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Forest Management System Based on Fuzzy Comprehensive Evaluation Method

Yuanwu Li, Yutong Bai, Tiancheng Li

North China University of Science and Technology, Tangshan 063210, China.

Abstract: Reducing greenhouse gas emissions is one way but not enough to deal with the current climate change problem, especially decrease the amount of greenhouse gases in the atmosphere. We need to isolate carbon dioxide from the atmosphere through biosphere or mechanical means. In this process, forests are indispensable to any effort to mitigate climate change. This paper not only considers the absorption of carbon dioxide by forests, but also considers the storage of carbon dioxide by forest products to a certain extent.
Finally,using stepwise regression, the positive impact of forest coverage on carbon sequestration is analyzed, and the best forest management scheme is obtained.At the same time, the cutting methods are also considered in this paper.
The traditional cutting form is to complete the cutting quota by tending the forest ecosystem and forest stand transformation. Such cutting management measures are not perfect , but need to be imp-roved on the basis of forest cultivation , management and rational utilization of resources.
Keywords: Forest Management Plan; Carbon Sequestration; Coupling Coordination Analysis; Stepwise Regressio

1. Introduction

1.1. Background

According to research, the global land and ocean surface temperature is 1.14 degrees Celsius higher than the average temperature in January of the 20th century (12 degrees Celsius). The rise of the earth's temperature leads to the melting of glaciers in the Himalayas and other mountains, forming a long-term hidden danger to fresh water resources; It can even be said that climate change poses a great threat to life. In order to mitigate the impact of climate change, we have taken many measures to reduce the amount of greenhouse gases in the atmosphere. We strive to increase the storage of carbon dioxide by isolating it from the atmosphere through biosphere or mechanical means. In this regard, we can think that forests are in-dispensable to any effort to mitigate climate change. Forests isolate carbon dioxide from living plants and products made from trees. Compared with carbon sequestration without deforestation at all, the combination of carbon sequestration in some forest products and carbon sequestration due to young forest regeneration may allow more carbon sequestration over time.

2. Problem Analysis

The question is how much carbon dioxide our forests and their products can store over time. We know five typical forests in different climatic regions of the world by consulting the data. Through the analysis and calculation of forest coverage and forest wood production, we can get the difference between the total carbon sequestration of the forest and the annual average release of forest products to the service life.

3. Basic assumption

It is assumed that trees grow naturally, without considering the impact of natural disasters, such as fire and insect disasters on the value of trees.

The self propagation of trees is not considered, and the increase in the number of trees is only considered after felling and artificial tree planting.

It is assumed that all trees can grow normally, regardless of accidental death.

4. Models

4.1 Analysis and Solving of Question One

4.1.1 Model Preparation

By consulting the data, we can understand five typical forests in different climatic regions of the world, namely, the Northeast deciduous forest in temperate deciduous broad-leaved forest, the Amazon rainforest in tropical rainforest, the Yangtze River Basin in subtropical evergreen broad-leaved forest, Siberian coniferous forest in subtropical coniferous forest Mediterranean evergreen hardwood forest located in subtropical evergreen hardwood forest and Valdivia winter rain forest located in temperate evergreen broad-leaved forest.

(1) Data Processing

This paper collected and consulted the Northeast deciduous forest of temperate deciduous broad-leaved forest, Amazon rainforest located in tropical rainforest, Yangtze River basin located in subtropical evergreen broad-leaved forest, Siberian coniferous forest located in subtropical coniferous forest The timber reserves, forest coverage and forest area of Mediterranean evergreen hardwood forest in subtropical evergreen hardwood forest and Valdivia winter rain forest in temperate evergreen broad-leaved forest.

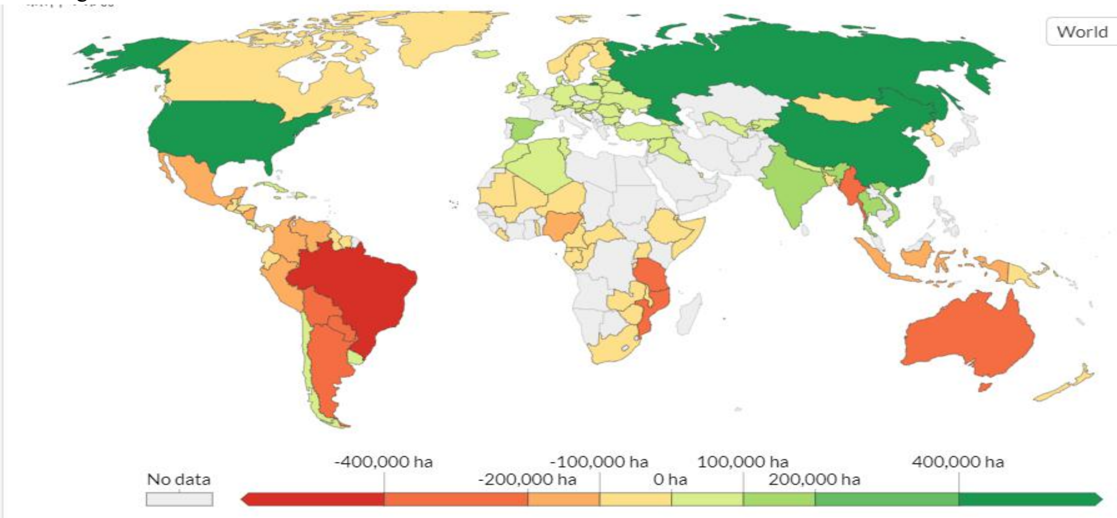

Figure 1 Annual change of forest area in 200

(2) Assumptions

- ❖ It is assumed that all wood products have a normal life.
- ❖ It is assumed that all trees can grow normally.
- ❖ Assuming that there is no consumption of carbon dioxide in production, all carbon dioxide is stored in wood products.

Table 1 Index factors of different types of forests

Forest type	Typical forest	Typical forest timber reserves (10000 m ³)	Typical forest coverage%	Typical forest area (10000 K ㎡)	Wood volume distribution per unit coverage of typical forest (10000 m ³/ 10000 K ㎡ / 1%)
Temperate deciduous broad-leaved forest	Northeast deciduous forest	100000	78	15	85.47008547
Tropical rain forest	Amazon Rainforest	13950000	58	700	343.5960591
Subtropical evergreen broad-leaved forest	Yangtze river basin	550000	43	55	232.5581395
Coniferous forest in sub cold zone	Siberian coniferous forest	11100000	60	963	192.1079958
Subtropical evergreen hardwood forest	Mediterranean evergreen hardwood forest	50000	90	5	111.1111111
Temperate evergreen broad-leaved forest	Valdivia winter rain forest	200000	80	25	100

4.1.2 Model Establishment

Step 1: Let the coverage rate of each year be x_i **(i= 1,2,..., n)**; The annual timber output is y_i (y= 1,2,..., n), The average annual coverage rate is

The average annual output is

Step 2: Calculate the net change of coverage rate as Δ **x** =x_i-$\bar{x}$ (x_1 as the benchmark)
Total carbon sequestration is

Step 3: Average annual carbon emission at the end of product life

(1 ≤ m ≤ n)

Step 4: Finally, the net carbon sequestration of the forest is **c**=c_1-c_2.
Step 5: Obtain the coverage per unit area and wood reserve distribution of typical forest is

Step 6: Old is the average life of the product, **a** is the coverage per unit area of the typical forest and the distribution of wood reserves, **s** is the area of the sample forest, and **b** is the carbon sequestration per cubic meter of wood.
Step 7: Finally, find two typical forests, Saihanba and Daxinganling, and implement two different schemes to properly cut Saihanba, but not Daxinganling. Calculate the carbon sequestration density **c** under the unit coverage of the two forests according to the above steps.

4.1.3 Results

Table 2 The results of the model parameter value table

Coefficient a: wood volume distribution per unit coverage of typical forest (10000 m) ³/ 10000 K ㎡ / 1%)	85.5
Coefficient B: carbon sequestration per unit wood reserve (T / 10000 K ㎡)	18300

Table 3 Daxinganling (no logging)

	Timber reserves (10000 m) ³)	Forest coverage%	K ㎡ (10000 m2)	c
Daxinganling (no logging)	80000	78	12	1564102.564

4.1.4 Analysis of the Result

The parameters we will get can calculate the carbon sequestration of forests every year.When we calculate the carbon sequestration in recent 15 years, we can get the amount of carbon dioxide that can be stored over time, that is, the amount of carbon sequestration.

At the same time, if we get a negative forest coverage, we need to consider the change difference again, and part of the carbon dioxide will be discharged in the production process.

Finally, by comparing the density values of carbon sequestration per unit coverage from different schemes of two forests, we can compare which scheme is more suitable for this forest.

5. Conclusion

Carbon sequestration: know the wood reserves, forest coverage and forest area of a forest, and bring it into the model established in this paper to calculate the amount of carbon dioxide sequestered by this forest and its wood products.

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