollutants, and improve the emission technology of single car, and how to contain the share rate which has yearly increased of automobile emissions in the atmosphere and urban air pollution, has become the keystone of governmental work. In recent years, the Chinese government has taken actions to strengthen the policies of restricting automobile exhaust emission and

promoting development of clean automobiles in order to restrain exacerbation of urban air pollution.

3. Policies that the Chinese government has made to promote automobile energy saving and reduce exhaust emission

In the aspect of technology policy, in order to reduce automobile fuel consumption and exhaust emission from a middle-term and long-term point view, it is a efficient measure to accelerate hybrid power cars, electric cars, fuel cell cars, and bio-fuel cars, that is, to promote and popularize the clean automobiles. But at this stage, in order to achieve fuel-saving and reduce the restrictions on automobile fuel and exhaust emission, improving the quality of fuel, and enhancing the engine performance of existing fuel automobiles and the efficiency of exhaust purifier are also extremely important measures. At the same time, to facilitate technology development for automobiles manufacture, and to encourage the consumer purchasing low consumption and low emission automobiles, and to introduce financial and tax policy of tax break are the significant means to popularize the low consumption and low emission automobiles. Accelerating the scrapping of old automobiles and restricting the high-emission automobiles' running range and time are also efficient measures. In order to promote the development of energy-saving and less-emission automobile technology, the government can take actions in law and regulation, technology policy, finance and taxation policy.

3.1 Main policies of promoting energy saving automobiles

In 1997, China has established the *Law of the People's Republic of China on Conserving Energy* which is not involved in the energy saving car, it's expected that the 2007 revised edition will add some items about energy saving cars technology. The *Automobile Industry Tenth Five-Year Plan* which published in March 2001 gave a clear data goal for automobile fuel consumption improvement and referred that the consumption of a car driving 100 km in 2005 should be improved 10 per cent than that in 2000, with a detail that light automobiles will be improved 5 to 10 per cent and heavy automobiles is 10 to 15 per cent, but with no specific restriction on single automobile fuel consumption.

The *Automobile Industry Development Policy* published in May 2004 encourages the development of low-emission cars, hybrid cars, diesel engines and cars with new energy technologies, and put forward the goal that the average fuel consumption of automobiles would be improved 15 per cent better by 2010 on the basis of 2003. In order to achieve this goal, in October 2004, limitation standard for the fuel consumption of one automobile with weight categories is established and published for the first time, which requires that the new type approval automobiles should reach the first stage standards of fuel consumption restrictions from 1 July 2005 (former type approval automobiles could be delayed a year later to achieve the goal). From January 2008, the type of new type approval automobiles shall reach the second stage of limit standard (former type approval automobiles could be delayed a year later to achieve the goal). In 2007, limit standard of fuel consumption for light commercial automobile has been established and published, and will be implemented from 2008.

As the bad average level of automobile fuel consumption at the present stage of China, it's very important to urge the automobile manufacturers to improve fuel consumption level of one automobile. The technology policy of restrictions on automobile fuel consumption reflects the government's determination that spurs automobile enterprises improve fuel consumption technologies. In the aspect of finance and taxation policy, in April 2006, the government adjusted the automobile consumption tax rate, and raised the tax rates of large-size automobiles. In addition, in energy saving technology policies, the finance and taxation policies which can guide consumers to buy low fuel consumption automobiles still lack.

3.2 Main policies of restricting automobile exhaust emission

The laws and regulations which are used to restrict car exhaust emission in China beginning with the *Law on the Prevention and Control of Atmospheric Pollution* published and implemented in 1987, and revised respectively in 1995 and 2000. In the aspect of technology policy, technology policies about the pollution emissions of cars, motorcycles and diesel automobile have been made and implemented successively after the year 1999. In March 2001, the *Automobile Industry Tenth Five-Year Plan* has explicitly encouraged to achieve many goals including producing and popularizing clean automobiles, implementing much stricter automobile inspection system, improving car fuel quality, introducing exhaust emission standard and system from Europe, and so on.

In the aspect of technical standards, the automobile exhaust standard has been established since 1983, but all of those are not perfect enough. Until 1999, China began to introduce automobile exhaust standards and systems from Europe, and make and publish a standard which came into effect from 1 January 2000 in order to limit the exhaust emissions of light automobile. In 2001, China made the National Standard System which based on the automobile emission standards of Europe for light automobile exhaust. The standard of exhaust emission limit is required to reach its first stage (equivalent to the Euro 1 Emission Standard) on 1 January 2000, and put its second stage (equivalent to the Euro 2) and third stage (equivalent to the Euro 3) into practice respectively on 1 July 2004 and on 1 July 2007, and is expected to implement the forth stage (equivalent to the Euro 4) by 2010. In big cities such as Beijing, Shanghai, Guangzhou, the corresponding stage of emission standard have been put into practice in advance. In the aspect of fuel quality, on 1 July

1999, the main cities have achieved unleaded petrol for automobiles, and the whole country have achieved on 1 July 2000. Thereafter, in order to meet each stage of the emission standards, the fuel quality standards have been gradually increased at the same time.

In the aspect of fiscal policy, the automobile manufactures which have reached the national emission standards in advance will be rewarded tax cut. In 2001, the government began to give an excise cut of 30 per cent to those light cars which had reached the second stage of emission standards in advance, until the end of 2003, the total amount of tax cut had reached eight billion, which has made a part of the light automobiles reaching the third stage of the exhaust emission standards ahead of schedule.

The Chinese government has taken great effort to control automobile exhaust emission, such as making relevant laws and regulations, technology policies and technical standards, and trying to implement preferential taxation policies, which has achieved important progress in controlling the automobile exhaust emission. However, we must realize that just like the policies of technology for energy-saving automobiles, the majority of work is still at the beginning, especially the aspect of rewards and punishment policy for finance and taxation; China should learn the experiences from developed countries and seek an international cooperation on energy-saving cars and technology for reducing exhaust emission.

4. Basic stance and mutual interests between Japan and China in preventing air pollution

4.1 China's basic stance in preventing air pollution

Firstly, as the urban air pollution problem is very serious, more and more attention has been paid to the environmental problems in China, and the awareness of environmental protection is getting stronger and stronger. The government and the people eagerly expect to improve the serious urban air pollution situations, and also look forward to great improvement of the environment quality in China, East Asian region and even the whole world.

Secondly, the Chinese government eagerly expects to enhance the government departments' capability of making environmental relative policies and protecting environment, and hopes to cultivate a large number of human resources. And the Chinese government is very willing to improve the management capability in this field and cultivate talents in the environmental protection field through an international cooperation. When the Chinese government studies, makes and implements the policies of preventing air pollution, reducing automobile emission and saving energy, we can find the participator of the international relative organizations and people from the concerned countries.

Thirdly, the Chinese government and enterprises eagerly expect to enhance the technology level of energy saving and less-emission automobiles. Except enhancing industrial technology level by its own efforts, China has many successful cases and experiences to enhance industrial technology through an international cooperation.

Finally, in the aspect of air pollution prevention, especially the less-emission and energy-saving cars, as China has just entered the initial stage of automobile's popularity, the demand for cars will increase rapidly in a long period of time, and the automobile's production, sales, and ownership scale are ever-expanding, it's sure that there will be a promising future for the advanced technology of less-emission and energy-saving car.

4.2 Japanese basic stance in preventing air pollution

Since the Japan experienced the extremely serious and painful environmental pollution from 1960s to 1970s, its social value or cost contributed to the quite great progress in technology level. Today, as a developed country, the advancement of Japan is including energy-saving automobiles and exhaust emission reduction and other environmental protection aspects, details as follow: Firstly, Japanese government and its people have a higher level awareness of environmental protection and are willing to devote themselves to improving the air quality of East Asian region even the whole world.

Secondly, since Japan has experienced serious environmental pollutions in a long period of time when the economy grows very fast, the government has accumulated much more experiences for making policy and technical standard and supervision of implementation for environmental control, therefore, the governmental management capability is very strong.

Thirdly, Japanese enterprises have the most advanced environmental technologies in the world and the further development capability of new technologies. In the aspect of energy saving and exhaust emission reduction technology, Japanese automobile manufacturers master the most advanced technology recognized by the whole world and have made actual achievements.

Fourthly, as Japanese domestic automobile market tends to be saturated, Japanese automobile manufacturers have very strong motivation to export technologies into international market, and win a larger share of the international market. As for the energy saving and exhaust emission reduction technology, the Japan has a very obvious superiority to those emerging markets, which have a low technical level, including China.

4.3 Mutual interests between Japan and China in improving atmospheric environment

Two factors of mutual interests will possibly facilitate both Japanese and Chinese governments and enterprises reaching a consensus and working together to solve the air pollution problems in China.

One factor is that the air pollution is a transnational problem, and it is necessary for Japan to consider the further development trend in future. Although there is insufficient evidence to prove the air pollution in China may have started to affect other countries, especially the neighboring countries such as Japan and other East Asian countries, it's a fact that the liquidity character of air can cause the possibility of transnational atmospheric pollution, which makes the pollution problem internationalized, and the East Asian region will be the first victim. Therefore, it's necessary for relevant countries and regions to join together to face the problem, and in the East Asian region, it's undoubtedly that the most necessary thing is to unite the China and Japan firstly.

The other one is technical aspect. Japanese environmental technology for building country strategy and enterprise strategy both need to search market for the accumulation of environmental technologies. As for the automobile industry, the automobile market of developed countries and domestic Japan is gradually becoming saturated; meanwhile, the emerging market is gradually enlarged, while the Chinese market is the largest and active emerging market. Japanese automobile manufacturers obviously will not give up the Chinese market. And the use of advanced energy-saving and exhaust emission reduction technologies is just what China need to improve atmospheric pollution and urban air quality situations. Apart from self-development, seeking international cooperation and introducing advanced technology are also good choices. Therefore, the cooperation between Japan and China in exhaust emission reduction and energy-saving automobile technologies are in line with the mutual interests of the two countries.

5. The possibility and problems of air pollution prevention alliance between Japan and China

For years, China has cooperated with Japan in many ways of environmental protection. Especially at the governmental level, the *Sino-Japanese Friendly Environmental Protection Center* found by both Japan and China, which implements the Sino-Japanese expert technology partnership projects. China and Japan have started the environmental cooperation in many fields through the ways that Japanese experts were sent to the Center for work, Chinese research students were sent to Japan for further study, aid for equipments were offered by Japan and so on, all of the cooperation can reflect Japanese government's support to Chinese environmental protection. The relative enterprises have made a lot of efforts, such as the Toyota Motor Corp have offered an investment to build *Research Center for Industrial Development and Environmental Governance* in Tsinghua University in China, and conduct policy research, academic exchange, graduate education, in-service personnel training and other activities. The Sino-Japanese environmental cooperation is most important of China's international cooperation. At present, under the bilateral and China, Japan, Korea and East Asian region framework, the environmental cooperation between Chinese and Japanese government have made some progress (Qu, 2006). For the future, cooperation on atmospheric pollution problems will be further developed between Japan and China, and the cooperation scope will cover governmental management capacity, making policy and standard, technical cooperation, training for human resources, and so on. Therefore, the *Air Pollution Prevention Alliance between Japan and China* at governmental level will be possibly achieved, and the achievement can be extended to the entire East Asian region.

However, the deep technical cooperation between the automobile manufacturers of the two countries is not ideal because there are some differences in the awareness of technical cooperation. The core issue of improving atmospheric environmental pollution situation by any possible means is to improve the environmental technologies level in automobile industry, and it's also a possible option to obtain technology through cooperation or independently develop technology. Under the background of globalization at present, international cooperation is a more effective way, and the Chinese government tends to encourage the enterprises to gain technology through international cooperation. The three main international advanced technologies of United States, Europe and Japan are all optional collaborators for Chinese enterprises. However, after implementing the unsuccessful *market exchanging technology* strategy for more than ten years, the Chinese government begins to emphasize that the enterprises should choose international cooperation on the premise of establishing *independent brand* and possess of *core technology* strategies, and should attach great importance to the introduction of core technologies and participation in further technology development when taking the cost of introducing technologies into account, rather than accept as the *no core technologies* and *no intellectual property* collaborators.

Both Japanese government and enterprises are willing to enlarge the market share in China, but at the same time, they worry they will lose the core technologies or not receive corresponding market return. In many public occasions, we can hear many remarks that Japanese government and business people worry about the loss of technologies, especially aiming at China. Therefore, Japanese seem to be very cautious to start cooperation with Chinese enterprises, they hope to expand the application market for their own advanced technology, and on the other hand, they don't want their collaborators to contact their core technologies, not to mention participating in the further development of subsequent technology.

China will seek collaborators which are willing to offer lower cost technologies, offer core technology and admit Chinese people to participate in the further development of technology, or directly purchase the international advanced technology, and then further develop the completely independent knowledge proprietary technology which based on the bought technologies. Judging from the current situation, Japanese automobile manufacturers will possibly keep the traditional stand, and they will not change their stand to open the core technology to China and develop a new generation of technology with China together to solve the air pollution problems which are caused by automobile exhaust in China. Therefore, under such circumstance, there is a little possibility that the automobile manufacturers in Japan and China will establish an alliance which focuses on solving the atmospheric pollution and urban air pollution problems in China together. The relationship among enterprises is a competitive relationship in essence, and we haven't seen any precedents that the enterprises cooperate for solving the air pollution problem together except the symbolic *friendly cooperation*. Moreover, there are many automobile manufactures which come from different countries in the Chinese market, but on the point of solving the air pollution problem together, we fail to see what the cooperation or alliance between the two enterprises can do, and how long can it work.

References

ESA. (2005). Space Sensors Show Massive Surge in Chinese Air Pollution. [Online] Available: http://www.spacemart.com/reports/Space_Sensors_Show_Massive_Surge_In_Chinese_Air_Pollution.html (September 1, 2005).

Li, Xinmin. (2005). The Control Policies of Automobile Pollution in China. [Online] Available: http://auto.people.com.cn/GB/3545925.html (July 15, 2005, in Chinese).

Qu, Geping. (2006). The Chinese Environmental Situation and Some Opinions on Environmental Collaboration between China and Japan. Wuxi, China, Environmental Forum Comments, December 21 (in Chinese).

Sun, L., Muto, S., Tokunaga, S., & Okiyama, M. (2006). Numerical Analysis of Environmental and Energy Policies Related on Automobiles in China: Evaluation by Dynamic Computable General Equilibrium Model. *Studies in Regional Science*, 36 (1), 113-131 (in Japanese).

Sun, Lin. (2007). The Impacts of Consumption Tax Reform for Passenger Car in China: Simulation Analysis by CGE Model. *Forum of International Development Studies*, 33 (3), 89-109 (in Japanese).

Wu, Wenhua. (2005). Energy Saving Status and Policy-orientation in Transportation Field. [Online] Available: http://www.finance.people.com.cn/GB/8215/49768/49774/3491654.html (June 23, 2005, in Chinese).

Xi, J. and Chen, G.Q. (2006). Energy Analysis of Energy Utilization in the Transportation Sector in China. *Energy Policy*, 34 (14), 1709-1719.

Zhang, S., Jiang, K. & Liu, D. (2007). Passenger Transport Modal Split Based on Budgets and Implication for Energy Consumption: Approach and Application in China. *Energy Policy*, 35(9), 4434-4443.

Zhang, Shuwei. (2007). Transportation Energy Scenarios for China: Emphasis on Technological Advancements and Modal Evolution within a CGE Framework. Presented at the Annual Meeting of International Association of Energy Economics 2007, Willington, New Zealand.

Zhang, Zhengzhi. (2007). Our Nation Shall Establish Industrial Policies for Supporting Low-emission Vehicle Quickly. [Online] Available: http://www.autoinfo.gov.cn/ (September 25, 2007, in Chinese).