

# Study on the Influencing Factors and Policy Simulation of Low Carbon Business Behavior of Metallurgy Enterprises in Jiangxi Province

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**Abstract.** As a province with rich resources, Jiangxi Province has many metallurgical enterprises. However, most of Jiangxi metallurgical enterprises' production pattern are not environmentally friendly. The government urgently needs to formulate policies to reduce pollution. This paper uses the method of system dynamics to simulate and analyze the policies affecting metallurgical enterprises, and gives some policy recommendations.

## Introduction

At this stage, the production mode of metallurgical enterprises in Jiangxi is not environmentally friendly. The government urgently needs to formulate policies to reduce pollution. To formulate policies to reduce pollution in metallurgical enterprises, we must first understand the factors that affect low-carbon operations of enterprises. Scholars believe that there are many factors that affect the low-carbon operation of enterprises.

From an energy point of view, Michael Grubb, Lucy Butler, Paul Twomey (2006) through analysis of the UK power industry, found that new energy is an important factor affecting the UK power industry, if new energy such as wind and solar energy with enough reserves, the UK power industry can get rid of its dependence on coal and improve the environment.

From a social perspective, Eva Heiskanen, Mikael Johnson, and Simon Robinson (2009) believe that individuals will have a huge impact on low-carbon society, including personal preferences, lifestyles, and consumption habits.

From a government perspective, Montalvo (2008) believes that there is a direct link between low carbon and government action. He advocates that the government's direct mandatory constraints can reduce the company's carbon emissions.

From the perspective of the company itself, Ashford Zwetsloot (2000) believes that technology is the key to low-carbon operations. He believes that low-carbon environmental technologies should be developed to reduce energy consumption. Alexander (2007) agrees with this view.

## SD Model

Before modeling, the author conducted a questionnaire survey on four of the five listed metallurgical enterprises in Jiangxi Province. Through questionnaires and other means, the author obtained some data needed for modeling. In order to reduce the design difficulty and understanding difficulty of the system, this study uses the positive feedback loop to design, and uses Vensim software to draw the causal relationship diagram of the low-carbon business behavior of metallurgy enterprises in Jiangxi Province. The author will add various influencing factors to facilitate subsequent policy simulation, and show the complete flow chart of the influencing factors of low-carbon business behavior of metallurgy enterprises in Jiangxi Province. According to the author's test, the difference between the simulated value and the actual value is between  $\pm 0.05\%$ , indicating that the model is feasible and effective. Due to the limited space, the list of parameters of the SD

model and the equation of the system will not be shown. The total system flow diagram is as follows:

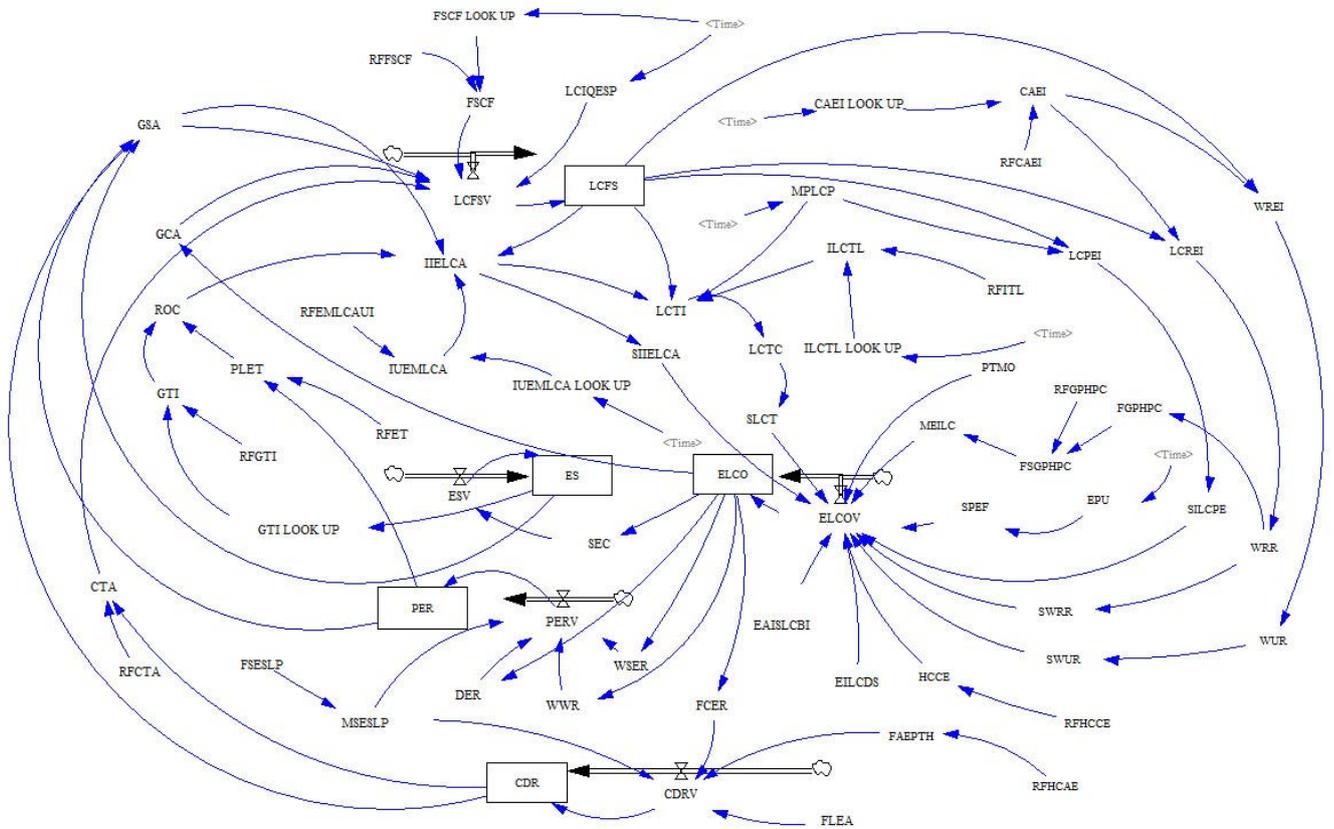


Figure 1. System flow chart of low carbon management behavior and influencing factors of metallurgical enterprises in Jiangxi Province

### Sensitivity Analysis

The author uses Vensim software to adjust the above influencing factors, and draws a trend comparison chart of various behaviors. So, we can identify the sensitive variables, and formulate relevant policies. The values of the various variable factors are shown in the results of the operation and are will not be described separately.

First, the author adjusts the factor of financing scale in carbon fund, the results are as follows:

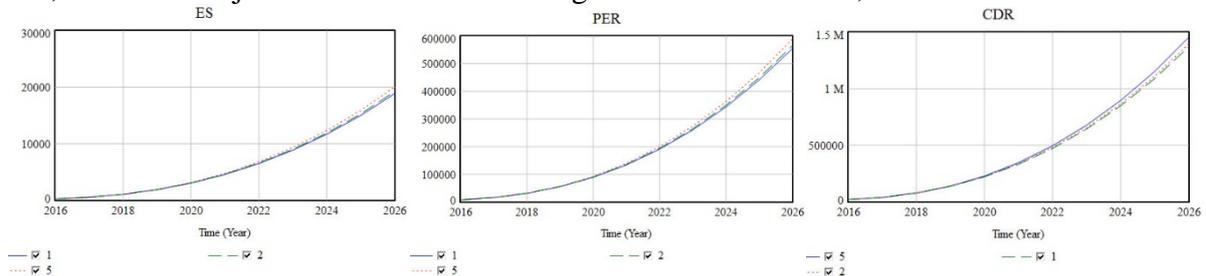


Figure 2. Operation result chart of regulating the factor of financing scale in carbon fund

Figure 2 shows that when the scale of financing for enterprises is greatly increased, the results of energy conservation and emission reduction will be significantly changed.

Second, the author adjusts the factor of carbon transaction amount, the results are as follows:

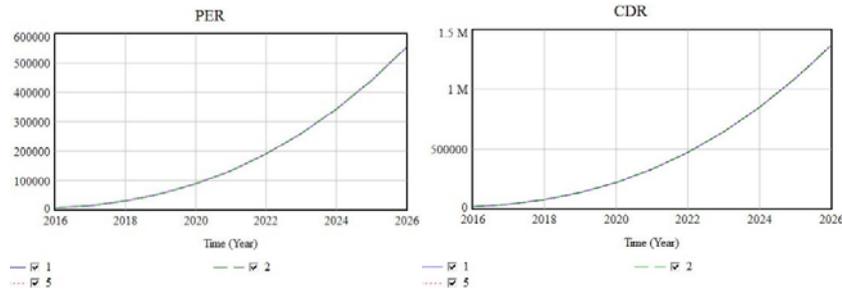


Figure 3. Operation result chart of regulating the factor of carbon transaction amount

Figure 3 shows that changing the carbon transaction amount has little effect on energy saving and emission reduction of metallurgy enterprises.

Third, the author adjusts the factor of industry technical level, the results are as follows:

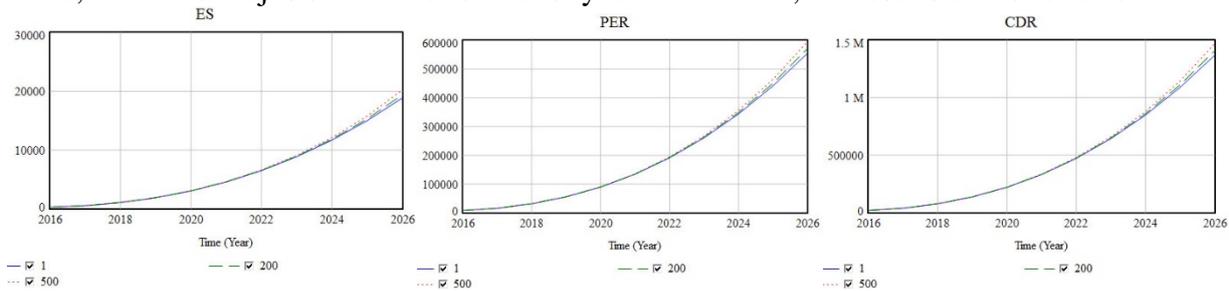


Figure 4. Operation result chart of regulating the factor of industry technical level

Figure 4 shows that the continuous improvement of the technical level of the industry will have a certain positive impact on the energy saving and emission reduction effects of enterprises.

Fourth, the author adjusts the factor of consumer's awareness of environmental issues, the results are as follows:

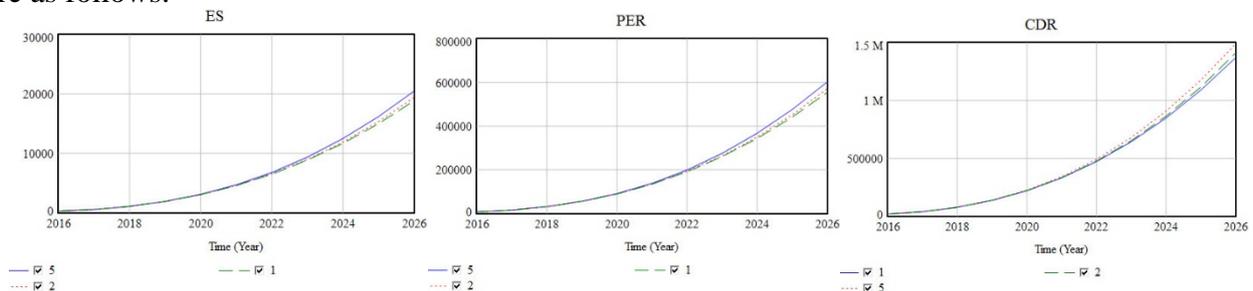


Figure 5. Operation result chart of regulating the factor of consumer's awareness of environmental issues

Figure 5 shows that the continuous improvement of consumers' awareness of environmental issues will have a certain degree of supervision and promotion for low-carbon operations of enterprises.

Fifth, the author adjusts the factor of enterprise management's low carbon awareness upgrade investment, the results are as follows:

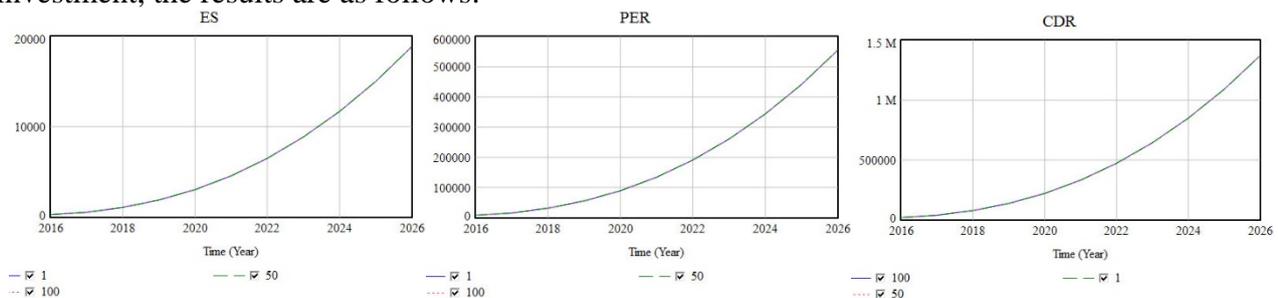


Figure 6. Operation result chart of regulating the factor of enterprise management's low carbon awareness upgrade investment

Figure 6 shows that enterprise management's low carbon awareness upgrade investment has changed, and there has been almost no substantial change in the energy-saving and emission-reduction effects of listed metallurgical enterprises.

Sixth, the author adjusts the factor of government penalties for highly polluting companies, the results are as follows:

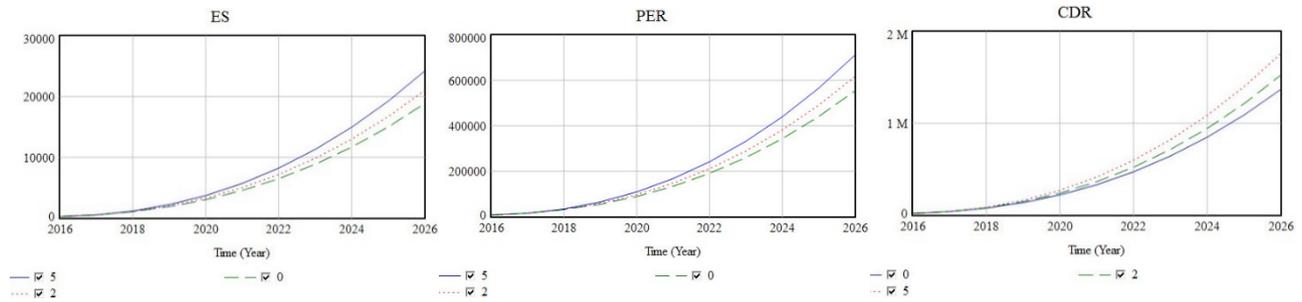


Figure 7. Operation result chart of regulating the factor of government penalties for highly polluting companies

Figure 7 shows that the change of government penalties for highly polluting companies will have a very significant impact on the energy saving and emission reduction effect of enterprises.

Seventh, the author adjusts the factor of high cost of clean energy, the results are as follows:

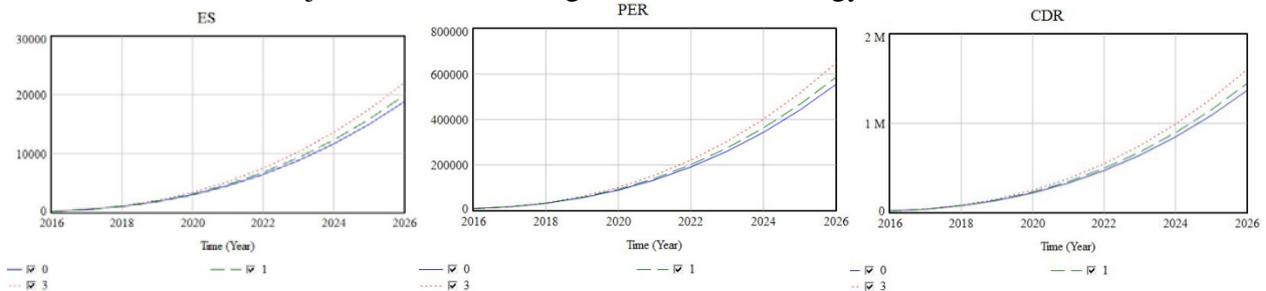


Figure 8. Operation result chart of regulating the factor of high cost of clean energy

Figure 8 shows that change the value of high cost of clean energy will also have a very significant impact on the energy saving and emission reduction effect of enterprises.

Eighth, the author adjusts the factor of high cost of alternative energy, the results are as follows:

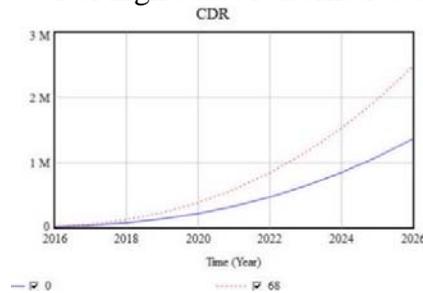


Figure 9. Operation result chart of regulating the factor of high cost of alternative energy

Figure 9 shows that the decline in the price of alternative energy sources will have a very positive effect on the company's carbon dioxide emission reductions.

Ninth, the author adjusts the factor of government's tax incentives, the results are as follows:

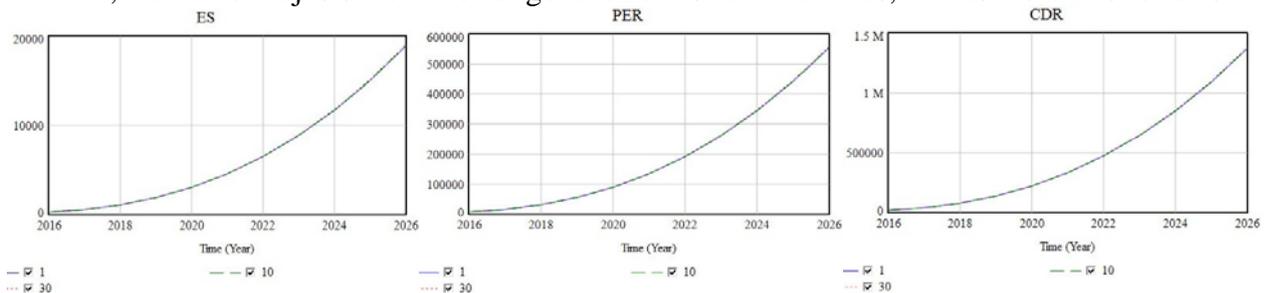


Figure 10. Operation result chart of regulating the factor of government's tax incentives

Figure 10 shows that the government's tax incentives for low-carbon companies have little impact on listed metallurgical enterprises in Jiangxi Province. A large part of this phenomenon is due to the wide financing channels of listed metallurgical enterprises.

Tenth, the author adjusts the factor of environmental tax, the results are as follows:

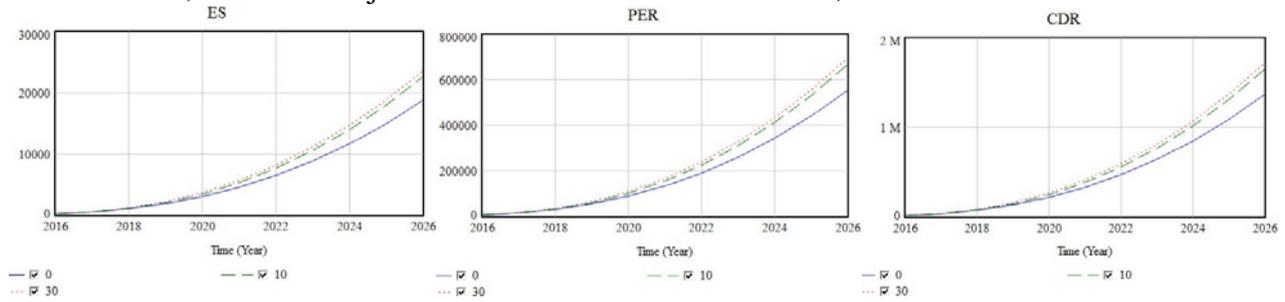


Figure 11. Operation result chart of regulating the factor of environmental tax

Figure 11 shows that the environmental tax will greatly promote the energy the energy saving and emission reduction of enterprises.

### Policy Simulation and Results

Through the above observations, the author has several sensitivity factors, which will be combined to get the best results. The author will use these sensitive factors to develop a combinational policy, the specific values are as follows.

Table 1. Value list of various categories of policies and regulatory factors

Measure	Corresponding regulatory factor	Factor value
Encourage the development of carbon funds. Guide the establishment and development of powerful carbon funds and expands the size of the carbon fund	Financing scale in carbon fund	5
Strengthen public awareness of environmental protection	Consumer's awareness of environmental issues	100
Increase penalties for highly polluting enterprises and enforce strict standards	Government's penalties for highly polluting companies	5
Promote the development of energy technology and significantly reduce the cost of clean energy	High cost of clean energy	3
Reduce the price of alternative energy sources	High cost of alternative energy	0.68
Increase environmental taxes	Environmental tax	30

Next, the author will simulate the implementation of the combinational policy to observe the effect of this policy. The following is the policy simulation result:

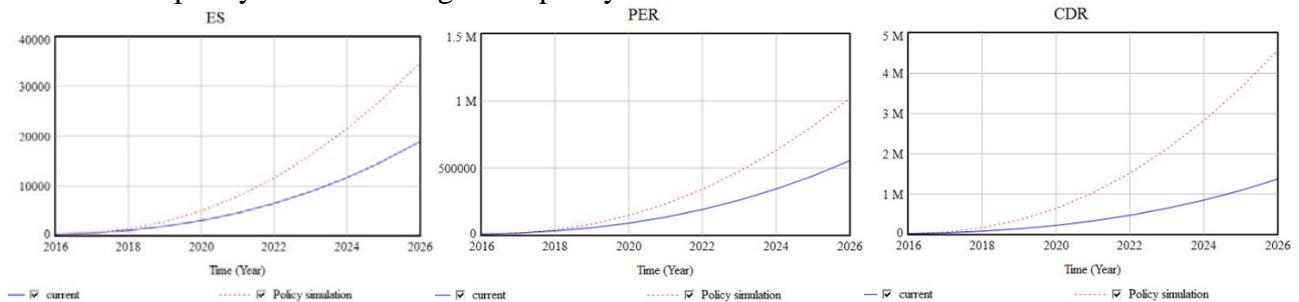


Figure 12. Policy simulation operation result

Obviously, if the combination policy is put in place, the energy conservation and emission reduction effect of metallurgy enterprises in Jiangxi Province will be greatly improved compared with the current conditions.

## Conclusion

Based on the simulation of the combination policy, the author gives some policy recommendations on the metallurgical enterprises in Jiangxi Province. First, the government should encourage the development of carbon funds, guide the establishment and development of powerful carbon funds, and expands the size of the carbon fund. Second, the government should do more public environmental publicity to raise consumers' awareness of environmental protection, to encourage enterprises to save energy and reduce emissions. Third, the government should increase penalties for highly polluting enterprises to shock high-polluting enterprises. Fourth, the government should promote new energy research and development to reduce the cost of clean energy. Fifth, the government should reduce the price of alternative energy sources so that companies can choose to use low-pollution energy. Sixth, the government should raise environmental taxes and force enterprises to reduce pollution emissions.

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