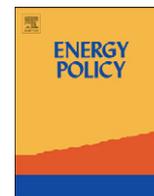




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Energy policies for sustainable livelihoods and sustainable development of poor areas in China [☆]

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ABSTRACT

Focusing on the sustainable livelihoods of rural households and regional sustainable development, this research takes Yan'an at the upper reaches of Yellow River and Zhaotong at mid-upper reaches of the Yangtze River as the study areas, extracts the central affecting factors of energy consumption and characteristic indexes of energy zoning based on 1560 rural household questionnaires of 85 villages in 4 counties (districts) and database analysis of socio-economic development, conducts energy zoning for the poor areas in China, and puts forward specific supporting policies for each type of zone. The research finds that (1) the study areas are found to have the following energy consumption characteristics: low per capita energy consumption (merely 1/4 of the national average), with energy consumption for non-production purposes taking up the main part (more than 70%), high proportion of non-commercial energy, i.e. firewood, straw, etc. (more than 45%), low utilization rate of such new energy resources as biogas, solar energy, etc. (lower than 2% in high mountain regions), remarkable differentiation of vertical and horizontal zonality, etc. (2) Physical conditions like temperature and topography, socio-economic factors, i.e. income of rural households, energy endowment, transportation conditions, and institutional factors like policy support are the major affecting factors of energy consumption and characteristic indexes of energy policy zoning. (3) According to the characteristic index evaluation and matrix classification of both the suitability for energy development and types of regional energy endowment, the poor areas in China can be divided into three energy policy-oriented zones, i.e. network-based centralized energy supply zone, diversified energy utilization zone, and new energy utilization zone.

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1. Introduction

China is a developing country with widely distributed poor areas and a large impoverished population. If we label a county as a poor county when its per capita income is 60% lower than the national average, the number of poor counties in China in 2003 would be 795, and the total population of these poor counties would be 0.319 billion and the total area of them would be 3.46 million square kilometers, accounting for 25.2% of the total population and 36.0% of the total area of China, respectively. After years of poverty alleviation, as the food problem of people living in poor areas has been basically solved, their energy consumption for non-production purposes has become the core problem confronting the poor areas and the important aspect of future poverty alleviation work (Fan, 1997).

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There are great differentiations among different poor areas in natural geographical environment, energy endowment conditions, transportation and geographical positions, economic development level, and so on. Therefore, it is vitally necessary to work out varied and target-oriented energy policies based on the regional differentiations.

Rural households are the basic unit of human activities in the poor areas of China (Zhao and Guo, 2000; Xu et al., 2008). From the perspective of sustainable livelihoods, energy is the basic livelihood asset on which the rural households rely for their survival and development (Chamber and Conway, 1992; DFID, 2000). China's poor areas are usually of vulnerable ecological background (Guo and Jiang, 1995; Fan, 2001). Rural households have long been using firewood and straw as their main energy consumption for non-production purposes on a large scale, leading to damage to vegetation, e.g. forests and grasslands, which has caused huge ecological stress on the natural environment of poor areas (Zhang, 1995), and the damage to ecological environment, especially large area of water and soil loss and the decrease in soil organic matter content, in turn, results in enormous decline in the output capacity

of the basic livelihood assets on which rural households depend for survival, such as agriculture, biomass energy, etc., and the long-term stagnancy or even retrogression of regional economic development, along which rural households' income level and livelihood assets also decrease (Su et al., 2009). Energy issues have caused problems to the sustainable livelihoods of rural households, and further affected the progress of regional sustainable development, and the intensification of regional unsustainability will make rural households' sustainable livelihoods deteriorate even further and hence forms a 'vicious circle of poverty' in some areas of China.

Solving the energy problem of rural households in poor areas is a key field of long-term poverty alleviation, but the effect of policy implementation is not satisfactory. This is mainly because universal poverty-alleviation-oriented energy policies are implemented in all different areas, ignoring the regional differentiations of the target objects. For example, the same kind of energy is developed in all areas regardless of their different energy endowment conditions, with all attention focused on small hydropower this time and all on wind power or solar energy the next time, reflecting no energy endowment disparities of different areas (Shi, 2000). In the implementation of "large power grid entering rural households", no consideration is given to the location conditions and regional differentiations in each area, resulting in huge cost of centralized energy supply. Another case in point is the development of solar cooker, wind turbine, and biomass gasifier regardless of local rural households' ability and willingness to pay and the accessibility of new energy. Once the state subsidy stops, so does the utilization of new energy. Therefore, the implementation effects of poverty-alleviation-oriented energy policies are by no means satisfactory.

The position of China's poor areas is more prominent in responding to global climate change. On the one hand, impoverished rural

households destroy ecological system such as forests and grasslands severely in order to solve their energy consumption problem. As a result, the carbon fixation capacity of plants is weakened; on the other hand, the energy utilization efficiency and conversion efficiency are generally low in poor areas, which lead to increases in carbon emission. Thus, finding the solution to the energy consumption problem in China's poor areas is also of remarkable value for carbon fixation and carbon emission reduction.

We brought up energy consumption characteristics and other related issues in poor areas as early as 1996 in China Energy Strategic Research (2000–2050) and the subsequent study on the Renewable Portfolio Standard in China (China Energy Strategic Research Group, 1996; Fan et al., 2005). In regional development research, especially in the related research projects of China's Western Development Program, we discussed sustainable development issues in poor areas such as the ecological deterioration and sustainable livelihoods of rural households, and suggested one of the reasonable approaches to deal with the energy problems of China's poor areas, which is to develop renewable energy and moderate centralized energy supply in the light of local energy endowment conditions. In 2003, we were commissioned by National Development and Reform Commission to conduct a research on the coordinated development of regional economy and resource environment in underdeveloped areas, in which the energy problem in poor areas again became our research focus in combination with the sustainable livelihoods of rural households and regional sustainable development. Due to the contract requirements of the program, the research achievements were not published until now. The energy consumption structure and energy policies in China's poor areas have not shown any significant changes in recent years, and our investigation data and research findings are still reliable and pertinent with a reflection of the objective situation and energy policy demands of China's poor areas.

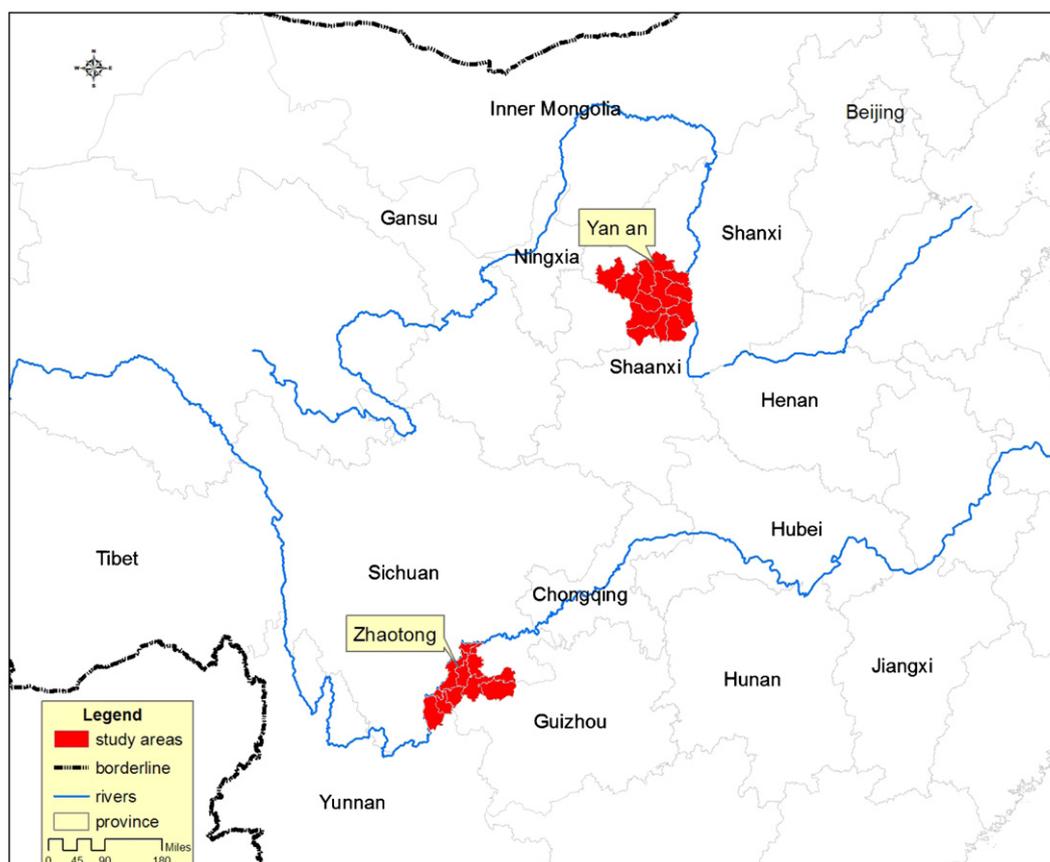


Fig. 1. Sketch map of study area distribution.

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