

# Research on the American Shale Revolution from the Ecological Perspective of Marxism

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**Abstract:** Since the entry to 20th century, the increasing ability of human beings to understand and change nature, the growth of population, and the negative effects of scientific and technological development have led to ecological crisis, exerting much influence on the future destiny of human beings. The damage human has made to the ecological environment, such as soil erosion, land desertification, land salinization, biodiversity reduction, has seriously done harm to the ecological balance. This paper takes the American shale revolution as the research object and further study the American shale revolution from the perspective of Marxist's ecological theory.

**Keywords:** Marxist's ecological theory, ecological balance, shale revolution

## 1. Introduction

There are still controversies in the academic circles about the definition of Marxist ecological theory. Scholars who support Marxist ecologicalism believe that Marxism must have its own ecological theory, but for others, this is not necessarily the case. Therefore, extracting the definition of Marxist ecological theory on the basis of existing research results at home and abroad is of great significance to the related research of Marxist ecological theory and the practice of human ecological civilization.

## 2. Marxist ecological theory

In the mid-nineteenth century, with the emergence of the Western bourgeoisie and the rise of the industrial revolution, large-scale machine production replaced factory handicraft production. This change led to a change in the relationship between man and nature. On the one hand, the capitalist mode of production led to a rapid increase in social productivity; on the other hand, it exacerbated the contradiction between man and nature: man destroys and pollutes the natural environment and wastes natural resources. The ecological thoughts of Marx and Engels were born in this context.

First of all, Marx and Engels believed that nature exists before human beings, which stems from the materialism that Marx and Engels always adhere to. Marx and Engels' view of the existence of nature before mankind laid the foundation of materialism for mankind to know the world, to understand the world, and to transform the world. Secondly, Marx and Engels believed that man is the product of nature, and that man lives on nature instead of nature relying on human beings. Marx once stated in the *Manuscript of Economics and Philosophy in 1844*: "Man is directly a natural existence[1]". Marx highly recognized Darwin's biological evolution theory of "It is not the strongest of the species that survive, but the one most responsive to change", and admitted that humans are the product of nature and the result of long-term natural evolution. In Marx's view, labor which is the fundamental symbol that distinguishes humans from animals enables the higher apes to evolve into humans. Marx said, "The labor process...is a purposeful activity that creates use value, the possession of natural objects for human needs, a general condition for material transformation between man and nature, and eternal natural condition for human life[2]". Finally, Marx and Engels believed that human beings should live in harmony with nature. Marx believed that humans should protect the natural ecological balance, maintain the ecological diversity of species, and achieve humanitarianism in nature. Man and nature have a mutual relationship. Man creates the environment, and the environment also creates people. Only when people respect and live in peace with nature can they blend in and adapt to nature, and ultimately achieve the true unity of man and nature. The ecological thought of Marx and Engels provided the ideological foundation for establishing the theoretical research paradigm of ecological

civilization, demonstrated the fundamental path of the harmonious development between man and nature, and also pointed out the general trend of the ecological turn of human civilization.

At present, the definition of the content of Marxist ecological theory by most scholars is prone to the materialistic and critical nature of Marxist ecological theory. However, there is no normative definition about what is the basic connotation of Marxist ecological theory. In my opinion, Marxist ecological theory is a scientific theory based on Marx and Engels' ecological thought and based on the basic position of Marxism, which takes the historical change of the relationship between man and nature as the research object. That is to say, the Marxist ecological theory contains two aspects: one is the thoughts and theories on ecological issues, and the other is to adhere to the basic position, basic viewpoints and basic methods of Marxism.

### **3. The U.S. Shale Revolution**

As a hot concept in the energy field in recent years, the shale revolution has been receiving extensive attention in the field of energy research due to its profound impact on the current international energy market structure.

Shale deposits are rich in oil and natural gas. It is well known that they have a large amount of reserves in the United States (according to the U.S. Energy Information Administration (EIA) assessment[3], the world's technically recoverable shale oil reserves are 46.9bn tonnes, Russia at top with 10.5bn tonnes, followed by the US with 6.72bn tonnes and China with 4.48bn tonnes. However, due to the lack of permeability of shale, it has been difficult to extract them by conventional methods and in a more economical and practical way. It wasn't until continued innovation and advances in extraction technologies such as hydraulic fracturing and horizontal drilling (often referred to as "fracking" when the two technologies are combined) that the status quo changed and solved the technical problem of how to extract oil and gas resources in rocks on a large scale and industrially[4]. It enabled the continuous explosive growth of shale oil and gas production in the United States, thus truly starting the Shale revolution in the United States.

The development of shale oil and gas in the United States can be roughly divided into three stages, each of which is marked by the application of one or several technologies and the growth of shale oil and gas production[5]. The first stage is the accidental discovery of shale gas in the process of conventional oil and gas exploration and development. It is mainly realized that shale gas reservoir with natural fractures is an important natural gas resource. The prototype of directional drilling and hydraulic fracturing appeared, but not directly used for shale gas development; the second stage is the shale gas development exploration and technology research and development stage led by the US government and participated by small and medium-sized enterprises and scientific research institutions. During the period, the US government funded a number of shale gas evaluation and development technology research, horizontal wells and hydraulic fracturing has realized the commercial development of Barnett shale gas, and the annual output of shale gas has exceeded 10 billion cubic meters. New technologies such as synchronous fracturing, repeated fracturing, and factory drilling have improved the efficiency of shale gas exploration and development and reduced costs. The effect of shale gas has gradually shifted to shale oil, which has promoted the coordinated development of shale oil and gas. According to data released by the U.S. Energy Information Administration (EIA) on February 15, 2019, in December 2018, the average daily shale gas production in the United States was approximately 65 billion cubic feet, accounting for 70% of the average daily U.S. natural gas production; at the same time, the average daily production of shale oil in the United States is about 7 million barrels, accounting for 60% of the average daily crude oil production in the United States. In December 2008, these two rates were only 16% and 12% respectively [7].

In the long run, the shale revolution will have a huge impact on the crude oil market. One is that falling oil prices will change the supply curve of crude oil. Under the same price, there will be more crude oil supply. When other conditions such as demand remain unchanged, the shale oil revolution will make the equilibrium price of oil lower than the current price. The other is to change the role of shale oil as a mobile producer, making it the same producer as conventional oil. On the contrary, some high-cost traditional oil producers will become mobile producers. In terms of current costs, Russian producers are facing the most pressure. Third, the United States will become an important crude oil exporter in the world. At the same time, once the shale revolution hits the crude oil market, resulting in a continuous decline in international oil prices and reaching a new equilibrium point, it will also have an impact on the development of global renewable energy. The price advantage will prompt the world

to generate more demand for crude oil, pose a challenge to the existing low-carbon policy, and may also trigger a reversal of global crude oil demand.

#### **4. The American Shale Revolution from the Ecological Perspective of Marxism**

The American shale revolution broke the traditional energy structure, changed the current international geopolitical structure, and had a huge impact on world economic and political development. At the same time, it also brought negative effects on our ecological environment.

##### ***4.1 Failure to adhere to the basic position of Marxism***

Xi emphasized: "Position is the foothold for people to observe, understand, and deal with problems. This foothold is fundamentally determined by people's economic, political and social interests and status[8]". From the basic position of Marxism, Marxist ecological theory is to protect the ecological interests of the masses and meet their needs for a good ecological environment from the position of the masses. Water, air and land are all the material foundations on which the people live. However, the American shale revolution not only wasted and polluted a lot of water and land resources, but also caused serious air pollution. The comprehensive utilization of horizontal wells, hydraulic fracturing and supporting technologies (hydraulic fracturing) has realized the commercial production of shale oil and gas. It can be seen that the status of water is very important in the development of shale gas oil. But because the fracturing fluid is 99% fresh water and 1% chemical additives, it consumes a lot of water resources. According to the U.S. Environmental Protection Agency (EPA) estimates, a horizontal well requires an average of 5 million gallons of water to be injected for fracturing. In addition, different formations and different geological conditions require different amounts of water. Secondly, it is understood that 14 oil and gas companies in the United States have used about 295,000 cubic meters of fracturing additives in the past five years during the rapid increase in shale gas production, including more than 750 chemical products and toxic substances such as benzene and lead [9]. These toxic substances may cause the fracturing fluid to penetrate into the groundwater layer and pollute the local water resources due to the damage of the gas well casing and the lack of tightness. In addition, these harmful substances may also penetrate into the shallow layer of the ground through the cracks, pollution of land resources. Finally, as an unconventional fossil energy source, shale gas will also have a negative impact on the environment. Shale gas will release methane during the combustion process (the carbon dioxide produced by methane combustion is the root cause of the greenhouse effect). Some natural gas is also released during shale gas extraction. However, because of the decline in natural gas prices, developers are unwilling to invest funds to build pipelines, gas storage tanks and other facilities to store them, so this part of natural gas has to be burned in vain. This not only caused a waste of resources, but also aggravated climate warming. These behaviors are contrary to the basic position of Marxism. They not only fail to satisfy the people's need for a good ecological environment, but also seriously damage people's health and affect people's normal lives.

##### ***4.2 Failure to adhere to the basic viewpoints of Marxism***

Xi pointed out: "Viewpoints are people's views on things. Marxist views are Marxist scientific understanding of the general laws of the development of nature, society, and human thinking. They are a scientific summary of the laws of nature and the practical experience of human society, which is presented in the Marxist philosophy, political economy and scientific socialism [10]". From the basic point of view of Marxism, Marxist ecological theory is to scientifically understand the ecological law, the ecological harmony between man and nature, the dialectical relationship between ecological civilization and social development, and the inner connection between ecological civilization and socialism. In today's world, energy security has become the top priority of the national security of all countries, and the geopolitical game based on oil has also become an important concern in the international political field. The shale revolution made the United States an important global crude oil exporter. The U.S. Energy Information Administration (EIA) [11] expects the U.S. to account for 70 percent of new oil production on November 11 as shale production continues to grow. The US is likely to overtake Russia in recent years and overtake Saudi Arabia as the world's largest crude exporter by 2024. This means that the global crude oil market will enter an era in which OPEC, the United States and Russia are triumphant. The United States ignores the ecological damage and pollution brought about by the shale revolution, pursues political and economic interests, seeks world hegemony, and neglects the importance of the ecological environment. This did not adhere to the basic viewpoints of

Marxism and did not recognize the dialectical relationship between ecological civilization and social development.

#### **4.3 Failure to adhere to the basic methods of Marxism**

Xi pointed out: "The method mentioned here is a methodology that is unified with the Marxist world outlook, and it is the fundamental method of thinking and work that guides us to correctly understand and transform the world [12]". From the basic methods of Marxism, Marxist ecological theory is to use the world outlook and methodology of dialectical materialism, adhere to the method of seeking truth from facts in accordance with ecological laws, the dialectical method of correctly dealing with ecological protection and economic and social development, the historical analysis method of the social root of ecological problems, and the mass line method of ecological construction for the people and ecological construction relying on the people. The United States, as the superpower in the world, knows that the exploitation of shale gas and oil has a bad impact on the environment, but it turns a blind eye and only cares about its own interests. From this point of view, the action of the United States is an act of ecological colonialism that disregards human interests, which seriously violates the current concept of development and the Marxist ecological concept.

#### **5. Conclusion**

This paper takes the American shale revolution as the research object and studies the American shale revolution from the perspective of Marxist ecological theory. Firstly, the American shale revolution did not meet the people's need for a good ecological environment, which is contrary to the basic Marxist position; Secondly, the American shale revolution failed to recognize the dialectical relationship between ecological civilization and social development, and failed to adhere to the basic Marxist viewpoints. Finally, the American behavior was an ecological colonialist behavior that disregarded human interests and seriously violated the current development concept and Marxist ecological view.

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