

# Present Situation, Problems and Prospects of Construction Waste Treatment in China

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**ABSTRACT:** With continuing to increase in construction waste produced from urban and rural construction, how to effectively treat construction waste has become one of the important problems to be resolved in China's city. This paper is to discuss the present situation and existing problems of construction waste treatment in China, and to make a prospect for the future treatment. The results of the study show that, at the present stage the simple stacking or landfill mainly adopted by most of the cities not only takes up a lot of land, but also causes the environment pollution. However, as most components of construction waste may be recycled, so if some effective policies and measures can be took, its potential environmental benefits and economic benefits may be played. This requires the state and government to improve the relevant laws and regulations, to vigorously promote the relevant management and technical innovation, to develop and perfect the relevant product technical standards, to improve the relevant markets, and to give preferential policies in taxation, funding, technology R&D and market access.

**KEYWORD:** Construction waste; Treatment technology; Resource recovery and utilization; Regeneration construction products

## 1 INTRODUCTION

With the development of cities and construction industries, construction waste produced from the urban and rural construction is increasing, too. A large number of construction waste generated not only occupy valuable land resources, but also have a great impact on the environment. Therefore, how to effectively treat construction waste has become one of the most important problems to be solved by each city in China (Wang et al. 2014).

The best way to address the problem of construction waste is from the source to reduce the generation. In fact, scientific design and optimization of initial construction scheme may help to greatly reduce the generation of construction waste. The second is to make the resource recovery and utilization of construction waste, as a large part of construction waste can be reused again. The final is to make the harmless treatment for the rest that cannot be made for resource recovery and utilization. Obviously, the treatment of construction waste is a systematic engineering, only scientific management in the whole process from the source to the final treatment can fundamentally resolve the problem of construction waste (Marzouk & Azab 2014, Yuan & Shen 2011).

In recent years, national and local government has paid more attention to construction waste management, and attempted by the regulations and policies to promote effective treatment of construction waste. However, compared with the developed countries, the governance of construction waste in China is still at the primary stage, and the reduction, resource recovery and harmless treatment levels are significantly lower than that of developed countries. Therefore, in the future it will still need further improvement and enhancement. This article mainly analyses the current situation and issue of China's construction waste treatment and makes a prospect for the future governance.

## 2 MATERIALS AND METHODOLOGY

### 2.1 Construction waste and its properties

Construction waste mainly includes the construction waste generated from construction, the construction waste of demolition of old buildings and the construction waste generated from house decoration. The main composition of construction waste contains brick block, concrete, mortar, sand, scrap steel, metal pipeline, waste wood, all kinds of packing ma-

materials, and these materials account for about 80% in the total construction waste (Silva et al. 2014).

In municipal solid waste, construction waste accounts for 30-40%. Because most components of construction waste may be reused after being processed properly, so compared with other municipal solid waste, the construction waste has relatively small harm and as long as taking the scientific and reasonable treatment they will not cause the second pollution. However, since most components of construction waste are difficult to biodegrade readily, so if not to treat and use them in a scientific way but simply by landfill manner, it will occupy a lot of land. At the same time, it will cause pollution such as dust, heavy metal and others, too. Therefore, the core of the problem is how to fully utilize them in a scientific way, which involves the technology, cost, market and policy (Yu et al. 2013).

## 2.2 Treatment technology and its application

In addition to waste brick, metal and others that may be directly recycled in construction waste, the rest can be made into the aggregate, base material of road, high performance recycled brick and others to be used for new construction projects through scientific processing. Therefore, the majority of components of construction waste can be recycled and reused again. For example, at present the resource recovery rate of construction waste in the EU countries has exceeded 90%, while in South Korea and Japan it has reached more than 97% (Li et al. 2013).

Treatment of construction waste is mainly associated with the generation, collection, intermediate treatment and recycling use. At the generation stage, it is mainly to take the scientific design to reduce the production of construction waste as much as possible. Removal is mainly related to the collection and transportation tool, thus the technique is relatively simple. Intermediate processing and recycling technology is relatively more complex, involving the crushing and screening technology, separation and impurity removal technology and renewable product molding technology (Ma et al. 2014). At present, these techniques have been relatively mature and have obtained the preliminary application in China, too. Whether they can be used on a large-scale mainly depends on the investment, operation costs and markets.

## 2.3 Real management manner and its influence

The amount of annual construction waste generation in China is greater than 16 million tons. Moreover, along with the continuous expansion of the size of urban and rural construction, the amount of construction waste generated is continuously

expanding, too. However, resource recovery and utilization ratio of construction waste in China is only about 5%, while most of the construction wastes are treated through free stacking or landfill without any treatment. It is estimated that, at present the construction waste without any treatment has reached 7 billion tons, and has been increasing with the growth rate of 3 billion tons per year (Fu & Zhang 2010, Wei & Lai 2013).

Simple stacking or landfill will cause countless adverse consequences. The first is to occupy a lot of land. Not only that, because the construction waste is difficult to make natural degradation, it will gather more and more in the long run. In some cities of large-scale demolition and construction, construction waste is piling up and occupies a lot of land. How to treat the construction waste has become one of the most difficult problems that need to resolve.

Simple stacking or landfill will pollute environment. Construction waste contains large amounts of dust and bacteria and will inevitably be scattered into the air in the cleaning, transportation and stacking process, bringing pollution to environment. At the same time, construction waste also contains some heavy metals and they will pollute environment through the air or infiltration. Moreover, such pollution is difficult to be completely removed through the natural purification, resulting in long-term adverse effects on the environment.

Most components of construction waste can be recycled through simple or deep processing. While simple stacking or landfill will cause a lot of waste of resources and it does not accord with China's reality of resources shortage. In fact, the main components of construction waste may be reused in some new project construction only through a simple treatment. This not only saves resources, but also protects the environment.

## 3 RESULTS AND DISCUSSIONS

### 3.1 Low treatment rate and its reasons

At the present stage, construction waste in China mostly adopts simple stacking or landfill, and resource recovery rate is very low. Especially in some medium and small cities and rural areas, construction waste has not been made any treatment, which not only occupies a lot of land, but also causes environment pollution, becoming a public hazard of affecting people's normal production and life.

The cause of low construction waste treatment rate has many. Firstly, the people's perception and cognition level on the property and dangerous degree of construction waste are not high. On the one hand, in the early phase due to the limited size of the urban and rural construction and renovation, amount of construction waste generation is very small.

Therefore, the contradiction of taking simple stacking or landfill is not prominent, growing up to be a habit of treatment. On the other hand, people always think that the construction waste itself is a kind of garbage and do not know its characteristics of renewability and resource recovery so that resource value for reusing has not been given enough attention.

Secondly, the relevant regulations and policies are not perfect. China has promulgated and implemented the "Solid Waste Pollution Prevention Act" in 2004 and the "Technical Specification for Construction Waste Treatment" in 2009, and revised and improved the "Regulations of Urban Construction Waste Management" in 2005. Although these laws and regulations have played a certain role, the actual effects are not ideal. The main reason is perhaps that, due to the lack of the detailed rules for the implementation and operation of the actual work, it results in the difficult implementation in practice. Especially for some small construction enterprises with small size, due to the existence of financial and technical difficulties, it is virtually impossible to carry out the treatment according to the technical specification, or at least in the short term it is difficult to perform. In addition, there are still uncoordinated problems between construction department and the environmental protection supervision department.

The third is the absence of technological innovation. Construction waste treatment technology in China mainly relies on the import from abroad and the improvement on this basis, but the capability of independent research and development of technology is insufficient, resulting in the low level of construction waste treatment technology on the whole. At the same time, because of the difference of construction techniques and materials between China and foreign countries, the components of construction waste in China are different from foreign countries, resulting in the unsatisfactory effect of foreign technology application, too. In addition, because the treatment technologies of construction waste mostly belong to heavy mechanical equipment technology, the costs of investment and use are high. For ordinary construction enterprises, the technical and economic value of their application is not high, thus it needs to promote its innovation from the state and government level. However, at the present stage national support and driving forces on the innovation are not sufficient, resulting in the lack of innovation power.

The final is the factor of management system. The management of recycling and reusing of construction waste involves the three parties of the government, the construction units and the waste treatment enterprise. Only if they work together, the target of management of construction waste and recycling of

resources may be really realized. Among them, the construction unit and the waste treatment enterprise are the most critical, as they are specific practitioners. However, the construction unit and the waste treatment enterprise for their own economic interests are not willing to carry out this work, or because of the lack of funds and technologies they are unable to carry out this work, which requires the government to give support and help from the system, policy and funds. Obviously, at present the operation and supervision system of benign interaction between the three parties has not still formed. This is one of the principal reasons that the relevant regulations and policies are difficult to really get for the implementation.

### *3.2 Technical standard of products and market promotion*

The key of whether the regeneration construction products produced from construction waste can be popularized and applied is to make market recognition. However, due to people's lack of awareness of recycling and recovery of construction waste, people are more accustomed to the use of new construction products in reality. To change this situation, the state must first formulate the corresponding product technical standards for the regeneration products from different materials to guarantee the quality and availability of products from technology.

At the same time, it is also required to strengthen the promotion of the regeneration construction products. Firstly, it is necessary to change the people's understanding of the regeneration construction products to make the construction enterprises actively to accept them. In fact, some properties of recycled construction products are actually even higher than new construction products, but people do not just recognize its advantages and properties. Especially in the early period of promotion of regeneration construction products, it is necessary to adopt the material and spiritual incentives to encourage construction enterprises to actively use the recycled construction products.

From the perspective of the economy, because of the influence of technology, production scale, management and other factors, the costs of production in some regeneration construction products in early promotion are still relatively high. For this kind of regeneration construction products, the government may give some subsidies to encourage construction enterprises to actively use them. With the mass production and use of recycled construction products, their technology and management level will continue to enhance, and until then they may be completely adjusted by the market supply and demand.

### 3.3 Policy implications

The key to legal management of construction waste is to perfect the related laws and regulations and to make the whole process of the construction waste collection, transfer, resource recovery and processing as well as the series of treatment norms and standards of construction waste to be managed through the legislation form, and thus it needs take specific policies and measures to implement them. At the same time, it is necessary to enhance the supervision and administration of market subjects such as the construction enterprises, transport units, resource processing and disposal enterprises to ensure the implementation of construction waste treatment in the whole process (Wang et al. 2009).

In the construction waste management, the resource recovery processing of construction waste and the popularization and application of regeneration construction products are the most important parts. In the treatment mode, there are two modes of the centralized and the decentralized treatment. The centralized treatment mode is suitable for large construction enterprise. In this mode, the enterprises themselves buy and equip with related technology and equipment to make the resource recovery and utilization for the construction waste from their construction. Therefore, it is helpful to reduce the costs of collection and transfer, and supervision is relatively simple, too. However, for some small construction enterprises, they have not the ability to purchase and equip the related technical equipment. In this case, it is necessary to set up specific treatment enterprises for unified construction waste treatment. In this mode, it needs the government to actively cultivate and foster the development of resource recovery and treatment enterprise of construction waste.

As construction waste treatment has a certain public welfare, so the principle of both the maximization of the society benefit and the rationalization of the economic benefit should be followed. Therefore, both in the technology innovation of construction waste treatment and in the promotion of regeneration construction products need the state and the government to give preferential policies in taxation, funding, technology R&D and market access. As the resource recovery and treatment of construction waste and the application and promotion of regeneration construction products belong to the emerging industry of environmental protection, so the state should promote it to the national strategy of industry development and ultimately make it really to become a green environmental protection industry to give full play to its environmental benefits and economic benefits.

## 4 CONCLUSIONS

With the development of urban and rural construction, construction waste is more and more generated, too. Therefore, how to effectively treat construction waste has become one of the important problems to be resolved in China's city. Since most components of construction waste may be recycled and reused, so it has immense economic potentials. The crux of the problem is how to take effective policies and measures to make it to play its potential environmental benefits and economic benefits. This requires the state and government to improve the relevant laws and regulations, to vigorously promote the relevant management and technical innovation, to develop and perfect the relevant product technical standards, to improve market environment, and to give preferential policies in taxation, funding, technology R&D and market access.

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