

claim in the process of remaining allocation.

5. More supporting on the reallocation of vulnerable population, improving the social security system and welfare policies, increasing governmental fund into public welfare undertakings, reducing the social problems caused by physiological and psychological poverty.

6. Implementing the moral country's combination with law and system management, advocating civilization and integrity, promoting social equity by the policies of finance and allocation, establishing environment of harmonious social relationship and ideology.

Implementation of these policies will be benefit to establish a new order of harmonious human relationship. The necessity of conducting the policies is based on three judgments. First, there is a huge change in contradiction of human survival, from the goods and services' scarcity to resource and environment scarcity. Second, although the twists and turns, human develop in an overall direct of harmonious behaviors, such as open, cooperativeness and respect. Third, the harmonization of human mutual relationship is the basic premise and basis of the harmonization between human and nature. The premise is necessary. If there is no among human beings, there is neither harmony between in human and nature nor mitigation of the contradiction among world population, resource and environment.

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**The Economic Ecological Development Pattern:  
The Material Basic of Ecological Civilized Society**

**[CN] Qizhi Cheng**

**I. Extensive—Intensive—More Intensive:  
Traditional Development Pattern and its Non-sustainability**

In agricultural civilized society, human beings' ability to conquer and transform the

nature was poor restricted by productivity level, so natural environment and ecological balance weren't destroyed globally as nowadays they were. We can, however, found the harm of this economic development pattern to environment from some agricultures civilization around the world such as the vicissitude of Maya Civilization, we still can see economic growth pattern to the environment. Engels had been discussed it for a long time: "Civilization is an opposing process which makes lands barren, forests overgrown with underbrush, soils can not produce products it did initially, and makes the climate worsen".

①Therefore, as for the relationship of human being and nature, agricultural civilized society and industrial society shares the same pattern of production and development in spit of the difference of productive method between them. That is to say, both in these two societies, the way of economic growth is extensive production initially, then intensive production and finally more intensive production, with human beings' increasing ability to conquer and transform nature and worsening ecological environment. So the economic development pattern of these two societies is called as traditional development pattern or un-ecological development pattern in this article, responding to the economic ecological development pattern in future ecological civilized society.

Extensive economic growth is that growth stems mainly form the increasing quantity of productive factors; while intensive economic growth is that growth comes mainly from the increasing efficiency of productive factors. In fact, extensiveness and intensiveness are relative: intensive growth way in curtain time will become to extensive growth way in future because of some more intensive technology.

Recollecting back to the civilization history of production and development, we can found that both agricultural society and industrial society comply with the increasingly intensive economic growth pattern. In Chinese ancient society, for pressure of population,

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① [Germany]Engels, *Natural Dialectics*, Beijing: the People's Press, 1984, pp.311.

the agriculture produces and development actually adopted increasingly intensive economic growth pattern since Qin and Han Dynasty, namely intensive cultivation mode of production. According to some scholar's accounting, the average yield of grain was about 50kg per mu in 1st century B.C. (the Western Han Dynasty); while it already amounted to 100kg per mu in Southern Song Dynasty, and even 500kg in some high-yield areas which approximated modern levels.<sup>1</sup> Therefore, even if the development of technology and productivity were very slow, the way of economic growth in agricultural society was also increasingly intensive development pattern as well as in industrial society.

The Western's industrialization process can be divided to four increasingly intensive stages: The first stage was early extensive development stages which form the springing up of the Western capitalist mode of production to mid-18 centuries, being just called as the workshops handicraft stage by Max. The second stage was intensive development stage symbolized as steam-engine technology which from later of 18 centuries to mid-19 centuries, being Max's big machine industry stage. The third stage was intensive development stage taking electrification and internal-combustion engine technology as denotation which form the latter half of 19 centuries to the first half of 20 centuries. The fourth stage was intensive development stage taking modern new technique as denotation which from post of Second World War to 1980s. This stage was considered as the later of Western industrialization because most scholars thought that the western society, symbolized as the new economic growth in USA in 1990s, began to step into so-called post-industrial society, namely information society or knowledge-base economy times.

As well known to us, this increasingly intensive industrialization process in Western countries created much more material wealth than the societies in the past and showed the splendid of industrial civilization, but it was at cost of harmed ecological environment.

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<sup>1</sup> Quoted from Chen Ping, *Civilization diversion, Economic Chaos and Evolutional Economic Dynamics*, Beijing: Peking University Press, 2004, pp.160.

Moreover, the serious problem is that the other undeveloped and developing countries are following Western industrialization's footsteps. According to the data, the developed countries accounting for 20% population of the world consume 70% energies, 75% metals, 85% woods and 60% foods. It is calculated that fossil fuel consumption will increase by 10 times and mineral resources consumption will increase by 200 times in the whole world if the developing countries copies the developed countries' standard of material consumption.<sup>1</sup> This simple arithmetic tells us that this intensive traditional development pattern is impossible to spread to other countries because of its non-sustainability. Rethinking profoundly to economic unsustainable growth in industrial civilized society, this article suggests that economic development pattern of ecological civilized society is an ecological development pattern.

## **II. The premise of the transformation of Economic ecological development pattern**

1. Transformation of developmental view. Disregarding in agricultural society or in industrial society, the fundamental guiding ideology of economic development view is material-oriented. Traditional development view regards productions, distributions, exchanges and consumptions of material wealth as the unique purpose since human beings' development is equivalent with material development in this view, and as a result economic development is embodied as material growth. Now upheld by industrialized technologies, this economic development pattern aiming at material growth has brought about enormous disaster even an irreversible disaster to environment in which we live. It is environment

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<sup>1</sup> Quoted from Bin Jian-cheng and Wei Shu-lin, People-Oriented Economic Growth Should be A Basic Approach of Our Economic Development, Academic Intercommunion, no.4( 2004), pp.58-60.

crisis resulted from this economic development pattern that make us return to scientific development view which is people-oriented, thereby bringing forward and carrying out economic ecological development pattern.

2. Transformations of happiness view and pattern of consumption. Human beings' Boundless pursuit to happiness or welfare, pursuit to utility maximization in economics term, is a basic difference between man and animals; exactly this human being's unique quality determines that human society is progressing increasingly. Therefore, ecological civilized society and realization of its economic ecological development pattern can not depend on inhibiting people's desires and needs, but on the transformation of happiness view and satisfaction of desires, namely pattern of enjoying consumption. Undoubtedly, production and economic development is for the survival and development of human society. But what is the ultimate purpose of human beings' survival and development? It is obviously to make humans live happier! Material growth is regarded as realization of happiness for a long time since desire of happiness should be alienated in material. Actually, mans' pursuit to material implies their pursuit to happiness. Therefore, only happiness is the nature of mans' desire and ultimate purpose of development of society and economy. Once mans' happiness view return to desire of happiness from material, do they will find immediately that some productions and consumptions themselves are sources of happiness such as environment, leisure, healthy, and friendship etc. that do not need to spend much. If this revolutionary transformation happened in human being's happiness view and pattern of consumption, realization of the economic ecological development pattern has inherent most powerful driving force, and then ecological civilized society will arrive.

3. Transformation of technical path of ecological development pattern. The technical path of traditional development pattern is such a one-way mobile linear path as "resources—products —wastes or contaminates". In this technical path, human beings produce and consume infinitely, ask for resources and energies from the earth increasingly, and then abandon large amount of wastes and contaminating to the earth, ultimately initiate global environment problem and make economic and social development unsustainable. Exactly because of this crisis, people proposed demands of technical revolution of circulation economy, which is a sublation of traditional linear economy. Objectively speaking, circulation economy is just a new path of technical revolution that already appeared at present, and although it resolved the problem of harmony between man and nature for our production and economic growth, it can't resolve fundamentally the problem of harmony between man and man. We consider that only the problem of harmony between man and man is resolved, will it be harmonious between man and nature. According to the principle that productivity determines production relations and production determines consumption, the ecological development pattern must provide technical supporting for the harmony between man and man, such as technical supporting for producing happiness.

### III. Theoretical Analysis of Economic Ecological Development Pattern

economic ecological development pattern as material basic of ecological civilized society brought forward in this article is still a theoretical hypothesis and will be proved by practice in future society. So we can only use some existing analytical implements to prove it logically. Following two hypotheses should be brought forward to analyze:

#### 1. Hypothesis of ecological utility

Utility is essentially the degree of person's desire or enjoyment satisfied by materials, a theoretical reflecting of our production and consumption and pursuit. Ecological civilization is impossible to come true if our pursuit to utility is still in traditional pattern. So we assumed that man's pursuit to utility has transform to a new ecological utility, that is to say, variables of utility function are one-dimensional material product (P) no longer, but a 3-D variables including natural resources (z) and ecological environment (h), which can be expressed by:  $U = f(P, z, h)$ . To simplify the analyses, the expanding utility function can be simplified to:  $TU = f(P, E)$ , without influencing the analyses result. Here E stands for generalized ecological environment including natural resources (z) and ecological environment (h). Although the transmission mechanisms of natural resources and the ecological environment affecting on utility are different,<sup>1</sup> the directions of their effect are identical and have strongly positive correlativity, therefore, they can be considered as one variable. There is an ecological relation demanded by utility transformation in ecological development pattern between the new influencing factors P and E. And this utility function can be called as ecological utility function.

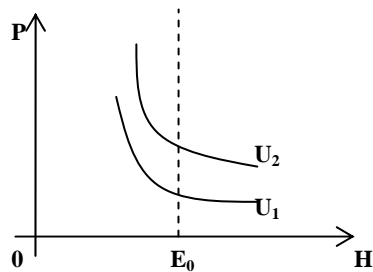
According to this new function relation, indifference curve of ecological utility can be

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<sup>1</sup> For example, situation of natural resources effect utility mainly by effecting people anticipates while ecological environment affects utility by determining living quality directly.

established, which indicates all assembles of equal material production and ecological environment. We introduce a parameter  $E_0$ , minimum stock of ecological environmental preference, to establish the indifference curve model of ecological utility. It represents the minimum stock of ecological environmental preference that proposed subjectively by human beings, which is a result of ecological crisis that stems from economic development at cost of environment for material utility maximization in industrial times. So  $E_0$  is a dynamic concept, reflecting human beings' subjective wants to ecological environment, and it depends mainly on populations and income. When income is given, with the increasing of population, minimum stock of ecological environment that our survival needs will reduce responsibly;<sup>1</sup> when population is given, increasing income will make our minimum stock of ecological environment increase.<sup>2</sup>

According to above-mentioned hypothesis, indifference curve model of ecological utility can be established. (Graph 1)



**Graph 1 Indifference Curve of Ecological**

## 2. Hypothesis of ecological constraints of technological transformation

There is a contradiction between product and growth and ecological environment

1 Effect mechanism is that human being needs more products to survive with population growth and is forced to reduce the request to ecological environment. This stands for increasing pressure of population growth on ecological environment.

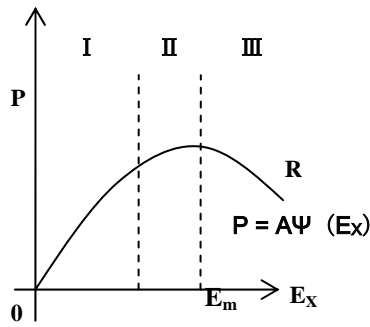
2 Higher minimum stock of ecological environment people request has reflected the improvement of human being living quality.

quality, namely the transformation relation between ecological environment and product which depends on technology. So we build production transformation function  $P = A\Psi(EX)$ , and  $A$  is coefficient of technological level,  $EX$  is the input-consumption level of ecological environment and  $\Psi$  represents functional relation. When technology is given, production can be divided to three stages: in the first stage, increasing of product ( $P$ ) will reduce gradually with the rising of ecological environment input ( $EX$ ) because of the law of diminishing marginal returns.

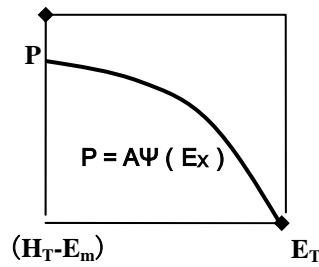
In the second stage, environmental consumption has approached the maximum load of ecological environment, but ecological environment can be renovated by consuming a part of products. So as long as marginal output of ecological environment consumption is more than marginal cost of renovation, will product ( $P$ ) increase with the increasing of ecological environment input ( $EX$ ), but the range of increasing is smaller. In the third stage, ecological environment consumption exceeds the safe ecological value ( $Em$ ) obviously<sup>1</sup>, that is to say, it exceeds objectively the maximum load of ecological environment, at this time  $EX$  are beyond the consumption range  $[0, Em]$  ecological environment can bears, but on the right of  $Em$ . So in the condition of given technology, marginal revenue of production transformation is negative and marginal output of ecological environment consumption may be much lower than marginal cost of renovation, moreover, product ( $P$ ) falls off absolutely with the increasing of ecological environment input ( $EX$ ). Thus production transformation curve ( $OR$ ) can be gotten (graph 2).

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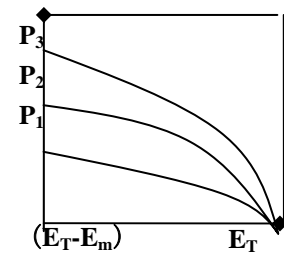
1 Parameter  $EM$  and  $E0$  are different. The former is an objective boundary of ecological environment situation in which human being live and human society can't survive beyond the boundary; while the latter is a subjective variable relating with population and income thus connecting with subjective demands for living quality. So it is a dynamic variable. Certainly,  $EM$  has set a limit to the final boundary of  $E0$  objectively.



Graph 2 Production Transformation



Graph 3 Ecological Constraints Curve of Technology Transformation



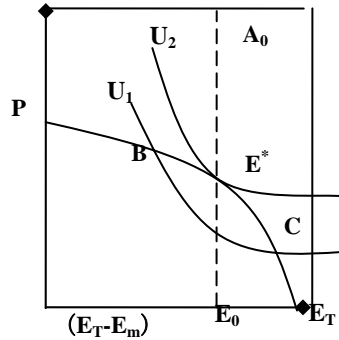
Graph 4 Movement Of Curve PE<sub>T</sub>

Ecological constraints curve of technological transformation can be inferred from production transformation curve, transforming the consumption level of ecological environment indicated by horizontal axis from low to high to stock level of ecological environment from low to high. Assuming amount of ecological environment as  $E_T$ , stock of ecological environment is  $(E_T - E_X)$ , so ecological constraints curve of technology transformation can be inferred from production transformation curve directly. Ecological constraints curve of technology transformation is  $PET$  curve (graph 3) since production is impossible and not allowed to enter the third stage. The point  $E_T$  on horizontal axis in this graph indicates that consumption of resources is zero, therefore maximum stock of ecological environment is  $E_T$ , and meanwhile the quantity of production is zero. And the point  $(E_T - E_m)$  is minimum stock of ecological environment in which human beings can survive because maximum ecological consumption is  $E_m$ , then corresponding output of production ( $p$ ) is maximization, which means human beings' survival crisis is in critical point.

The characteristics of ecological restraint curve of technological transformation are as follows: (1)  $A$  is an invariable constant when technology is given, transformation relation between ecological environment and production will be given, which determines a  $PHT$  curve. (2)  $PET$  curve is concave because marginal rate of transformation ( $MRT$ ) decreases with the consumption of ecological environment. (3) Every point on the  $PET$  curve indicates that available technology has already played as important role as possible, so production can't increase without more input. Area below the  $PET$  curve indicates that there is growth space for production; while area above the curve indicates that the output is beyond available technology. And (4)  $PET$  curve swinging forward right and upper implies technological progress around point  $E_T$  as the centre of a circle, which stands for more production with equal consumption of ecological environment because of technological progress (graph 4). If stock of ecological environment is  $(E_T - E_m)$  which means consumption of ecological environment is  $E_m$ , before ecological environment reality exists amounts are horizontal when being  $(E_T - E_m)$ , the quantity of production with different

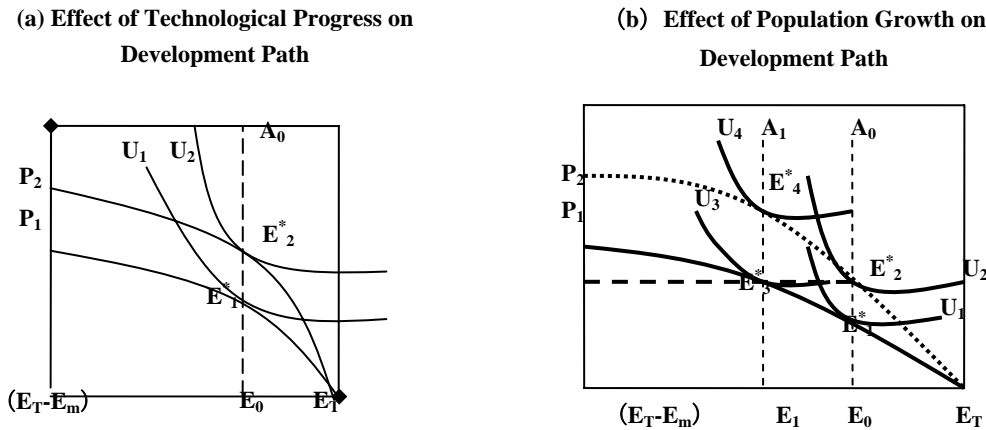
technology is  $P_1, P_2, P_3$  respectively, and  $P_1 < P_2 < P_3$ .

With above-mentioned assumptions, putting the ecological indifference curve and ecological constraints curve of technological transformation in one graph, production equilibrium model of economic ecological development can be established theoretically. (Graph 5)



**Graph 5 Equilibrium Model in Given Technologies and**

Analyses above-mentioned exclude the effect of technological progress and population growth. We will discuss the impact of technological progress and population growth (not including time factor) on economic ecological development respectively. The maximal effect of technological progress lies in enhancing efficiency of production transformation, then more output is able to be gained with given consumption. Therefore, PET curve swings towards right around point HT in the model (graph 6(a)) and P2ET curve stands for higher technological level than P1ET curve. Technological progress determines the new equilibrium of economic ecological development. The quantity of production on the new equilibrium point  $E^*2$  is more than equilibrium quantity determined by original technology. So technological progress has driven economy develop toward a high-level in ecological civilized society. With technological progress, equilibrium point moves up gradually, and the trajectory of these equilibrium points is the path of economic ecological development with technological progress. curve  $E_0A_0$  in 6 (a) is a path of development.



**Graph 6 Equilibrium Model of Economic Ecological Development**

Population growth effects social economy comprehensively, and the basic effect is increasing pressure on ecological environment. with the pressure of populations growth, the minimum stock of ecological environment that human being survival demands comes down that, curve E0A0 moving towards the left to E1A1 (graph 6(b)). Curve E1A1 is the economic development path pulled by population growth, which means the minimum stock of ecological environment that human being survival demands lowered from H0 to E1. Appearance of this new development path represents more pressure of population on ecological environment; consequently minimum stock of ecological environment needed by human society reduces. This implies lower environmental quality people relied on, thereby, human being's utility preference correspondingly moves from U1 to U3. New equilibrium point E3 indicates that living quality turns bad because of pressure on ecological environment though increasing production quantity satisfied population growth. Therefore, technology been invariable, social production will tend to P1 if population growth is continuous, leading to an ecological environment worse irreversibly. But if technological progress is available, economic development will confront with two choices (graph 6(b)): One is to move from E\*3 to E\*4 along the path H1A1; another is to move from E\*3 on path E1A1 back to E\*2 on path E0A0. Obviously, the first choice can improve people's consumption standard of material production, however, quality of ecological environment is lower than that of path E0A0, then living quality maybe not good. While although the second choice can not improve people's consumption standard of material production, ecological environmental quality is good, as a result people's living quality is better. But this choice depends on the preference to production and ecological environment. In a society with stronger desiring for materials, people will choose economic growth path E1A1; while in a society with ecological rationality, people will choose the ecological development path moving from E\*3 back to E\*2.

Summarizing above-mentioned discussions, Population growth is a key factor breaking equilibrium of economic ecological development and threatening ecological

civilized society. The effective path relieving pressure of population growth is to depend on technological progress to make curve PE swing towards right forming equilibrium point  $E^*$ , thus production quantity recovers as it was before population growth without damaged ecological environment. Therefore, technological progress is a fundamental factor to maintain and promote economic ecological development.

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