

4. Global Warming as a Manifestation of Garbage

Tian Song

In the ancient times, there were ten suns over the sky. The land was burnt. Rivers and lakes were dry, trees did not grow, and animals were dying. A hero appeared.

This is Houyi, a talented archer. He had a strong bow and sharp arrows. Houyi shot down nine suns and kept one. The land survived and flourished again.

The Book of Mountain and Sea

When Svante Arrhenius published his idea in 1896 that “As human activity puts ever more carbon dioxide into the atmosphere, global warming becomes ever more likely,” [\[1\]](#) [\[#note 1\]](#) his contemporary scientists thought it was a joke. After the Intergovernmental Panel on Climate Change (IPCC) and Al Gore won the Noble Peace Prize in 2007, global warming became accepted as a fact rather than a theory or a hypothesis. This award may have even shaken former president George W. Bush from his intransigent denial.

By looking at the first and second law of thermodynamics—the law of the conservation and transformation of energy and the law of increasing entropy—we can skip the complex technological details of the greenhouse effect and interpret global warming as a direct manifestation of something more basic: garbage and a consequence of human behaviors in industrial civilization.

The earth is a closed system that exchanges energy with the outside: it absorbs solar energy and emits thermal radiation; but it has almost no mass to exchange with the outside. Normally, the earth absorbs and emits equal amounts of energy in order to remain a system in a state of heat balance. The temperature of the earth basically depends on the energy it receives from the sun. In the course of natural history, the plants on the earth have retained a certain amount of solar energy, in turn decreasing the energy emitted by the earth. There are, of course, many natural activities

that release energy from inside the earth, such as volcanic eruptions, but these cannot be modulated by human behavior, and we could view them as a constant. Undoubtedly, humans have released more and more energy since industrial civilization, especially after World War II. The coal and oil we are using right now, according the orthodox theory, were the solar energy of ancient times that were stored by plants and organisms. Hence, when we burn coal and oil, it is just like hanging the ancient suns in the sky again.

The final state of energy after its usage is heat, which, when radiated, will increase the average temperature of the earth. If the earth still emits the same amount of energy into outer space, and if the earth tries to keep the same level of temperature, it must emit more energy to outer space. Yet as an isolated body in space, the only way it can release energy is through radiation. But ironically, as an approximate black body, the energy it radiates only depends on its black body temperature to the 4th power. We are then faced with a jarring dilemma: if the earth wants to radiate more energy, it has to increase its temperature. This is just the problem we are facing, global warming.

Now let's see how much extra energy humans release every year, or how many more suns we put in the sky.

The energy that the sun radiates to the earth can be regarded as a constant, the Solar Constant. On average, since 1978, it has been measured at 1367 Watts per square meter by satellites outside atmosphere. [\[2\]](#) [\[#note 2\]](#) Given that the section area of the earth is 127,400,000 square kilometers, the overall energy the earth accepts from the sun is 1.740×10^{17} watts. For one year, it's $1.740 \times 10^{14} \times 365 \times 24$ kilowatt hours, i.e., $15,242.4 \times 10^5$ billion kilowatt hours. In 2006, the world total net electricity consumption was 16,378.62 billion kilowatt hours. [\[3\]](#) [\[#note 3\]](#) All these kilowatt hours will ultimately be transformed to dissipated heat. It is approximately one ten-thousandth of $15,242.4 \times 10^5$ billion kilowatt hours, the energy released by a sun every year. One ten-thousandth seems to be a small number. However, let's consider other factors, such as: 1) because of absorption and reflection,

only ten percent of the solar energy can reach the surface of the earth; 2) on the earth surface, only 25 percent is land, and only a small part is habitable for humans; 3) even in societies, humans are not the only species to live on the energy from the sun. Thus, by a rough estimate, the energy that humans have used is close to or even greater than the amount humans could have from the sun. This means that not even one sun is enough to support the human lifestyle, if we can somehow collectively curb fossil energy use. But, if humans keep expending fossil energy, the temperature of the earth will continuously increase. As a result, global warming becomes an unavoidable consequence of industrialized civilization.

As long as humans continue their contemporary ways of life, more and more energy will be used, and global warming will become increasingly severe.

Now clean energy, or green energy, is a buzzword, and many people pin their hopes for humanity's future on it, but no matter what kind of energy is used, its ultimate state is heat. There is no kind of energy that can be named clean energy. The central issue is not what kind of energy humans use, but how much energy. If they surpass the limited amount one sun can bestow, any kind of energy will be "dirty."

1. The Economic Chain is a Transforming Chain of Matter and Energy

Let's start with a simple question: why can we drink a bottle of mineral water coming from some remote mountain on any street corner of any city whenever we want to? Such a thing happens so frequently that we do not feel anything strange about it; the experience is part of daily life. Only 20 years ago when bottled water first appeared in supermarkets most Chinese viewed it as weird: who would be so rich and so silly as to buy it? How things change. What does it mean?

The simple answer is this: we are able to buy it, and we are able to afford it. Why can we buy it and afford it? Because of economic development, we can

exploit mineral water from the source at a low cost, then we can bottle it and transport it all over the globe. This is the upper link of the transformation chain of mineral water. The consequences of the upper link are the following: 1) a large amount of water is taken away from its original place; 2) the water will no longer play its original ecological role for humans, animals, and plants there. The water companies obviously do not pay their workers enough compensation, since if they did the bottled water would be too expensive to afford.

But only considering the upper link of the economic chain is not enough to answer my question: why can we drink a bottle of mineral water on any street of any city? Answer: because we can throw the empty bottle into any garbage can in the streets. This thoughtless action concerns the latter half of the economic chain. Why can we throw the empty bottle into any garbage can? Because the garbage in the can will be transported to some garbage dump outside the city by a large group of cleaners employed by the city. Why can the city build garbage dumps outside the city? Because the city is able to buy land for its garbage dumps at a low price, given its economic and political power. If we continue asking questions in this way, we can trace the rest of the economic chain, and reach its lower link.

Similar to the upper link, the consequence of the lower link is that humans, animals, and plants living in the location of the garbage dump can no longer live there as before, and the ecological system at the site of the garbage dump is destroyed.

The importance of this lower link is no less than the upper link. If you were not allowed to throw the bottle into a garbage can, you would have to keep it in your bag or take it home. If that were the case, would you drink bottle after bottle without hesitation? In industrial civilization, when we drink a bottle of mineral water in a city we indirectly harm the ecological systems at the very source of our water and the place of the garbage dump.

Bottled water is, for me, a symbol for everything in modern industrial cities—from TV sets, to cell phones, computers, handbags, cars, buildings,

highways, and other commodities that do not cease existing when we have used them. Where did they come from? Where will they go? When we trace back the source of everything in a city, we eventually arrive at places such as forests, natural bodies of water, and mines (including coal and oil). When we follow the path, we end at garbage dumps. Here, I generalize the concept of garbage—but it should be understood as the opposite pole of all discussions of vanishing resources such as high-quality petroleum or water. In general, garbage includes solid garbage (the original meaning of this term), liquid garbage (waste water) and gaseous garbage (waste gas), as well as dissipated heat (waste heat), the final state of all types of energy after usage. Viewed from a thermodynamic perspective, the term “garbage” can be defined as matter and energy in a higher entropy state. Viewed thusly, global warming becomes a manifestation of the garbage problem. Everything in modern cities goes through the same economic chain, which is also a chain of transformation of energy and matter.

2. An Additional Explanation of Limited Earth

“We have only one earth,” seems the consensus of humans across the globe. The slogan can even be seen on a wall of a small village in China. It is usually interpreted in this way: the earth is limited, energy and resources are limited, and we must economize on energy and resources so that we can develop continuously. This is the scenario of so-called sustainability. But this interpretation considers only the upper link of the chain through which matter and energy are transformed, i.e., the former half of the economic chain. Considering the lower end of this chain, i.e., its economic process, we need to add: the capacity for containing garbage is limited too.

As a dynamic system for keeping its body in order, a living person has to: 1) take food in, and 2) discharge waste out. Similarly, as a bigger dynamic system a city has to: 1) take in energy and matter in a lower-entropy state, such as food, vegetables, water, coal, oil, natural gas, electricity, etc. from the outside, and 2) discharge that energy and matter in a higher-entropy state to the outside.

Viewed as a dynamic system, a city behaves like a heat engine. The more powerful it is, the more energy and material it needs to import and the more waste it must discharge to the outside. Garbage, or waste, is not avoidable in the operation of a heat engine. This is a simple application of the second law of thermodynamics. No heat engine has 100% efficiency. Otherwise, it would be a perpetual motion machine. A modernized city, like a huge heat engine, connects the two ends of the transformation chain of energy and matter: at one end are forests, minerals, and natural water, the energy and matter of lower-entropy states; at the other end is garbage, the energy and matter of higher-entropy state.

Industrialized civilization engine inputs natural water, mines, and forests, and outputs garbage. The more highly developed a city becomes, the more powerful the engine is, and the faster it transforms nature into garbage. Therefore, in the countryside around every big city, there must be many great garbage dumps. Even if the size of the city does not expand, and the living standards are not raised, new land for dumping garbage is still necessary. Beijing is an example of a city besieged by garbage. An aerial survey in 1983 showed that, within the city's 750 square kilometers, there were 4,699 garbage dumps! An official said in 2009, in Beijing, that the annual rate of increase for garbage had reached 8%, and that all available garbage-treating facilities had been working in excess of their maximum capacity. The daily municipal garbage production had reached 18,400 tons, and the corresponding capacity for waste treatment was 10,400 tons. As Xu Nan indicates in "To Look for the Way out of Garbage Dumps Besieging the City," within four to five years, there will be no place to dump the garbage.

Most substances in garbage are not produced by nature, but by humans. Many of the different materials in garbage never occurred together in nature, and we hardly know what kind of chemical reactions can result, what kind of compounds will be produced, and what consequences will result. It's not rare for garbage to explode, or for leakage on the scale of Love Canal to escape. Only a few of these potential catastrophes were explored by laboratory experiments. Garbage dumps have become the most mysterious and dirtiest places on earth. Even if we were to dig pits with steel or concrete walls to confine the solid waste for millions of years, the

situation would still be horrible. The contents of these garbage coffins cannot be part of any natural ecological system of the earth. In the crazy tide of modernization and globalization, these coffins will eventually cover the earth.

What is discussed above is only solid garbage. It seems that solid garbage can be treated most easily and relatively locally. As for liquid garbage (waste water) and gaseous garbage (waste gas), they directly join into the global flow of matter. Wastewater is ceaselessly discharged into rivers, lakes, and seas; and waste gas is interminably sluiced into the sky. They aggravate air pollution and water pollution on a global scale, regardless of how they are treated. In this way, environmental pollution can be viewed as garbage in a dispersed state.

For the fourth state of garbage, dissipated heat, there are no stopgaps.

Generalizing from a human body to a city, and from a city to the globe, one conclusion is that in any modernized area on a global scale, modernization is based on two premises:

1. Energy and resources are transported continuously from non-modernized or sub-modernized areas.
2. Garbage is discharged ceaselessly to these same areas.

Modernization is therefore like a “food chain.” The upstream nations or areas not only take the resources from the downstream, but also discharge their garbage into the downstream. Furthermore, any country engaged in modernization has to situate and hold its own “downstream.” Not all nations or areas can control and maintain the downstream as their own.

3. In the Age of Limited Earth, Industrialized Civilization is Non-Sustainable

Throughout most of human history, Terra was almost infinite in relation to the human deployment of nature, and the potential for development was regarded as unlimited, too. During these earlier times, the level of development a nation was able to reach ultimately depended on readily available energy and resources. In those times, technology worked in two ways: 1) to exploit energy and resources in greater amounts and more quickly, and 2) to make use of resources and energy more efficiently. Because of the seemingly limitless Earth, new places could always be found and used as garbage dumps. So the garbage issue was only a simple and relatively insignificant issue related to saving or thrift; it was piddling and insignificant, while the energy and resource issues were tied to national policy.

Classical capitalistic economics is based on the very premise of an unlimited Earth. According to Adam Smith, the founder of classical capitalistic economics, through commercial exchange, different regions can interchange goods with each other and achieve a win-win result. Even under an unfair distribution system, every part in the economic system can obtain more production. That is so-called enlarging the pie. To expand the economic pie, it is necessary to develop new markets, to find new business partners, to exploit new resources, and to find new places to dump garbage. In this way, the pie can be made bigger and bigger, and the standard of living can be improved in every region. This win-win model is still espoused by most countries; more and more join the global capitalistic matrix, whether by design or default.

We have now entered a new period of history; I call it the Age of Limited Earth. We have only one Earth, and the Earth is limited. In the Age of Limited Earth, the capitalistic economy meets its upper limit immediately, i.e., the Earth itself.

To overcome the limits at the systematic ceiling, many people still pin their hopes on future science and technology. They hope that unlimited science and technology can break through the Earth's limitations. In fact, the validity of our contemporary life is based on future technologies that are

not yet invented. Like a credit plan, we are spending technological and intellectual capital that we do not yet possess.

The belief in science and technology has a long history. Optimists imagined and expected many future technologies to solve the problem of energy and resources. It is often said that when wood was nearly exhausted, a new technology for using coal was invented; when coal was far from exhausted, a new technology for using oil and natural gas was invented. By this line of reasoning, humans will invent alternative energy and resources in the future again, and enlarge the pie again. This way of thinking considers only the upper link of the transformation chain of energy and resources. Considering the lower extreme of the chain, we find that, no matter how highly developed the technology, human-generated garbage may only be cut quantitatively but not eliminated; otherwise, the second law of thermodynamics is violated. The energy problem can probably be solved by new technology. For example, if cold fusion is realized, theoretically, we will possess infinite energy. But, this will make the garbage and resource problems all the worse. The more energy an engine uses, the more raw materials it needs to take in, and the more garbage it generates. [4]
[#note 4]

The garbage crisis will therefore exceed the crises in energy, food, and finance; it will become the most pressing geo-ecological threat of the near future. The next large-scale war will not be waged over taking something in, but over spewing something out.

Humans have overdrawn on the energy and resources of the entire globe; on the very spatial terrain for containing garbage. The Age of Limited Earth, of globalized monolithic modernization, is obviously doomed to failure. Simply speaking, if only half of the Chinese lived in a comparable way to Americans, the resources of the earth would not be sufficient. It will be problematic, to say the least, to isolate space for the garbage being generated as we speak.

Industrialized civilization is definitely non-sustainable. This provides the framework in which we ponder the problems of modernized globalization and globalized modernization.

4. Modernization is a “Food Chain”

Because of terrestrial limitations, globalized modernization means a contest for global resources. To maintain and lift their modernization level, the upstream nations and areas must ensure that they can obtain energy and resources from the downstream, and also discharge their garbage to the downstream. The unification of the global economies means that the energy and resources of the earth converge into one chain of transformations. The Washington Consensus, promoting the unification of global economies, can be viewed as a means that opens the flow of energy and resources transporting and transforming on a global scale. Contemporary international policies are surely profitable to the upstream countries because the policies were initiated and made by them.

If a traditional area wants to or is forced to join the modernization “food chain” and become a link in it, it can only join from downstream. This means that it has to provide energy and resources upstream, and accept garbage from there.

The “Guiyu garbage phenomenon” [\[5\]](#) [\[#note 5\]](#) is a good example for illustrating the “food chain” of the global economic system. Guiyu (贵屿) is a small county in Guangdong province, China. Its main industry has been treating and recycling e-waste since 1990s. Millions of pounds of e-waste is shipped to Guiyu every year, mostly from North America, and to a lesser degree from Japan, South Korea, and European countries. Thousands of workshops of different scales manually treat the e-waste, using a range of primitive techniques. Copper, steel, aluminum and some other profitable materials are distilled from the e-waste. In terms of thermal dynamics, lesser amounts of low-entropy-state matter are distilled from the matter in a high entropy state, consuming large amounts of power and clean water (low-entropy-state energy and matter). At the same time, the land, water,

and air in Guigyu are severely polluted, and people's health is seriously harmed.

“Chemicals, including mercury, fluorine, barium, chromium and cobalt, which either leach from the waste or are used in processing, are blamed for skin rashes and respiratory problems.” In “In E-Waste Heartland, a Toxic China,” Christopher Bodeen has bemoaned that “Contamination can take decades to dissipate, experts say, and long-term health effects can include damage to the kidneys and nervous system, weakening of the immune system and cancer.”

Such a garbage recycling industry positively thrives on the pollution and deterioration of the environment.

The “yew-stripping event” is another good example to illustrate the “food chain.” ^[6] ^[#note 6] At the beginning of the 1990s, a patent for making breast cancer medicine, paclitaxel, which is distilled from yew bark, was approved in North America. Then, more than 3 million “red bean yews” in the Northwest of Yunnan Province, China, were stripped completely from 1992 to 2001, and left dead or dying. Lijiang (丽江), a city in Yunnan Province, inhabited by the Naxi ethnic group (纳西族) who historically have had a special tradition of environmental sustainability, suffered the most serious damage. The economic chain-reaction was as follows: Local Lijiang peasants stripped the yew and sold the yew bark to packmen; packmen sold the yew bark to small companies; small companies sold it to the Hande company (汉德公司) in Kunming, which is supported by the government of Yunnan province; Hande distilled paclitaxel from the yew bark with technology provided by Kunming Botany Institute, Chinese Science Academy; Hande sold paclitaxel to medical corporations in North America, which produced cancer medicine. In this chain, all links made money. But the later the link in the chain, the more money it earned. The peasants stripping the yew gained the least money; and the medical corporations, the most. Which link, however, will bear the biological consequence of stripping yew? Of course, it is the local peasants, the lowest link of the “food chain.”

In this food chain, the medicine company is the upstream, and the local people are the downstream. But, we should not ignore that the yew, the local ecological environment, is the bottom link of the chain.

As a downstream area, Lijiang provides a resource to upstream countries; while Guiyu accepts garbage from almost the same upstream countries. Viewed from the perspective of the transformation chain of energy and matter, the “yew-stripping event” shows the uplink of it, and the Guiyu garbage shows the downlink of it. In the contemporary unification of global economies, all countries in the world are involved in the same chain, the economic “food chain,” i.e. the transformation chain of matter and energy. Being located in the downstream or mid-stream of the global modernization “food chain” is the background of all problems in non-modernized or sub-modernized countries and areas.

5. A Case Study: Garbage of Lake Lugu, Yunnan Province

Development is a big word in contemporary China. For traditional areas, are there other ways to develop, which neither provide energy and resources to the upstream, like yew-stripping in Lijiang, nor accept garbage from the upstream, like Guiyu? Tourism seems such an ideal way. But the garbage problem in Lake Lugu tells us that the so-called “ecological tourism” is hardly ecological.

Lake Lugu (泸沽湖) is a great and beautiful lake at the boundary of Yunnan and Sichuan Province, in the Southeast of China. Since the 1980s, more and more tourists have been visiting there.



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Figure 8

Lige peninsula in Lake Lugu, October, 2000.



[\[/o/ohp/images/10803281.0001.001-000000009.png\]](#)

Figure 9

The entrance of Lige. Note that there is a garbage can in the center of the photo. October 2000.



[\[/o/ohp/images/10803281.0001.001-00000010.png\]](#)

Figure 10

Garbage can at the center of the previous photo.



[\[/o/ohp/images/10803281.0001.001-00000011.png\]](#)

Figure 11

Garbage dumped by Liege Village.



[\[/o/ohp/images/10803281.0001.001-00000012.png\]](#)

Figure 12



[\[/o/ohp/images/10803281.0001.001-00000013.png\]](#)

Figure 13

Garbage hill: six years of garbage from Luoshui village. Photographed by Zhao Hua,
May 21, 2004.



[\[/o/ohp/images/10803281.0001.001-00000014.png\]](#)

Figure 14

The garbage dump of Yongning in a mountain valley near Lake Lulu. Photographed on August 19, 2008

In September 2003, I met Zhao Hua (赵画), an anthropological photographer. She took many pictures of the Nari people on the boundary of Sichuan Province and Yunnan Province. In January 2004, Zhao Hua told me that she would spend the spring festival with the Nari people close to Lake Lugu. I asked her to find the places where Lige and Luoshui (落水) dump their garbage. Luoshui is another Nari village close to Lige. It is the first village there that developed tourism, and therefore is the richest village around Lake Lugu. It had Internet bars even before 2000.

One month later, Zhao Hua informed me that she had located the garbage dumps of Lige and Loushi. Outside the latter village, a hill hundreds of meters long was covered by six years' worth of garbage. There were plastic bottles, drinking packages, shoes, glass bottles, and batteries inside. Almost nobody from the village visited there; hence, nobody knew how bad the garbage problem had become.

As I stated above, the garbage problem in Lake Lugu is the internal problem of the industrial civilization. There are no industries around Lake Lugu, so there is no directly industrial garbage there. But they nonetheless had to deal with the garbage of industrial civilization. When they joined the “food chain” of modernization, the garbage problem was not avoidable.

The garbage there had two origins: that left by tourists, and that produced by villagers themselves after their living standard was raised. They made more and more money, and they began to use more and more industrial products in their daily lives, such as washing powder, shampoo, plastic shoes, etc., which are signs of civilization, development, progress, and so on. As a consequence, more and more non-biodegradable garbage appeared. The villages are at the bottom of “food chain”; they can’t find their own downstream for dumping their own garbage, and can only dump their garbage on their own mountain.

A CCTV crew saw the pictures by Zhao Hua, and they made a TV program. I saw it when it aired. They did not consider an explanation such as the one I have provided above; rather, they framed it in a conventional way: that the garbage dumps happened because some certain officials were not dutiful. After its broadcast, the mayor of Lijiang government asked the county to solve the problem immediately. The garbage hill was closed for several days, the garbage was burnt and moved, and it disappeared from the hill. Then, interesting things happened. As garbage was still produced every day in Luoshui, but officers dared not allow the villagers to dump it in the original hill, they had to find a brand-new place. At first, they wanted to dump the garbage in the mountain of another village, but that village refused to accept it. At last, they had to dig a pit the size of a basketball court, on the land of the party secretary of the village, as a temporary garbage dump.

In 2006, a formal garbage dump was established in a mountain valley tens of miles from Lake Lugu by the county government, which was designed by Tsinghua University. This is the only formal garbage dump in the area, and it was designed for the garbage from Luoshi, Youngning Township, and

from a hotel run by the government. Some workers charge to burn some of the garbage, and compact the rest. This garbage dump was designed for a 20-year lifespan. The garbage dump looks like a white tinea on the mountain and can be seen from far away.

Readings taken of water visibility over a period of time in Lake Lugu can give us information about liquid garbage. Lake Lugu is very clear. In 2000 when I visited there, the visibility of the lake water could reach 11 meters. In 2004, when Zhao Hua visited there, the visibility was down to 9 meters. A journalist friend for Yunnan TV told me that the number was 14 meters in 1984. Obviously, the lake is becoming dramatically more polluted. Nari people have lived around Lake Lugu since the Han Dynasty, and they always drank lake water directly. But in 2000, I was told in Luoshui that the water close to shore was not drinkable, and people had to draw a boat to the center of the lake to take drinkable water.

Lige and Luoshui are symbols of traditional indigenous homelands. We can also view them as the boundary between traditional areas and industrial civilization. It is often argued that people in the village should pursue advancement, and that they have the right to advance or develop. It seems that tourism is an ideal way for the downstream to develop: it doesn't require people to cut trees, dig mountains, or bottle water, but instead just sing and dance, row boats for the tourists, and make money. But, what are the consequences after they have made money?

There is an internal paradox in so-called ecological tourism that takes biodiversity and cultural diversity as resources to be exploited in "development." Any "resource" will be consumed and exhausted. With respect to culture diversity, the indigenous patterns of singing and dancing were originally people's way of life. When these were made into the resources of tourism, people began singing and dancing for money, with the result that these activities became not life itself, but a performance of life. When people make money, they want to live in increasingly modern ways; they no longer live as before, but as people in modern areas far from the village. Their singing and dancing lose authenticity and become a staged

performance. This means that the deepest resources they used for development are actually lost. This is a palpable shrinking at the “spiritual” level.

Considering development merely from the material point of view, development means making more money. It is a way of lifting the standard of living, of being able to use more products emanating from industrialized civilization. In the meantime, however, the village must accept garbage from the industrialized sector. The garbage problem would definitely accelerate, as in the villages considered above. The garbage problem is intrinsic to industrialization.

In the transformation chain of matter and energy within industrialized civilization, both the territory for resources at the upstream and the territory for garbage at the downstream, the original ecological system will be destroyed after the resources are lost and garbage is dumped. This is not a win-win situation, but a lose-lose situation. In the case of Lake Lugu, the two links happened in the same territory.

When the traditional people have used up their tourism resources (i.e., the clean water, the green mountain, the native and local culture), the temporary modernization will disappear immediately. But they cannot go back to their original “primitive” life again, because they have lost their original environment and culture.

At the very beginning, when people in Lake Lugu chose their path to development, they did not foresee they would develop a severe garbage problem. If they had known, would they still have chosen this way?

6. From “How” to “Why”

All human economic activities are no more than links of matter and energy within the transformation and transportation chain. Science and technology are currently the engine of the chain. The advancement of science and technology can only accelerate and strengthen the chain, but

can't change the chain. Mineral water is a relatively simple product of industrial civilization. Turning on a TV, one can see more and more new products being advertised, all of which prove bewildering to people's eyes and minds, and ruinous insofar as they ceaselessly prompt the creation of new desires. All economic activity, such as updating a computer or renewing a cell phone, accelerates the chain-reaction to convert more forest, minerals, and natural water into garbage. Modern civilization is established on the remains of nature, constructed at the side of a garbage dump. As I discussed at the beginning of this paper, all the energy will turn into heat, the fourth state of garbage. Global warming is a byproduct of industrial civilization, of our modern way of life.

Why can we drink a bottle of mineral water on a city's streets? Because there is still natural water that can be exploited, there is still land that can be used for dumping garbage. But this lifestyle is not sustainable. We should think about not only "how": how to find and make use of more natural water, or how to increase the capacity for dumping garbage on certain land; but also "why": why must we drink a bottle of mineral water from a remote mountain in a city street?

What we need now is a new hero to shoot down the extra sun over the sky of industrial civilization, inside the mind of industrial civilization.

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Notes

1. Spencer R. Weart, “The Discovery of the Risk of Global Warming.” 
[[#link_note_1](#)]

2. Claus Fröhlich, “Construction of a Total Solar Irradiance (TSI) Time-Series from 1978 to Present.” ♣ [\[#link note 2\]](#)
3. “World Total Net Electricity Consumption, 1980–2006. Statistics gathered and furnished by the U.S. Government, Energy Information Administration. ♣ [\[#link note 3\]](#)
4. I have discussed the legal dimension of these issues in my “The Third Class of Perpetual Motion Machine.” ♣ [\[#link note 4\]](#)
5. Greenpeace China conducted an investigation in Guiyu in 2001 and published some Chinese-language reports. An English-language publication incorporating the Guiyu case study is *Exporting Harm: The High-Tech Trashing of Asia*, prepared by the Basel Action Network (BAN) and Silicon Valley Toxics Coalition. See, in addition, reportage furnished by He Hainang, Chien-Min Chung, and Christopher Bodeen. The Guiyu phenomenon was reported in an expose in the well-known Chinese newspaper, *Southern Weekend*. ♣ [\[#link note 5\]](#)
6. Zeng Lin, “The Red Bean Yew Being Barked are Weeping.” ♣ [\[#link note 6\]](#)

Contents [<https://quod.lib.umich.edu/o/ohp/10803281.0001.001/1:6/--impasses-of-the-post-global-theory-in-the-era-of-climate?rgn=div1;view=toc>] Next Section [<https://quod.lib.umich.edu/o/ohp/10803281.0001.001/1:7/--impasses-of-the-post-global-theory-in-the-era-of-climate?rgn=div1;view=fulltext>] Previous Section [<https://quod.lib.umich.edu/o/ohp/10803281.0001.001/1:5/--impasses-of-the-post-global-theory-in-the-era-of-climate?rgn=div1;view=fulltext>]

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