

Economic Cost-benefit Analysis of Green Building Based on the Low-carbon Economic Policy

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Content

- 1. Introduction
- 2. China's Energy Conservation Policy on Green Building
- 3. Cost-benefit Analysis of Green Building
- 4. Conclusion



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1. Introduction



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1.1 Background

- Global Tendency
- China's Vision
- Green Building Development



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1.2 Literature Review

- Existing Research
- Incremental cost on establishment of green building
- Cost analysis on green building market
- “Economic evaluation” method in the construction phase
- Content of the specific economic data analysis
- Limitation
- Focus on the technical level
- Lack of economic efficiency analysis from the basic economic theory



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1.3 Why I want to make an analysis efficiency problems on green building policy

- Limitation of traditional urban construction
- Avoid of economic phenomenon--“Government Failure”
- Distribution of economic property-- Institutional Choice



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2. China's Energy Conservation Policy on Green Building



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2.1 Government restriction policy system

- Five gradations:
 - Law
 - Administration regulation
 - Ministry rules
 - Policy oriented document
 - Standard specification and technical directives

- Three principles:
 - Energy conservation content provision should be clear
 - Composite the macro goal into technical specifications
 - Efficiency supervisory control method



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2.2 Economic policy system

- Main three parts:
- Economic incentive
- Energy price
- Energy conservation label and Green building label certification



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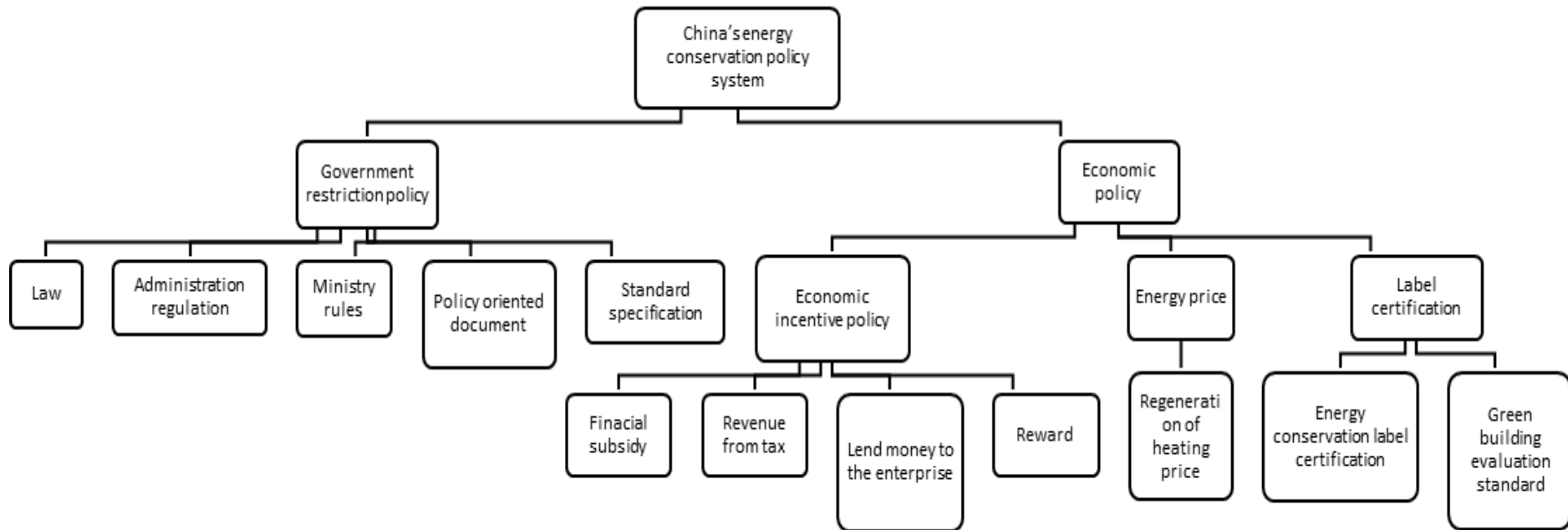
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2.3 Economic efficiency of China's energy conservation policy



2.4 Comment of economic efficiency on China's energy conservation policy

- Government restriction policy
- Clear and specific standard of carbon dioxide emission control
- No suitable emission reduction level for overall social benefit
- No preferred plan for the whole social economy efficiency
- Economy incentives policy
- Transfer the public resource to private part
- No analysis on cost-benefit for implement of policy and regulation



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How to measure each policy or method is more efficient ?



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3. Cost-benefit Analysis of Green Building



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3.1 Theoretical basis of using cost-benefit method on economic efficiency of green building policy analysis

- Resources allocation
- Cost-benefit factor outline for policy reference
- Environmental impact can be compared
- Cost-benefit method for policy option
- Avoid effect of different cost and benefit level in different time



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3.2 How to use?

-- The basic concept of cost-benefit method of green building

- The impact of environmental damage and pollution can be assessed by economic loss and calculated by economic price;
- Green building construction will increase more incremental cost both in the technological application, trading cost, policy cost and all kinds of cost on capital and asset investment;
- The main theory of cost-benefit method is to solve the problem of externality.



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3.3 How to use?

-- Basic model of cost-benefit method of green building--Economic model

- Marginal cost and benefit
- Present Value and Net Present Value

$$PV_C = \sum_{t=1}^n \frac{C_t}{(1+r)^t}$$

$$PV_B = \sum_{t=1}^n \frac{B_t}{(1+r)^t}$$

$$NPV = \sum_t^n (B_{jt} - C_{jt} + B_{et} - C_{et})(1+r)^{-t}$$

- Decision rules

- $PV_B > PV_C, NPV = PV_B - PV_C > 0$

- Benefit-cost ratio: $PV_B / PV_C > 1$

- Internal Rate of Return (IRR):

$$B_0 - C_0 + \frac{B_1 - C_1}{(1+r)} + \frac{B_2 - C_2}{(1+r)^2} + \dots + \frac{B_t - C_t}{(1+r)^t} = 0$$

PV_C = Present Value of total cost of green building, PV_B =Present Value of total benefit of green building, C_t = the cost for the number t years, B_t =the benefit for number t years, r =discount rate, and t =time (year), NPV =Net Present Value of low-carbon green building, B_{jt} = basic building benefit for the number t years, C_{jt} = basic building cost for the number t years, B_{et} = basic green building benefit for the number t years, C_{et} = basic green building cost for the number t years.



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3.3 How to use?

-- Cost and benefit factors

	Cost	Benefit
Government	Promotion cost of green building construction	Investment reduction of conventional energy resources
	Management cost of policy implementation	Incremental GDP caused by construction of green buildings
	Financial incentive cost	Incremental job opportunities by construction of green buildings
	Subsidy of new energy of industry	
Organization /Developer/ Investor	Low-carbon technologies and facilities	Government financial incentives by adopting low-carbon development model
	Green building design, certification and examination	Rise in selling price and renting price
		Company brand value
Consumer/ User	Maintenance and operation management of new energy facilities	Reduction of energy usage
	Extra cost of buying low-carbon green building	Government financial incentives
	Government financial method (the price of heat supply and power supply)	



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3.3 How to use?

-- Particularity of cost-benefit method of green building

- Minimum baseline protection as a rigidity index
- Constant of rigidity index and relevant emission index
- Integrated Assessment Model (IAM) used in cost calculation of carbon emission



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4. Conclusion



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4.1 Conclusion

- Follow the dynamic market mechanism and optimize policy system
- Establish the overall cost-benefit economic efficiency framework
- Take trading cost of governmental regulation into consideration
- Promote the economic incentives on consumer terminal, leading the terminal market demand driven supply.
- Design a set of operational analysis tools in the project level
- Put benefits of low-carbon green building construction on a macro economy level from different aspects of economic bodies.



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4.2 Further research

- How the additional incremental investment on green building have a macro impact on the overall economy?
- How to use all kinds of IAM(Integrated Assessment Model) in cost calculation of carbon emission?
- How to apply carbon trading system for green building promotion?



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Thank you



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