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Review

Ecological governance in rural areas: Finnish approaches and practices

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Along with the development of rural areas, rural ecological issues caused by inappropriate anthropogenic activities have not been drowned in the contexts of global environmental problems. The acceleration of rural development in developing countries would result in a series of potential threats to the deteriorating environment, if no effective governance strategies were applied. The significance of ecological governance in rural development has been widely recognized. Nonetheless, literature information available on successful approaches for ecological governance in rural areas is limited or fragmented. As a successful country in both urban and rural environmental protection, Finland has the advanced mechanism of ecological governance applied in all sectors of society. Based on an exploratory investigation, this study generally illustrates and discusses the Finnish approaches and practices in rural ecological governance. As a context of this research, the Finnish rural development in general has been discussed. Subsequently, this paper illustrates the Finnish approaches and practices in the governance of rural water, waste and land, followed by the discussion of the enlightenments for the promotion of rural ecological governance in developing countries. The main contribution of this paper resides in the experience sharing and learning to help developing countries or regions build up better ecological governance to support their rural development.

Key words: Ecological governance, rural development, environmental instrument, Finland.

INTRODUCTION

Over the past several decades, the global economy together with the population has been booming. Through industrialization, urbanization and modernization, the world is witnessing severe environmental problems due to inappropriate anthropogenic activities (Sivrikaya et al., 2011; Xie et al., 2014). Especially the developing countries, such as China and India, have over-emphasized the economic development, bringing in the most serious environmental problems on the planet. Environmental terms, such as global warming and climate changes, water pollution and biodiversity loss, are not new at all for human beings. Natural disasters

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resulting from global warming can give rise to tremendous damages to local areas in terms of the economy, and people's health and safety (Cai et al., 2012). Water pollution from agriculture, industry, and municipalities is a major global problem. Nutrient imbalance in water can lead to eutrophication, causing disasters to the respective ecosystems and risking the integrity and development of biodiversity (Zhu and Ketola, 2011; Zuo et al., 2011).

Environmental degradation in developing countries is rapidly accelerating not only in cities but also in rural areas. Since stricter environmental regulations have been employed in urban regions, polluting corporations have moved to rural areas where environmental regulations still remain weak (Yu, 2014). Therefore, rural areas of developing countries have been shouldering the ever-increasing environmental burden. According to Massoud et al. (2009), up to 82% of rural populations in developing countries lack access to sanitation services. Wastewater from household in rural areas is found to flow into rivers, lakes and seas without any treatment, polluting the environment and threatening people's health and food security. The wastes in rural areas cannot be efficiently tackled, eroding the land and threatening the localhygiene (Al-Salem et al., 2010). It is reported that rural pollution during urbanization and economic development has contributed to the prevalence and exacerbation of allergic diseases in many Asian countries (Leung et al., 2012). In addition, rural areas in developing countries also witness a lack of efficient land resource governance, causing forest shrinkage and the change of agricultural land usages. The number of forest-dependent poor people in rural areas is increasing, and it is believed that 2 billion rural poor across the globe rely on degraded forest for their livelihoods (Kettle, 2012). Farmland use change is another emergent issue in developing countries. Taking China as an example, a serious replacement of farmland with urban and rural settlements, construction land and artificial ponds has been occurring, due to rapid industrialization and urbanization (Long et al., 2009).

As mentioned above, the accelerating rural development in developing countries would result in a series of potential threats to the deteriorating environment, if no effective governance strategies were applied. Ecological governance is significant in rural development. Ecological governance refers to the control and management of the environment and natural resources during the processes of decision-making (Robertson and Choi, 2010). Ecological governance issues mainly include water pollution, waste disposal, and soil deterioration, and it requires human beings to adjust their behaviors of living on the earth. Through relative rules, practices, policies and institutions, ecological governance shapes how humans interact with the environment, which helps us move towards a more sustainable future.

The instruments for ecological governance consist of law, economic and policy methods, which have been well developed in the context of current ecological governance. Especially new policy approaches such as tradable permits have obtained increasing political importance for ecological conservation in the past decades (Mann and Absher, 2014). Effective ecological governance at local, state and international level is critical in an attempt to seek solutions to these challenges (Pincetl et al., 2011). Many efforts have been made to establish participative, collaborative processes that contribute to the effective ecological governance (Robertson and Choi, 2010). Evans (2010) proposes integrated, collaborative, and adaptive governance, where the inclusion of a diversity of stakeholders and their knowledge and values in governance processesis advocated.Tang and Tang (2014) have illustrated incentive dynamics for collaborative governance in land and ecological conservation and found how various interactive dynamicsaffect efforts applied by stakeholders from multiple sectors. Investigating watershed ecological governance, Parkes et al. (2010) suggest that integrated governanceis more likely as a basis for the fosterage of health, sustainability and social–ecological resilience.

OBJECTIVE AND STRUCTURE OF THIS STUDY

Finland is considerably successful not only in economic growth but also in environmental protection over the last thirty years. According to several international indicator comparisons, Finland is successful in competitiveness. The World Economic Forum (WEF), for instance, shows that Finland was the world's most competitive country in 2005 and ranked second after Switzerland in 2013. This success tems from substantial natural resource endowments, a low population density as well as effective governance of ecology. As to ecological governance, Finland's advantages include highly effective environmental legislation, and the ways that environmental protection is taken into account in all sectors of society (Lyytimäki, 2007). Ecological governance has a key role to play in the Finnish environmental protection not only in urban areas but also in rural regions. However, there is fragmented information published about the Finnish approaches and successful experiences of rural ecological governance in practice.

This is an exploratory study and it generally discusses the Finnish approaches and practices in rural ecological governance. Thus, it can add some advanced information into literature to help developing countries or regions build up better ecological governance in rural areas. In the coming sections, we first introduce the Finnish rural development. Afterwards, rural ecological governance approaches and practices will be presented and discussed, followed by enlightenments for developing countries to promote their rural ecological governance. Finally, a summary of this study will be concluded.

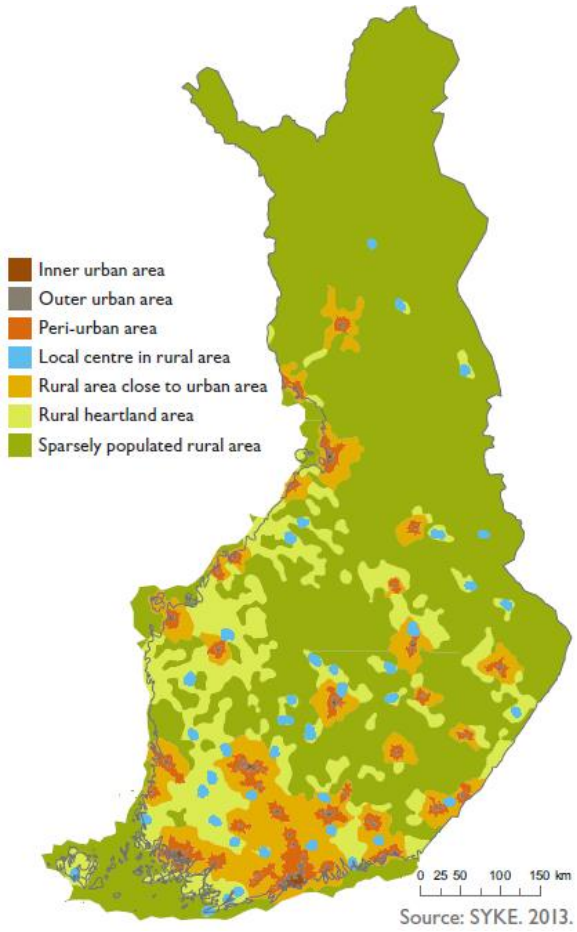

Figure 1. Urban-rural classification in Finland (Putkuri et al., 2013).

FINNISH RURAL DEVELOPMENT

As we all know, it is hard to define rural areas. One of the most popular definitions is based on a three-level division: urban-adjacentrural areas, rural core areas and remote rural areas (Muilu, 2010). In the last 2 decades rural issues have been increasingly researched in many countries. Undoubtedly, rural development is a hot topic, since it refers to the process of life quality improvement and well-beings of people who live in rural areas. One obvious characteristic of rural development is urbanization. During the urbanization, the drift of population away from the countryside is one of the main features, which have affected the regional structure in many countries. The process for the movement between countries might be different. Education, entrepreneurship, environment and infrastructure have important roles to play in developing rural regions. Unlike urban areas, rural regions are highly distinctive from one another. Therefore, a large variety of rural development approaches exist globally and Finland has its own properties in contrast to other countries.

Following Iceland and Norway, Finland is the third European country with the sparsest population (Muilu and Rusanen, 2003). According to the World Bank, population density in Finland was last measured at 17.7 inhabitants/km^2 in the later time of 2012. Finland has broad rural areas (Figure 1). However, the current rural population occupies only 16.15% of the total population in Finland. As shown in Figure 2, three development phases are classified in Finnish rural evolution: Urbanization, joining the EU, and globalization (Kivinen et al., 2006). As to each stage, some distinct properties are presented. The changes in rural population, age structure, entrepreneurship, facilities and industrial structure evidently occur during the Finnish rural development. Under this situation, environmental pressure has been increased accordingly. How to prevent and control rural pollution is not only an assignment but also an artwork for Finland.

ECOLOGICAL GOVERNANCE

The Ministry of the Environment formulates the Finnish Government's environmental policies such as ecological governance and environmental protection. The Ministry supervises the environmental work undertaken by the regional and local agencies. The Ministry is also responsible for strategic planning and management, new legislation establishment, and environmental co-operation at international level. Here, the main ecological governance in Finnish rural areas will be presented and discussed, including the governance of water, waste and land.

Water governance

Almost one million residents in Finland live in houses where the centralized sewage systems are not extended. It is reported that there are about 350,000 onsite wastewater systems serving about 300,000 permanent residences and 450,000 holiday cottages (Matikka, 2013). The discharge of phosphorus into water body in Finnish rural areas witnesses 50% higher than that in urban areas (Ruokojärvi, 2007). Rural waterbodies are subjected to eutrophication (Zhu et al., 2011) and thus rural water governance is essential in Finland. Compared to other EU countries, Finland has thorough and strict rural wastewater treatment policy, since a lot of lakes are located in Finland and they are sensitive to eutrophication (Matikka, 2013).

The constitution of Finland defines that every citizen is responsible for the environment, and authorities shall endeavor to guarantee every one the right to a healthy environment. The Environmental Protection Act states the general requirement to treat waste waters using appropriate methods to prevent any threats to the environment. In addition, the Water Services Act regulates

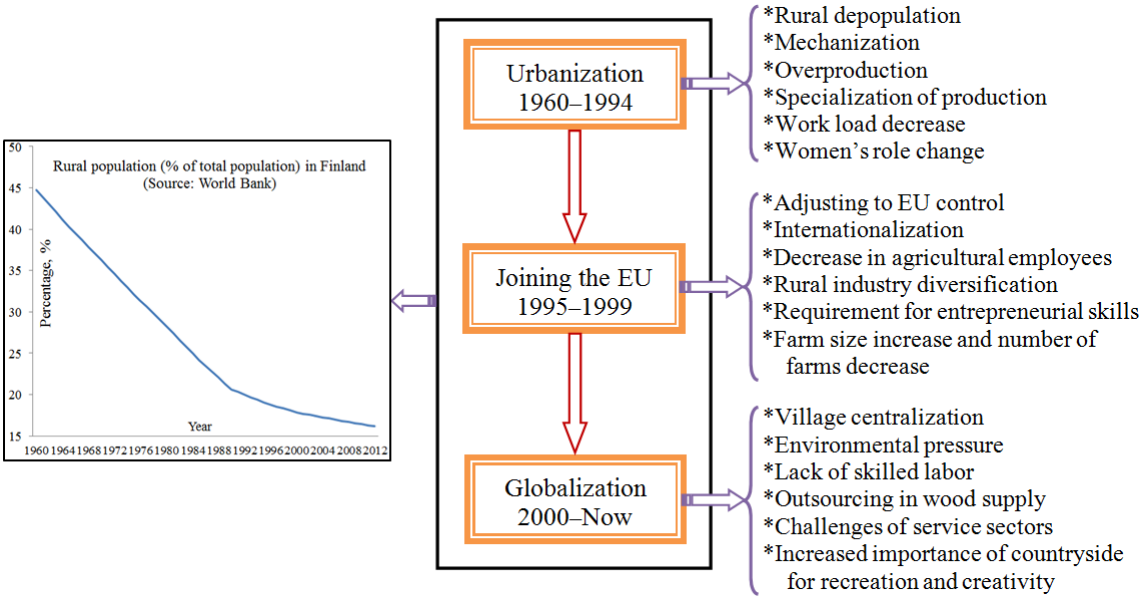

Figure 2. Rural development in Finland from the 1960s to now.

that every household which is within the municipal sewage networkis required to be connected to the system. Targeted to treat rural wastewater, the Onsite Wastewater System Decree, which was established in 2004 and updated in 2011, sets minimum requirements for wastewater treatment in areas outside sewer networks.The decree stipulates that at least 90, 85 and 40% of the organic matters (BOD_7), total phosphorus and total nitrogen should be respectively removed from wastewater in rural areas. The local municipality who is the supervising authority, might also have their own stricter regulations.

Whenever it is possible, rural wastewater should be linked into the sewer network system for centralized treatment if costs are affordable. Due to the sparse population distribution in rural regions, decentralized wastewater treatment methods are preferable in Finnish villages (Figure 3). The wastewater within a village or from nearby households can be collected together, and a joint sewer system can be built. For example, 560 small wastewater treatment plants in Finnish rural areas were designed for over 5000 inhabitants in 2004 (Santala et al., 2006). However, a joint treatment requires share holders to cooperate in division of labor, allocation of costs as well as agreement of maintenance responsibilities.

If joining a centralized sewer system or building a joint treatment plant is not feasible, plenty of onsite wastewater treatment systems which are popular in Finnish rural regions can be considered for decentralized wastewater treatment. One approach is to treat the toilet waste and washing waters separately. This method is well used in summer cottages in Finland. A dry toilet (composting toilet) can be installed, and washing waters can be treated separately with some simple methods such as leach field or sand filter. Modern dry toilets are found to be comfortable andodorless when properly used (Matikka, 2013). Another prevailing approach is to treat wastewater in a combinedmanner via a two- or three-stageseptic tank and the subsequent treatment systems, such as batch plants, active sludge plants, biofilter, sand filter, biological-chemical plants and constructed wetlands (Zhu et al., 2013). Among all of the systems, a buried sand filter equipped with a separate unit forphosphorus precipitation is well employed in Finnish rural areas (Tuukkanen, 2006).

Waste governance

The rural population has been decreasing for a long time in Finland. Usually, the villages are small, and industry is also sparsely distributed. Thus, it is necessary to centralize wastes from different villages and deliver them to a certain place for the subsequent disposal (Figure 4). Waste governance in Finland aims to prevent the generation of wastes and promote the recovery of waste materials. During the waste governance a certain order of priority should be considered as follows (Ministry of Environment, 2013): The generation of wastes should be avoided; if wastes are produced, they must be considered for reuse or recycling; if recycling is not possible, wastes must be used to produce energy; and wastes may be landfilled only if recovery is not economically or technically viable. In 2008 the Finnish government established the National Waste Plan, where around 20, 50 and 30% wastes will end up in landfills, be

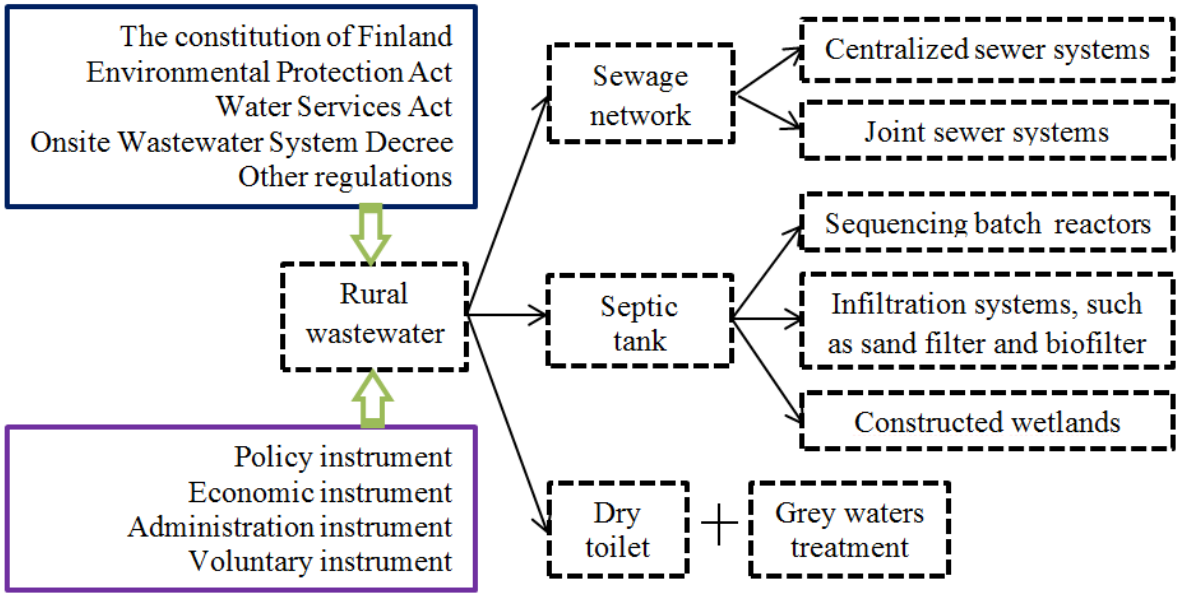

Figure 3. Finnish rural wastewater management and treatment technologies used in practice.

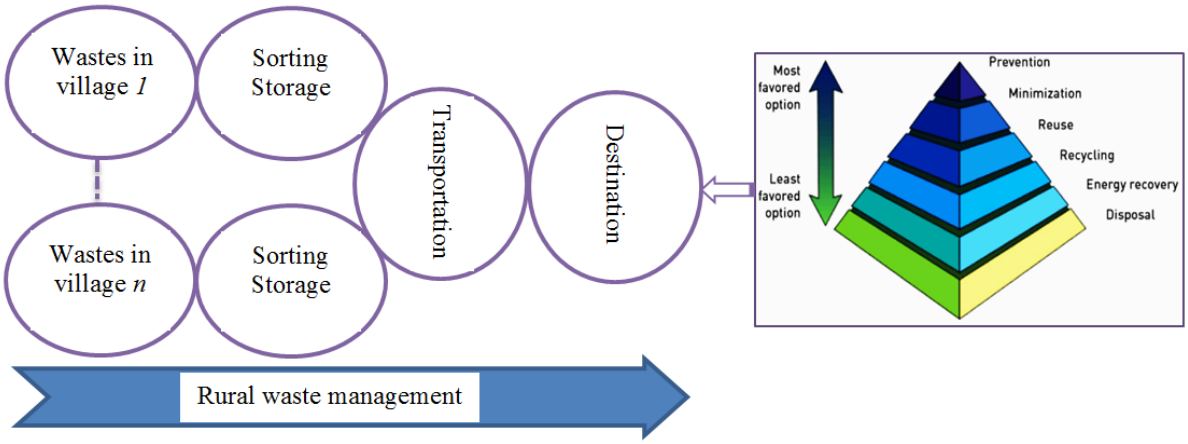

Figure 4. Rural waste governance in Finland on the basis of the waste disposal hierarchy.

recycled and be recovered for energy, respectively (Putkuri et al., 2013).

Another characteristic for Finnish rural waste management is effective sorting. This is attributed to Finnish education for environmental protection as well as waste sorting dissemination in rural regions. The sorting of wastes is regulated by Finnish law (Waste Act), and any activities related to littering, burning of garbage and leaving garbage on road sides are prohibited. Finnish rural wastes contain paper and cardboard, bio-waste, glass, metal, wood and plastic, all of which cannot be mixed before throwing (Piippo, 2013).

Property-owners and housing companies are obliged to organize waste collection points and containers. After efficient sorting by waste producers, wastes should be taken into containers designed for different types of wastes at collection points. After transportation, where logistics are effectively organized by municipal waste companies, municipalities are obligated to organize the utilizationand treatment of the wastes in an appropriate way.

In Finnish rural areas, economic instruments are also applied to createincentives for people to act a more environmentally preferable behavior (Finnish Environment Institute, 2010). These instruments include waste chargesfor the collection and transportation of wastes, oil waste charges for managing oil wastes, drinks packaging taxes for the reuse of drinks packages, and

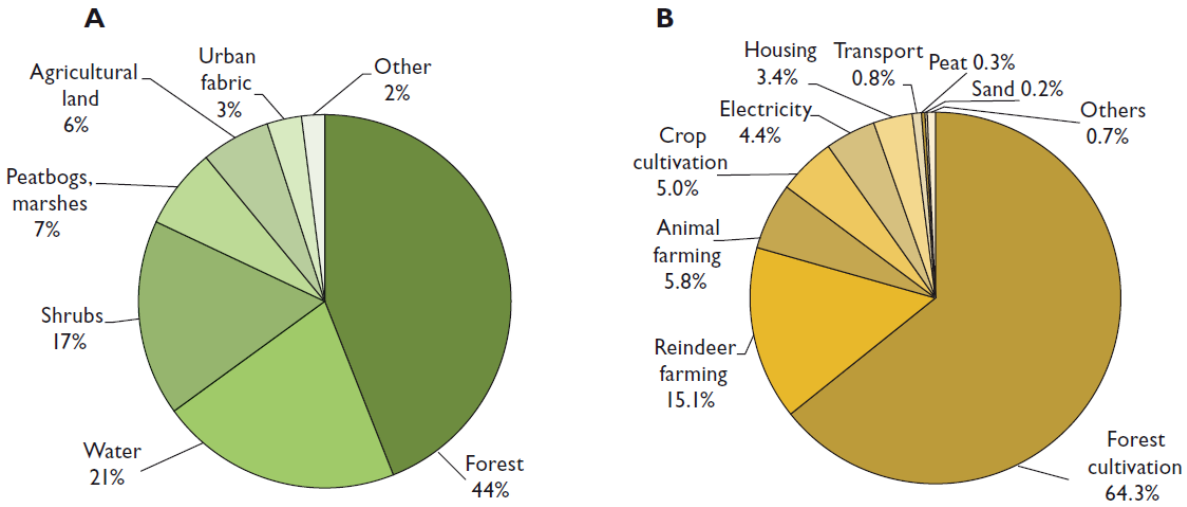

Figure 5. Current status of land in Finland. A: Total land surface coverage; B: Allocation of the inland area to different usages. Source: Mattila et al. (2011).

waste taxes for landfilling.

Land governance

A high-quality environment, which results from well-considered and integrated land use, presents one of Finland's strengths (Ministry of Environment, 2006). The objectives of land governance in Finnish rural areas are to preserve the prerequisites for forestry and agriculture, to diversify industry and business, and to provide good residential conditions. From the land coverage perspective, forests represent the largest share (Figure 5A). The share of agricultural land in the total land coverage is very small, and it maintains the biological diversity. From the land use point of view, forest cultivation accounts for 64.3% of the total, followed by agricultural activities (Figure 5B).

In Finland, land use planning at different levels is always participatory, which means that local communities and stakeholders are involved in all of the planning processes. Agriculture and forestry are practiced in the manner of economically and ecologically sustainable and ethically acceptable throughout the country (Ministry of Agriculture and Forestry, 2013). It is widely recognized that appropriate rural land management can solve five key environmental issues: biodiversity loss, landscape damage, water management deficiency, soil erosion and climate change (Figure 6).

Agriculture has an important role to play in the whole society, since it undertakes the responsibility to preserve the feasibility of farming, maintain managed agricultural landscapes, and provide products such as food for the people and other rural industries. Through the effective management of agriculture, landscape and biodiversity can be protected efficiently. Still, pollution stemming from agriculture witnesses a positive decrease (Ministry of Agriculture and Forestry, 2014). Due to the more accurate utilization of nutrients and prohibition on the use of synthetic chemical fertilizers andpesticides, organic farming witnesses lower environmental and water loadings compared to conventional agriculture in Finnish rural regions.

Finnish forestry also has potential to help mitigate climate change and reach climate policy objectives through the appropriate usage of the natural forest resources and the production of bioenergy. Finland is the most forested country in Europe, and the share of forest land area in total is 73.9%, 36.1% higher than average value in EU-25countries (Ministry of Agriculture and Forestry, 2014). In contrast to other European countries, Finland employs stricter regulations for forest protection. The area of protected forests has been tripled over the past 35 years (Lier and Parviainen, 2013). The average size of managed stand, which is the basic unit for forest governance in Finland, is 1.2 ha, the same as the average in Germany, Austria and France (Kellomäki et al., 2005). Forest governance on a mosaic-like basis is throughout the growth and regeneration phase. Seedling stands are managed by cleaning and thinning in the growth phase, while in the regeneration phase seed trees are left standing to seed the site.Each year, two thirds of the area of regenerated forest land, which is equal to about 0.8% of all forest land, is cultivated with seedlings, while one third is regenerated either naturally or by direct seeding (Lier and Parviainen, 2013).

ENLIGHTENMENT FOR DEVELOPING COUNTRIES

During the Finnish rural development, ecological governance plays a key role in rural environmental

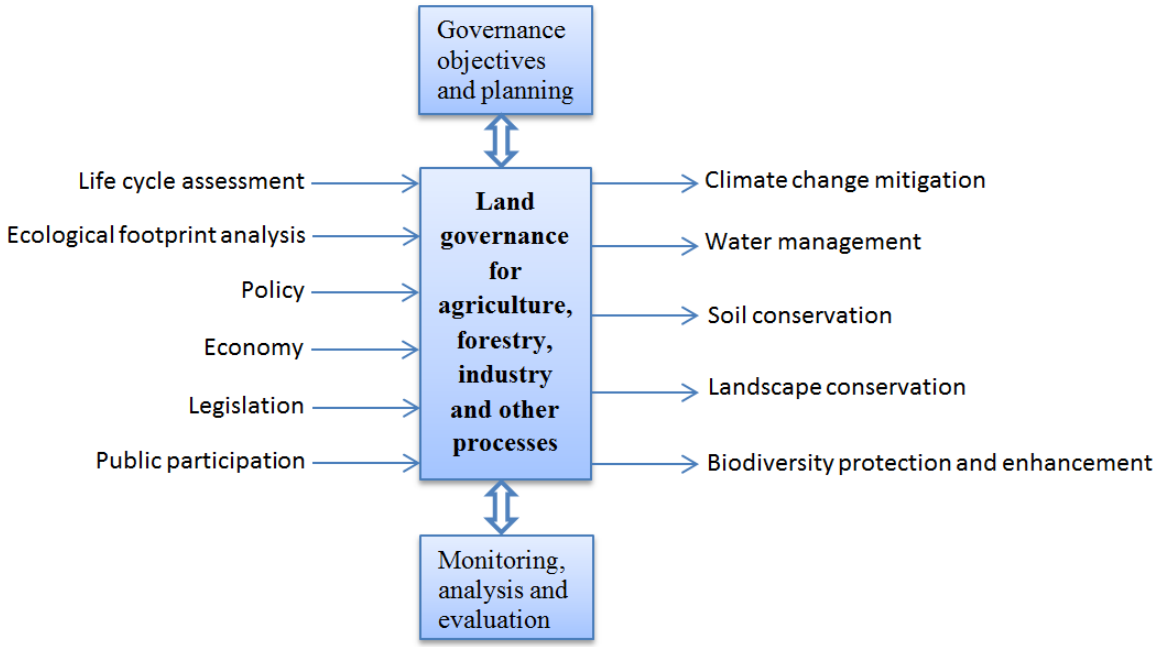

Figure 6. Land governance approaches and potential effects in Finnish rural areas.

protection and construction. The Finnish success has provided some enlightenment for developing countries or regions to promote their rural ecological governance. In order to achieve better rural ecological governance, several key areas should be emphasized as follows:

1. Reduce environmental load to water, soil and air from agricultural sources. Organic farming is recommended, since it will cause less loading to water, soil and air than conventional farming and thus increase local biodiversity (Ministry of Agriculture and Forestry, 2013). The rural areas have good advantages in the access to green manure and compost, which can become the organic fertilizers for crop cultivation. In addition, techniques, such as crop rotation and biological pest control, can also be applied in organic farming.
2. Reduce environmental load to water and soil from household. Developing countries cannot afford the funding to construct centralized facilities and lack thetechnical expertise to operate them (Zhu et al., 2013). Thus, decentralized wastewater treatment systems can be employed in rural areas. For small communities a decentralized system is a long-term solution with reliable and cost effective performance (Massoud et al., 2009). Environmental policy and reform including funding support concerning wastewater management in developing countries can help promote the process.
3. Minimize the generation of wastes and promote the recovery of waste materials. Villagers might lack knowledge about the waste sorting as well as awareness for this practice. If the wastes in country side can be effectively sorted, the following disposal will be easy to proceed and the costs will be limited as well. Therefore, some relative dissemination and education is necessary to improve the public awareness and participation of waste management.
4. Maintain various landscapes no matter whether they are used to produce food or other raw materials. Landscapes with native wildflowers, grasses and trees can improve the local environment. In addition, landscapes can contribute to maintaining the habitats of large number of plant and animal species living in farming environments.

The efficient rural ecological governance can provide foundation for the construction of local eco-village (Figure 7), which develops the basic sources of livelihood and the competitiveness of business in the rural areas. Local residents, enterprises, municipalities and associations can be brought together to develop the residential areas, to preserve local culture, to enhance the local skills as well as to build the active network between the rural and urban areas.

CONCLUSION

Finland, as a country with very sparse population, is predominantly or significantly rural. Through urbanization, modernization and globalization, the structure of Finnish countryside has been changed not only in population but also in economy. Agriculture and forestry are still the

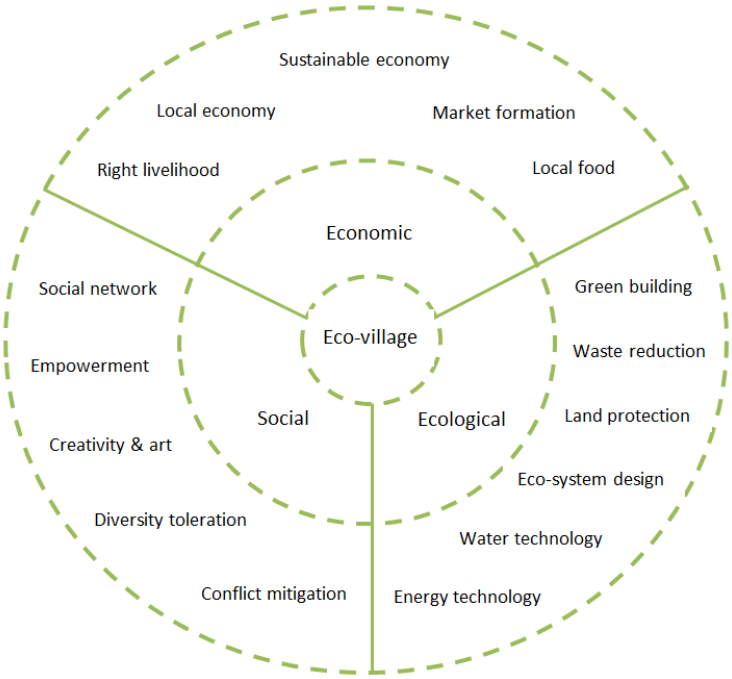

Figure 7. A proposed framework for eco-village construction and its elements.

main sectors during rural development. Along with the development of rural economy and the improvement of life quality, Finnish villagers have been attaching more and more importance to rural environment.

The role of rural ecological protection and management in Finnish rural development has received more and more attention. Finnish rural ecological governance mainly includes the governance of water, waste and land. From the water governance point of view, decentralized wastewater treatment systems have been successfully applied to purify rural wastewater. By following the order of priority applied to waste governance, rural wastes have been reduced through efficient sorting and recycling. From the perspective of land governance, efficient land use planning and regulations have ensured that Finnish agriculture and forestry are operated in an environmentally friendly manner. Organic farming and forest governance via growth and regeneration have contributed to biodiversity maintenance, landscape conservation, water quality improvement, soil restoration and climate change mitigation.

The Finnish approaches of ecological governance in rural development have been introduced and discussed in this paper. Via experience sharing, the study is beneficial to developing countries or regions to establish advanced ecological governance systems. This study may also be viewed as a starting point for practitioners, authorities and stakeholders to understand ecological governance practice in rural regions. Learning from Finnish approaches, developing countries or regions can decide upon the specific objectives and forms of ecological governance in their rural development, thus hopefully achieving better rural living quality via the construction of eco-village.

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CONFLICT OF INTEREST

The authors have not declared any conflict of interests.

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