International J.Math. Combin. Vol.4(2021), 75-89

Economic Logic in the Carbon Neutrality with Reflection on Human Civilization

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Abstract: Clearly, the excess carbon emission is a natural accumulating of 300 years of humans' industrial activities that released carbon dioxide, also with other greenhouse gases. The main objective of carbon neutralization is to correct human's wanton interference to the nature, realize self-absorption of carbon emissions from human activities and then, only zero emissions to the nature so as to achieve the harmony and symbiosis of humans with the nature. In fact, this is to regard the humans and the nature consist of a binary system in biology and to re-understand the nature according to the principle of everything mutually reinforcing. But then, how to achieve carbon peak and then, carbon neutrality and *what is the underlying logic of its impact on economic development*? Taking carbon dioxide as a single substance flow, a particular case of continuity flow or mathematical combinatorics, this paper analyzes the way to achieve carbon neutrality and its impact on energy, industry and transportation industries according to the binary system, which points out that the Chinese civilization is the only possible way for humans to achieve carbon neutrality and return to the beautiful picture of green mountains with clear waters.

Key Words: Continuity flow, mathematical combinatorics, substance flow, carbon emission, carbon neutralization, natural circulation, conservation law on node, binary system, Chinese civilization.

AMS(2010): 05C22,91B76.

§1. Introduction

The notion of harmonious coexistence and symbiosis of humans with all living things is a philosophical proposition that regards the universe as a biological system and realizes the sustainable development of humans ourselves. Carbon neutralization refers to the balance between the total amount of carbon of human activities emitted to the nature and the amount of natural consumption. It is a reflection of the philosophical proposition of "*the harmony of humans with the nature*" in the Chinese culture. It is a reflection of scientific civilization and human industrialization activities as well as the adjustment of industry and industrial layout, to guide a civilized consumption direction in the mark. During the general debate of 75th Session of the

[1]Received October 5, 2021, Accepted December 20, 2021.

United Nations General Assembly, September 22, 2020, China pledged to improve the country's independent innovation capacity and strive to peak its carbon emissions by 2030 and achieve carbon neutrality by 2060, which is an arduous, also a complex systematic work. According to the statistics, China's carbon emissions accounted for 30.7% of the global carbon emissions in 2020, accounting for 9.899 billion tons, ranking first in the world statistics, with a gap of 5.442 billion tons between China and the United States, which ranked second with 4.457 billion tons of emissions. It should be noted that to close the gap on the second place the target of carbon emission should be reduced with 5.442 million tons, without mention the gap of carbon neutrality.

Then, *what is the carbon emission*? The carbon emission is a general term or abbreviation of greenhouse gas emission, refers to human activities or naturally formed greenhouse gases such as water vapor (H_2O), freon, carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), ozone (O_3), organofluorines, perfluorocarbons, etc. However, the carbon dioxide is the main contributor, contributing about 60% to greenhouse gases, which is the governance priorities of abatement and control. Certainly, the economic development satisfies the people's ever-growing material and cultural needs but the energy conservation and emission reduction bring benefits also to the people. In this situation, as a whole for the contradictory relationship in the production with consumption, it is a very important thing of humans. Therefore, it is necessary to scientifically analyze the connotation of carbon neutrality, analyze the excess carbon emission of existing industrial production layout, reflect also on the human civilization formed over thousands years, and explore the coordinated development, namely the *humans in harmony with the nature* advocated by the traditional Chinese culture.

§2. Carbon Balance of Substance Flow

All things in the universe form a whole, an organic system that is complementary to each other, and led to a naturally series forms of combination mechanisms such as those of matter made up of molecules, molecules made up of atoms, and atoms made up of elementary particles. Among them, atoms cannot be born and cannot be perished also, can only be converted from one form to another, i.e., matter is immortal or conserved. This fact is reflected in carbon emissions, i.e., the total amount of six greenhouse gases discharged is equal to the total amount of natural consumption and floating in the air, which forms a natural conservation mechanism, namely the carbon emission equivalent to the natural consumption. What the emissions can't absorbed by the nature are floating in the air, form the greenhouse gases and cause the global temperatures to rise.

The substance flow analysis (SFA) is a method to describe the flow status of a specific substance (element or compound) in a specific system [11], and the conservation relationship among the inflow I, inventory R and outflow O on each node of the system follows a conserved equation

$$I = R + O. \tag{1}$$

Here, the carbon dioxide is taken as a substance flow [11] to analyze the circulating pro-

cess of carbon dioxide in the nature, including the subjects of carbon emission and the way of absorption to maintain the balance mechanism. As we known, the carbon C and water H_2O are the main elements of livings in the earth. The carbon dioxide CO_2 is a molecule composed of carbon C and oxygen O and has three forms, namely the gaseous, liquid and solid. Here, its gaseous is commonly known as carbon dioxide, the liquid carbon dioxide is gaseous liquefaction under high pressure and low temperature and its solid carbon dioxide is liquid rapid coagulation under low pressure, also known as dry ice. The main origins of carbon emissions includes: ①Σ_1:breathing of living animals and plants; ②Σ_2:decomposing, fermenting, decaying and deteriorating of the carcasses of animals and plants; ③Σ_3:ordinary consumption of residents for survival needs; ④Σ_4:coal, petroleum, paraffin, natural gas, wood and other fuels burning; ⑤Σ_5:coal, petroleum and other production of chemical products; ⑥Σ_6:industrial production, especially energy consuming industrial production; ⑦Σ_7:transportation, especially energy-consuming transportation; ⑧Σ_8:residents consumption; ⑨Σ_9: waste disposal, especially waste disposal that consumes a certain amount of energy.

Then, *how are these carbon emissions absorbed*? There are four main types of consumption on carbon emissions that are known in the following.

Type 1. R_1**: photosynthesis.** The photosynthesis refers to the process in which green plants absorb light energy, synthesize carbon dioxide and water into energy-rich organic matter, and release oxygen at the same time including the absorption, transmission and conversion of light energy to electrical energy and electrical energy to chemical energy, as shown in Figure 1. The photosynthesis is the most common and largest natural reaction process on the earth. It plays a natural regulatory role in the synthesis of organic matter, solar energy storage and air purification and it is mainly realized by green plants, including green plants and algae in waters which convert carbon dioxide and water into oxygen and organic matter through photosynthesis. By the respiration, oxygen and organic matter decomposition into carbon dioxide, water in the nature which plays an irreplaceable role in maintaining the natural carbon-oxygen balance. At the same time, plants constantly release oxygen to enrich animal breathing, combustion and other consumption caused by oxygen deficiency in the process of photosynthesis, maintain the balance of oxygen in the nature for humans and other creatures to coexist peacefully to provide material security.

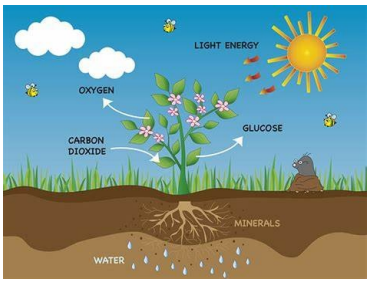

Figure 1. Photosynthesis

Type 2. R_2**: water absorption.** The carbon dioxide dissolved in water will react chemically to form carbonic acid, which is usually applied to make carbonated drinks. The chemical equation is $CO_2 + H_2O \rightarrow H_2CO_3$. Notice that the carbon dioxide dissolved in water forms carbonic acid is unstable, easy to decompose and reduce to carbon dioxide and water, i.e., $H_2CO_3 \rightarrow CO_2 + H_2O$ floating in water. Certainly, the water absorption of carbon dioxide does not means that carbon dioxide is dissolved in water but that the water, including seawater contains a large number of green unicellular or multicellular plants which absorb carbon dioxide through photosynthesis similar to that of terrestrial green plants.

Type 3. R_3**: soil absorption.** The respiration of microorganisms and plant roots in soil emits a certain amount of carbon dioxide, resulting in a higher concentration of carbon dioxide in soil than in air. The absorption of carbon dioxide in soil mainly occurs in arid and semi-arid regions. Most of these soils are alkaline, containing calcium ions, which react with carbon dioxide to form calcium carbonate. Notice that this consumption eventually forms calcium carbonate, which can lead to soil calcification or desertification, which is not conducive to humans survival.

Type 4. R_4**: humans disposal.** The carbon dioxide produced by industrial production is purposefully collected and sequestered to prevent it from being released into the air.

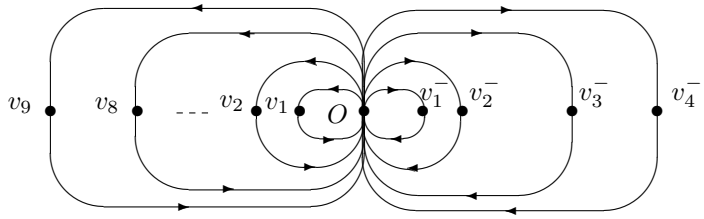

Figure 2. Carbon dioxide flow

The $\overrightarrow{G}-$flow of carbon dioxide is shown in Figure 3, which is in fact a particular case of continuity flow with all end-operators $1_{\mathscr{B}}$ of Banach space $\mathscr{B}$, a globally mathematical element on non-living body introduced in [8] and [9] or mathematical combinatorics. Here, the vertex v_1 refers to the breathing of living animals and plants; v_2 refers to the decomposition, fermentation, decay and deterioration of animals and plant corpses; v_3 refers to the ordinary consumption of residents for survival; v_4 refers to the combustion of coal, petroleum, paraffin, natural gas, wood and other fuels; V_5 refers to the production of chemical products of coal and petroleum, etc.; v_6 is the industrial production, especially energy consuming industrial production; v_7 is the transportation industry, especially energy consuming transportation; v_8 is the residential consumption; v_9 is the waste disposal, especially energy consuming waste disposal and the vertex v_1^- is the consumption by photosynthesis; v_2^- is the water consumption, v_3^- is the soil absorption, v_4^- is the human disposal on carbon dioxide. The input flow of the node O is $\Sigma_i, 1 \leq i \leq 9$, the output flow is $R_k, 1 \leq k \leq 4$ and the node inventory is R_{air}, the amount of carbon dioxide in the air.

Thus, the conservation equation of carbon dioxide flow at node O is ([8-9])

$$\sum_{i=1}^{9} \Sigma_i = \sum_{i=1}^{4} R_i + R_{air}. \tag{2}$$

In general, the amount of carbon dioxide in the air satisfies the condition of $R_{air} \leq R_{human}$, where R_{human} is the threshold of the allowable amount of carbon dioxide in air for human survival. When land, water, soil and human disposal are insufficient to absorb carbon dioxide emissions, resulting in $R_{air} \geq R_{human}$, i.e

$$\sum_{i=1}^{9} \Sigma_i > \sum_{i=1}^{4} R_i + R_{human} \tag{3}$$

and once the R_{air} exceeds R_{human} is no longer suitable for human survival. Even R_{air} is less than R_{human}, it can also induce the extreme natural disasters. For example, $R_{air} \geq 2\%$ is thought to cause the destruction of the atmospheric ozone layer, global temperature rise, ice sheet melting, sea level rise, extreme weather, drought and virus mutations such as SARS and novel Coronavirus (COVID-19) have caused attrition of humans worldwide. A few international public organizations estimate that 5 million people die every year from air pollution, famine and disease caused by climate change and excessive carbon emissions, and this number is expected to rise to 6 million on 2030 if the current patterns of fossil fuel consumption remain unchanged.

Figure 3. Negative consequences of carbon overshoot

§3. Carbon Imbalance Caused by Humans Industrialization

Then, *what is the carbon neutralization*? The carbon neutralization refers to the greenhouse gas emissions directly or indirectly generated by enterprises, organizations or individuals within a certain period of time are all offset to achieve *0 emissions* to nature through by the afforestation, soil organic carbon, carbon sequestration and other forms. That is,

$$\sum_{i=4}^{9} \Sigma_i \leq R_4, \tag{4}$$

which is a human initiative to return to the natural carbon equilibrium

$$\Sigma_1 + \Sigma_2 + \Sigma_3 = R_1 + R_2 + R_3 + R_{air}, \tag{5}$$

at the vertex O in Figure 2.

First, the carbon emissions are balanced in the farming societies. At that time, carbon emissions consisted of animal and plant respiration, decomposition, fermentation, decay, deterioration of animal and plant carcasses, and common consumption for survival, namely Σ_1, Σ_2 and Σ_3. After 13.8 billion years of evolution, the earth became a cyclic ecosystem, meet the basic requirements of carbon and other harmful elements absorption balance.

And then, *when does the carbon balance start to get out of balance*? Due to the large-scale industrial production, carbon emissions increase sharply, which destructed the earth's green vegetation, reduce the ability of natural carbon absorption and damage to the ecological environment. This is expressed in the *Kyoto Protocol* and the *Paris Agreement* under the *United Nations Framework Convention on Climate Change*. For example, the Article 2 of the *Paris Agreement* explicitly requires all signatories to strengthen the global response to the threat of

climate change by holding the increase in global average temperature below 2^oC above the pre-industrial levels and striving to limit the increase in temperature to 1.5^oC above pre-industrial levels, recognizing that this will significantly reduce the risks and impacts of climate change. Here, the *pre-industrial level* refers to the farming society (manual workshop) era, that is, to the carbon emission balance at that time as the standard.

The large-scale industrial production is the main *cause* of natural carbon imbalance, while excessive humans consumption is the *effect* of carbon imbalance. Industrial production comes from the development of science and technology, that is, science's cognition of nature is applied in the scope of humans activities, forming large-scale production and especially, the result of *money* directed by the logic of capital. In this production process, those beneficial to consumption and also beneficial to big money by a large number of mining, processing and manufacturing for people's consumption but the products that seem to have no value for consumption such as waste residue, waste gas, waste water and solid waste are consciously or unconsciously thrown to the nature in the belief that it can tolerates all the evil consequences of human actions. And *is the earth's environment still suitable for human life as a result of this natural regression to the carbon imbalance*? The answer is not necessarily! The humans ourselves do not know whether the period of this natural return will be past years, decades or hundreds of years, but it is certain that the return process will be accompanied with frequently natural disasters and the loss or destruction of humans and animals, because *the nature treats everything as mere nothing* without particularly generous to humans.

Here, the carbon emission sources of industrialization processes are analyzed as follows:

(1) Energy production. Energy is the basis of large-scale industrial production, including energy development and production, such as coal, oil, natural gas extraction, storage and electricity production. No matter the energy consumption is primary or secondary, the source is combustion. The chemical reaction equation such as $C + O_2 \to CO_2$, $2C + 2O \to 2CO$, $2CO + O_2 \to 2CO_2$ is accompanied by a large amount of carbon dioxide emissions, consumes lots of oxygen. At the same time, there is a lack of research on whether the massive development of coal, oil and natural gas will upset the earth's other ecological balance in addition to the carbon imbalance. As we know, water is the source of life, water shortage on earth is like human body water loss, lack of oil, lack of gas human body shrivel and even death. Similarly, the existence of things is the reason, the massive exploitation of the earth's coal, oil, natural gas and other fossil energy would result in the imbalance of materials that currently maybe unknown.

(2) Industrial production. Industrial processing, manufacturing and production based on energy consumption with carbon emissions in the process, also with harmful substances. The processes include: ①the produce cement, lime, molten steel, coke, clay brick and other furnace firing; ②the process steel rolling, alloy, metal surface coating; ③the machinery manufacturing; ④the produce chemical fertilizer, medicine, pesticide and paint, food additives refining or production, etc. Among these processes, unless the physical deformation of industrial products such as forging and pressing, a large number of industrial processes involve chemical reactions. The most basic question is whether these processes are reversible. The answer is that a large number of industrial processes are irreversible! Therefore, using industrial reverse processes to

deal with waste including carbon emissions is not feasible for humans. Even if a small amount of industrial process is reversible, according to the law of substance conservation the consumption of material is the same as that of production but the energy required is far greater than that of a production, and it is impossible to produce economic benefits. At this point, the economic benefits obtained by human industrialization are essentially at the cost of the earth's ecological environment.

(3) Construction. The production of building materials production of finished products or semi-finished products such as fire, precast concrete components made of cement, sand and water, the condensation and the chemical reaction, condensation, concrete, mortar, and energy consumption in the process of construction such as construction machinery, electric welding, spray gun, etc., there are carbon dioxide emissions. At the same time, a large number of high-rise buildings, residential pavement and road hardening as well as river hardening, crowded into the living space of green vegetation, carbon dioxide emissions to the upper air but artificially blocked the flow of atmosphere, water and stratum, broke the natural absorption of carbon dioxide process.

(4) Transportation. The fossil-based transportation such as cars, trains, ships and airplanes releases carbon dioxide into the air when coal, oil and natural gas are burned.

(5) Light industry and food processing industry. The light industry and food processing that are based on refining, burning or consuming energy release carbon dioxide in the process.

(6) Agricultural production and household consumption. The agriculture is the production process of green vegetation on earth, theoretically there should be no carbon emissions to the ecological environment pollution. However, accompanying with the industrialization of agriculture, large-scale mechanized operations and product processing, there are also emit pollutants including waste gas, waste water, animal excrement, dust and smoke, including carbon emissions while releasing productivity. In addition, in order to satisfy some people's pursuit of off-season fruits and vegetables, the widespread implementation of *plastic greenhouses* in agricultural production consumes water and electricity and other resources and at the same time, the man-made discarded plastic film is not degraded by the nature, forming the earth white pollution. On the other hand, the planting of green plants such as fruits and vegetables can absorb carbon dioxide from the atmosphere during photosynthesis nature, release oxygen required to human survival but the existence of greenhouses artificially cut off their photosynthesis and oxygen release, this fact reflects also the human's activity is causing the carbon imbalance in the nature.

Here, we take a few data from Chinese carbon emission database in 2019 as an example to show the proportion of carbon emissions from human industrialization activities in the total carbon emissions: ① Power and heat production accounted for 50%; ② Non-metallic mineral products, black metal smelting, processing and other heavy industry accounted for 33%; ③ Transportation, storage and postal service accounted for 8%; ④ Light industry production accounted for 1%; ⑤ Service industry accounted for 2%; ⑥ Agriculture, construction and residential carbon emissions accounted for 6%.

Even so, *stop the industrialization of human activities can return to the natural balance of carbon*? Up to now, the simple industrialization of humans cannot return to the natural

carbon balance state because over the past 300 years, the population continues to increase, human's construction land continues to expand, forest and green vegetation reduction, land desertification, water and green plants reduction. In stark contrast, human industrialization has been disturbing the nature for more than 300 years. The continuous increase in the stock of supernaturally absorbed carbon emissions has been broken the carbon balance. The natural restoration needs to last for hundreds or thousands of years, and it is impossible to return to the carbon balance in a short period of time. At the same time, the cessation of industrial production will certainly affect the survival and development of humans and it is impossible to reverse back to the agricultural era. In this case, humans need to decide their own survival, *whether to let go, continue to destroy the earth, destroy humans themselves or humans and the nature coordinated development*? The answer is self-evident because we have only one earth. The hope of finding another planet to live on can only be an illusion because humans and the nature live in symbiosis. What is needed is the self-restraint of humans, including the change of consumption pattern and the realization of zero emissions of pollutants caused by human activities, and the carbon neutrality is humans initiative actions.

§4. Economic Logic in Carbon neutrality

The ultimate goal of carbon neutrality is to achieve carbon zero emission through the transition of energy conservation and emission reduction, which is a coordinated development between humans and the nature. The *Guidance of Accelerating the Development of Establishing and Perfecting the Green Low Carbon Circular Economy System* by the State Council of China explicitly proposes that, to implement the carbon amount to ensure peak carbon neutral goal under the premise of full the whole process of implementation, namely the all-directions, the whole process of planning, investment, design, construction, production, circulation, life, green consumption, and the development should be based on efficient use of resources, strict protection of the ecological environment and effective control of greenhouse gas emissions.

Certainly, the key to peaking carbon emissions by 2030 is to adjust the energy arrange and industrial distribution and to conserve energy, reduce emissions and consume green energy [3-4]. It plans to reduce carbon emissions every year from 2035 and become carbon neutral at 2060. The carbon neutral core lies in the fact that after 2035 to green energy as the main power supply, with carbon neutral technology development as the breakthrough, eliminate those industries and enterprises that can't carry out carbon zero emissions, and on the basis of organizational economic benefits to the people, this is a new concept of economic development. It is estimated that 86% of global CO_2 emissions come from fossil fuel use and 14% from land use. Of this, about 46% is retained in the atmosphere, 23% is absorbed by the ocean and about 31% is absorbed by the land. According to the commitment of the *Paris Agreement* signed by China, the carbon peak is to ensure that the rise of carbon emissions in global average temperature is limited to 1.5^oC above pre-industrial level and to control the growth of carbon emissions so as to achieve a steady decline in carbon emissions after 2035.

4.1. Energy Restructuring. Energy industry is the power base of industrial development

and the energy distribution is related to industrial adjustment and industrial distribution, also the residents' life. According to official data released by the *National Bureau of Statistics of China*, energy output will be 3.9 billion tons of raw coal, 1.947.69 million tons of crude oil, 1919.25 billion cubic meters of natural gas, and 7.779.06 billion kilowatt-hours of electricity in 2020. For example, according to the statistics of *China Energy Big Data Report* (2021), the installed capacity of domestic thermal power will be 1.25 billion kW, accounting for 56.07%; Hydropower 370 million kw, accounting for 16.6%; Nuclear power 0.4989 billion kW, 2.24%; Grid-connected wind power 280 million kw, accounting for 12.56%; Grid-connected solar power 250 million kW, accounting for 11.21%; Biomass power generation is 0.2952 billion kW, accounting for 1.32 % until 2020. Among them, thermal power accounted for 56.07%.

Then, *how does the domestic energy distribution need to be adjusted before carbon peak 2030*? First, the existing thermal power projects should be maintained and no new projects should be added. We will improve and supervise the environmental protection of existing thermal power projects, urge them to upgrade their technologies, gradually replace coal with gas and reduce pollutant emission targets to meet the needs. At the same time, we will significantly increase the grid connection of hydropower, wind power and photovoltaic power generation and develop clean energy technologies such as hydropower, geothermal energy, marine energy, hydrogen energy, biomass energy and photovoltaic power generation in light on local conditions so as to increase their share in the energy distribution. As mentioned above, thermal power accounts for 56.07% of the installed power generation capacity alone. The replacement of fossil energy and emission reduction tasks are quite heavy.

After 2035, it needs to reduce the use of fossil energy every year. The clean energy technologies such as those of hydropower, geothermal energy, ocean energy, hydrogen, biomass energy and thermal power generation gradually as the main energy supplies in the market and the proportion of fossil energy such as coal, oil, natural gas and other fossil energy reduced year by year, gradually out of the energy market for using clean energy or carbon dioxide emissions of fossil fuels were completely disposed by humans until 2060. It is necessary to change the power configuration mode, adjust or dismantle some power generation and distribution facilities. This means that to achieve carbon neutrality by 2060, the first is to promote the replacement of fossil fuels with clean energy; the second is to develop carbon sequestration technology to collect carbon emissions from fossil energy and sequestration or utilization and the third is to promote the natural absorption of carbon emissions by photosynthesis, restore green plants in land and water including the sides and roofs of buildings and structures built by humans. If necessary, it needs to demolish redundant buildings and structures for planting green plants and open fruit and vegetable greenhouses to absorb carbon emissions from human activities.

4.2. Industrial Layout Adjustment. Energy is the power source of modern industry. Industrial production is realized by energy supply. The adjustment of energy structure will inevitably affect the industrial layout. Therefore, the core of industrial layout adjustment is energy conservation and emission reduction before carbon peak in 2030. On the basis of the existing industrial layout, limit and reduce the energy consumption of heavily polluting and energy-intensive industrial projects such as petrochemical, chemical, iron and steel, smelting, building materials and other industries is the key to achieve carbon peak, whose carbon emis-

sions account for more than 70% of the country's total emissions. After a smooth transition period of carbon peak after 2030, the petrochemical, chemical, iron and steel, smelting and building materials industries will be urged to introduce environmental protection technologies or devices into their projects to carry out technological transformation, so as to realize artificial carbon absorption or storage. If necessary, the production of national defense and necessities shall be maintained while all other projects shall be shut down. At the same time, restore the green living space occupied by these industrial projects, remove or plant green plants on their sides and roofs to absorb carbon dioxide. The core of this period lies in the practical implementation of the *Circular Economy Promotion Law of China*, the implementation of ecological economic transformation of industrial projects, that is the output of one project is the raw material or semi-finished product of the next or several projects, the establishment of waste disposal centers and the implementation of zero emission of harmful substances including carbon dioxide [5] as shown in Figure 4. At the same time, the closed buildings and structures still need to carry out environmental protection, the demolition of all kinds of items to clean up and resources integration, recycling, in order to build a domestic circular economy system.

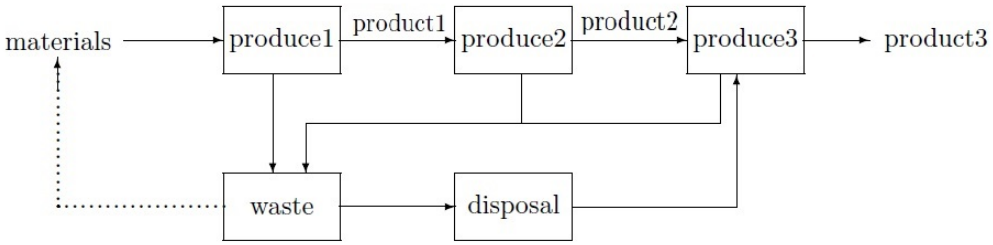

Figure 4. Circular model of economy

It should be noted that the traditional industry is based on fossil energy and a large amount of carbon is emitted in the industrial production, that is, the combustion process of fossil energy. After 2035, to achieve carbon neutrality by 2060, a fundamental question is whether clean energy can replace industrial production from fossil fuels. If not, it is necessary to propose new alternative energy schemes or research carbon absorption or carbon sequestration technologies to achieve zero emissions of carbon from industrial production. If not, the industrial production needs to be scaled down. Let's take the domestic power production as an example, clean energy such as hydropower, wind power and photovoltaic power only accounts for 43.93%, which is a large gap. Moreover, the wind power, photovoltaic power and tidal power are greatly affected by the nature and their power supply is unstable. So few of them can meet the requirements of grid-connection. If there are no new energy alternatives that rely on industrial projects of power supply in order to eliminate, ensure the livelihood of the people power or green electricity can't supply, it should construct the sort of small wind or solar power stations for replacing the gap. However, this way is bound to affect the industrial production, also affect the change of residents' consumption structure, namely driving less or not driving.

4.3. Transportation Restructuring. Under the existing road network it is necessary to develop new energy vehicles. Before the carbon peak in 2030, the electricity, gas or hydrogen can be used as the alternative energy for transportation. Although the electricity and gas still

have certain carbon emissions, their emissions are small compared with oil. After 2035, the clean energy should be adopted to gradually replace petroleum-based or electricity-consuming vehicles. Among them, some breakthroughs have been made in using hydrogen energy to replace fuel oil on ships but it will take some time to complete. The core of using electricity to replace fuel lies in whether clean energy can meet the electricity demand of vehicles after a large number of thermal power plants shut down. Notice that the most need to pay attention to the first is the aircraft, the second is high-speed rail because the aircraft use so much fuel, there is no consensus on which energy source to replace them. In the experiment, people hope to use solar energy instead but whether it can meet aviation needs time to test. As we known, the high-speed trains consume electricity directly. It will also take time to test whether the electricity generation can meet the demand of high-speed trains after adopting clean energy.

4.4. Adjustment of Consumption Structure. In the dual relationship of production with consumption, the consumption decides the production and the production promotes consumption. The scale of production and construction content are determined by the basic necessities of life. At the same time, it guides the development of industries that produce for free consumption. According to Maslow's hierarchy of needs, a human first meets the physiological needs such as food and water, and then the safety needs such as personal safety, life stability, freedom from pain and disease were followed by social contact,namely the respect and self-fulfillment. So, *how does carbon peak and carbon neutrality affect consumption structure*?

First of all, in order to achieve the goal of peaking carbon emissions by 2030, consumers need to consciously comply with energy conservation and emission reduction and reduce the consumption of products with high energy consumption in production. For example, ① Dress in accordance with the norms of social behavior, natural and simple prevail, do not pursue too fancy, luxury or strange and let the light textile industry do not pursue too printing and dyeing colors or strange, do not artificially discharge harmful chemicals to nature; ② Take "*eat all off in the plate* " as the standard for food, avoid extravagance and waste or excessive consumption because more and more research makes clear that the rich disease of a person such as those of wait like fat of 3 high disease, coronary heart disease, diabetes, obesity, alcohol liver accompany by the person overeat, eat too good and too fine. Return to the diet to satisfy the stomach, can effectively reduce the rich disease, put an end to the phenomenon of excessive medical treatment in hospitals and return to the way of Chinese traditional medicine; ③ Home decoration and home appliances are both with green environmental protection products, do not pursue luxury and the building materials comply with green environmental protection from the procurement of raw materials to the processing and use of finished or semi-finished building materials and then guide home appliances to save energy, environmental protection, do not emit harmful substances to nature; ④ Advocate green travel, do not drive or buy green vehicles for travelling such as gas vehicles, electric vehicles, etc..

Secondly, after 2035, in order to achieve carbon neutrality by 2060, households need to promote the role of solar energy, biomass energy and other clean energy in using electricity, water, heating and cooking, consciously implement green consumption and carry out carbon recovery or storage so as to achieve zero carbon emissions. Among them, clean energy such as hydropower, solar energy and biomass energy can effectively guarantee family life but the

problem of family car is similar to that of the above transportation structure adjustment, that is, whether clean energy can completely replace fossil energy. If not completely replaced, one is to solve the problem of carbon emission recovery consumption and storage in the use of household cars; another is to drive less, do not drive, which presents a challenge for energy storage technology such as the hydrogen cell with long duration.

4.5. Carbon Sequestration Technology. Return to the natural balance of carbon dioxide, namely the equation (2) to achieve carbon neutrality, i.e., the amount of carbon dioxide floating in the air is basically the same as before the industrial activities of humans, the premise is to carry out harmless sequestration and disposal of carbon dioxide emitted by industrial activities of humans. One is the energy conservation and emission reduction, led to change the layout of human production and consumption; another is the developing of carbon dioxide harmless sequestration and disposal technology, including geological sequestration, marine sequestration, mineral sequestration and ecological sequestration.

(1) Geological storage technology. The geological sequestration of carbon dioxide is to inject carbon dioxide as a substance flow into deep underground suitable places for storage through pipeline technology and make use of the gas tightness of geological structures such as oil fields, natural gas storage, salt formations and unrecoverable coal seams, abandoned mines and so on. In special cases, some of the carbon dioxide reacts with the surrounding material to form carbonate minerals. There have been some engineering examples of geological sequestration of carbon dioxide but it is not determined whether the formation structure will be unstable after injection. At the same time, when natural disasters such as earthquakes occur in the region, they can cause massive eruptions of carbon dioxide that can kill people also. For example, when a natural disaster occurred in the crater of a volcano in Cameroon in 1996, the release of carbon dioxide killed more than 1,500 persons, animals living within 14 kilometers are all killed.

(2) Marine storage. The idea of marine sequestration is to use the pipeline technology to transport liquid carbon dioxide to a depth of 1000m-3000m in the sea and use seawater to sequestration carbon dioxide. It is known that the carbon dioxide is normally denser than seawater, would react with seabed material to form a solid or liquid paste of carbon dioxide, slowing its decomposition into the above-ground environment. The problem of carbon dioxide sequestration in the sea is that there is no conclusion on the impact of such sequestration on the marine ecological environment. *Would humans destroy the marine ecological environment while they protect the ground ecological environment*? The answer is certainly not because this would be also a crisis of humans survival.

(3) Mineral storage. The mineral sequestration of carbon dioxide involves the acidification of various naturally occurring minerals with carbon dioxide to obtain stable carbonates, including alkaline and alkaline earth oxides. This is a permanent sequestration method that will not cause harm to humans. It is theoretically feasible but how to make the carbon dioxide emitted by humans react with such minerals has not been solved technically and if just by its natural reaction, the process is very slow and the hardening rate artificially needs to consume a lot of energy, which is not economical.

(4) Ecological conservation. The ecological sequestration refers to the use of plants, green

algae and other autotrophic microorganisms in land and water to photosynthesize with carbon dioxide to realize the conversion to organic carbon under certain conditions, the purpose of storing carbon dioxide, which is actually the nature's way of storing carbon dioxide, an ecological way. Correspondingly, it is necessary to increase the forests, vegetation, land microorganisms, grasslands, crops, tundra and swamps on the land and remove plastic greenhouses so that green crops can photosynthesize with the carbon dioxide, and then promote the natural mechanism of carbon reduction.

§5. Chinese Civilization for Achieving Carbon Neutrality

As the imbalance of carbon balance is caused by the large-scale industrialization of humans, it is necessary to further analyze its underlying reasons so as to realize the carbon neutralization.

5.1. Reflections on Science with Applications. Notice that the large-scale industrial production is based on scientific cognition of nature. However, *does science know things in the nature as a whole or as a part*? The answer is certainly as a partial cognition! *Why local cognition*? Because people's cognition of thing in the nature depends on the six of humans, namely the vision, hearing, smell, touch, taste and consciousness because humans can perceive things but their scope are limited, too large or too small cognition is not clear for humans. For example, we will never know whether the universe is spherical or circular in shape because we cannot fly out of it and whether or not parallel universes are useful in explaining some natural phenomena. Another example is why there is uncertainty principle in quantum mechanics. It is because humans cannot observe the behavior of particles in the microscopic world but can only discover the laws of particles in the range that humans can observe. That is why quantum mechanics uses probability statistics as a tool to study the wide range of possibilities of particles rather than certainty. This confirms from one side that human beings are only knowing the objective existence that can be observed, that is, humans are partially but not completely knowable to natural things ([6-10]).

5.2. Chinese Civilization to Carbon Neutrality. The humans and the nature constitute a binary system which is similar to the predator-prey model in biological world, i.e. they interact and influence each other. In this binary system, human activities on the natural too intrusive result in the nature adjusting the universe to follow the natural laws, including global warming, drought, severe weather, floods, virus and other natural phenomena, the essence of which is natural in the adjustment, adapt to the universe of conservation of mass, the natural reaction of the nature to human activities including cutting human to return to a new balance. In this case, what needs to be changed is for humans to correctly understand the relationship of humans with the nature and change themselves actively because humans can never compete with nature.

The view that human's cognition of the nature is a partial cognition has existed in the middle ages of Chinese culture. For example, Laozi said at the beginning of his *Tao Te Ching*: "*Tao that experienced is not the eternal Tao; Name named is not the eternal name* " is to indicate this point ([1-2]). A few of humans think that there are no science in ancient China.

This claim is sure if you think science is the local recognition on natural things and did not develop science in ancient China. However, it is a systemic recognition on the nature by Chinese because the Chinese know that our understanding of the universe is local, the application of science must include two aspects, i.e., one is beneficial to human society and meets the needs of human survival; another, it should not destroys the ecological environment of the earth and even the nature. In other words, science and application also constitute a binary system. They complement each other and are a kind of unity of opposites. That is, there are indeed sciences in ancient China, a system science in the eyes of today's human.

The carbon imbalance is the result of economic development without acknowledging the limitations of scientific cognition and unilaterally exaggerating the role of science. Because in the economic society, especially in the era that pursuit of profits by capital, most humans pursue *selfish interests*. In this situation, it is easy to exaggerate a scientific achievement that is beneficial to human society while ignoring its harmful side to the nature, which led lots of humans in the pursuit of economic benefits under the premise of unrestrained abuse.

Notice that the human science is a partial knowledge of nature, *how to use scientific results is the correct application*? Laozi pointed out "*the human follows the earth, the earth follows the universe, the universe follows the Tao and the Tao follows only itself* " in Chapter 25 of *Tao Te Ching*, as a way of survival for humans on the partial cognition, which requires human self-restraint. The word *follows* is generally interpreted as *imitation*. That is, to live on the earth, people need to follow the living rules of things on the earth, the earth needs to follow the rules of heaven, the heaven needs to follow the rules of Tao, and the Tao needs to follow the rules of the nature. In this way, the universal things can live altogether. However, according to the viewpoint that humans with the nature constitute a binary system, the *follow* besides *imitation*, also means *controlled or restricted* in fact, i.e., humans' behavior is restricted by the earth, and the movement of the earth is restricted by the heaven, the movement of heaven is limited by Tao, which derives from nature. Just imagine, the excess carbon emissions caused by human industrialization is due to the misunderstanding of the relationship of humans with the nature, believing that *science*, the partial knowledge of the nature can control the universe for humans' *selfish interests*. I think this is the top issue that needs to review for thousands years of human civilization in the carbon emissions!

Then, *how should humans consume in harmony with nature*? The answer is implied in the sentence of *Tao Te Ching*: "*the five colors blind the eye, the five sounds deafen the ear, the five flavors numb the taste, the maddening to ride the field and the desires wither the heart.*" That is to say, all things in the world are dazzling and easy to arouse people's private desires and go astray, and urge human to follow the "*saints* " because saint's eating is "*for the belly but not for the eyes* ". By contrast today's excess emissions of carbon is just the result of the pursuit of the *blind*, *deaf*, *taste* or *crazy* in the human civilization, stated in the *Tao Te Ching* [1].

Human civilization is not the resource plunder or war between humans or between humans and other creatures. Conservation is the premise of sustainable development of humans, and the nature will never allow any single creature to dominate the universe. For example, the unexplained destruction of dinosaurs. Chinese culture holds with the theory that "*humans are an integral part of the nature*" because the ancient Chinese realized that humans and the

nature consist of a system. The standing of humans in the universe is insignificant, which requires humans' excellent virtue in living and hold with "*virtues the same as the heaven and the earth, appearing or showing the same as the sun and the moon, order the same as the four seasons and well or evil the same as the ghosts or the god*" [12]. The idea of carbon neutrality is nothing more than a retelling of the ancient Chinese notion of the harmony in humans with the nature. Consequently, to achieve the goal of carbon peak, the reduction of energy and carbon emission is needed. However, the fundamental way to achieve the carbon neutrality lies in the harmony of humans with the nature, advocated by Chinese civilization because the carbon neutrality can be only truly realized on the earth in this way.

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