

Environmental Policy in China: Forest Management and Development in Heilongjiang Province

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Abstract

Consumption of natural environment and resources often relates to economy growth of a nation. Environmental policy is a lever for coordinating the delicate balance between economic development and environment to solve the problem of concern around the world. At the same time, it is also a guiding policy that restricts the transitional development of environmental resources by enterprises or individuals. China is known as the world's second largest economy and developing country with the most rapid economic growth. Besides that, it faces the most critical problems in overexploitation of resources and environmental destruction. In China, Heilongjiang Province plays an important role in China's forest reserves and production due to its status as a major province with huge coverage of forest, and its policy related to forest management is certainly an important factor which will definitely affect the development and protection of forests in China.

As such, this article reviews and focuses on the impact factors of forest management and development-related environmental policy.

Keywords: *environmental policy, forest management, Heilongjiang Province, state-owned forest farm*

1. Introduction

Environmental policy is an intentional action to manage human activities in order to prevent, reduce or mitigate the harmful effects on nature and natural resources and to ensure that man-made changes to the environment do not have any harmful effects on human beings (McCormick, 2001: 17-40). It includes two key terms: environment and policy. Environment refers to a broad concept of three major dimensions which are the ecological (ecosystem) dimension, the social (quality of life) dimension and the economic (resource management) dimension (Bührs and Bartlett, 1993). According to the *Concise Oxford Dictionary*, policy can be defined as a course of action or principle adopted or proposed by a government, party, business or individual (Hothersal and Bolger, 2010). Therefore, environmental policy focuses on the problems posed by human activities towards the environment, by which negatively affecting human health or environment. The environmental policy always comprises environmental issues encompassing (but not limited to) management of waste, ecosystem, air and forest, protection of biodiversity, and protection of endangered species, wildlife and natural resources (*Tutorials Point*, 2018). Some certain environmental issues are addressed by a few instruments which are combined in a mixed policy. A few policy tools may be required to sufficiently remedy each issue since environmental issues have many aspects. Plus, a varied policies'

combination may provide better flexibility in compliance of policy and to alleviate uncertainty as to such compliance's cost (Braathen, 2007: 190-220).

1.1. Environmental Policy Related to Forests in China

The towering peaks and huge valleys of China's forests have promoted speciation and supplied refuge for wildlife such as golden monkey, snow leopard, giant panda, and crested ibis since the Ice Age for millions of years. China's lowland river valleys are sheltered by forested uplands which is storing rainfall and slowly delivering it so as to lessen the floods and droughts' severity, avoiding soils from eroding and making possible the nation's concentrated irrigated agriculture system. 40% of the fuel for rural households are contributed by forests. China has been known as one of the most forest-dependent civilizations in the world due to these solid reasons (WWF, 2016).

After China implemented the economic reform in 1978, state-owned enterprises such as state-owned forest farms began to be established and developed (Wang *et al.*, 2004: 71-83). Due to the lag and imperfection of the policy, institutional reforms were not in place causing state-owned forest farms to manage the forest unsatisfactorily (Chang, 2007). China's forests have been under unbelievable tension because of China's hunger for development. To make it worse, these developments have stolen the country of almost all of its great primordial forests (Greenpeace, 5th June 2011). For now, only 2% of its forests remain undamaged – that is only 55,448 square kilometres, of which solely 0.1% is completely preserved (State Forestry Administration of China, 2012).

China has halted the commercial logging of its natural forest in 17 provinces since 1998. Nevertheless, the globe's second largest timber importer is China (after the US), with approximately 15 million cubic meters of timber imported in 2000 (as compared to about 4 million cubic

meters before the logging ban), which is rushing the ruination of Siberian and Southeast Asian forests (Dauvergne and Lister, 2011: 605-606).

China develops specifications and guidelines for the protection of forest resources and the development of forestry production. Chinese forestry policy is an integral part of national economic policy and the objectives of government are implemented in the forestry sector. In order to determine the status (success or failure) of China forest policy, five factors are applied, namely as competence authority, human power, institution, management system and policy, by the government. All levels of forestry departments intervene and influence the direction of forestry to solve development problems according to the forestry policy guidance. Some policies may also be in legal form as national laws and regulations to be mandated in the implementation process. China's forestry policies are listed in Table 1.

Chinese central government policies are applicable to China's various provinces and regions. Due to the situation of rich forest resources in Heilongjiang Province, Heilongjiang provincial government developed provincial forestry policy in accordance with national policy strictly in the direction of the content and spirit of the central policy, with details of the actual conditions of the province.

1.2. Situations of Heilongjiang Province

Heilongjiang (literally “Black Dragon River”) Province is located in the northeastern part of China (Figure 1) with a total area of 10,098,000 hectares of forest, accounting for 22% of the province's land area (Heilongjiang Forest Industry Bureau, 2017). There are 8.46 million hectares of forest land, accounting for 11.7% of the national state-owned forest area (Zhang *et al.*, 2005:111-116). Living wood growing stock is 770 million cubic meters, accounting for 31% of the national

Table 1 China’s Forest Policy

Chinese Forest Policy (nationwide)			
	Name of Policy	Setting authority	Publishing date
1	Forest Law of The People’s Republic of China	National People’s Congress	1984/09/20
2	Law of The People’s Republic of China on the Protection of Wildlife	National People’s Congress	1988/11/08
3	Seed Law of the People’s Republic of China	National People’s Congress	2000/07/08
4	Law of the People’s Republic of China on Prevention and Control of Desertification	National People’s Congress	2001/08/31
5	Measures for the Implementation of the National Compulsory Tree Planting Campaign	State Council	1982/02/27
6	Regulations on Forest Fire Prevention	State Council	1988/01/16
7	Regulations on Forest Pest Control	State Council	1989/11/17
8	Regulations of the People’s Republic of China for the Implementation of the Protection of Terrestrial Wildlife	State Council	1992/02/10
9	Regulations of the People’s Republic of China on Nature Reserves	State Council	1994/10/09
10	Regulations of the People’s Republic of China on Wild Plants Protection	State Council	1996/09/30
11	Regulation of the People’s Republic of China on Protection of New Varieties of Plants	State Council	1997/03/20
12	Regulation on the Implementation of the Forestry Law of the People’s Republic of China	State Council	2009/01/29
13	The Act of Conversion of Degraded Farm Land into Forest	State Council	2002/12/06
14	Measures for the Management of Natural Reserve Areas of Forest and Wildlife	State Forestry Bureau	1985/06/21
15	Measures for the Management of Forest Harvesting and Reforesting	State Forestry Bureau	1987/08/25
16	Measures of the People’s Republic of China for the Control of Hunting Rifles and Ammunition	State Forestry Bureau / Ministry of Public Security	1993/10/27
17	Measures for the Property Disputes in Forest Wood and Land	State Forestry Bureau	1996/09/26
18	Measures for Quality of Afforestation	State Forestry Bureau	2002/02/17
19	Measures for the Management of Audit and Approval in Occupancy of Forest Land	State Forestry Bureau	2003/08/14
20	Measures for the Administration of National Forest Parks	State Forestry Bureau	2011/05/20
21	Regulations on Plant Quarantine	State Council	1983/01/03
22	National Treatment of Large Forest Fire Emergency Plan	State Council	2006/01/10

Source: SFA, 2017.

state-owned forest (Gao, 2012). Forest coverage is 84%, distributed in the Lesser Khingan Range, Zhangguangcai Range, Laoye Range, Wanda Mountains and other mountains (*ibid.*). It is one of the mainstays of the natural ecosystem in Northeast Asia and natural barrier of the northeastern large granary. It is also the main birthplace and conservation of the six major water systems – Heilong (literally “Black Dragon”) / Amur River, Ussuri River, Songhua/Sungari River, Nen River, Mudan River, Suifen/Razdolnaya River. The ecological status of this area is very important (Guo, 2013: 118-120).

Figure 1 Heilongjiang Province’s Location in China



Khingan Range (興安嶺) is China’s most northern and largest modern state-owned forest which is divided into Greater Khingan Range (大興安嶺), Lesser Khingan Range (小興安嶺) and Outer Khingan (外興安嶺). Greater Khingan Range spans across the Inner Mongolia

Autonomous Region (內蒙古自治區) and Heilongjiang Province (黑龍江省). Its capital city, Jagdaqi/Jiagedaqui (加格達奇) is located in the Inner Mongolia Autonomous Region. However, it is under the jurisdiction of Heilongjiang Province. The Greater Khingan Range with a total area of 84,600 square kilometres is equivalent to Austria or 137 times of Singapore (He *et al.*, 2018). Forest stock volume amounts to 501 million cubic meters accounting for 7.8% of total China (Tan *et al.*, 2014). Additionally, Lesser Khingan Range is China's key timber base whose forest area are 12.06 million hectares (*ibid.*). The pine stock volumes are over 4300 million cubic meters, accounting for more than half of the total volume of pine in China, which is known with the reputation "pine hometown" (*China Daily*, 28th December 2015).

The main job scopes of Forest Department of Heilongjiang Province are related to forest management. The Department has responsibilities to protect, develop, supervise and manage the forest resources. It formulates annual cutting quota and timber harvesting plans after approval. The Forest Department also supervises and inspects the registered logging and transportation of the provincial forest. In addition, it guides the management in forest ownership. Predominantly, it oversees approval of requisition and expropriation of woodland and the establishment of timber checkpoints. Besides that, the Department guides, coordinates and solves the forest ownership, and investigates forestry administrative cases. It proposes management plans for all counties, forest farms and units that own forest and approves management plans of state-owned forest center. The Forest Department checks and accepts logging, while supervising the afforestation work in the province. It manages not only the forests, wetlands, desertification and wildlife, but also construction and nature conservation. Furthermore, it supervises and inspects the development of forests, wetlands, desert and wildlife resources of all industries. It then develops

plans to optimize distribution of forestry resources in the province. Table 2 shows the Heilongjiang Provincial forestry policies.

Table 2 Heilongjiang Provincial Forestry Policy

Chinese Forest Policy (province-wide): Heilongjiang Province			
	Name of Policy	Setting authority	Publishing date
1	Regulations on Forest Management in Heilongjiang Province	Heilongjiang Provincial People's Congress	1995/08/23
2	Regulation for Heilongjiang Province on the Protection of Wildlife	Heilongjiang Provincial People's Congress	1996/08/31
3	Regulations for Heilongjiang Province on Forest Tree and Seed Management	Heilongjiang Provincial People's Congress	1997/08/20
4	Regulations of Wetland Protection in Heilongjiang Province	Heilongjiang Provincial People's Congress	2003/06/20
5	Regulations of Forestry Park in Heilongjiang Province	Heilongjiang Provincial People's Congress	2010/10/15
6	Measures for the Implementation of Forest Fire Prevention in Heilongjiang Province	Heilongjiang Provincial Government	1989/03/09
7	Administrative Measures of Heilongjiang Nature Reserve	Heilongjiang Provincial Government	1996/02/08
8	Measures for the Management of Forest Harvesting in Heilongjiang Province	Heilongjiang Provincial Government	2002/05/27
9	Measures for the Management of Regulations on Restoring Farmland to Forest in Heilongjiang Province	Heilongjiang Provincial Government	2003/05/12
10	Measures for the Implementation of Forest Diseases and Insect Pests in Heilongjiang Province	Heilongjiang Provincial Government	1997/11/01
11	Measures for the Implementation of Forest Plant Quarantine in Heilongjiang Province	Heilongjiang Provincial Government	1996/11/22

Source: Forestry Department of Heilongjiang Province; Heilongjiang Forest Industry Bureau, 2017.

Moreover, the Forest Department also develops the standards of the forestry industry, supervises the implementation, monitors the quality of the forest products with comprehensive development of the mountains. and manages the establishment and changes of forestry park at the provincial level. Finally, the Forest Department investigates the criminal cases related to forest destructions, wildlife and wetland resources.

1.3. Evolution of Environmental Policy

Environmental policy goes hand in hand with environmental research and evolution policy. As an example, this can be seen in European environmental research and innovation policy, which aims to define and implement a transformative agenda in achieving green economy and society for sustainable development. Europe is particularly active in this field, via a set of strategies, actions and programmes to promote more and better research and innovation for building a resource-efficient, climate-resilient society and thriving economy in sync with its natural environment. Research and innovation in Europe are financially supported by the programme Horizon 2020, which also opens its participation worldwide (European Commission, 3rd December 2013).

Environmental policy evolves as policy developed during phenomenon of change and its system adapts to the advancement of environmental performance. Policy sciences are generally represented by policy changes, and substitution and conversion between different policies. This process follows a certain guideline in the interest of policy sciences. However, “individual facts” is unreliable, which is summed up by Western scholars from their country’s policy practice. Thus, research or environmental policy evolution lacks a general framework for the abstract description under the law of evolution. If under the dynamic-equilibrium point of view to study the evolution rule of environmental

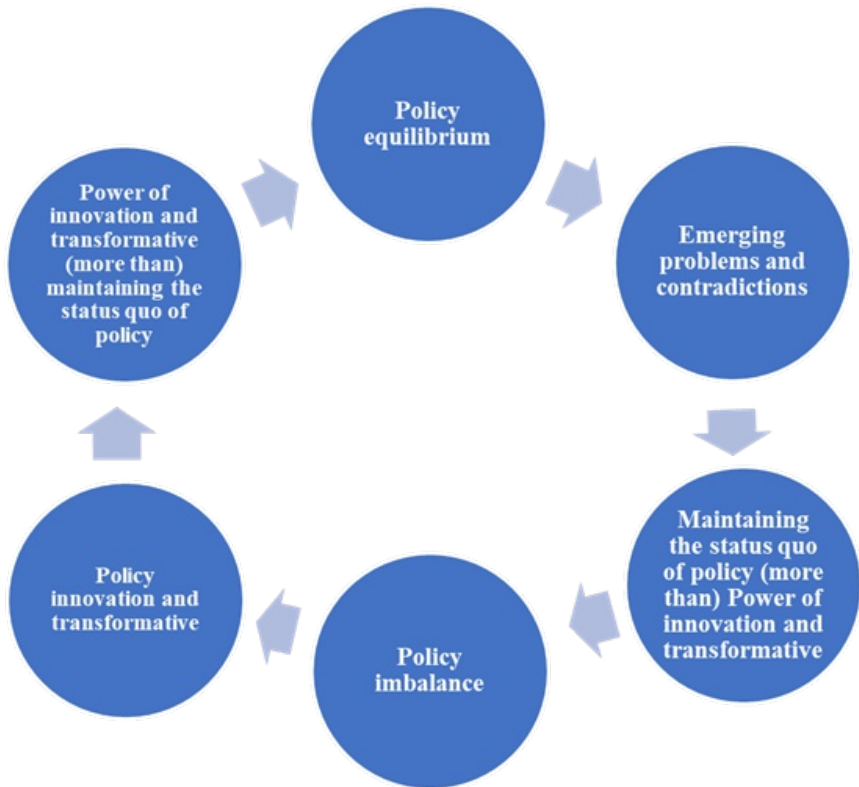
policy, the policy change process can be divided into three phases, namely policy imbalance, policy innovation and policy equilibrium. Thus, it is important to further research on the causes of policy evolution and development process. A change in general law of policy could promote virtuous circles of change in social practice and development can be summarized. Overall, the theory and practice of policy sciences have an important significance.

1.3.1. Policy of equilibrium and imbalance

Policy equilibrium and policy imbalances have always existed. Starting from the policy imbalances, through policy innovation, and policy contradictions or solving the problem, a balanced policy will eventually be established. This is a policy transition period. Changes need to be foreseen when it enters the equalization period. Policy changes will be finalized after the connection of the “imbalances, innovation, equilibrium” cycle of each stage of the process as shown in Figure 2.

In the policy “equilibrium – imbalance – innovation – equilibrium” dynamic process, the original policy which achieves relative balance would be disrupted due to the presence of the contradictions and problems. That is a kind of natural policy in the process of dynamic operation condition, as any policy will inevitably go through the same process. In the process of dynamic operation, the current situation which is upheld by the policy and the opposition from the participants are two fundamental core elements that determine the policy evolution. There are many reasons that can cause the participants protesting the policies which support the power and present situation. Eventually, this directs to policies confronting different changes in cycle in terms of “equilibrium – imbalance – innovation – equilibrium”.

Figure 2 Cyclical Changes of Policy Balance and Imbalance



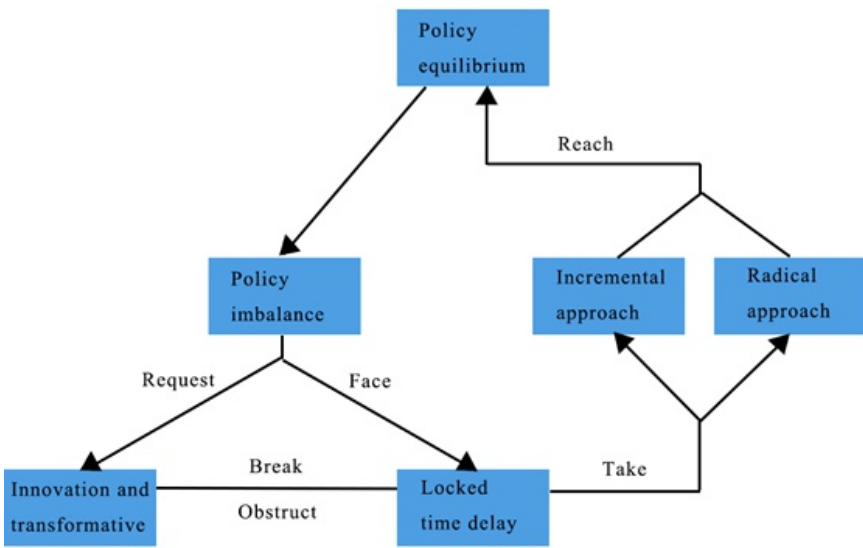
Source: Adapted from Song, 2008.

1.3.2. The creative change in the policy evolution

“Equilibrium – imbalance – innovation – equilibrium” constitutes a complete process of policy evolution. However, after a complete cycle of change in policy, the policy does not remain the same. Furthermore, after a period of time, it will be affected by various factors. The balance

of power between different policy actors will produce changes to the equalization policy that will be a trend of lurking imbalance transition. Thereby, policy evolution will proceed to the next cycle of “equilibrium – imbalance – innovation – equilibrium” (Figure 3).

Figure 3 The Creative Change in the Policy Evolution



Source: Adapted from Song, 2008.

Therefore, under the perspective of dynamic equilibrium, environmental policies will evolve one after another to imbalance – innovation – equilibrium. At any given time, a policy may not always be in equilibrium. The replacement, evolution and improvement are the natural process for environmental policy and this will be faced by any policymakers in the world.

Heilongjiang Province is one of the main areas of distribution among China's forests, and its policy related to forest management is certainly an important factor which will definitely affect the development and protection of forests in China.

2. Forest Management and Development

2.1. China's Environmental Crisis and Forest Management

Over the past 50 years, the world economy has experienced tremendous growth, but there is a growing concern over environmental issues which might undermine mankind's survival and development. Since the first United Nations Environment Assembly in 1972, environmental issues have attracted wide attention from policymakers and researchers all over the world and a series of plans have been made and implemented. However, the current implementation has not achieved the desired results from it. Therefore, nowadays environmental protection has become one of the major concerns across all countries. In order to ensure effective implementation, China sees environmental protection as its main priority among the rest of its national policies. It has formulated a series of laws and policies for environmental protection. In 1978, it introduced "Reform and Opening" policy and forest ecosystems has since then improved (Liu, 2018). However, it is facing an uphill battle with pollution in the country. The main causes are lack of innovation for sustainable development in the ecosystems, failure to implement effective regulation, effects from agricultural production and usage of forest resources (Lin and Trianingsih, 2016: 62-68).

The societal planning for future development by the government calls for more effective environmental protection policies. This is particularly important for forest management to ensure appropriate land-use management and a sustainable development to prevent destruction of

the environment. A healthy forest maintains species and structural variance, while preserving a balanced ecosystem and providing for current and future human needs. Insufficient conservation and protection of forest lead to ecosystem imbalance and biodiversity loss. Thus, maintaining balance between sustainability, production of goods and provision of services are challenges faced by owners and managers of state's forests.

One of the branches of forestry is forest management, which involves overall administrative, economic, legal, and social perspectives, as well as scientific and technical aspects, including silviculture, protection, and forest regulation. This comprises management for recreation, water, aesthetics, fish, wasteland, wildlife, timber products, urban values, forest genetic resources, and other forest resource values (British Columbia Ministry of Forests and Range, 2008). Management can be on the basis of economics, conservation, or a blend of these two. The timber extraction, planting and replanting of different species, cutting pathways and roads through forests, and preventing fire are among these techniques.

Forest management is intertwined with political and human intervention. The effectiveness of forest management relies heavily on management activities of forest farms, as well as employee's working conditions (Helms (ed.), 1998). Utilization of China's forest area is at an alarming state. Thus, the protection of forest and its value is highly important. This is due to the reckless development of forest area, as well as clearing forest area for timber and other land-uses, which put forests protection in a dire situation.

2.2. Forest Management and Development in Heilongjiang Province

Heilongjiang Province plays an important role in China for forest conservation and production since it is a major province with the richest

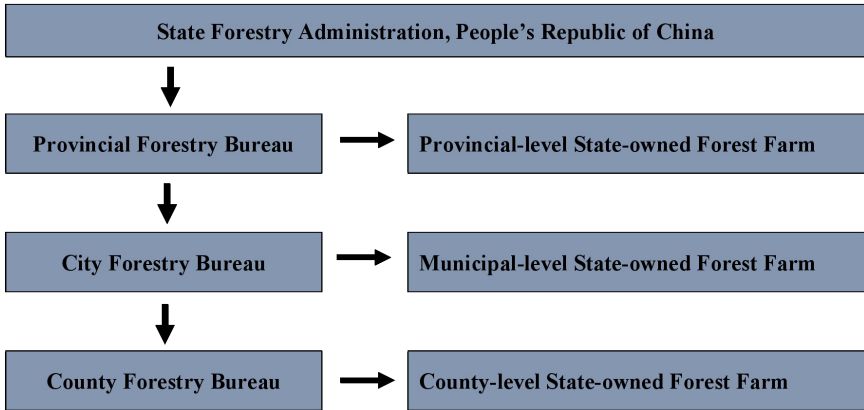
forest resource in China. Its timber stocks are the highest in China's provinces, and its harvesting volume has accounted for one-third to half of China's total amount. It is China's most important forestry base. Heilongjiang State-owned Forest Farm is the largest and most concentrated state-owned forest area, which guarantees the ecological security of Hulunbuir/Hulunbeier (呼倫貝爾) Prairie and the main grain-producing areas in Northeast China. It is regarded as an important ecological barrier in northern China.

Heilongjiang's forestry is under the management of Longjiang Forest Industry (中國龍江森林工業集團總公司 / 黑龍江省森林工業總局, formerly "Heilongjiang Forest Industry Bureau") and the Forest Resources Management Bureau of Heilongjiang Province (FRMBHP). FRMBHP has insisted on forest conservation and artificial afforestation activities for environmental and ecological construction. This is to ensure that two objectives which are forest plantation and protection are being met. Longjiang Forest Industry has established numerous small towns in primeval forest which were inaccessible in the past and with poor infrastructure. This action has turned it into a relatively complete forest ecosystem by having a developed forest industry and social system in it. All these are done to enhance the social development.

The organization structure of forestry management in China is composed of the State Forestry Administration under the leadership of the State Council. The Forestry Bureaus are established by every province and autonomous region, the county and municipal levels of forestry bureaus and the work-stations. All levels of forestry bureaus' main duties are to study and draw up guidelines and policies for the forest ecological environment, forest resources protection and landscaping, drafting of relevant laws and regulations, as well as supervising the implementation. The Forestry Bureaus at the national, provincial, municipal and county levels are managed level-by-level, and

their respective State-owned Forest Farms. Forestry Bureaus and work-stations are assigned to respective levels as shown in Figure 4.

Figure 4 Forest Management Organizational Structure in Heilongjiang Province



Source: Adapted from Forestry Department of Heilongjiang Province; Heilongjiang Forest Industry Bureau, 2017.

3. The Impacts of Deforestation and Land Development in Forest Management

3.1. Deforestation Impacts and Concern

Population growth and rising demand for agricultural product may not necessarily lead to deforestation. Therefore, investing in sustainable agricultural method and increase of productivity will be able to offset demand-side pressure and reduce soil erosion. However, in the poor area, supply-side pressure for agricultural expansion often leads to an encroachment of cropping activities on forest resource land because of

the limit capacity in agricultural infrastructure and technology investment. Faulty land tenure arrangements also have provided incentives to individuals to mine the forests for short-run gains to the ultimate detriment of society in the poor areas (Dorner and Thiesenhusen, 1992).

The decline of the cover rates of mature forests represents the structural change in China's forest resources while most of the natural forests are under the jurisdiction of state-owned enterprises. The corresponding regional pattern is at the southwest and northeast forest regions, which own most of the China's natural forests and are traditionally national forest regions where serious deforestation was detected. The magnitude of the deforestation has been long overlooked and the data is hard to get as the main data source has been the national forest resource census, which usually aggregates away the pattern of forest resource change at the sub-regional level (d'Annunzio *et al.*, 2015: 125-130). China has developed various policies with regulations related to ecological and environmental problems since 1980s. But the laws, regulations and policies are normally either too broad (too general) or too ambitious to implement. On the other hand, both institutional arrangements and human capital should be developed in order to strengthen and enforce the implementation of laws and regulations.

Currently around 22.2% of China is covered by forest (World Bank, 2016). Most of these are in the northern, southern and mountainous central parts of the country. Amounts of tropical rain forests are living in Yunnan province in southwestern China and in other provinces along the southern coast. By illegal logging, slash and burn, approximately 5,000 km² of virgin forest or more are consumed annually. In the past two decades, the forest coverage in northern and central China have been reduced by half. Deforestation, logging, hunting and collecting plants and animals for traditional medicines have caused serious ecosystem

damages to the mountains in southwest China as well (Xu and Wilkes, 2004: 970-980).

China's deforestation is mainly due to many factors such as rapid population growth, and the increasing demand for timber and fuel wood. These factors lead to agricultural expansion, and insecurity of forest land tenure system (FAO, 10th May 2007). Most of these factors are directly or indirectly linked to the level of income or the extent of poverty at the local level. For example, in the hilly areas of the Loess Plateau (Huangtu Plateau, 黄土高原) which is located in central China, the densely populated valley residents (mostly are poor farmers) throughout history and increasingly in recent years have invaded erosion-prone hills, cut down trees and brush oil, and promote agricultural activities up off the valley floor (CBD, 1992). Once the natural protective layer on the hillside is cleared or deforested, unless properly designed and carefully managed, the rain will lead to further collapse of the barren soil foundation. Even common erosion control techniques, such as terraces, can lead to serious long-term loss of soil and fertility and lead to serious economic consequences (World Bank, 1992).

The last remaining large scale of forest in the location of Manchuria in the northeast of China are also suffering from being cut down at an incredible speed to be "produced into toothpicks, furniture, chopsticks, paddles of table tennis" (Theroux, 2006). Most of the rain forests on the southern coast of China are threatened although a few areas are protected. Nowadays, China's needs for timber are exhausting forests worldwide. In order to fulfill the increasing demand of wood for China and its fast-growing furniture industry, the rain forest of Central Africa, especially in Congo and Cameroon, the Amazon basin and the Indonesian islands in Southeast Asia are all being logged heavily. China's furniture industry has accumulated large amounts of Chinese timber and illegally harvested rainforest timber from Indonesia and other

places. The statistics from Chinese Ministry of Environment show that approximately 1.3 million cubic meters of timber would be made into disposable chopsticks annually (Xinhua News Agency, 22nd March 2006).

Between mid-1990s and mid-2000s, China became one of the world's leading exporters of furniture, plywood and flooring while importing large quantities of wood products. China is also a major consumer of paper (Zhang, 2007: 39). Although many paper products are made from recycled paper, China still built many new pulp mills. In the future, they will need trees to keep them running.

Deforestation occurred in a large scope due to some of the factors such as disregard of ascribed value, weak forest management and inadequate environmental policy. Deforestation, both naturally and anthropogenically, is an ongoing problem in lots of countries. Observing by present conditions and in the past through the fossil record, it is clear that deforestation causes extinction, climatic condition changes, desertification, and population displacement (Sahney *et al.*, 2010: 1079-1082). More than half of all plant and land animal species in the world live in tropical forests.

The commercial logging in all natural forests was restricted by China by the end of 2016 in an enterprising initiative's expansion which begin in 1998 to enable forests to be recuperated from decades of excessive logging and to assist reinstating ecosystem and resilience of forest (Sun *et al.*, 2016).

April 1, 2014 was the initial date of the stop of commercial logging in state-owned natural forests in Heilongjiang Province (*Global Times*, 26th October 2017). This is quite an add-on of the National Forest Protection Program (NFPP) due to the fact that this is already not a recent restriction. There are two existing state-owned logging companies, namely Longjiang Forest Industry and Greater Khingan

Forestry Company, affected by Heilongjiang's ban (Anling Forestry). The yearly timber production of Heilongjiang had already been substantially reduced before the 2014 trial logging ban. There was merely 0.89 million m³ of wood that had been harvested, down from 4.1 million m³ within the years before the NFPP II by 2013 (Zhang, 2014). Heilongjiang, the powerhouse of Chinese local production, nonetheless, delivered a strong message and is seen as the symbol of Chinese endeavours to avoid further ecosystem degradation by commencing a logging ban.

All natural forests over Northeast China and Inner Mongolia Autonomous Region were protected by the ban's extension in April 2015. The government organizes for further extension to all other state-owned natural forests, comprising those in the 14 provinces contemporarily not protected by the National Forest Protection Program (NFPP) (*Global Times*, 26th October 2017). The trial bans in non-state-owned natural forests in late 2015 is organized by the government. This would ultimately guide to the entire termination of commercial logging in all natural forests across mainland China by 2017 (Zhao, 2015).

The Chinese government completely executed the National Forest Protection Program (NFPP), which inculcated bans on logging and lessened harvesting in 68.2 million ha of forest area – comprising 56.4 million ha of natural forest (nearly 53 % of the entire natural forests in China) in 2000 (SFA, 2016a). The State Forestry Administration (SFA) developed the NFPP with the trial restriction's initiation on commercial logging in state-owned natural forests in Heilongjiang Province in 2014, which has factually manufactured over 30 % of local timber supply of China (*ibid.*). The SFA gradually extended the trial ban to natural forest areas in other Northeast provinces since April 2015, and to the entire country in 2017 according to the outcomes of the Heilongjiang trial (*ibid.*). A logging quota of 254.036 million m³ for 2016-2020 shows a

6.3% drop as compared to 2010-2015, highlighting its effectively enforcement, according to the newly issued China's 13th Five-Year Logging Quota (2016-2020) (SFA, 2016b). There is no quota for commercial logging in natural forests countrywide and it is portrayed by a closer observation at each province's logging quota specifically on natural forests and plantations (*ibid.*).

There is unavailability of information on these limitations' anticipated duration. Nevertheless, the restrictions' aim is to enable the inventories of forest to elevate again to an extent that would assist mercenary industries again in the time ahead since that has been clearly identified at least in certain regions. The per-hectare stocks of forests in the Khingan Mountains, as such, would grow from approximately 77 m³ to 88 m³ provided that the restriction continues for a decade whereas the forests administered by Longjiang Forestry Industry will expand from 95 m³ to 110 m³ (Zhang, 2014).

Deforestation of Lesser Khingan Range for reclamation has intensified. Lesser Khingan Range is the key state-owned forest in north central of Heilongjiang Province and its forest area covered about 12.06 million hectares which makes it the world's largest area of virgin forest pine, growing multiple precious trees (Local Records Committee of Heilongjiang Province, 1998). Although the state has banned the logging of natural forest for two years, illegal deforestation of Lesser Khingan Range still continues to exist. Civilian organizations showed the evidence of on-going deforestation to the government but to no avail, and it gets worse over time. In early 2015, environmental volunteers observed that Wuyiling Forestry Bureau (烏伊嶺林業局) was illegally logging for land reclamation in Yichun City (伊春市), Heilongjiang Province. Many NGOs (Non-Governmental Organizations) in Heilongjiang Province play an important role in protecting the forest and supervising the government work in forest management. Relative

specific latitude and longitude and compartments numbers were indicated by volunteers in field investigation, and in the meantime, they kept reflecting this issue to the State Forestry Administration and the related departments. After six months' reporting, land reclamation continued with intensified signs. Volunteers' survey results confirmed that after implementation of full cessation of commercial logging of natural forests of state-owned forest in Heilongjiang on 1st April 2014, deforestation in Lesser Khingan Range, especially Wuyiling territory was carried out in full swing (Xingzhe Yue Hua, 2015). Statistics from volunteers showed that, there were fifteen pieces of land being reclaimed, covering an area of up to 3,000 hectares (about 4,000 standard football fields) (*ibid.*). To facilitate the investigation and verification of law enforcement, reclaimed GPS positioning were recorded as listed in Table 3.

Table 3 GPS Positioning of Deforestation in Wuyiling

Compartment number	Longitude	Latitude
1	E 129.55728	N 48.44998
2	E 129.08911	N 48.89632
3	E 129.06387	N 48.90735
4	E 129.05553	N 48.91198
5	E 129.04861	N 48.92203
6	E 129.06660	N 48.93748
7	E 129.05522	N 48.93645
8	E 129.02055	N 48.97020
9	E 129.02733	N 48.96188
10	E 129.05013	N 48.91608
11	E 129.05489	N 48.91228
12	E 129.10728	N 48.94209
13	E 129.11678	N 48.94534
14	E 129.04848	N 48.92262
15	E 129.12584	N 48.93850

Source: Adapted from Xingzhe Yue Hua, 2015.

3.2. The Impact of Land Development in Forest Management

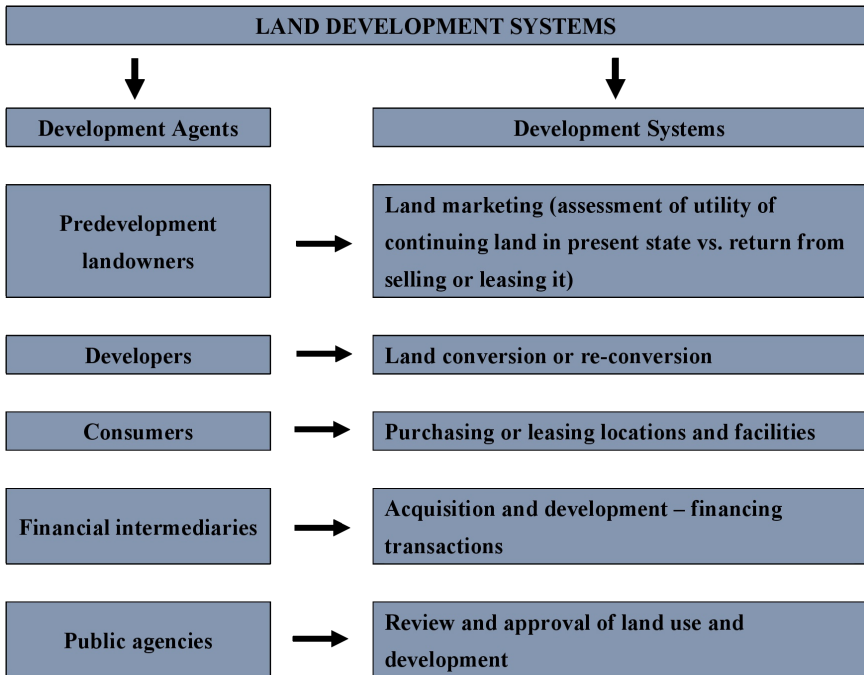
Land development puts more emphasis on the expected economic development, as a result of land conversion focused on the general physical and biological aspects. Land improvement in the economic condition can often lead to land degradation from the ecological perspective. Land development and the change in land value do not usually take into account the ecological changes in the developed area. While conversion of (rural) land with a vegetation carpet to building land may result in a rise in economic growth and rising land prices, the irreversibility of lost flora and fauna causes habitat destruction, the loss of ecosystem services and the decline in environmental values. This need to be considered as priority in environmental full-cost accounting (Khalid, 2010).

The land development system (Figure 5) focuses on the process of converting spaces and adapt them for activity system usage. The principal agents in the development systems include pre-development landowners, developers, consumers, financial intermediaries and public agencies.

Yue *et al.* (2014: 789-799) argued that land development has contributed notably to Shanghai in terms of spatial patterns of economic activity and conditions of the environment, particularly in respect of influencing the intensity and range of air pollution and urban heat island (UHI). They examined patterns of urban expansion in conjunction with other socioeconomic data and described the correlation between conditions of the environment and development of the economy. Xu *et al.* (2014: 867-880) promoted the integration of carbon sequestration into sustainable forest management and rural development plan with multi-stakeholder participation. Sustainable development indicator system evaluates against various aspect of forest carbon sequestration rate and rural sustainability based on a variety of stimulation of forest

land-use scenarios. The comprehensive evaluation based on the Analytic Hierarchy Process (AHP) method provides an efficient instrument to assist the understanding of how social, environmental and economic components are associated with each other in influencing the rural sustainability's nature. Niu and Sivakumar (2014: 857-865) indicated that the hydrologic response to land use change was important to develop sustainable water resources in the area where the feasible effects of land use change lead hydrology response.

Figure 5 Land Development Systems



Source: Adapted from Kaiser *et al.*, 1995.

The world's forests play an important role in maintaining fundamental ecological processes, such as water regulation and carbon storage, as well as in providing livelihoods and supporting economic growth (Mansourian and Stephenson, 2009). There were approximately 1.6 billion people relying on forests for their livelihoods to some extent, while the timber and other goods extracted from forests were estimated at US\$122 billion in 2005 (World Bank, 2004). As the home of two thirds of all plants and animals living on land, forests have been considered comprising the most biodiversity in the terrestrial ecosystems (Schmitt *et al.*, 2009: 2122-2130). Many of the indispensable benefits derived from forests are supported by forest biodiversity, which is equivalent to the capacity of forests to adapt to pressures, including climate change (Seppälä *et al.* (eds.), 2009).

4. Conclusion

In recent years, although great progress has been made, China's forestry still faced some difficulties. How to rejuvenate the forest industries for the sake of resource protection? The alternate ways to replace the traditional local lifestyles which relies heavily on timber logging, hunting, and fire-farming need to be investigated. The local ownership and forests benefits under the public-owned system must be identified. Besides that, local community needs to be encouraged to participate in ecological improvement efforts with economic interests as secondary objective. Regulations, principles, guidelines, and incentive mechanisms for full and healthy participatory forest management must be developed. The public needs to have easy access to an easily understandable knowledge and information about forests and wildlife. The foresters, professionals, educators, policy makers and legislators

will need to face a great deal of challenges to steward the forests for the future generations.

In early 1990s, the forestry sector in China accepted the concept of sustainable development and began to focus on researching about the principles, strategy, standards and indicators of sustainable forest management. The leading forestry NGOs, scientists, social activists and journalists participated in the dissemination of sustainable development concepts and worked hard to promote the establishment of healthy, participatory management systems (SFA, 2014). The government issued Agenda for 21st Century and Forestry Action Plan (Li, 2014). The National People's Congress passed the Forests Act, and other legislative provisions on the protection of environment, water, and wildlife which have been adopted to protect the natural resources. A large number of small paper mills for pulping and papermaking, logging, and timber sawing will be closed (SFA, 2014). Logging in natural forest areas will be restricted or prohibited. The right of local people or communities will be strengthened to share the management and employment. Legislative and law enforcement will become the top priority of forestry development in the future.

The Forests Act was launched in 1981 and amended in 1998 (Wang *et al.*, 2007). The forest resources' possession, comprising the forest-covered land, and specifying the responsibility, obligations, rights, and restrictions of the management of forests at all levels, tree farms, tenure units, industries, and persons who control the resources of forest – all of them are governed by the Act. The Act also includes compensation requirements, penalties on the destruction of forests and wildlife habitats, which is the basis and general guidelines for the entire forestry industry (Forest Legality Initiative, 2014).

As the basic principle of sustainable forest management, public participation plays an increasingly crucial role in the development of

forestry and environment. It is essential to meet the fundamental principles of sustainable development equality, restrictions, harmonious cooperation and social support for natural resources management. However, most of the Chinese citizens do not have the right consciousness to participate in the processes of resource management. Since the establishment of People's Republic of China, the land has been owned by the state, or the collective, that is, public. The governments at all levels "Represent" the public in managing all the resources including the land. In fact, the local people did not have much interests and power to get involved in the decision-making process on the public forest management or forestry development. That certainly led to the unsustainable forest management. In China, NGOs, and their involvement in forestry and environment development, including their departments, networks and members, have been playing an increasingly important role in the national and regional strategy, policy, and decision-making processes related to forestry development (Li, 2014). These NGOs influence the decision-making and the initiation of those large-scale afforestation and reforestation projects. Most of them are involved in the national forestry issues. In general, the NGOs have their own departments or technical committees that are in touch with the local governments and communities (*ibid.*). They participate in the start-up, design, planning and implementation of the projects, and have the public educated to increase awareness. Their technical services in forestry or natural protection are numerous throughout the whole country.

In addition, forest degradation and reduction are serious ecological problems faced by Heilongjiang Province. The implementation of the corresponding forest management policies also has other major problems. State-owned Forest farms have faced various setbacks even though they have a pivotal role in national forest industry development. This was due to their focus on public welfare operations which resulted

in smaller income sources and slower economic growth. All these can undermine employees' enthusiasm and the functions of forest farms can never be fully utilized. Besides that, most of the state-owned forest farms are in low economic growth areas. Thus, completion of infrastructure is slower than expected, mainly due to insufficient number of forest guards, lack of access to drinking water, poor road maintenance and weak communication network. Due to the lack of proper facilities, living conditions are affected, bringing challenges to the state-owned forest farms' development. Against the background of the current booming economy, the reform of state-owned forest farms is imperative. Therefore, further research needs to be conducted in order to identify the emerging issues and challenges, and to find suitable solutions to the problems.

Note

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