

RESEARCH OF LOCAL GOVERNMENT BEHAVIOR IN ECO-TECHNOLOGICAL INNOVATION PROCESS¹

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Abstract: The formation of Eco-technological Innovation comes from the rational introspect of conflicts between economy growth and destruction of ecosystem in traditional technology innovation. By considering the mutual relations and interactions, the innovation regards economic activities, natural ecosystem, social ecosystem and spiritual ecosystem of human as an organic system, at the same time considers the mutual relations and interactions of them. In order to make technological innovation good for environmental protection, healthy existence of human as well as social harmony, the innovation, it takes the protection and reconstruction of natural ecosystem as premise and the harmonious development of economic social ecosystem as the target. This thesis begins from the economics characteristics analysis of enterprise eco-technological innovation and discusses the Characteristics of Sunk Cost, Externality and Public Goods in the process of eco-technological innovation. Market failure exists in consequence and the solution is the guidance and support from all levels of government. The thesis substitutes the Multiple Target Function of Local Government into Cournot Equilibrium and Beicrand Equilibrium to study how the local government behaviors can influence the enterprise eco-technological innovation process.

Key words: Economic Behavior, Eco-technological Innovation, Local Government Behavior, Coevolution

1. INTRODUCTION

Since the foundation of Creation Theory by American Austrian Economist Joseph A. Schumpeter at the beginning of 20th century, technological innovation has undergone several phases, namely the Exploration Research in 50th and 60th, the Systematic Research from 70th to 80th, the Synthetical Research form 80th to the end of 20th century as well as the Ecosystem Innovation in this century. The opinions of Technological Innovation before 20th century rest mainly on the layers of economic and

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enterprise values. This traditional technological innovation is to introduce a “New Combination” of Production Factors that never exist before. The New Combination includes the Introduction of New Products and Technology, Exploration of New Market, Control on the New Supply Resources of Original Materials as well as realizing New Industrial Organization etc. But from the perspective of internalities, the enterprises often increase Marginal External Cost of Production while decrease Marginal Internal Cost. The research on traditional technological innovation mainly rests on realization of final target, that is, Economic Value, moreover, people regard the economic value in the market for the first time as the rule of evaluating the products. The activities create large quantity of material wealth and promote economy growth as well as Destruction to Ecosystem, Energy Crisis and Enlargement of Gap between the Rich and the Poor etc., which draws out the suspect to traditional technological innovation.

The scholars at home and abroad bring about the concept of Eco-technological Innovation based on the situations above. In China, Professor Fu Yang Peng from Hunan University do research on Eco-technological Innovation systematically in early time-“Ecosystem Divert of Technological Innovation” (2002 National Social Science Funds). It points out that the trend of technological innovation and final target should achieve the harmony of Economy Increase, Natural Ecosystem Balance and Social Ecosystem. After the synthesis of views from scholars we suggest that Eco-technological Innovation is an integrated process that joints economy, technology and ecosystem together for mutual unification, promotion and inversion. The eco-technological Innovation is a social activity that owns economics characteristics as well as technological and ecosystem characteristics, which is the strong motivation of technological and economic development. Ecological virtuous circle not only brings economic benefits and social benefits to the enterprises, but also realizes sustainable economic development. Ecological Technology Innovations include Product Innovation, Processing Innovation, Service Innovation and Organizational Innovation and so on. It is a complicated and systematic project as well as economic activities with close relation to the market⁴. There is no doubt that it is of great importance to construct the harmonious development of Economy, environment and the society. However, how to improve the motivation of enterprises in technological innovation is the key problem to be solved currently. What role does the government play in the promotion of eco-technological innovation process? On one hand, local government is a part of national administrative sequence in China. On the other hand it is the protector and investor of local economy. This dual role places local government at a special status in the development of local economy. He is not only the executive of central government but also a relatively independent regional economic actor. This thesis studies how the Multi-target Function of local governments’ behavior can influence enterprise eco-technological innovation based on products market.

2. ECONOMICS CHARACTERISTICS ANALYSIS OF ECO-TECHNOLOGICAL INNOVATION

Eco-technological innovation combines economic and ecological benefits together, which realizes the enterprises value and creates ecological value at the same time. Analyzing the ecological characteristics of eco-technological innovation from the view of mainstream of economic school is the base to study the behavioral principles and route of local government.

2.1 Easy to sink in the initial investment

Sunk Costs include two connotations⁵: First, Economic Sunk Costs, that is, the costs in the promised

⁴ Peng Fuyang, Zeng Guangbo, Lan Jiayun. Ecological transference in technological innovation (in Chinese), *Hu Nan Journal: Social Science*, 2004, 18(6):49-54.

⁵ Huang Jinsong. Eco-technological innovation based on cycle economy (in Chinese). *Ecological economy*,

investment which can not be fully compensated through price transference or the sale price; Second, Social Sunk Costs, that is, the right commitment under the contractual arrangements, whose interests cannot be compensated once terminates the contract, this also have creates sunk costs. Investment on technological innovation includes two areas: Input of funds and personnel, the enterprise is the carrier and mainstay of technological innovation. Ecological Technology Innovation owns greater dependence on technological process and hardware facilities. There exists a common feature for investment on eco-technological innovation regardless the kind of project and constructing scale, that is, large investment is required, moreover, the investment is difficult to recover once input. Therefore, the investment of eco-technological innovation contains economic sunk costs characteristics as well as social sunk costs characteristics. If certain capital is invested into the R&D projects of eco-technological innovation, it is virtually impossible to recover in the half way and divert to other projects. An obvious "Exit Barrier" characteristic makes the majority enterprises whose behavioral goal is maximum profit to act away and it is universal phenomenon that there is inadequate investment supply to eco-technological innovation.

2.2 Obvious externality

According to the views of mainstream economics, so-called externality is the phenomenon that the inconsistency of private benefits with social benefits. If private benefit is less than social benefits, it means obvious positive externality; On the contrary, if the private benefit is superior to social returns, it means obvious negative externality. There are two main reasons for externality from economics: First, because of the lack of property rights on certain resources, which induces the abuse of corresponding resources and results in externality; second, the Jointing Characteristic in production and consumption process which results in external effect. Externality of Eco-technological Innovation is in close relation to the private and social costs of enterprises as well as the private and social benefits of enterprise. The private costs and benefits of enterprise means the gains, losses and benefits which brought to the enterprise through eco-technological innovation activities. Social costs and benefits of eco-technological innovation means the benefits and losses brought to the society by the innovative activities. Obviously, if the social benefits of eco-technological innovation is more than private benefits compared with general technological innovation that owns positive externality. E.G.: An innovator manufactures a new type of environmentally friendly appliance, which enhances the self-purification ability of environment so that better and cleaner environment can be brought to people. But people who enjoy this beautiful environment do not have to pay for it and then the private benefits is minor to social benefits, which is positive externalities. Only will the Eco-technological innovation done by the enterprise brings direct economic benefits to itself but also provide social benefits to consumers ,the public or other enterprises indirectly through reducing the pressure of environmental polluted resources. Figures 1, Market Supply Curve-S to eco-technological innovation, Marginal Private Benefit-MPB is inferior to marginal social benefits-MSB, there is output quantity gap of $Q_e Q_0$. if calculates from maximum private benefits and maximum social benefits separately, this will increase net benefits of area $\triangle abd$. Seen from the internality of enterprise that implements eco-technological innovation, whose innovative yield is not high, but the overall benefits is far greater than the cost seen form regional society, hence the social investment- return rate is quite high⁶.

Clearly, eco-technological innovation will put on a quite outstanding performance of externality. In the general equilibrium analysis model of new classical micro-economics, the participants of market activities are the recipients of market price. Individual behavior changes the private economic benefits only and won't influence the economic benefits of other participants in the market anyway. Because of the existence of externality in eco-technological innovation, Pareto optimal status would not be achieved and externality results in the market failure mechanism.

2007(12):54-59.

⁶ Varian, H.R, Intermediate Microeconomics, 2000

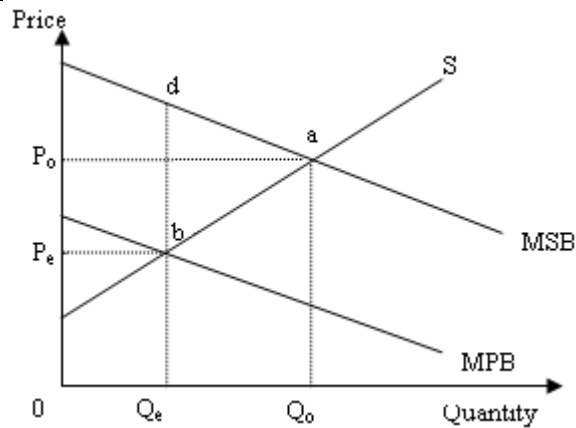


Figure 1 Externality of Eco-technological Innovation

2.3 Public goods of eco-technological innovation

According to the views of mainstream economics, public goods are the products that are not excludable characteristic in consumption activities and can be consumed by people at the same time. Eco-technological innovation centers on ecological protection, which introduces the concept of ecosystem in technological innovation system, so as to guide the technological innovation to develop coordinately in the direction for the favorable use of resources, environmental protection and keep in virtuous circle with economy and society harmoniously. The enterprise must provide a certain scale of public facilities and environment to microscopic subjects for clean production provided that it aims at the realization of eco-technological innovation. As displayed in Figure 2, the beneficial object of enterprise eco-technological innovation-Public Environment, the excessive consumption lead to the loss of efficiency. The marginal social benefits are the sum-up of all the individual benefits and external benefits of environment. Market Demand can only reflects personal benefits, not the social benefits. Market supply quantity is inferior to the quantity of maximal social net benefits. There comes the absence of supply subjects⁷.

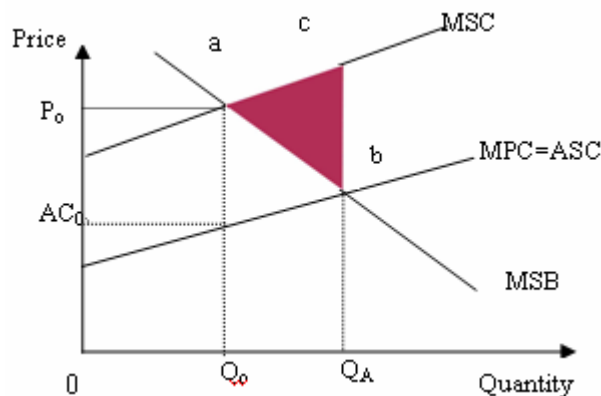


Figure 2 Public goods of enterprise eco-technological innovation

The characteristics of sunk costs, externalities and public goods in the process of eco-technological innovation is quite significant, which owns the characteristic of market failure, there are two main ways for the solution of market failure. First, correct market failure in private sectors. Second, correct market

⁷ Varian, H.R, Intermediate Microeconomics, 2000.

failure of the government. In many countries the solution for inadequate investment supply to eco-technological innovation is to increase the government investment support, especially the local government's special role in the developing process of Cycle Agriculture.

3. LOCAL GOVERNMENT BEHAVIORAL MODELS ANALYSIS IN ECO-TECHNOLOGICAL INNOVATION AND DEVELOPMENT PROCESS

Eco-technological innovation is the inevitable trend of enterprise technological development, but because of ineffective government promotion, inadequate ecological consumption of the public and other obstacles, the innovation process are delayed. Traditional concept of development constraints enterprises eco-technological innovation, the interaction of economic instruments and behavioral targets of local governments and enterprises eco-technological innovation will influence the developing process of eco-technological innovation system surely⁸.

3.1 Model descriptions and basic assumptions

The protection, support and promotion efforts should be strengthened to eliminate barriers of enterprises eco-technological innovation. Establishing a government-led promotion and motivating mechanism is the specific expression of local government functions in the process of enterprise eco-technological innovation.

3.1.1 Technological innovation market

In order to simplify the discussion, this article divides the enterprise technological innovation into: General Technological Innovation and Eco-technological Innovation. Local government will execute two measures including subsidy and tax on enterprise technological innovation, both of which will influence the costs, price and competitiveness of new technological innovation products.

3.1.2 Local government behavior

In the impetus of main regional subjects' functions among the performance assessment index by the central government currently, local government's behavioral target is not just "Rational Economic Man", as said in classical economics, who is cost-benefit analysis oriented and in pursuit of self-interest maximization. The behavior models contain the characteristics of multi-target, ambiguity and complication. So as to discuss the local government behavior of product market theory based on technological innovation, the thesis simplifies the behavior utility model of local government into the behavior target function of local government in enterprise eco-technological innovation process $\bar{U}=p_iq_i+\mu_iI_i$. Among them, p_iq_i is the market economic value commuted by total quantity of technological innovation quantity in the region, I_i are the other concerns of local government, μ_i is the preference extent between the two targets. Obviously, if $\mu_i \rightarrow 0$, local government will prefer to the market economic value made by the technological innovation of local enterprises. If $\mu_i \rightarrow \infty$, local government will prefer to other targets. Assume that local governments' technological innovation constraints in the region is

$G + t\pi_i = s_i c q_i + I_i$, G stands for the non-tax revenue of local government, which may include the transfer payments from central government and extra-budgetary revenue etc $t\pi_i$ stands for the overall revenue that the government obtains from the two types of technological innovation enterprises. $s_i c q_i$ stands for the subsidies that local government gives to the enterprises at the early period of eco-technological innovation. I_i is the required financial expenditure of local governments by concerning other targets. Here we make the same assumption that all aspects will not affect the incentive mechanism of enterprise. The local government's subsidy rate s_i and fiscal expenditure I_i are the decision-making variables

⁸ Russell S, Williams R. Concepts, spaces and tools for action? Exploring the policy potential of the social shaping perspective. *Cheltenham: Edward Elgar*, 2002. 133-154

maximizing the target functions.

3.1.3 Technological Innovation behavior of enterprises

Assume there are only two enterprises in a certain area, one is an eco-technological innovation enterprise, the other is a traditional technological innovation enterprise. There exists strong substitution between the technological innovation products of two enterprises. The demand function of eco-technological innovation products is $P_1=A-bq_1-bE\sum q_2$, P_1 stands for the price of eco-technological products, q_1 stands for the quantity of eco-technological products, E stands for the substitution extent between q_1 and q_2 , the products price of traditional technological innovation enterprise will not influence that of eco-technological innovation enterprise, when the substitution extent is quite low ($E \rightarrow 0$), but the two enterprises will be in the perfect competition state when the substitution extent is quite high ($E \rightarrow 1$). The enterprise profit function is $\pi_i=p_iq_i-c_iq_i$ ($i=1, 2$) without considering the policy tool of government. For the product costs of eco-technological innovation enterprises- C_1 is higher than the that of traditional technological innovation enterprises- C_2 , set $C_1=c$, $C_2=kc$ ($0 < k \leq 1$) for convenient discussion, Different policies measures adopted by local government will result in different influences on the enterprise profit function; here we mainly consider the financial subsidy policy for the products cost of eco-technological innovation enterprise. It can be seen that one-off subsidies will not influence the maximizing behavior of enterprise because of the peculiarities of eco-technological innovation. Although the one-off fiscal subsidies will influence the current profit of enterprise, it won't affect the quantity and price of a product that are manufactured under the condition of enterprise eco-technological innovation. Moreover, it is not helpful to provide the lasting power for enterprise eco-technological innovation? Consequently here we grant that local government adopts subsidy rate s_i to provide subsidy for the R&D costs of enterprise eco-technological innovation. Such measures may be embodied as fiscal discount loan that provided by local government to eco-technological innovation enterprises. The profit function of eco-technological innovation enterprise can be amended into $\pi_i=p_iq_i-(1-s)c_iq_i$ ($i=1$) without considering the incentives mechanism influences by subsidy. As the s here is the net subsidy compared with general technological innovation enterprise, the profit function of general technological innovation enterprise will stay unchanged.

Market structures will influence enterprise behavior. The enterprise can make use of price as decision-making variable to achieve maximum profits when the eco-technological innovation enterprise holds a higher monopoly extent ($E \rightarrow 0$). The enterprise will adopt the quantity of eco-technological innovation products as decision-making variable, when the monopoly extent is quite low ($E \rightarrow 1$). Here considering the game of two types technological enterprise in one region only and Cournot Equilibrium-takes product quantity as decision-making variable and Beicrand Equilibrium-takes price as decision-making variable will be studied respectively.

3.2 Specific analysis of model

Target function and decision-making variables of local government

$$\bar{U} = p_iq_i + \mu I \quad (1)$$

Budget constraints:

$$G + t\pi_i = scq_1 + I \quad (2)$$

Profit function and decision-making variables of enterprise technological innovation:

$$\pi_1 = p_1q_1 - (1-s)cq_1 \quad (3)$$

$$\pi_2 = p_2q_2 - kcq_2 \quad (4)$$

Market demand function:

$$P_1 = A - bq_1 - bEq_i \quad (5)$$

in which, π represents Enterprises Profits, p , q stands for the price and quantity of product

3.2.1 Cournot Equilibrium of enterprise

Cournot Equilibrium is created by French mathematical economist Cournot in 1838 through the example of natural mineral water. The specialty is to seek maximum profit by assuming presumed quantity, acceptable price. The competition between enterprises will be embodied in quantity if the prices are not so much different between the products of eco-technological innovation and traditional technological innovation. It can be regarded as following the Cournot Model.

Setting the maximum profit conditions of eco-technological innovation enterprise are:

$$\frac{\partial \pi_1}{\partial q_1} = P_1 - (1-s)c = 0 \quad (6)$$

$$s = 1 - \frac{P_1}{c} \quad (7)$$

The maximum profit conditions of traditional technological innovation enterprise are:

$$\frac{\partial \pi_2}{\partial q_2} = q_2 - kc = 0 \quad (8)$$

$$q_2 = kc \quad (9)$$

When $E \rightarrow I$ the substitution between the two products is quite high, there is nearly no differences in price, the two enterprises are in perfect competition status. There are several following situations against $P_1 = P_2$.

When $s = 1 - k$, the subsidy of local government to eco-technological innovation enterprise will only result in the two types of enterprises are in the competition of same costs, any product quantity will make the enterprises' maximum profit.

When $s > 1 - k$, any behavior to increase the product quantity of eco-technological innovation enterprise will make additional profit. On one hand, enterprise eco-technological innovation is promoted; on the other hand, the continuous behavior to increase the productivity will lead to the expansion of $s_1 c q_1$, which will result in the local government to run out of the subsidy resource and to give up subsidy rate.

When $s < 1 - k$, the maximum profit can be achieved against eco-technological innovation enterprise to reduce the quantity of innovative product and there no sense for local government to provide subsidy to eco-technological innovation enterprise.

Government subsidy rate to the enterprise under Cournot Equilibrium Condition:

The Profit Function of Enterprise 1 that performs eco-technological innovation:

$$\pi_1 = p q_1 - (1-s)c q_1 = (A - b q_1 - b E q_2) q_1 - (1-s)c q_1 \quad (10)$$

First order condition of maximum profit:

$$\frac{\partial \pi_1}{\partial q_1} = -2b q_1 + A - b E q_2 - (1-s)c = 0 \quad (11)$$

The Profit Function of enterprise 2 that performs eco-technological innovation:

$$\pi_2 = p q_2 - (1-s)c q_2 = (A - b q_2 - b E q_1) q_2 - (1-s)c q_2 \quad (12)$$

First order condition of maximum profit:

$$\frac{\partial \pi_2}{\partial q_2} = -2b q_2 + A - b E q_1 - kc = 0 \quad (13)$$

Uniting the response functions of enterprise 1 & 2:

$$q_1 = \frac{AE - 2A - kcE + 2(1-s)c}{b(E^2 - 4)} \quad (14)$$

$$q_2 = \frac{[A - (1-s)c]E - 2A + 2kc}{b(E^2 - 4)} \quad (15)$$

Differentiate equilibrium product quantity by s :

$$\frac{\partial q_1}{\partial s} = -\frac{-2c}{b(E^2 - 2)} > 0 \quad (16)$$

Carrying q_1, q_2 into Demand Function:

$$\frac{\partial P_1}{\partial s} = \frac{c(E^2 + 2)}{E^2 - 2} < 0 \quad (17)$$

It can be seen that the subsidy rate to eco-technological innovation enterprise is of positive correlation with the product quantity, but is of negative correlation with price in perfect competition, and the relation with overall benefits ($\frac{\partial P_1 q_1}{\partial s}$) is not sure. The concrete subsidy rate lies in the maximizing procedure of local government.

The behavior target function of local government in the enterprise eco-technological innovation procedure: $G = s_i c q_i + I_i$. This thesis will mainly discuss the subsidy of local government to enterprise eco-technological innovation process. The enterprise will choose the product quantity or price to achieve maximum profit against the condition that there exists some substitution between the products of two type technological innovation enterprises. Local government will choose fiscal subsidy to affect enterprise behavior against the anticipation of enterprise behavior.

Carrying the budget constraints of local government into government target function, trimming:

$$\bar{U} = p_i q_i + \mu(G + t\pi_i - scq_i), \quad (t=0) \quad (18)$$

Carrying π_1, π_2 into (18), trimming: $\frac{\partial \bar{U}}{\partial s} = -\mu c q_1 < 0$. Consequently the utility target and subsidy of local government change to the opposite direction provided that local government takes the production quantity as main target function.

It can be seen that the target function of local government have to be amended, provided that local government promotes enterprise eco-technological innovation from economic point of view. The confirmation of local government target function mainly lies in the performance indicators of superior government. Therefore, the central government should carry out the Green GDP performance indicators and make concrete plan for main functions. Besides, the environmental performance indicators of local governments and the transformation of GDP growth are indispensable. Only in this way can amend the objective function of local government completely.

3.2.2 Beicrand Equilibrium of enterprise

The enterprises can make use of price as instrument to achieve maximum profit provided that the products of eco-technological innovation enterprise and that of traditional technological innovation enterprise are regarded by the consumers to be totally different. This means latently that the products of eco-technological innovation enterprise are not the recipient of price, which owns certain monopoly capability. The inverse demand function⁹ that two enterprises face is: $P_i = A - bq_i - bEq_1$

⁹ Stephen Bely. *Local economics: theory and practice*. Beijing: Peking University Publisher, 2006(3):45、314

Uniting, the demand curves for the two enterprises are:

$$q_1 = \frac{(E-1)A + P_1 - EP_2}{b(E^2-1)} \quad (19)$$

$$q_2 = \frac{(E-1)A + P_2 - EP_1}{b(E^2-1)} \quad (20)$$

Carrying $\pi_1 = p_1 q_1 - (1-s)cq_1$ in and differentiating P_1 by first order:

$$\frac{\partial \pi_1}{\partial P_1} = \frac{(E-1)[A - (1-s)c] + 2P_1 - EP_2}{b(E^2-1)b} = 0 \quad (21)$$

$$P_1 = \frac{(E^2 + E - 2)A - 2(1-s)c}{E^2 - 4} \quad (22)$$

$$\frac{\partial P}{\partial s} = \frac{1}{2}(1-E)c > 0 \quad (23)$$

$$\frac{\partial q_1}{\partial s} = \frac{(2-E^2)kc}{(E^2-4)(E^2-1)b} > 0 \quad (24)$$

Explanation: provided that there are monopoly characteristics for the products manufactured by eco-technological enterprise to the consumer, the enterprise makes the decision on price, subsidy of government can promote the monopoly behavior of enterprise and it can increase the production quantity of eco-technological innovation enterprise. The overall subsidy level still lies in the target function of government. If the target function of government is:

$$\bar{U} = p_i q_i + \mu(G + t\pi_i - scq_i) \quad (25)$$

Carrying in π_1, π_2, P_1 , trimming:

$$\frac{\partial \bar{U}}{\partial s} > 0 \quad (26)$$

Consequently the target function of local government is in positive correlation with subsidies provided that the products manufactured by eco-technological enterprises place at monopoly position in the market.

To sum up, the behavior of local government that impacts on enterprise in the early period of eco-technological innovation is very obvious. The support and protection to eco-technological innovation enterprises must be strengthened in order to change the change the manner of enterprises in technological innovation.

4. CONCLUSION

To see from the level of central government, macro planning, coordination and amending to the traditional performance evaluation indicators will guarantee the promotion of enterprises eco-technological innovation. In view of tremendous economic, social and environmental benefits brought by eco-technology-based industries, the state should support the regions based on eco-technology, and take the regions as new economic growth points. Promote the traditional industries; establish the research and development, innovation and service system based on ecological technology according to different subject functions of regions. Besides, strengthen the construction of eco-technological innovation research and development capacity and support the project approval,

funding and personnel distribution. Technological Transference, Promotion Center and eco-technological resources information network should be established. In order to put eco-technological innovation into the overall development strategy of national economy and establish sustainable industrial structure, the Central Government should draw out the plans and schemes for eco-technological innovation by organizing related departments and forces.

Local governments should give the full play in promoting enterprises for eco-technological innovation and correct market failure. First, local governments must strengthen the laws and regulations in accordance with national requirements, improve the level of environmental sewage fees so as to increase the costs of using traditional technology and promote the enterprise to carry out eco-technological innovation and application. Second, encouragement and penalties for green technological R&D polices should be strengthened. E.g.: Local governments can offer financial assistance to the R&D of green technology by establishing Special Eco-technological innovation Fund and perform some tax relief policies for the enterprises that make less sewage or reduce the pollution. Discount loans and other ways of support can be done to the enterprises that develop environmental friendly or less harmful products and clean production technology. Meanwhile, promote the enterprises to reduce environmental pollution voluntarily and increase environmental protection input through gradual increase of sewage charges and other punitive measures. Third, establish high-efficient Information Network for Green Technology and Technology Promotion Center so that the enterprises can learn the latest foreign eco-technological innovation in time and diffuse the up-to-date developments as well as reducing the learning costs of enterprise eco-technological innovation.

Before eco-technological innovation, the enterprises should setup "Ecological Concept" and "Sustainable Development Concept" first. Focus on the sustainable development targets of enterprise and introduce Ecological Concept in the entire process of technological innovation. Resources allocation, sustainable use and protection should be done under the condition of following ecological laws. Promote the virtuous circle and development of economy and ecological environment so as to keep the development of enterprises to adapt to the loading force of environment. Enterprises should make control of the environmental factors that have greater impact on eco-technological innovation and pay attention to the changing trend of external environment in enterprise eco-technological innovation. Through introducing ecological innovation concept into enterprise target, strengthening the organizational management and solidifying technological strength to create favorable internal environment for the carry-out of eco-technological innovation. It is important to establish two-level dynamic innovation system for eco-technological innovation. The enterprises should establish a "Technology-Management," two-level innovation system so as to ensure the development of eco-technological innovation. Technologically, in order to realize the full process "ecological" control of enterprise production activities, the enterprise should establish a "Resources-Product-Process" ecological innovation system, introduce and develop green products vigorously and environmental friendly technologies. For example, clean technology, ecological processes and symbiotic technology, pollution-free production at the technological level. At the management level, the enterprises should draw out eco-technological innovation strategy according to the ecological environment and create a favorable eco-technological innovation organization system, management system of product developing process and the eco-technological innovation mechanism with the eco-technological incentive mechanism as content.

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