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RESEARCH ON CONSTRUCTION OF ECO-CIVILIZATION AND INDUSTRY ECOLOGY SYSTEM

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ABSTRACT

Eco-civilization is the integral product of material, spiritual and regulation achievement; it's the cultural and ethical manifestation of the harmonic co-existence of human and nature, balanced development, sustainable prosperity. The major characteristics of eco-civilization are studied in this paper. The paper further does investigation on strategies for industry ecology system (IES) construction, which include establishing and improving the legal system and industrial policies to promote industrial ecology, collecting more comprehensive information on waste stream from all users, as well as the government should play a key role in coordinating and maintaining the security and stability for the industrial symbiosis network.

Keywords: Eco-civilization, Ecological industry, Sustainable development, Circular economy.

INTRODUCTION

Since the beginning of last century, industrial civilization brought a lot of issue as well as progress made in technology & material wealth. The rapid development of the world economy brought unprecedented pressure to ecology environment, depletion of resources, pollution, and environmental degradation. Resource and environmental issues have become increasingly prominent day by day. The environment is only treated as resources, carrier & receptor. While enjoying economical prosperity, mankind sacrifices hygiene, health, pleasant environmental conditions, & peace of mind. To a certain point, these issues are anti-human & anti - nature. People have to rethink about the consequences and try to find a new model of development for the sake of sustainable development for future generations. Since 1972 Stockholm Conference on the human environment, the United Nations, international organizations, governments, and academic researchers have been exploring how to make the human economic development and ecological environment accommodates each other. With the efforts from the end treatment of environmental campaign to the sustainable development strategies of world countries, people are realizing that the solution of resource and environmental issues lie in the implementation of the development strategy of economic ecology, total control from the source, changing the original over-demanding operation mode, the recycling of natural resources, the development of renewable resources, the transformation in the direction of restoring the natural environment and expansion of the environmental capacity, limiting the human social and economic activities within the scope which the eco-system can withstand to promote coordination between man and nature, then mankind entered eco-civilization period. Eco-civilization coordinates social-economical development with the environment & natural resources, establishes a new civilization based upon mutual benefit & coordination between man & nature. It's a cultural & ethical manifestation of harmonious coexistence, well-rounded development, and sustainable prosperity between human & nature.

Eco-civilization has the following aspects: the first is the harmony and equality between man & nature. Eco-civilization requires the culture value view-point of

eco-system, humans regard nature protection as their inherent faith rather than humans-oriented. The second is production under the precondition of sustainable development. Obeying the principle that the ecological system is limited, elastic and unable to be predicted completely, the work of us, humans has to use natural resources in a way that's economical, synthetic and recyclable. An ecological industry system needs to be formed which becomes the main source of economical development. The third is consumption to satisfy one's own need without harming the environment. The life style of "living by no more than essential demand" is recommended, by which the pursuit of mankind is not materialism but to satisfy one's own need without damaging nature, to satisfy the need of this generation without harming the prospects of future generations. This ethics of peace and sharing is the code of harmonic coexistence and development between humans and nature, and within human society.

THE FEATURES OF ECO-CIVILIZATION

Eco-civilization means that the natural ecological environment is proactively protected when human being transforms nature, and the relationship between man and nature is improved and optimized. The summation of the material, spiritual and system achievements to build a good ecological environment is the expansion and extension of human social civilization into the natural environment on which the survival of human being depends. Eco-civilization requires that moral concepts, values and responsibility of ecology be implemented in every aspect of economy, politics, culture and society in order to achieve a comprehensive, coordinated and sustainable scientific development among nature, people and society. Eco-civilization demands the establishment of cultural values which meet the requirements of the ecological laws of nature, the concept of sustainable development and the concept of green consumption under the premise of self satisfaction without compromising the natural environment. Chuanhao (2010)pointed it out that, from a philosophical point of view, eco-civilization is a more advanced civilization which is above the material, spiritual and political civilization.

Eco-civilization pursues the harmonious development between man and nature

Achieving the harmonious development between man and nature is the most basic feature of eco-civilization, the basic premise of sustainable development of human society, and also the fundamental interest of mankind. Eco-civilization is centered on the interaction between man and nature, puts nature as the foundation of human survival and development, and emphasizes on that the common evolution of man and nature, not just to measure the relationship between man and nature through the scale of human interest, but also to respect the right and recognize the value of nature. It also advocates that production activities should be conducted to best suit the natural status, so that the relationship between mankind and nature becomes more harmonious and unified.

Eco-civilization is an organic system of rich connotation

Eco-civilization is one of the greatest consensuses of our time. It has permeated into the political arena, promoting environmental justice and the establishment of ecological laws; it has permeated into the economic arena, changing the traditional model of economic development to achieve sustainable development; it has permeated into the culture arena, promoting ecological aesthetics and ecological culture; it has permeated into the social arena, promoting green consumption and environmental friendly living. In addition, eco-civilization is also related to the spiritual achievements such as social values, philosophy, ethics, view of nature, etc.

The goal of eco-civilization is to achieve a comprehensive, coordinated and sustainable development of human society

Eco-civilization maintains that nature, people and society are an indivisible organic unity. It takes the whole nature as the material cornerstone and spiritual source of the development of human society, and converts the relationship between man and nature into the internal relationship of social development. The harmonious development of people, nature and society reflects the values of eco-civilization, reflects a high degree of uniformity of the economic sustainability, ecological sustainability and social sustainability.

Ecological industry: a new model of industrial developing

From the 1990s, the development of industrial ecology has become a growing trend in the developed countries. In 1988, Robert U. Ayres proposed the concept of industrial metabolism, carried on the research of human industrial system and natural environment between the material and energy flows. In 1990, United States National Academy of Sciences and the Bell Laboratories jointly organized the first "industrial ecology" Forum. At the Forum, they overviewed industrial ecology concepts, contents, methods and applications, and formed the conceptual framework of industrial ecology. The framework describes an industrial bionic system to maintain a sustainable development of the industrial system through imitating ecological systems and structures. In the system, the waste (output) of an industrial activity is the raw materials (inputs) of another industrial activity. Scholars agree that this "material-loop" that can radically conserve the natural resources,

reducewaste, and improve the ecological and economic efficiency. Allenby assigned industrial eco-system the very broad definition, "science of sustainability" (Allenby,1999). This classification is persuasive at first glance, but to some extent misleading when following the argumentation of Wilderer (2007b). A more comprehensive discussion of industrial eco-system contribution to ecologic sustainability is presented by Manahan (1999) who proposed that the goal of industrial ecology is to realize sustainability as a means to achieve "the basis for a much more sustainable global industrial system compared to the one that now exists". The highly acclaimed work of Frosch and Gallopoulos (1989) suggests that the focus of industrial eco-system is "to develop a more closed industrial eco-system, one that is more sustainable". This implies the need to shift from linear (open loop) to multiple use of natural resources, to create cascading energy flows and a closed loop flow of materials, that is to develop ecological industry.

Industrial ecology is operating and managing traditional industries based on the principles of ecological economics

Industrial ecology is operating and managing traditional industries based on the principles of ecological economics and the ecological, economical, and systems engineering approaches. It aims to achieve the following goals: social and economic benefits maximization, efficient uses of resources, ecological and environmental harm minimization, and hierarchy recycles and uses of the wastes. Industrial ecology implements the concept of circular economy and ecological economic laws. At the macro-scale level, to ensure stable, orderly, and harmonious development of the whole system, it includes the conformity within all structures and functions of the entire industry ecosystem and optimal operation of material flow, information flow, energy flow, and value chain; at micro-scale level, through the integrated applications of clean production, environmental design, green manufacturing, green supply chain management and other means, it improves the efficiency of resources and energies in enterprises and reduces the consumption level of energy and material as well as the pollution emissions.

Industrial ecology is the operation process of integrating the industrial activities into the natural ecological system

Industrial ecology is a gradual process in which anti-ecological characteristics of industries become weakened and ecological characteristics of the process strengthened. In this process, people create a new paradigm for industrial systems where the man-made systems are integrated into the operating mode of natural ecosystems, and gradually change the linear (open) systems to cycle (closed) systems. Industrial system not only forms its own material cycle feedback mechanism, but brings itself into the material circulation system of ecosystem as much as possible. Industrial ecology is to bring industrial activities which serve as the main contents of material production process into the ecosystem cycle. It makes the consumption of natural resources and environmental impacts by industrial activities integrated into the total material and energy exchange loop process of the ecosystem, therefore, to achieve the realization of virtuous circle and sustainable development between industrial activities and natural ecological systems.

The core of industrial ecology is the construction and integration of industrial ecosystem

Sustainable development in human economic society in harmony with natural ecosystems requires the establishment of a well-structured, multi-level functional, and a material carrier system to ensure efficient circulation and flow of the material and energy in the "nature—social economy" system. This system with above features is called industrial ecosystem. In natural ecosystems, the use of substances is not always efficient from the aspect of a single food chain material flow. However, due to the diversity, hierarchical relationships, and separate functions among the different species in a unit space, materials are used efficiently. All of this comes from the "precision" division and coordinating functions between species so as to achieve circulating flow and efficient use of materials and energies in the natural ecological system.

Eco-industry is a new model of industrial development

Through the simulation of natural ecosystems and the establishment of organic circular industrial development model, industrial ecology aims to solve the problems in industrial economic development, environmental protection, and sustainable uses of resources. Similar natural ecological chain within the different industrial enterprises and different types of industries should be set up. Therefore we can make full use of resources, reduce wastes, use recycled materials, eliminate environmental damages, and improve the scale and quality of economic development, achieve sustainable economic development and coordination and harmony between man and the nature. Thus, industrial ecology is a new industrial development approach since the industrialization development, and is also a new industry model to build harmonious development of both the economic society and the nature in a virtuous cycle.

Strategies for industry ecology system construction

Government is the coordinator of the public interests, the overall interests and long-term interests, and bears responsibilities for sustainable development of society through the establishment and improvement of

industrial ecology in laws, regulations, industrial policies, institutional norms and incentives.

Establishing and improving the legal system and industrial policies to promote industrial ecology

First, it is important to establish the laws and regulations to promote eco-industrial system. More specifically, we should card and upgrade the existing environmental laws and regulations, completely eliminate the obstacles from industry eco-cooperation in the traditional regulations and practices, encourage cooperation between enterprises, and construct ecological industry chain to play the protection and guidance role in the industrial ecological process. For example, the laws for resources and environment protection, single ecological industry, eco-industry link, etc. The second is the establishment and improvement of relevant industrial policy. Through the development-related fiscal policy, investment policy, financial policy, and market regulation, the government encourages enterprises to adopt cleaner production technology, foster eco-enterprise community progressively, form industrial symbiosis networks gradually, and promote regional recycling economic development. For example, through fiscal and financial support, the government provides the eco-cooperation enterprise tax incentives and financial subsidies. In a given period of time, the ecological enterprises can be reduced or will be exempt from sales tax and the income tax to newly developed green products, etc.

Construct information sharing platform and coordinate the consistency between the upstream and downstream firms

Build a regional enterprise resource information exchange platform to form an exchange mode with dynamic nature, networking, management, services, and customers all in the platform. Collect more comprehensive information on waste stream from all users, establish a fast waste recycling network chain for waste, materials, and products, and make the wastes resources to be obtained, configured, and exchanged across the enterprises.

The above main approach of industrial ecology is to utilize the upstream businesses waste as raw materials and energy for the downstream enterprise, but that does not mean that the upstream businesses can produce what wastes or how much they want to. On the contrary, the first thing we should remember is to reduce the waste of the upstream businesses in the "food chain" of symbiosis networks, especially the hazardous substances. In other words, each ring of the system cuts resources and considers how much resource the entire symbiosis network need, comparing with the emissions acceptance capacity of symbiosis network. Otherwise, the "food chain" of the symbiosis network will be out of control due to an imbalance at any ring of the network.

Government coordination and maintenance functions

Local government as a "third party" coordinating role for the stability of the network is also extremely important. Because of the special position of the government, it has the independence and authority in coordinating and maintaining the security and stability for the industrial symbiosis network, which will be good for the coexistence of a variety of governance structure, preserving the interests of honest businesses, and maintaining impartiality.

In the ecological chain network operation process, local governments may, in accordance with the actual development situation of the industrial symbiosis network, encourage enterprises to exchange by-products, improve the efficiency of resource use, and make enterprises share the benefits of symbiosis. When the relationships between enterprises affect the network stability, the Government, as the Park's management, is best suited to play the role of the “facilitator” to help enterprises realize “upstream supplies, downstream receives”. Through the government's facilitation, the possibility of breaking relationships between enterprises due to small conflicts can be reduced, therefore avoiding a greater loss. In addition, the government has a deterrent role on some enterprise bad behaviors such as degeneration or speculation, maintaining the industry ecosystem stability.

Establish mechanisms for fostering trust between enterprises

Efforts should be made to educate managers with ecology, business philosophy, business ethics, core values, corporate social responsibility, and the ways of cooperation of industrial ecology. If enterprises in the same industrial chain have similar organizational culture, they have a solid foundation to achieve a good communication and friendly cooperation. Especially when the managers share the similar business philosophy and values, they would more likely to establish trust, keep promises and long-term cooperation between enterprises, and maintain the stability of the eco-industry chain. Industrial symbiosis networks have well established trust mechanism. Due to the geographical closeness, good relationships among members of the enterprises would increase the level of trust in the communication.

Therefore, enterprises in the industry ecosystems should strive to promote and integrate their corporate cultures. They should learn and tolerate from each other, communicate and share with each other, and promote the industry ecosystem stability and development.

CONCLUSION

The construction of eco-civilization contains contents from multi-level and multi-perspective, which includes not only the establishment of the ecological viewpoint of administration, ecological values, the promotion of ecological ethics and cultural heritage, but also the production methods of energy conservation, waste reduction, the construction of a resource-conservative society etc., achieving the transformation from "economic man" to "ecological man" . Traditional linear industries led to dwindling resources and even exhaustion, as well as environment pollution, it is a short-sighted unsustainable development mode of the economy. Industry ecology is to realize the harmonious development between economy and nature ecology by planning industrial systems according to material cycle in the natural ecological system, and to establish the circular economy mode of "resources-products-renewable resources".

Industry ecology system is conducive to completely change the current way of economic growth mode, it is one kind of ecological economy pattern and a sustainable economic development model.

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