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Study on the externality and the incentive mechanism of green building's development

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ABSTRACT

Green building has great external economy, resulting in both producers and consumers of green building has no enthusiasm; it can make the internal economic externalities to solve the problem of market failure. This paper discussed the external economy problems of green building caused by externality. A market allocation model of both the common architecture and green ones was set up, and an excitation mechanism of externality governance and compensation to compel the development of the green building was put forward. © 2013 Trade Science Inc. - INDIA

KEYWORDS

Green building;
Externality;
Market failure;
Market allocation;
Excitation mechanism.

INTRODUCTION

With the rapid developing of the social economy and urbanization, the exhaustion of resources and energy and the deterioration of environment have been a great threat of the survival of human beings and our descendants. In China, the architecture business has gradually been the three most energy consumers which the other two are industry and transportation. Consequently, to develop the green building is a new breakthrough to accelerate the transition of economy development mode. However, present situation of green building's development is not satisfactory. On the one hand, the government increased strength to promote green building, but on the other hand, the society has been lack of interests of them. The most important reason is green building's externality of economy, to discuss the external economy principles and supplement

mechanism, and to promote the development of green building policy according to that, must be beneficial to promote our green building's development.

MEANING OF GREEN BUILDING

“Green Building Evaluation Standard” issued by the Ministry of Construction give the definition of green building: During the full life cycle of the building, it can maximize conservation of resources (energy, land, water, and materials, namely, the “Four Saving”), meantime protecting the environment and reduce pollution, providing people with healthy, suitable and efficient use of space and building in which harmony with nature. It can be seen that green building is emphasized in harmony with nature, in line with local conditions, and among building design, construction and the choice of building materials, all do we consider the rational use of

resources and disposal, to implement resources efficiency, protection of environment and meet the needs of people to use.

SIGNIFICANCE OF THE DEVELOPMENT OF GREEN BUILDING

Effectively reduce excessive consumption of resources

At present, China is in a period of rapid development of urbanization, expanding the scale of urban and rural construction, According to statistics, the urbanization rate for each additional one percentage point, the newly-increased amount of land resources will reach 1,000 square kilometers; the newly-increased consumption of building materials such as steel, cement, brick, wood and so on reach over six hundred million tons; energy consumption newly-increased achieves the equivalent of 6,000 tons of standard coal. China has the world's largest construction market; the energy consumption of per unit area is almost 2 to 3 times that of the developed countries. Green building makes it to reduce the excessive consumption of resource through the full life cycle energy, land, water and materials efficiency, which is the inevitable choice for China's construction of a conservation-oriented society.

Reduce pollution discharge and improve environmental conditions

The construction industry is one of the important origins of greenhouse gas emissions, which engendered a direct impact on climate change. According to the statistics, China's general construction brought about the air pollution, light pollution and electromagnetic pollution and so on, which have exceeded more than 1/3 of the total environmental pollution, and building waste produced in the architecture industry have accounted for about 40% of the total amount of garbage. Accelerating the development of green architecture, not only can greatly reduce greenhouse gas emissions and effectively improve China's environmental conditions, but also play a vital role to realize the green economy construction of emission reduction targets and environmental-friendly society, and to devote a contribution to the global climate change.

Promote the sustainable development of the construction industry

For a long time, construction has been as China's pillar industry in national economy; it has become China's main industry of the energy consumption. Without transforming production mode of construction, it will not only directly affect the sustainable development of the construction industry, but also seriously affected the sustainable development of our country's economy and society. Development of green building can effectively promote the construction to convert from the traditional extensive development mode to technological, high-quality, effective, healthy, sustainable development mode, accelerating the efficient usage of energy, section, water and materials, with high efficiency utilization of resources, and reach the harmonious coincidence with natural environment.

EXTERNALITY AND MARKET FAILURE OF GREEN BUILDING

Externality of green building

The value of green building is embodied in three aspects: first one, the developer of green architecture or the producers of green products can obtain profits a lot; secondly, users and consumers of green architecture have access to the profits, such as health and environmental protection; last one is the indirect external effects, which is the whole social members' benefits obtained, such as clean water, fresh air, and beautiful environment. The green building will cause the additional costs under the current technology condition, resulting from green ecological concept. However, under the condition of the market mechanism, the producers and consumers of the ordinary building will not pay the wage of green building. Thus, the social benefits are far more than the incomes of individual of the green building, which leads to the externality.

Market failure

Market Failure is that the society cannot allocate the commodity and the labor effectively and relying solely on price adjustment can not realize the greatest resource configuration. Because the green building has a stronger external economic efficiency rather than the ordi-

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nary ones, but it will be a big investment and high prime cost under the current technology level. However, because of external benefit unable transfer to private benefits, resulting in the private marginal profit is less than the marginal social benefit, which is “market failure”.

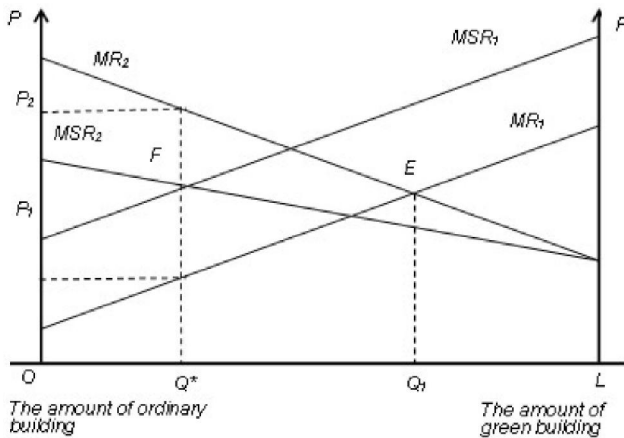


Figure 1 : Green building's market allocation model

Figure 1 is the model of the market allocation. There are two types of architecture in the market, green ones and ordinary ones. The point of *O* represents the allocation of the ordinary ones; the point of *L* in the right shows the allocation of the green ones. The total market demand is assumed *OL*. The curve *MR₁* and *MSR₁* in the figure represent the marginal private benefit curve and marginal social benefit curve of the production or consumption of green building, while the curve *MR₂* and *MSR₂* in the figure represent the ordinary ones. Without the externality, at a certain time the allocation of the green and ordinary ones will get balanced by the market mechanism. This point is the crossover point *E* of the marginal curves *MR₁* and *MR₂* which belong to green and ordinary ones respectively. At this point the balanced quantity of green architecture is *Q_{1L}* and *Q₁₀* for the ordinary ones.

However, the best social allocation should be at the crossover point *F* of *MSR₁* and *MSR₂*, which represent the marginal social benefits of the producer or the consumer of green architecture and of ordinary ones respectively by the externality, the corresponding balanced quantity is *Q_{1*}* for green ones, *Q_{0*}* for ordinary ones. At the balanced point *Q**, the private marginal benefits of producers or consumers of green architecture is *P₁*, and *P₂* for the ordinary ones. So there is a different quantity *Q*Q₁* between the market spontane-

ous allocation and the society's maximal allocation, which results the difference $\Delta P = P_2 - P_1$ between the private marginal benefits of green ones and ordinary ones. As for the producers or consumers of green architecture, owing to the incapability of internalization of external benefits, the *Q** will move to *Q₁*, which means the existence of externality will result the market failure of green building, and the market allocation of green architecture will never reach the social maximal level.

ELIMINATE THE EXTERNALITY OF GREEN BUILDING

The economic principles to eliminate the externalities of green building

Assume that *V_p* represents the private benefit of producers or consumers of green building and bring social benefits for *V_s*. Due to the presence of external income, personal income is less than the social gains, that is $V_p < V_s$; private producers or consumers of green building cost *C_p* higher than the private benefits *V_p*, *C_p* less than the social benefits of *V_s*, that is $V_p < C_p < V_s$. Although the optimal configuration of the whole community needs to develop green building, green building producers or consumers are lack of enthusiasm; green building development level will be lower than the optimal level of social expectations. (*C_p - V_p*) is the producer or consumer of green building loss portion, (*V_s - V_p*) is for the part of other people in society get social benefits, As (*V_s - V_p*) is greater than (*C_p - V_p*), if we set aside from other people in society get social benefits (*V_s - V_p*) to compensate for producers or consumers of green building loss, which results in the external benefits for producers or consumers of green building will achieve the internal configuration and thereby promote the green building market allocation coordinate the pace of the social development optimal level.

Analysis of the method to compensate for externality

Subsidies for producers—As Figure 2 shows, *D* for green building demand curve, *S* on behalf of green construction supply curve, market equilibrium point is *E₀*, corresponding to the equilibrium price is *P₀*, balanced output is *Q₀*. If Government subsidizes to producers by enabling producers to take to minimize the marginal cost

curve of S_1 , at this point, the output level of green building by the demand curve D and marginal cost curves of the new S_1 , the intersection of E_2 decisions correspond to the price and yield respectively P_2 and Q_1 . The total subsidy paid by government subsidizes to producers is $(L \times Q_1)$, that is, the area of rectangles $P_1E_1E_2P_2$ in Figure 2. Subsidies to producers so that the equilibrium price P_0 down to P_2 , as consumers benefit units $(P_0 - P_2)$, The total benefit to $(P_0 - P_2) \times Q_1$, producers benefit for $L \times (P_0 - P_2)$, In the figure $(P_1 - P_0)$ part of total benefits $(P_1 - P_0) \times Q_1$. Consumption of green building Q_0 increasing to Q_1 , the marginal cost that has increased exceeds marginal benefits, and the loss of efficiency resulted from subsidizing equals to the areas of $\Delta E_0E_1E_2$ in Figure 2.

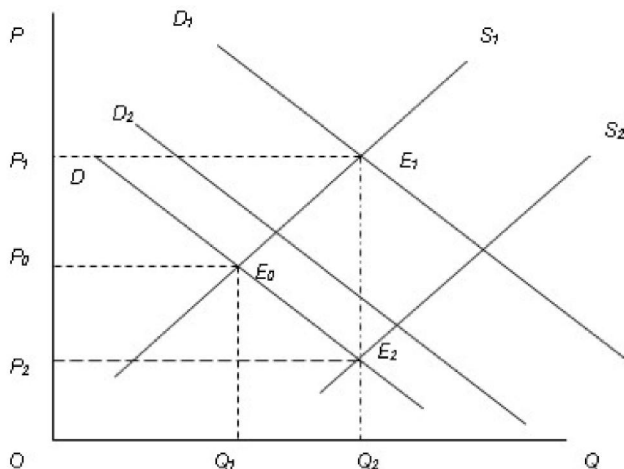


Figure 2 : Compensation modes to eliminate externalities

Subsidies for consumers – If the subsidies for consumers increase the marginal benefit of consumers, green building demand curve D shift up to D_1 , moved a distance of L , a new market equilibrium point is E_1 , corresponding price is P_1 , yields increase as Q_1 . Under this production, the original demand curve corresponds to the point E_2 , the price is P_2 . The amount of subsidy $(L \times Q_1)$ paid by the government is $(P_1 - P_2) \times Q_1$, that is the area of rectangle $P_1E_1E_2P_2$ in figure 2. Producers and consumers of the gain determined by the elasticity of the demand curve and supply curve, consumer subsidies so that the equilibrium price P_0 rose P_1 , producers benefit units $(P_1 - P_0)$, Total benefits is $(P_1 - P_0) \times Q_1$; and consumers benefit units $[L - (P_1 - P_0)]$, the part of $(P_0 - P_2)$ In figure 2 is the total benefits $(P_0 - P_2) \times Q_1$. Consumption by Q_0 increases to Q_1 , increasing marginal cost than marginal benefit of consumption

subsidies efficiency losses arising out of the same as the areas of $\Delta E_0E_1E_2$ in Figure 2.

THE ECONOMIC MEASURE OF THE GREEN BUILDING EXTERNAL COMPENSATION

Tax & preferential credit

Government could adopt tax revenue preferential policies such as the reduction and exemption of turnover tax, income tax, urban infrastructure supporting fees, or take a low-interest loan policy to support various types of credit guarantee institutions to provide security for the green building production. As for the consumers, the government could give appropriate preferential home loans interest rates, property tax exemption and other incentives as the compensation of externalities.

Financial investments and subsidies

The production of green building contains a series of complete industrial train, which including architectural planning, design, building materials, construction and operation, therefore, the focus of the financial investment is to increase the support of innovative research and development of green building, increasing the research investments on the critical technology, so as to reduce the production cost. Besides, the government should also increase investments on green building projects while reducing the marginal cost of private producers or consumers of green building.

Economic laws and regulations

Economic measures are not enough to guarantee the smooth implementation of green building, It is need to establish a perfect hierarchy legal system of China’s green building, issuing relevant laws and regulations timely in order to restrict ordinary construction, forming a sound law system composed of China’s basic law and related regulations. While collecting environmental taxes on the ordinary constructions, the producers or consumers will transfer from the common building to green building.

Social funds

The government should encourage and support the establishment of industry associations, as well as green

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building social welfare organizations, non-governmental organizations, which bring the social organization into full play, establishing special development funds for the green building attract and raising social idle funds into the green building market. The private capital can take part in the green building through wholly-owned, joint venture, cooperation, and donations, as well as participate in various forms of green building.

Other measures

Formulate policies to promote the development of green buildings in the transfer of land policy, land bidding, auction and transfer planning conditions to clear the promotion of land for construction of green buildings, has a right of first refusal in the process of bidding and auction, standards of green building land exempted from land transaction tax. Besides, the government should regulate the volume rate incentive policies and regulations to encourage the green building construction. In addition, in the process of project bidding, green construction methods and means can be as an important evaluation.

CONCLUSION

Developing green building has become the consensus of the whole society, although the number of green buildings is increasing rapidly, the long-term mechanism to support the development of building energy efficiency and green building has not yet been established, and the promotion of green buildings still has many difficulties. Only reasonable use of the financial investments, tax incentives, credit support and other economic incentives could promote the development of green buildings.

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