

RIVIEW:  
**An international comparative study on the  
regulation policy of asbestos usage in China**

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**Abstract**

Due to its outstanding physicochemical properties, asbestos is widely used in construction and thermal insulation of buildings. The United States and Japan used to be the largest consumers of asbestos during their period of rapid economic growth. Although many countries have banned the use of asbestos because of its health risks to humans including mesothelioma, China continues to produce and use large amounts of asbestos because of its low price, high performance, and abundance of asbestos mines and related industries in China. We studied the current issues associated with asbestos use in China including resources, usage, regulations and substitutes. In most countries it took a long time to ban asbestos use. In an international comparison, we refer to the experience of the United States and Japan to predict the upcoming problems related to asbestos in China and reach some conclusion on how to persuade the Chinese government to reconsider its policy stance on asbestos.

**Keywords:** asbestos, China, comparative policy study, environmental health, environmental policy, mesothelioma

**Introduction**

The international society has taken an increasingly stiffened the regulations on asbestos use. The International Ban Asbestos Secretariat (IBAS) has listed 54 countries that have banned the use of Asbestos. Most developed countries have already completed or are moving towards a complete prohibition of asbestos use. In Japan, the use of asbestos has been banned since an asbestos pollution incident happened in Kubota Amagasaki factory, also known as the Kubota Shock. In Japan, it was predicted that there would be at least 100,000 mesothelioma patients in 40 years since 1970s when the asbestos use reached 300,000 metric tons (t) per year.

In the United States (US), about 8,500 to 19,000 people have suffered annually from asbestos pollution since the annual asbestos use reached 700,000 t in 1960s. The US has since sharply reduced the annual net domestic use of asbestos to 1,100 t. Severe damages and social problems may happen in China in the same way.

Since the risk of damage associated with the use of asbestos was first discovered in the 1920s in Britain, a lot of research has been done on asbestos regarding both its medical effects and applications in the construction industry. The International Agency for Research on Cancer (IARC) affiliated with the World Health Organization (WHO) classifies asbestos as a “known human carcinogen”, as does the US Environmental Protection Agency (EPA).

In Japan, Murayama investigated the risk of spreading exposure to asbestos in environment and argued that asbestos damage is in the form of an “environmental pollution” rather than just an "occupational disease" (Murayama 2002: 328).

However, due to its outstanding physicochemical properties and low price, serpentine asbestos is still widely used in construction and thermal insulation materials and for other uses in China (Zhou 2008: 109-126). The use of asbestos in China has kept increasing in recent years and reached over 600,000 t per year, which is currently the largest asbestos consumption in the world. China is one of the few countries with lots of asbestos mineral resources and related industries, and has taken up a positive policy on asbestos use.

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## Methodology

This study is an analytical review based on the information collected and analyzed from literature, official data released by governmental agencies and also data collected through field works and a survey in Xi'an by one of us. Currently, there are two opposing views on the asbestos usage policy: one is that asbestos can cause serious public health problems and should be banned immediately, such as by the European Union (EU), US and Japan; the other is that serpentine asbestos can be "safely" used and successfully applied to wide industrial areas for its high performance, such as in China. Our study attempts to discuss the asbestos problems from a different viewpoint. We argue that China has focused on the "current" situation and conditions of asbestos usage, while similar problems that the EU, US and Japan experienced could probably happen in China in the "future"; this is because a similar process is being repeated in all these countries. By going through the history of asbestos usage from the peak consumption period to its prohibition and ban in those countries, we can estimate the future situation of asbestos usage in China and make some suggestions for the associated problems.

We first summarize the situation of asbestos usage in an international comparison and then analyze the role of asbestos at the current stage of economic growth and development in China with the possibility of its ban in the near future. Moreover, we compare the experience of the US and Japan to predict the potential of upcoming problems related to asbestos use in China. This discussion we allow us to provide several suggestions that may stimulate the Chinese government to reconsider its current policy over the use of asbestos.

## Findings

### Asbestos Production and Consumption in China

About 50 asbestos mines had been explored in China until 2000, holding 93,025,000 t of serpentine asbestos, and making it the 3<sup>rd</sup> largest in the world, based on the statistics of China Non-metallic Minerals Industry Association (CNMIA) in 2000 (CNMIA 2003). More than 90% of the asbestos resources are located in western areas such as 58,095,000 t in Qinghai, 15,585,000 t in Sichuan, 10,333,000 t in Shanxi and 5,135,000 t in Xinjiang. Mangya Town in Qinghai and Akesai Town in Gansu are the two largest production centers and produce more than half of the asbestos per year.

As the statistics of CNMIA show, China's annual asbestos production was 211,000 t in 1978, only 4% of the total production of the world at the time. China produced over 300,000 t per year, reaching 14.6% of the world production from 1998 to 2005, a period of rapid economic growth. In recent decades, the state-owned firms of asbestos mining and production have gone under reform and been privatized, which resulted in many issues for both employees and local citizens such as lower efficiency, a more dangerous operation and worse conditions.

Table 1 shows the top five producers and users in 2011, where the BRIC countries (Brazil, Russia, India and China) can be found. Presently, asbestos production in China is the 2<sup>nd</sup> largest one, and its consumption is the 1<sup>st</sup> largest in the world. As economy keeps growing rapidly, asbestos usage is increasing every year. Till 1992, the amount of domestic demands reached to about 240,000 t, and the annual average rate of increase was 4.5%. Furthermore, according to the statistics of CNMIA, the domestic asbestos demands reached 440,000 t in 2004.

The average annual asbestos usage in China is about 400,000 t, 25% of which is imported. Especially after China's WTO entry in 2001, the tariff of asbestos decreased from 12.0% to 6.8%. Larger amounts of high quality and cheap asbestos were imported compared with domestic production which decreased to 300,000 t in 2005. Moreover, due to the prohibition or decline of asbestos usage in the US and Japan and other large consuming countries, China has become the

target market of those asbestos-exporting countries such as Canada, where 90% of asbestos production used to be exported to Japan (Miyamoto etc 2006).

**Table 1:** The top five producers and users of asbestos in 2011

Top Five Producers (t)		Top Five Users (t)	
Russia	1,000,000	China	637,735
China	440,000	India	321,803
Brazil	302,300	Russia	251,427
Kazakhstan	223,100	Brazil	185,332
Canada	50,000	Kazakhstan	155,166

Source: IBAS 2012

More than 80% of the firms using asbestos in production are located in coastal cities. Regarding the categories of asbestos consumption, it is mainly used for asbestos cement products and friction material in vehicles brakes. As shown in Table 2, about 85% of the asbestos use is for asbestos cement products, where no less than 360,000 t are used every year. The asbestos cement industries have developed greatly since 1980s in the quantity and categories of products and the manufacturing techniques. About 560 asbestos cement firms exist now (CNMIA 2003). The 2nd largest usage of asbestos was for friction in automobiles and as a sealing material. The Chinese government proclaimed the new “automobile brake washer” national standard (GB5763-1998) in 1998, and forbid the use of asbestos in all brake systems since October 1, 2003. It is said to be the first asbestos use prohibition action in China (CNMIA 2006).

**Table 2:** The change in the types of asbestos usage in China

	1970-1979	1980-1989	1990-1999	2000-2008
Cement products	65-75	70-75	75-80	80-85
Friction products	15-20	15-20	13-18	10-13
Other products	15	10	7	5-7

Source: CNMIA 2003, Zhou 2008: 109-126

Asbestos is divided into two subgroups; chrysotile belongs to the serpentine family of minerals and demonstrates curly fibers while amphibole demonstrates needle-like straight fibers. The latter group includes actinolite, crocidolite, anthophyllite, tremolite, and amosite asbestos. Chrysotile is the only serpentine asbestos that may nowadays exist in almost any asbestos-based product; it is also the main type of asbestos being mined at present. Listed in the Rotterdam Convention as a hazardous industrial chemical, amphibole asbestos has been banned, even in most of the countries which still mine and use asbestos, ever since the Rotterdam Convention was enforced on 24 of February 2004. The prohibition of serpentine asbestos was submitted for a formal examination after the issue was raised by the EU and other countries; but finally serpentine asbestos was not put into the list because of the opposition of 5% of the members such as Canada, which has abundant mineral resources of serpentine asbestos.

### Regulations for Asbestos Use in China

Since 2002, China has banned amphibole asbestos and published stringent step by step measures for the use of serpentine asbestos, as a member of the Rotterdam convention (shown in Table 3). But the total consumption keeps increasing. In September 2006, CNMIA organized a national meeting and declared its policy of safe asbestos usage. Safe use refers to the requirements for the thorough management of the production circumstances. CNMIA also

suggested that a wet type production should be followed for the safe use of asbestos. However, most of mining industries in China used a dry type process. Moreover, the asbestos produced in Mangya Town, one of the largest production centers, was not suitable for the wet type spinning production of asbestos due to its physical characteristics. Dry type production can result in the dispersion of asbestos particles, which may impair the workers' health, and also the health of people living nearby. The national standards have also specified detailed requirements for safe production such as 2 mg/m<sup>3</sup> for asbestos emission limitation; however the best case reported in Mangya Town was 10 mg/m<sup>3</sup>. Small private firms even cared less about the asbestos pollution during production; the regulation and standards were rarely followed with strict supervision and clear penalties.

**Table 3:** Important events for asbestos use

Year	Event
2002	<i>Actinolite, tremolite, amosite anthophyllite asbestos</i> were listed in the catalogue of outdated products as technologies and products to become phased out (3 <sup>rd</sup> batch). (enacted by the State Economic and Trade Commission as Decree No. 32; enforced from 1 <sup>st</sup> of July 2002)
2003	China banned asbestos for <i>friction materials in the auto industry</i> : GB 12876-1999: road vehicle braking systems; structure, performance and testing methods.
2005	The import and export of amphibole asbestos, both <i>amosite</i> and <i>crocidolite</i> were prohibited.
2008	On December 6, the final decision of no consent to import <i>actinolite, tremolite, amosite Anthophyllite asbestos</i> was published by State Economic & Trade Commission (currently National Development and Reform Commission).
2010	In December 2010, in MSC.282(86) banning asbestos products for all ships was emphasized by China Classification Society, which belongs to the Ministry of Transport.
2011	From June 1, using any type of asbestos, including <i>chrysotile</i> , as <i>construction material in the siding and wall</i> has been banned based on the Chinese national standard GB50574-2010.

Source: IBAS 2012, Rotterdam Convention 2012

Even though asbestos has been proved to be dangerous, the Chinese government takes a positive policy for asbestos use under safe use conditions. Besides the low cost and good performance, there are some other social and economic reasons to make asbestos prohibition difficult in China.

**1) Economics:** the amount of asbestos use is quite large now, and the related industries including mining, asbestos cement, friction and sealing materials and etc, account for a large part of the economy. Asbestos prohibition can affect a lot of industries and the local employment opportunities. Besides, 90% of asbestos mines are located in west areas, where minority nationalities live. Asbestos production industries contribute a lot to the local economics, such as Akesai Town, where asbestos mining and related industries provide for over 90% of the tax revenue and 80% of employment. Asbestos prohibition would strike such areas severely.

**2) Substitutes:** research on Substitutes for asbestos has been conducted for a long time without satisfying results. One of the introduced non-asbestos fibers costs 160 CN Yuan/kg, 40 times that of asbestos fiber, which is just 4 CN Yuan/kg (Rong 2006: 132). The cost of imported artificial fibers is 15 times higher than that of serpentine asbestos, which is 2,000 CN Yuan/ton. If the asbestos friction material was to be replaced by imported artificial fibers, then the cost of one set would increase by 10 CN Yuan; with 20,000,000 sets produced and 30,000,000 sets for repair each year, the annual total cost would increase by 500,000,000 CN Yuan. A survey showed that the asbestos products accounted

for 48.5% of the friction material industry and 88.3% of the sealing material industry, and that the amount of production has kept increasing.

The substitutes for asbestos in China are divided into 2 kinds: natural fiber and artificial fiber. The former one includes sepiolite and brucite, the performance and the production of which are not as good as that of asbestos. The latter one includes glass fiber and rock wool, which are expensive but low-performance, and have been shown to be hazardous materials themselves. The substitutes are mostly used for friction and sealing material. But there are few suitable substitutes for the construction industry, where 85% of asbestos is consumed.

**3) Public awareness:** As a positive policy is adopted for asbestos use in China, researchers and media are talking more about the possible safety and safe use issues rather than the pollution hazards of asbestos. In the national meeting held by CNMIA, a report was presented that suggested safe use could be realized by controlling the emission density of asbestos to a certain level. The report also insisted serpentine asbestos was a safe and cheap mineral fiber because it could be discharged by the human immune system even after inhalation. After the meeting, the number of firms using asbestos increased. In this context, still some negative opinions are voiced, but they are weak and sometimes tactfully asserted.

The public including the citizens and the workers haven't recognized the danger of asbestos. A low level of public awareness was found through the field study in Xi'an in 2007 (Zhou 2008: 109-126). Even after detailed national standards for safe use were published, the workers of the factory that was surveyed in Xi'an still worked with bare hands, and no specific protective measures were adopted by the factory.

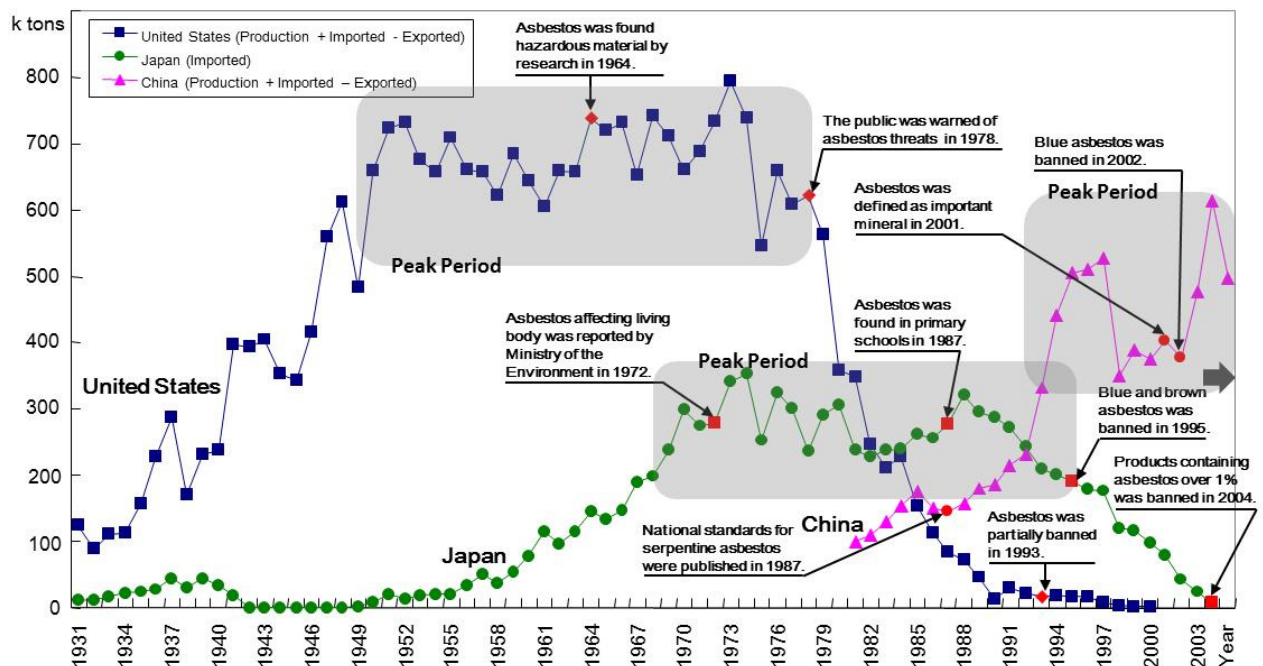
## Discussion

### Lessons from International Comparison on Environment policy and Asbestos Use

As explained before, the historical progress of asbestos usage in US and Japan were compared with those in China to arrive at some policy implications for China's asbestos problems. Figure-1 shows asbestos usage data from 1931 along with some important historic incidents. Similar histories can be found in the comparison of Japan with the US where unfortunately the Japanese delayed to respond and repeated the mistakes of the US with a 20 year interval. Both the US and Japan have implemented counter plans for a gradual and periodical prohibition of asbestos usage. However, China is confronting a more severe situation than Japan which applied stricter regulations following the US; this is because China is working in a slower pace according to a set of regulations and standards of positive policies. As such, asbestos usage is still increasing and a total ban in China is still far away in the horizon.

As shown in Figure 1, the US and Japan first found out about asbestos hazards in 1964 and 1972, respectively. The US started to control the use of asbestos from 1987, and Japan from 1988; they spent 14 years and 16 years to complete the ban, respectively. In addition, it can be seen that in 1970s when the US was reducing asbestos usage, Japan was right at the beginning of its peak use period. As the same time, in late 1980s while Japan was at its peak consumption, China experienced a period of rapid usage expansion. Now, China is the largest asbestos consumer in the world. The experts of CNMIA speculate that this tendency is unlikely to change within the next 10 years.

In 1978, the US government warned its citizens about the asbestos threats and completed the guidelines of asbestos waste management. Moreover, some of asbestos products were prohibited in 1993. In 2004, Japan amended and enacted the Enforcement Order of the Industrial Safety and Health Act and banned the import, production and use of 10 categories of products that contained over 1% of asbestos.



**Figure 1:** International comparison of asbestos use (Source: the US Geological Survey (USGS), Japanese Ministry of Health, Labor and Welfare (JMHLW) and China Non-metallic Minerals Industry Association (CNMIA), Zhou 2008: 109-126)

In addition, since the Kubota Shock, Japanese citizens have learned about asbestos pollution from the media, symposiums and so on and have rejected the use of asbestos containing products. Therefore to solve asbestos problems, it is indispensable to provide correct information to the public via mass communication.

Environment policy has a life cycle, which can be divided into 4 phases: recognition of the problem, decision of the policies, policy enforcement and management improvement. Regarding the policy life cycle, the US is in the management improvement phase, and Japan is in the phase of policy enforcement, while China is still in the first phase of problem recognition (Zhou 2008: 109-126). It is clear that the damages caused by asbestos will continue in Japan and the US, so China should understand its position in the cycle and learn the needed lessons from their mistakes.

### Outbreak of asbestos related health problems and their compensation

The first report on the health damages of asbestos was made based on the laboratory work of researchers, like other pollution substances used in the industries. It took a long process to recognize the damages and ban asbestos use in most countries including the US and Japan. There is a latent period until the damages of asbestos appear. It was reported that the average latent period was 20-30 years for mesothelioma.

Table 4 lists the main asbestos issues in the US and Japan. There were some social problems such as the Kubota Shock in Japan, or suing for exposure to asbestos in the US, which led to a thorough asbestos ban. The damage of asbestos can be estimated by applying information such as the dose and exposure area. In Japan, most houses and mansions had used construction materials containing asbestos that were going to be demolished or reformed. This attracted more public attention, because of the wide range of asbestos use in construction, happening 40 years after the asbestos peak. On the issue whether asbestos can be safely used or not, the facts mentioned above can't be denied, and neither the possibility of an outbreak of similar social problems in China.

**Table 4:** Main asbestos issues in the US and Japan

Main Issues	US	Japan
First report on the damage	1964 by researchers	1972 by Ministry of Environment
First report on mesothelioma	1972, due to air pollution	1978, workers 2005, neighboring residents
Public announcement	1978, warning to the public	1987, social problem happened
Peak usage	early 1950s to late 1970s, nearly 30 years; the average annual usage reached 700,000 t	early 1970s to early 1990s, about 20 years; the average annual usage reached 300,000 t
Estimated Impact	More than 200,000 asbestos related deaths estimated for the period from 1979 through 2001 by Environmental Working Group (EWG).	From 2000 to 2039, 100,000 deaths estimated to happen due to mesothelioma
Compensation Fund	140 billion dollars (90 billion from related businesses, 46 billion from insurance companies, 4 billion from bankrupt companies)	About 120 million dollars in 2007, mostly from the associated private companies.

Source: compiled based on data from the Environmental Working Group Action Fund, and other documents

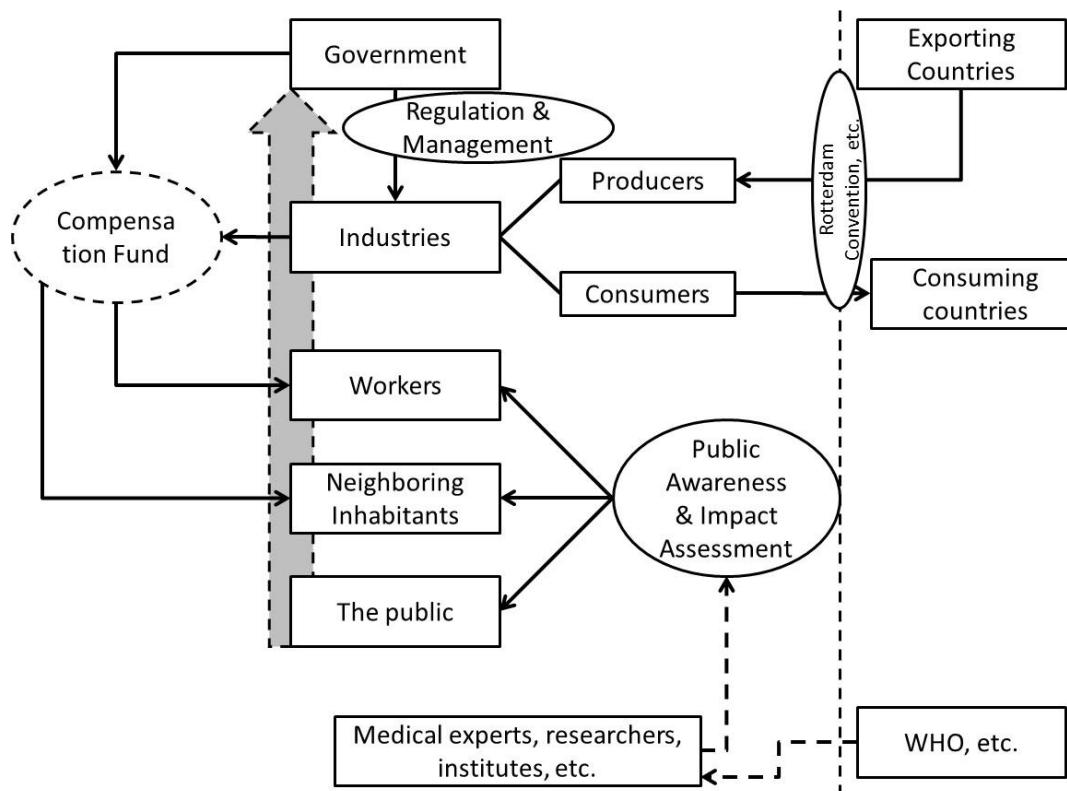
The estimated impact is also shown in Table 4. The mortality related to asbestos is estimated to be a large number. Besides, many more people may suffer from various lung diseases caused by asbestos, especially former workers of asbestos factories and their families. Hence, a compensation fund would be set up for taking care of the affected people. The compensation fund may be formed by the associated industries and businesses, and insurance companies such as the fund in the US and Japan. The asbestos lawsuits even resulted in the bankruptcy of several giant builders in the US. In other countries, the compensation fund was supported by the national government and resulted in a financial burden such as the famous FIVA in France. Considering the long term of compensation and the huge number of victims, the financial cost will probably be no less than the financial revenue from the asbestos related industries.

In China, diseases related to asbestos, such as mesothelioma and asbestosis, are categorized as occupational diseases. If confirmed, the medical expense is covered by the insurance for occupational diseases and the salary is paid as usual by the employers. However, the procedure from diagnosis, application and working disability assessment is usually not smooth and only applicable to the workers who still have their employment contracts. The part-time and retired workers are facing difficulties in paying for expensive medical expenses by themselves in case the diseases happen several years after their leave. The labor security bureaus are trying to improve the situation, but still just on a case-by-case basis due to the limited financial resources. Therefore, the Chinese government has not prepared well for the outbreak of asbestos related health problems.

## Conclusion

In order to solve the asbestos problems, cooperation of various parties is required. Figure 2 shows the stakeholders involved in asbestos problems; this model can be used for a consideration of suitable solutions to the problem.





**Figure 2:** The stakeholders related to asbestos problems (source: authors)

Firstly, the government policies of asbestos use should be reconsidered for a longer term and a wider scope, by referring to the experiences and mistakes of countries such as the US and Japan. No matter how thoroughly the safe production and use of asbestos might be implemented, the impact on human health cannot be fully controlled without a total ban of asbestos. Once the direction is decided, the process can be well planned step by step by dealing with legislation issues, technical issues for substitutes, public health and awareness issues, and the economic issues for related areas and industries. The economic structure of asbestos production centers should be adjusted by the government through appropriate supports.

Secondly, regulations and laws need to be reconsidered. Even though the current regulations about asbestos use are not that strict, few of them can be obeyed. So instead of making stricter regulations, a supervision system and clear penalties should be legislated. Besides, accurate definitions and detailed entries should be added to eliminate grey zones, which may commonly be utilized for short-term profit in China.

Thirdly, still the most difficult obstacle is that there are few suitable substitutes for asbestos. Being suitable means having a good performance at an acceptable cost. From the viewpoint of industrial ecology, not only the materials but also a thorough process should be reviewed in a substitute solution. Moreover, a combination of measures may work well through the transition of the industries, i.e. Japan banned asbestos for industries which had introduced substitute materials and technologies while applying safe use policies to others which didn't have substitute solutions.

Finally, the process of reducing asbestos use was started or accelerated after it caused social problems in the US and Japan. Therefore, after people realized the hazards of asbestos, the whole country was warned and therefore resulted in a move towards a total ban. Public awareness and consciousness for self-protection are the best supervisors of the public and environmental health. The survey in Xi'an (Zhou 2008: 109-126) shows that people who lived close to asbestos



relevant factories in China started to learn about this fact and from there this awareness spread to all over the country. Furthermore, it would be a good idea to encourage the medical experts and research institutes to perform objective investigations on asbestos issues, publish more reports for public perception and raise the public awareness.

Overall, it can be said that with so many stakeholders involved, asbestos problems are complicated and need a comprehensive consideration. Because the damage of asbestos occurs long before we learn about it, after a long latent period, we should take actions as early as possible. There are other hazardous materials used in industries besides asbestos. Research on asbestos problems may contribute to similar cases for a more healthy and sustainable environment.

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