

# Economic growth: the theoretical debate on resources, the environment and growth limits and the choices faced by human beings

Renzhong Ding

*School of Economics, Southwest University of Finance and Economics,  
Chengdu, China*

## Abstract

**Purpose** – The relationship between man and nature varies with different stages of the development of human society. The destructive consequences brought about in the early stage of industrialization sparked serious concerns about ecological and environmental issues.

**Design/methodology/approach** – The worldwide controversy aroused by The Limits to Growth published in 1972 made people realize that the carrying capacity of the ecosystem was limited, as were the resources. In the long run, scientific and technological progress can constantly discover new energy and resources.

**Findings** – However, in every specific stage of human society, the energy and resources crises are always a severe challenge that human beings should face. It is the core contents of sustainable development to change the old economic growth model and explore a new economic growth model.

**Originality/value** – The relationship between man and nature is one of the most fundamental relationships in human society and economic development. How to deal with it is also one of the most fundamental issues in human society and economic development. From the perspective of the historical process of human society, the relationship has roughly gone through the following stages.

**Keywords** Resources, Growth limits, Sustainable development

**Paper type** Research paper

## 1. The relationship between man and nature is the core issue of growth

The relationship between man and nature is one of the most fundamental relationships in human social and economic development, and how to deal with it is also one of the most fundamental issues in human social and economic development. From the perspective of the historical process of human society, the relationship has roughly gone through the following stages:

The first stage is the early agricultural society. During this long historical period, the relationship between man and nature was characterized by mankind's obedience to nature and nature's domination and rule over mankind: (1) Due to the extremely low level of science and technology, mankind had only a superficial scientific and technological awareness and were unable to explain and understand a large number of natural phenomena, which caused them to fear and admire the mysterious nature. (2) Since mankind had only simple labor tools and experience, the production level was extremely

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low. Mankind relied on the gifts of nature and lived on the ready-made food provided by nature to maintain a low life level via behaviors, such as hunting, fishing, and gathering fruits. (3) Due to the extremely low productivity and creativity, mankind could only blindly obey the domination of nature. In particular, human beings basically had no resistance in the face of natural disasters.

The second stage is the industrial society. In the course of human history, the industrial society is the period with the fastest population growth, the most rapid economic development, the greatest accumulation of material wealth, and the most drastic social changes. During this period, the relationship between man and nature has changed dramatically, i.e. mankind wanted to control and conquer nature: (1) The invention of the steam engine in the 18th century prompted mankind to enter industrial society, and the rapid development of science and technology in the 19th century, known as the “science century”, accelerated the strong momentum of the industrial revolution. With the help of advanced science and technology, mankind continuously discovered the laws of motion in nature and explored more mysteries of nature. This also led to “anthropocentrism”, which means humans unconsciously see themselves as the master of nature and proposed the unrealistic slogans of “man can conquer nature”. (2) The unprecedented expansion of human consumption desire stimulated the unprecedented development of social productivity, and technological inventions also became an accelerator for the development of social productivity. In the book *The Third Wave* (Toffler, 1984), American scholar Toffler believed that the industrial revolution was characterized in the technological field by large-scale production and the large-scale distribution system that went with it; and the core of industrialization was the upsizing (p. 72). Thus, in industrial society, “large-scale” became synonymous with “efficient”. (3) While the social productivity was unprecedentedly developed, the negative effects became increasingly apparent and severe. The resulting problems became increasingly diversified, such as the greenhouse effect, climate change, ecological destruction, environmental pollution, resource crises, food shortages, soil erosion, and land desertification.

The emergence of these problems highlighted the deepening of the imbalance and contradiction between man and nature in the industrial society, mainly in the following two aspects.

First, the relationship between development and ecology. In nature, the ecological system has a self-regulation function, which means it can regulate itself against various changes inside and outside the system to keep the system as stable as possible. Within a certain range, external factors can cause changes in the system, but the system can be restored to its original state after self-regulation. However, if the external interference is too strong and destroys the self-regulation function of the system, it will cause the system to become unbalanced. For example, pollution exceeding the water self-purification capacity will lead to the death of many aquatic lives, excessive deforestation to soil erosion, and overgrazing of grasslands to desertification. However, men tended to forget it and wanted to conquer and transform nature during industrialization, resulting in destroying the ecological balance and triggering many unexpected consequences. Engels (1973) warned in *Dialectics of Nature*, “Let us not, however, flatter ourselves overmuch on account of our human conquest over nature. For each such conquest takes its revenge on us. Each of them, it is true, has in the first place the consequences on which we counted, but in the second and third places, it has quite different, unforeseen effects which only too often cancel out the first. The people who, in Mesopotamia, Greece, Asia Minor, and elsewhere, destroyed the forests to obtain cultivable land, never dreamed that they were laying the basis for the present devastated condition of these countries by removing along with the forests, the centres for collecting and restoring moisture. When, on the southern slopes of the mountains, the Italians of the Alps used up the pine forests so carefully cherished on the northern slopes, they had no inkling that by doing so they were cutting at the roots of the dairy industry in their region” (pp. 517–518). However, his advice did not arouse much attention.

Second, the relationship between development and resources. In addition to a large-scale production and distribution system, the industrial society has another notable feature—large-scale consumption of resources. In fact, fossil energy and mineral resources have become the dominant resources and material basis for industrialization. Mankind always thought that natural resources were inexhaustible, so they exploited and used nature on a large scale without restraint. But now people have discovered that most of the natural resources are not only limited in quantity but also non-renewable. These resources will one day be exhausted by mankind. Meanwhile, the wastes generated after the consumption of conventional energy resources, represented by petroleum and coal, have caused great pollution and damage to the environment. In the middle of the 20th century, the limitedness of space and resources brought about by industrialization and urbanization began to affect people's lives, causing people's anxiety. The significance of rational use and effective protection of resources has gradually been recognized and accepted widely.

The various destructive consequences in the early stage of industrialization have aroused people's attention and reflection on ecological and environmental issues. People have gradually realized the drawbacks and harms of the thought trend of "anthropocentrism". On this basis, the concept of ecological holism appeared and was accepted. The core idea of ecological holism is to take the overall benefit of the ecosystem rather than the benefit of human beings as the highest value, to take whether it is conducive to maintaining and protecting the integrity, harmony, stability, balance, and continued existence of the ecosystem as the fundamental measure of all things and as the ultimate criterion for judging human lifestyles, scientific progress, economic growth, and social development (Wang, 2004).

The idea of ecological holism was formed in the 20th century, of which Aldo Leopold and Holmes Ralston were main representatives. Leopold proposed the three principles of ecological holism, namely "harmony, stability, and beauty". Ralston added "completeness" and "dynamic equilibrium" to the principles of ecological holism based on systemic argumentation, and another representative Arne Naess added "ecological sustainability".

Ecological holism transcends anthropocentrism that takes human interests as the fundamental yardstick, and humanism and liberalism that take the dignity, rights, freedom, and development of individual human beings as the core ideas and overturns some basic values that have long been universally recognized. It requires people to no longer understand the world only from a human perspective or pay attention to and seek the interests of only human beings. It demands people to consciously limit the material desires, economic growth, and living consumption beyond the carrying capacity of the ecological system for the benefit of the whole ecosystem rather than just human beings. Just because of this, ecological holism has aroused many doubts and criticisms and has become one of the most controversial issues in the field of ecological thoughts. However, it is realistic that ecological holism actively advocates mankind should throw away old concepts, strive to know about and understand the ecosystem, and take the overall benefits of the ecosystem as the basic standard for measuring all human concepts, behaviors, lifestyles, and development models. The proposal of ecological holism provides a new way of thinking and a theoretical basis for mankind to alleviate and eliminate ecological crises. In any case, people should not forget the truth—nature does not belong to mankind, but mankind belongs to nature.

## 2. Theoretical debate on the growth limit

In the process of industrialization, the relationship between man and the environment has become increasingly tense, and the degree of support of resources for social progress and economic development has attracted increasing attention. British economist T. R. Malthus focused on resource issues in *An Essay on the Principle of Population* (1978), especially on the

relationship between population growth and resource supply. According to Malthus, if the population were not controlled, the population would increase geometrically, while the food production would increase arithmetically, so the growth of the population is infinitely greater than the food productivity of the land. Although Malthus seemed to discuss the relationship between population growth and food production, he actually discussed the relationship between population and resources and the environment, that is, the number of people should be compatible with natural resources and cannot exceed their capacity; otherwise, it would destroy the balance between men and nature, and the population will be reduced due to catastrophic and compulsory suppression, such as famine, war, and plague. As Malthus advocated the “theory of absolute resource scarcity”, Ricardo put forward the “theory of relative resource scarcity”, and John Mill concluded the latter view (Hong, 2002). In his book *Principles of Political Economy* (1848), Mill disagreed with Malthus’s theory of absolute scarcity but also firmly opposed the endless development of natural resources because natural resources do have a limit. He believed that the natural environment, population, and wealth should be maintained at a static and stable level far from the limit of natural resources to prevent food shortages and the massive disappearance of natural beauty.

After mankind entered modern society, the accelerated process of industrialization made resource and environmental issues particularly noticeable., British scholar Voget (1948) discussed the population carrying capacity of land and other issues from the perspective of the relationship between population and land and proposed that the growth of world population had exceeded the carrying capacity of land and natural resources and mankind were faced with the disaster of extinction in *Road to Survival*. He claimed that the way to survive was to control population growth and restore and maintain the balance among population, land, and natural resources. Female American biologist Rachel Carson (1962) published a popular science book *Silent Spring*, which caused a sensation. In this book, Carson painted a terrible scene of environmental damage caused by pesticide pollution and warned people that they would lose the “bright spring”, which triggered discussions on the resource and environmental crisis and development concept around the world. American economist K. E. Boulding simlized the Earth as a spacecraft in the boundless space in *The Economics of the Coming Spaceship Earth* (1966). In this essay, the continuous growth of population and economy will exhaust the limited resources in the ship, and the waste discharged by human production and consumption will eventually make the ship completely polluted, which eventually leads to the collapse of human society. In 1978, Paul R. Ehrlich published *The Population Bomb*, arguing that if the population had grown without control, the population of the Earth would reach  $6 \times 10^{16}$  after about 900 years. At that time, each square meter would be occupied by 100 people, and there would be no enough place on the overcrowded Earth for men to live. Chinese scholar Ma Yinchu also raised the issue of population control in *New Population Theory* in 1957, but his view was not recognized then but criticized (Zhang *et al.*, 2002).

In April 1968, more than 30 scholars from 10 countries, including the United States, Germany, and Norway, gathered in Rome to discuss current and future dilemmas of mankind and established an informal international academic group—the Club of Rome. In 1972, a group of club members, represented by Dennis Meadows, published the first research report, that is, the sensational *The Limits to Growth*. In the 1970s, the “golden age” of rapid economic growth in the West, this report made a profound rethinking of the growth theory long popular in the West and uniquely proposed to focus on the “limits to growth”. The report argued that five main factors influenced and determined growth, i.e. population growth, food supply, natural resources, industrial production, and pollution. Population growth leads to an increase in food demand, while economic growth leads to an acceleration in the depletion of non-renewable natural resources and an increase in environmental pollution, all of which were essentially in exponential growth.

This report (Meadows *et al.*, 1983) concluded some important points based on the analysis of the above five main factors, such as the relationship between development and the environment as well as resources. Authors of the report believed that “. . . If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity” (p. 19). And these serious problems were caused by the current model of growth. “What validity our model has held up only to the point in each output graph at which growth comes to an end and collapse begins” (p. 206). The authors of this report deeply criticized the existing growth style and believed that if this growth model had continued, it would inevitably lead to the collapse of human society, and the best way to avoid it was to maintain factors, such as the birth rate and output rate, unchanged—“. . . we have now arrived at a minimum set of requirements for the state of global equilibrium. They are: (1) The capital plant and the population are constant in size. The birth rate equals the death rate, and the capital investment rate equals the depreciation rate. (2) All input and output rates—birth, death, investment, and depreciation—are kept to a minimum. (3) The levels of capital and population and the ratio of the two are set in accordance with the values of the society” (p. 200). The view of this report was later regarded as a “resource scarcity theory” and a representative work of the pessimists. Its view on economic growth was also called “zero growth”.

The publication of *The Limits to Growth* caused a strong response and also attracted numerous criticisms. Many scholars began to refute the views in *The Limit to Growth*, and American scholar Julian L. Simon was one of the representatives. In 1981, he published *The Ultimate Resource* and made a concentrated criticism of the resource scarcity theory. He first proposed different interpretations of the word “limitedness”, arguing that “the term ‘limitedness’ is not only inappropriate for natural resources but is obviously wrong from a practical and philosophical point of view. There are many important controversies, and the controversy over the word ‘limitedness’ is ‘not just in semantics’. The semantic controversy about resource shortages have disrupted public discussions and led to wrong decisions” (Simon, 1985, p. 44). Then, the book focused on “infinite natural resources” and “inexhaustible energy”, and the author proposed that “natural resources are not limited in any economic sense” (Simon, 1985, p. 7) because people cannot accurately detect the reserves of nature—“The amount of natural resources available, and more importantly, the utility that these resources may provide to us, is forever unknown” (Simon, 1985, p. 55). Meanwhile, the author believed that as technology advanced, new resources would continue to appear. For example, “. . . On the positive side, our energy supply is clearly not limited to the Earth. The sun is the ultimate energy resource among all energy sources except nuclear energy. Therefore, although we obviously cannot reuse energy like other mineral resources, our energy supply is not limited to the amount of energy that the Earth currently has. Therefore, energy is unlimited in any sense” (Simon, 1985, p. 66). The above views are also called optimistic views.

Since then, the controversy between the theories of “resource scarcity” and “resource infinity” has never ceased. New works and figures have appeared on both sides, which has caused heated discussions one wave after another. For example, the US government published *The Global 2000 Report* in 1980 (US Government Printing Office, 1980), supporting *The Limits to Growth*, while in 1976, the Hudson Institute of the United States published *Next 200 years: a scenario for America and the world* (Kahn *et al.*, 1976), refuting views in *The Limits to Growth*. Although the opposition represented by Julian Lincoln Simon held an objection to “zero growth”, the seriousness of the “global problem” put forward in *The Limits to Growth* has been recognized by the world. The energy crisis and the shortage of resources that hit human society from time to time have proved that the resources that human beings can find and are available for human use are always limited due to various limits within a

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certain period. Therefore, the rational use of resources is the inevitable choice for the sustainable development of human society.

### 3. Changing the mode of economic growth is the actual foundation for sustainable development

The debate on the limit theory and the infinite theory of growth is essentially rooted in the reflection on the economic growth model of early industrialization, i.e. the high-consumption, high-pollution, and high-speed model. To overcome the drawbacks of the traditional economic growth model, all sides of the debate have conducted constructive discussions on the future economic growth model.

#### 3.1 *Balanced growth theory*

According to *The Limits to Growth*, the traditional economic growth model would lead to the collapse of human society. In the face of growth, mankind has three options: unlimited growth, self-imposed restrictions on growth, and nature-imposed restrictions on growth, but in fact, only the latter two options are possible. According to the book, the ideal solution is a balanced global growth: "The state of global equilibrium is that population and capital are essentially stable, with the forces tending to increase or decrease them in a carefully controlled balance" (Meadows *et al.*, 1983, p. 198). Meadows and others compiled a "world model with stable population and capital" based on the idea of global equilibrium. In this model, they assumed that the population had stopped growing since 1975, industrial capital had stopped growing since 1985, and other conditions had remained unchanged. The result was that the exponential growth has disappeared, but only a temporary steady state could be reached as the population and industrial capital still remained at a relatively high level and resources were exhausted quite quickly.

Meadows *et al.* believed that to maintain equilibrium, in addition to growth-control policies, technological policies were needed, so they developed a "stable world model". In this model, they proposed a policy: To stabilize the population size since 1975 by making the birth rate equal to the death rate and allow the natural growth of industrial capital until 1980. Then, to stabilize the industrial capital through making the investment rate equal to the depreciation rate and to reduce the material consumption per 1 unit of industrial goods to 25% of the value of material consumption in 1970 for avoiding a shortage of non-renewable resources. To shift the economic focus from the production of material products to the increase of service facilities, including schools and hospitals and reduce the pollution to 25% of the value in 1970 for further delaying the exhaustion of resources and the deepening of pollution. To invest more capital in food production for increasing the average amount of food per capita. As the increase of investment in agriculture would reduce soil fertility, the capital for agriculture should be preferentially utilized to increase soil fertility and retain water and soil. As industrial capital was used for service facilities, food production, resource recovery, and pollution control, the stock of industrial capital would remain at a low level. The average lifespan of industrial capital should be increased to further reduce the consumption and pollution of resources for offsetting this impact. Meadows believed that equilibrium could be achieved and continue by implementing policies to control the growth and technological policies in the stable "world model".

The publication of *The Limits to Growth* has caused a lot of controversy and criticism in the world. It is not possible to provide a detailed review of the entire book in this paper, but there are a few points that need to be clarified.

First, *The Limits to Growth* does not put forward the view of "zero growth" but argues that equilibrium is not equal to stagnation, as "... An equilibrium defined in this way does not mean stagnation" (p. 200), and "... The picture of the equilibrium state we have drawn here is

idealized, to be sure. It may be impossible to achieve in the form described here, and it may not be the form that most people on the Earth would choose. The only purpose in describing it at all is to emphasize that global equilibrium need not mean an end to progress or human development” (p. 208).

Second, the book argues that instead of being stagnation, global equilibrium can go parallel with growth. “What would life be like in such an equilibrium state? Would innovation be stifled? Would society be locked into the patterns of inequality and injustice we see in the world today? . . . It seems possible, however, that a society released from struggling with the many problems caused by growth may have more energy and ingenuity available for solving other problems. In fact, we believe that the evolution of a society that favors innovation and technological development, a society based on equality and justice, is far more likely to evolve in a state of global equilibrium than it is in the state of growth we are experiencing today” (pp. 201–202). In addition, the book proposes that in an equilibrium growth model, what should be suppressed is not growth in general, but growth that consumes a large amount of resources and pollutes the environment seriously, and meanwhile, growth that does not consume many resources or pollutes the environment should be encouraged. “Any human activity that does not require a large flow of irreplaceable resources or produce severe environmental degradation might continue to grow indefinitely. In particular, those pursuits that many people would list as the most desirable and satisfying activities of man—education, art, music, religion, basic scientific research, athletics, and social interactions—could flourish” (p. 202).

Third, the book proposes that population growth is a key factor in the growth model, which has been proved correct by facts. The core of the sustainable development theory generally accepted by the world today is correctly handling the relationship among population, resources, and environment and maintaining a reasonable growth of population and mutual coordination among population, resources, and environment. Therefore, the book’s view is essentially consistent with the theory of sustainable development.

Fourth, the book suggests that in order to avoid a future collapse of human society, the current economic growth should be restricted, which is not very realistic. The history of the development of human society has indicated that passively restraining or slowing down the growth cannot fundamentally solve the problems. Instead, the defects of the old model should be overcome by exploring new ways for growth actively, and the old contradictions should be solved successively by relying on scientific and technological progress during economic growth.

### 3.2 Organic growth theory

As *The Limits to Growth* aroused strong reactions and heated debates from the outside world, the Club of Rome believed that it was necessary to explore this widespread issue deeper and expound their views much comprehensively. Thus, the club published the second research report in 1974, namely *Mankind at the Turning Point* by M. Mesarovic and E. Pestel.

According to *Mankind at the Turning Point* (Mesarovic and Pestel, 1987), mankind currently faces various unprecedented crises, including population crisis, environmental crisis, food crisis, and energy crisis, which brings mankind to an important turning point—“Mankind, therefore, appears to be at a turning point: to continue on the old road . . . or to start on a new path. In the search for such a new direction, the old premises must be re-evaluated. One such premise concerns the phenomenon of growth. Unless the place, nature, and content of growth and the process of growth are first determined, the issue of whether growth should or should not be made is not only a question whose meaning is ambiguous but is also a meaningless question. In order to understand the richness and diversity of the concept of growth, we should recall the various growth processes that exist in nature. What we are

interested in here are two types of growth processes. One is undifferentiated growth, and the other is organic growth, or say, differentiated growth” (p. 3). The so-called “undifferentiated growth” refers to the growth with no qualitative change that is completely the increase in quantity, while organic growth refers to not only quantitative growth but also qualitative growth. Various crises currently faced by humans are rooted in the model of undifferentiated growth. Therefore, it is necessary to stop pursuing this simple pursuit of scale expansion and quantity growth and shift to the organic growth model.

*Mankind at the Turning Point* changes the shortcoming of *The Limits to Growth*, that is, treating the world model as a whole, and divides the whole world system according to the differences of distributions of culture, environment, development level, and resource around the world into ten regions: North America; Western Europe; Japan; other developed market-economy countries; Eastern Europe, including the Soviet Union; Latin America; the Middle East and North Africa; the African Continent; South and South-East Asia; China and other Asian centrally planned economies.

Based on the above classification, *Mankind at the Turning Point* compiled a “multilevel world model”. Based on this model, the book argues that before the middle of the 21st century, different regions in the world might experience regional collapse due to different reasons at different times. Countries should unite and take concerted global actions to avoid or solve these problems. Meanwhile, another solution is to change the growth method from undifferentiated growth to organic growth.

Compared with *Limit to Growth*, *Mankind at the Turning Point* has some improvements and innovations regarding contents and methodologies. First, *Mankind at the Turning Point* abandons the world aggregate analysis method adopted by Meadows *et al.* and adopts the non-aggregate classified global model analysis method, which is more convenient to analyze regional changes and the interaction between national and global situations and is helpful to understand the dynamic process of global development. Second, in its study of material limits, *The Limits to Growth* did not link material limits with changes in the management system, political process, social form, and value system and ignored the internal connections between them. In an attempt to overcome the shortcomings of *The Limits to Growth* regarding the method, *Mankind at the Turning Point* explores the relationship between material limit and social, political, and managerial limit and organically combines society, politics, and economy as a whole for research, exploring a new research method. Third, *The Limits to Growth* puts forward that when solving various problems and crises faced by mankind, it is impossible to solve them in isolation solely. Only coordination and global cooperation among countries can solve these problems effectively, and new international economic order should be established to prevent possible international conflicts. This view is more in line with the current trend of world development and is of practical significance in solving some current global problems.

### 3.3 Surprise-free development theory

Herman Kahn, the first director of Hudson Institute, was a physicist and mathematician and also a representative figure against *The Limits to Growth* by the Club of Rome. He successively published *The next 200 years: a scenario for America and the world*, *World Economic Development*, *The Coming Boom*, and other books, which systematically expounded his vision for the future social and economic development.

First of all, Kahn strongly opposed the “zero growth” theory. He believed that “zero growth” would make poor countries poor forever and make people lose confidence about the future. He divided the development of human society into five stages from the perspective of economic history, namely, pre-agricultural society, agricultural society, industrial society, super-industrial society, and post-industrial society. In his view, the post-industrial society

was the highest stage. So how to transit to the post-industrial society? Kahn argued that the most important thing was to improve people's confidence about the future. However, if people had accepted the "zero growth" theory, hundreds of millions of people might be deprived of any hope of getting rich, and people would lose their confidence about the future.

On this basis, Kahn (1980) conducted an analysis on future development. First, he put forward a hypothesis in the world blueprint or the "400-year earth-centered vision" on population growth, that is, the world population growth rate was then close to the historical peak and would soon start to slow down. In the end, the world population growth rate will decrease within 100–200 years from then. Second, Kahn believed that for European countries and the United States that have completed industrialization, economic growth was a slow and lasting process of obtaining capital, resources, knowledge, and technology regarding economic growth. This process included invention, application, investment, and return, which would take several decades. From this point of view, the developing countries would face many difficulties in development. However, some favorable factors could help promote the economic development of the developing countries. These favorable factors included the following ten aspects: (1) accessing to capital, technology, and markets of developed countries; (2) exporting labor in exchange for foreign exchange and accessing to technology; (3) introducing export-oriented industries; (4) developing tourism to obtain income; (5) technology transfer getting easier; (6) making use of the development experience, technology and system of developed countries; (7) importing polluting and low-level jobs to increase employment opportunities; (8) developing import substitution industry; (9) possessing a stable international environment with reduced possibility of foreign aggression; (10) assistance from developed countries. Third, Kahn admitted that human society had serious problems in population, energy, food, environment, and other aspects concerning resources and environment. If these problems were not addressed carefully, they might have catastrophic evolution, especially when war or natural disasters occurred. However, according to Kahn, these problems "are basically solvable, or can be solved in the near or medium-term. They are some transitional problems in the transitional period, which is a period between world poverty and world prosperity" (p. 25).

Kahn believed that mankind could solve various serious problems through scientific progress, sound management, and wise policies. As Kahn was confident about the future of mankind, he believed that if no amazing and unexpected "innovation and progress" had happened, those developed countries would enter a super-industrial society at the end of the 20th century and the beginning of the 21st century and then a post-industrial society. Finally, all countries would enter super-industrial economies or post-industrial economies. This was what he called a surprise-free world blueprint for the future of human society.

From the above, four points can be concluded. First, Kahn strongly opposed zero growth. However, as mentioned in this paper, the pessimistic school did not explicitly put forward the view of zero growth, and Kahn's thought was based on a misunderstanding. Second, Kahn noted the importance of the population problem, believed that the population growth would enter a controllable state, and proposed that the economic growth would not continue indefinitely, which are in line with the reality and basically consistent with the view in *The Limits to Growth*. Third, Kahn realized that growth of population and economy would lead to excessive depletion of resources, so he proposed that attention should be paid to solving such problems, suggesting developing energy substitutes, strengthening the recycling and preservation of raw materials, establishing a food storage system, controlling pollution, avoiding nuclear war, etc. These suggestions were all very reasonable. Fourth, Kahn's theory had many guesses and lacked empirical and detailed argumentation, so it is not convincing.

### 3.4 Sustainable development theory

After entering the knowledge-based economy society, people began to be more rational about the problems of resources and environment and the issue of whether there was any limit to growth. They realized that the essence of these problems was the relationship between man and nature, and it was important to maintain the harmony between man and nature. Therefore, the sustainable development theory came into being.

The idea of sustainable development can be traced back to the United Nations Conference on the Human Environment in 1972. More than 1,300 delegates from 113 countries gathered in Stockholm, Sweden, to discuss the global environmental problems caused by development for the first time and issued a landmark document, *Declaration of the United Nations Conference on the Human Environment*, under the theme “what we should do to make the Earth a place fit not only for people now but also for future generations”. Although this conference did not clearly put forward the concept of sustainable development, its main contents were already clear.

The concept of sustainable development first appeared in the document *World Conservation Strategy* drafted by the International Union for Conservation of Nature and Natural Resources (IUCN) in 1980. The document put forward the policy of combining resource protection with economic development and argues that “development and conservation are equally necessary for our survival and for the discharge of our responsibilities as trustees of natural resources for the generations to come” (IUCN, 1980). In 1987, the United Nations approved the document *Our Common Future* drafted by the World Commission on Environment and Development. The epoch-making document, which concerns the challenges and strategies for the future development of human society, proposes that sustainable development “meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987). This document also discussed the principles, requirements, goals, and strategies of sustainable development, thus laying the foundation for the idea of sustainable development. In June 1992, the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, adopted *Rio Declaration on Environment and Development* and *Agenda 21*. These two documents were the beginning of putting sustainable development ideas and concepts into action, which fully affirmed the road of sustainable development and regarded the realization of sustainable development as the common goal of mankind. At this point, the thought of sustainable development has become the primary guiding principle that affects human civilization and progress.

The core of sustainable development is the harmonious view of nature. The document *Our Common Future* of the World Commission on Environment and Development (1987) emphasized that, “In its broadest sense, the strategy for sustainable development aims to promote harmony among human beings and between humanity and nature”. Principle I of *Rio Declaration on Environment and Development* also emphasized, “Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature” (World Commission on Environment and Development, 1992). From this, it can be seen that the relationship between mankind and nature is the foundation for the establishment of sustainable development mode, and the harmony between man and nature is the highest goal for sustainable development. Only when the harmony between man and nature is achieved can the sustainable development of human society be realized.

The focus of sustainable development theory is development, which is still in a prominent position. According to sustainable development theory, development is a common and universal right of mankind. Both developed and developing countries have equal development rights, and development is more significant for developing countries. However, at the same time, it should be noted that human development must be compatible with resources and the environment—humans must give up the traditional

methods of production and consumption and change the past wrong practice of consuming resources and sacrificing the environment for development to make the development and the carrying capacity of the Earth be coordinated and adapted to each other.

The basic principle of sustainable development is to consider the interests of both present and future generations. It is emphasized that while pursuing development and increasing consumption, present generations should recognize and strive to make the opportunities of future generations equal to their own opportunities. The present generations are not allowed to sacrifice or damage the interests of future generations during the pursuit of development and consumption selfishly, depriving future generations of equal opportunities for development and consumption.

To sum up, with the idea of sustainable development widely accepted by the world, global actions are underway, and theoretical debates have no longer been a problem. Lester R. Brown, director of the Worldwatch Institute, said in this regard, "Since sustainability has become the goal of economic policy and planning, the controversy that arose after the publication of *The Limits to Growth* in 1972 will be brought to an end. Because it is more appropriate to choose between one way or another of sustainable development than between growth and non-growth" (1984, p. 291). It should be said that Brown's remark is a quite pertinent conclusion.

At present, China has entered the middle stage of industrialization. With the acceleration of the process, the resource supply of China has become increasingly tight, and the carrying capacity of its resources is continuously declining. Therefore, the resource bottleneck has been highlighted as a key link in the economic growth of China. This forces China to correctly understand the relationship between mankind and nature, handle the relationship among economy, resources, and environment carefully, and strive to solve the constraint of resources on economic growth, while accelerating the development of the national economy. In the process of solving this difficult problem, increasing revenue and reducing expenditure are conventional measures, while the fundamental solution is to change the mode of economic growth from "high consumption, high investment, and high growth" to "low consumption, high efficiency, and high growth". This is a harsh reality that China has to face squarely in its economic growth.

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### Corresponding author

Renzhong Ding can be contacted at: [dryx@swufe.edu.cn](mailto:dryx@swufe.edu.cn)

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