Human-environment sustainable development of rural areas in China

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Abstract. Human-environment sustainable development has become the important issue of rural transformation development in China. This paper analyses the development status of rural sustainability in China, and also presents the challenges facing the sustainability from the economic, social and environmental levels, including land and energy efficiency, solid waste, water and other types of environmental pollution. At last, the paper proposes the measures to establish the sustainable and liveable rural areas in China, like raising rural community awareness of sustainable development thinking; improving resource efficiency and new energy; and creating rural green industries and green products.

1. Introduction
Rural development is the process of improving the well-being and life quality of rural people. In addition to the traditional economic development, it also involves social and environmental development. In recent years, China has made great progress in terms of the economic development of rural areas [1]. The living standards of the rural community have improved greatly. However, China also faces many economic, social and especially environmental challenges to making rural areas more sustainable and liveable, such as high cost of developing new energy, the presser to increase energy conservation, an increasingly ageing population, environmental burdens, natural resource constraints and other related issues. For example, the industrialization and modernization of the rural areas still largely depended on the consumption of the traditional fossil fuels, which contributes to the climate change. Furthermore, as industrialization, urbanization and agricultural modernization continue, the rural places are often faced by biodiversity loss, air and water pollution issues. These issues pose adverse risks to natural environment and local community development, eroding the natural and human capital upon which rural future development depends.

Currently, China aims to build a “Beautiful China” and enhance the ecological civilization development with emphasize on the quality and efficiency of rural economic development. This requires the rural areas to explore a new sustainable growth pattern, which combine human development and environmental sustainable development objectives [2]. Resource consumption, energy security and critical environmental issues are increasingly integrated in rural development and planning. In fact, the rural areas should pay more attention on green development and low carbon development to achieve poverty eradication, changing unsustainable and promoting sustainable patterns of consumption and production and protecting and managing the natural resource base of economic and social development.
2. Status and challenges of sustainable development of rural areas in China

The theory of harmony between nature and man is one significant component of the traditional values of Chinese civilization. During the past several years, China has proposed some comprehensive and sustainable development concepts such as resource-saving and environment-friendly society, ecological civilization and green development, innovation-oriented country, and continuously put these concepts into practice. These substantive actions have transformed the sustainable development of rural areas in terms of resource conservation and environmental protection [3]. For example, over the past few decades, China has put in great efforts to improve energy efficiency, and also intensified air and water pollution control and comprehensive waste management in rural areas. As a result, the total emissions of Sulphur dioxide and chemical oxygen demand have dropped by 14.29% and 12.45% in 2010. In 2009, China agrees to reduce CO2 emissions per unit of GDP in 2020 by 40% to 45% compared with 2005 levels. In fact, China has become the world’s largest producer in terms of renewable energy using, like hydro power, wind power installed capacities and solar water heater collector area (See Table 1) [4].

| Installed Renewable Energy and power-Generating Capacities in China. |
|---------------------------------------------------------------|
| Installed capacity(MW) | Power-Generating Capacity(100 billion kWh) |
| 2006 | 2007 | 2008 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|
| Nuclear | 6,850 | - | 8,850 | 543 | 626 | 684 |
| Hydro | 128,570 | 145,260 | 171,520 | 4,167 | 4,867 | 5,633 |
| Wind | 1,870 | 3,304 | 8,940 | 27 | 56 | 128 |
| Biomass | 84 | 268 | 596 | 1.04 | 7.00 | 18.04 |

Source: P.J. Li (2009)

As rural areas developed in China, both challenges and opportunities will arise. Thus, the benefits of rapid growth in rural areas have also caused some serious costs, including damages to rural environment and natural resources that could undercut sustainable future growth and development. Rural people face many interconnected environmental challenges. First, in terms of economic development, most of the rural places are still depending on the solely agricultural development, which are is not sustainable in the long term. Also, this can lead to more poverty in some areas. Second, rural people often lack of the knowledge of environment sustainability, which forms another challenge for the rural sustainable development. Residents and local rural leaders have limited awareness of the importance of saving energy and reducing emissions. Third, environmental damage has particularly important implications for increases in poverty and lack of inclusion. In some rural areas, land and energy, solid waste, water and other types of environmental pollution threaten people’s lives, health and productivity and also bring frequent occurrences of extreme climate events. For example, in some rural areas, people used marginal lands, destroyed forests for fuel or production, over-extracted and polluted of water resources, which brought long-term consequences. Other examples of environmental threats from rural development include dietary shifts towards meat and dairy, increased demand from urban populations for environmental services, and increased waste associated with changing consumption patterns. However, People in rural areas are particularly reliant upon natural resources for their livelihoods, with most engaged in farming.

In conclusion, rapid rural development causes the depletion of natural resources, threatens the live ability of rural areas, and impedes sustainable human development in China. Environmental degradation and the current unsustainable growth model add pressure on human health and ecosystems in rural areas. China needs a new transformative grow path to shift away from its GDP growth-driven development goals to sustainable development, green economy, and human development in its socio-economic blueprint in rural areas in order to improve rural people’s living standards and environmental quality [5].
3. Towards more sustainable and liveable rural areas in China

3.1. Raising rural community awareness of sustainable development thinking
China needs to establish a robust public awareness-building mechanism and education programs in energy saving and emission reduction, especially in rural areas, to raise public awareness about sustainable concept and promote public participation in environmental protection. Nationwide campaigns need to be launched to educate the public about sustainable concepts and to promote environmentally friendly consumption and lifestyles. [6] Meanwhile, public awareness needs to be fostered of low carbon and energy-efficient products, technologies, methods, and practices, and people should be encouraged to adopt sustainable consumption and production practices. The government also needs to ensure the fullest public involvement in scrutinizing the environmental management process.

Furthermore, the currently performance appraisal and review process and system for officials needs to be reformed to shift the focus away from only economic growth and infrastructure construction to include measuring their performance based on environmental protection in addition to improvement in living standards and social economic progress.

3.2. Creating rural green products and improving resource efficiency
Rural planning should aim at ensuring that rural areas are people-centered, which means that rural development should improve the quality of life and economic well-being of farmers. It involves rising agricultural productivity, commercialization and diversification of production patterns and livelihoods within the agricultural sector and the rural non-farm sector [7]. In addressing the sustainable development of rural areas, the rural should effectively adopt green production system and produce more green products.

China should transition from its heavy dependence on energy and resource consumption to improving energy and resource efficiency. The rural areas also should transfer from its heavy dependence on fossil fuel use to use new energy, such as solar energy, wind energy, and water energy to improve energy efficiency (see table 2). Such a transformation is not only for the economic development of rural areas, but also for the long-term sustainable growth.

| Table 2. Future of China's renewable energy development |
|--------------------------------------------------------|
|                                                      |
| Annual consumption of renewable energy(100 million tons coal equivalent) | 2.55 | 4.78 | - |
| Proportion of renewable energy in total energy consumption (%) | 7.8 | 9.5 | 15 |
| Annual bio-energy consumption(10,000 tons coal equivalent) | 550 | 5,000 | - |
| Solar power capacity(100 million kilowatts) | 80 | 2,100 | 5,000 |
| Accumulated area of solar heating(100 million square meters) | 0.17 | 4 | 8 |
| Grid wind power capacity(100 million kilowatts) | 0.31 | 1 | 2 |
| Hydropower capacity(100 million kilowatts) | 2.16 | 2.9 | 4.2 |

Source: National Energy Administration, 12th Five-Year Plan of Renewable energy Development

3.3 Promoting ecological civilization of rural areas
Ecological civilization is a new concept, which shifts from the past emphasis on economic construction as the core of social development, to one based on development that is more balanced between man and nature. The ecological civilization process of rural areas encompasses all material, spiritual and institutional achievements in easing the increasingly intense conflicts between humans and the environment. It includes mitigating ecological crises and disasters, relieving pressures on natural resources, and improving the balance between the environment and economy, and between individuals and society.
4. Conclusion
In conclusion, China’s rural areas have achieved great development during the past few decades. Nevertheless, this paper demonstrates that there is still a need to move to a green development mode which is not only environmentally sustainable, but also including creating the conditions for greater job creation, greater resource efficiency and energy security.

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