Hot Issues and Trends of Global Forestry Development

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Abstract With acceleration of economic globalization, ecological problem becomes increasingly prominent, and forestry and forest issues become world concerns. Since 1992 United Nations Conference on Environment and Development, sustainable forest management (SFM) becomes a subject of times, and hot issues, such as climate change, assessment of forest resource, biomass energy of forestry, combating illegal timber and relevant international forest product trade, gradually become world concerns. This paper sum up these hot issues, analyzes background and current situations of forestry development, and discusses the development trends of global forestry.

Key words Global forestry, Hot issues, Sustainable forest management, Multi-functional forest, Development trends

1 Background of global forestry development

1.1 Political background: climate politics brings new opportunity and challenge to the forestry Climate politics, also called carbon politics, is a new international political model originating from *United Nations Framework Convention on Climate Change* (UNFCCC) (1992) and *Kyoto Protocol* (effective as of 2005). The whole world starts political consultation and bargaining on carbon emission. Climate politics will become a development strategy of China and also a thorny problem in diplomacy. Besides, it will exert a profound impact on forestry concept.

1.2 Economic background: forest and other natural resources become basis of sustainable development The root of economy lies in natural resources. To realize sustainable development of economy, human beings must protect and use natural resources in conscientious and sustainable manner. (1) When we use natural resources to conduct processing and production, we should also make compensation for depleted resource or destroyed environment. (2) We should practice resource conservation, especially for those non-renewable resources. (3) We should protect, develop and foster natural resources, mainly those renewable resources. New natural resource concept promotes human beings to take new selection and action for forests and other resources.

1.3 Environmental background: industrial civilization development runs into serious environmental restriction More than 2 centuries of industrial revolution relies on fossil energy. Economic and social development of human beings is gradually restricted by following factors: (1) climate change; (2) ozone layer depletion; (3) sharp reduction of biological diversity; (4) air pollution and acid deposition; (5) water pollution and crisis of fresh water resource; (6) environmental pollution of toxic waste; (7) noise pollution; (8) water loss and soil erosion; (9) soil degradation; (10) soil desertification, *etc*. These problems threaten nature, economy and human itself from natural, economic and human ecology, and destroy foundation of social and economic development.

1.4 Social background: rapidly increasing world population is squeezing forest space The population carrying capacity of earth is limited. In 1960 - 2000, world population increased from 3 billion to 6 billion, global food production and drinking water supply increased about one times, and consumption of timber products rose 50%. Human being is part of forest ecosystem, and about 1.6 billion people in the world rely on forest for survival. Rapid growth of population and greater and greater population pressure constantly increase consumption of food, water and timber, while expansion of agriculture, animal husbandry and cities greatly squeeze forest space.

2 Current development situation of global forestry

2.1 Forest resource In 2010, global forest area was 4.033 hm^2, accounting for 31% of total land area, and forest area per capita was 0.6 hm^2. The forest area in every continent is shown in Fig. 1. Five forest-abundant countries (Russia, Brazil, Canada, the USA, and China) take up 53% of global forest. The forest coverage of every continent is shown in Fig. 2. In 2000 - 2010, the global forest area decreased about 5.2 million hm^2 annually, and about 13 million hm^2 forests were changed to other purposes each year. Most forest losses occurred in tropical regions, while increase of forest area in China, Vietnam, Philippines and India makes up decrease in Africa and Latin America. In 2005 - 2010, global artificial forest area increased about 5 million hm^2 annually.

2.2 Production of forestry products 34% of the world forest is for producing timber and non-timber forestry products. In the later period of the 1980s, timber products reached the peak point; at the early 1990s, it showed temporary reduction, but the overall trend was ascending, and it reached the peak point in 2007. After 2008, due to impact of financial crisis, timber yield experienced reduction, as shown in Fig. 3. In 2011, the timber yield of the world reached 3.435 billion m^3, log for industrial use reached 1.557 billion m^3, sawn timber 400 million m^3, and wood-based

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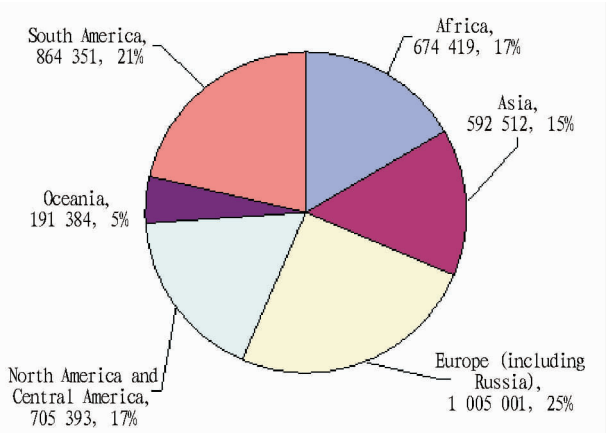


Fig. 1 Distribution of global forest resources in 2010

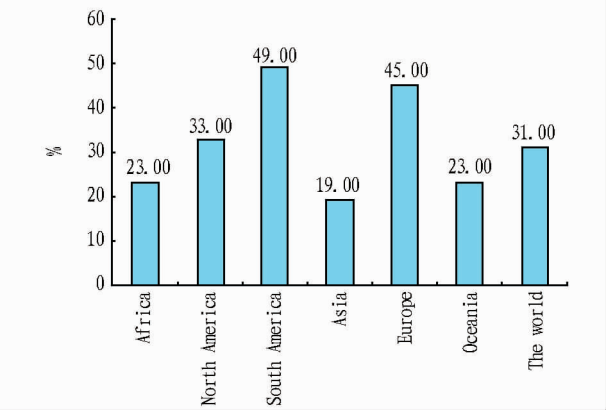
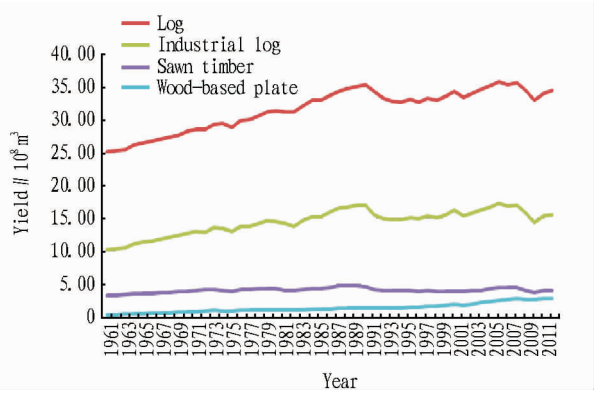


Fig. 2 Forest coverage of every continent and the world in 2010

plate 281 million m^3. According to *Global Forest Resources Assessment* 2010 issued by FAO, the turnover of non timber products in 2005 reached 18.5 billion USD, in which foods take up a larger portion. Forestry product structure has basically formed in all regions of the world. Europe and North America are high in yield of log, sawn timber and wood-based plate, forest management, forestry product processing and trade have balanced development, and primary forestry products and processing products are distributed in proportion; in Asia, Africa and Latin America, primary products take up a larger portion, and production of processing products has certain rise, especially development of Asian forestry product processing industry plays certain role in changing pattern of the global forestry.

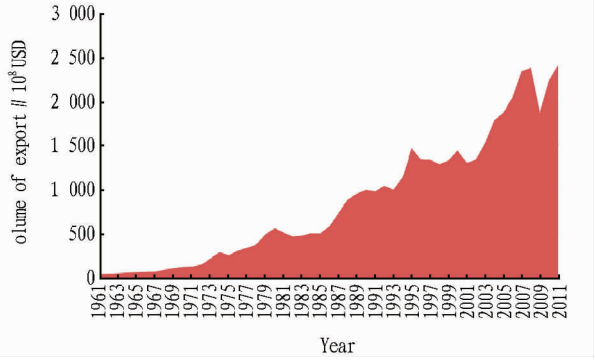
2.3 Trade of forestry products In recent several decades, rapid development of information and communication technology, acceleration of globalization, and quickening of social changes, promote huge changes of forestry sectors at all levels. Changes of population, economy, system and technology have changed pattern of demands for forestry products and services. Investment liberalization in the whole world and global financial market integration greatly drive global flow of forestry capital. Capital of transnational forestry countries in developed countries constantly flows to developing countries, to engage in resource cultivation, ecological protection, forest development, timber processing and timber product



Note: Data source: FAOSTAT, 2012.

Fig. 3 Yield of main forestry products in 1961 – 2011 (10^8 m^3)

sales; large forestry enterprises in developing countries constantly increase overseas investment, to develop overseas forest and allocate resources. This brings great change in structure of import and export of forestry products in all regions. Historically, at the background of the whole world focusing on relationship between economic development and forestry ecological protection, developed countries are still main force of import and export trade, while rise of developing countries is largely limited in technology and trade. Total volume of import and export trade of forestry products takes on growth trend, as shown in Fig. 4. Under the dramatic impact of financial crisis, volume of export of global forestry products rose from 129 billion USD in 1998 to 236.8 billion USD in 2008. But in 2009, it suddenly dropped to 188.8 billion USD, and in 2011 it rose to 241.4 billion USD.



Note: Data source: FAOSTAT, 2012.

Fig. 4 Volume of export of global forestry products in 1961 – 2011

Since the distribution of forest resource is unbalanced in the world, production and trade of forestry products are varied in every country. Under the background of wide concern of global climate and environmental problem, production and consumption of forestry products take on common trend of pursuing ecological demand, which promotes rapid change in both volume and structure of trade of forestry products. Traditional timber exporting countries gradually reduce log export and develop their own timber processing enterprises; simple resource-dependent forestry product trade is being restrained, and processing products, especially fine processing

products, are rapidly expanding, such as wood-based plate, paper and cardboard, *etc*. In the production, consumption and import and export trade of global forestry products, Europe, Asia and North America account for 90% of international trade amount, as shown in Fig. 5 and Fig. 6.

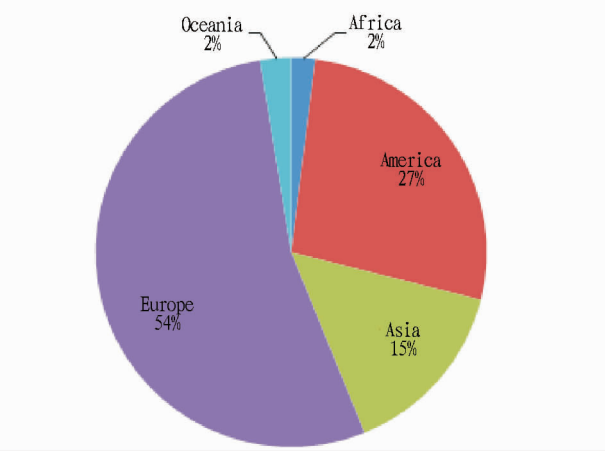


Fig. 5 Proportion of forestry product import of every continent into the world (2011)

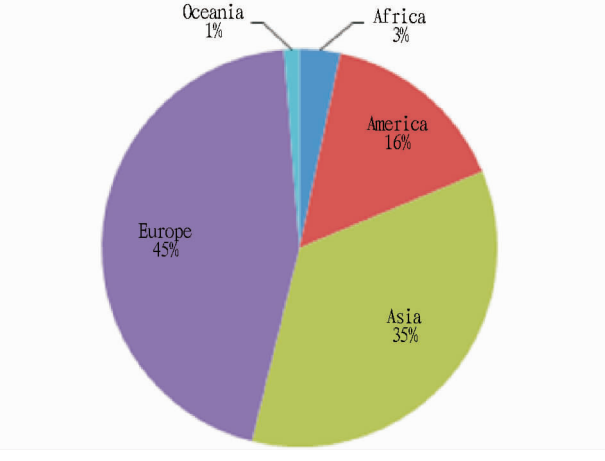


Fig. 6 Proportion of forestry product export of every continent into the world (2011)

2.4 Forestry policies and management After entry to the 21st century, oriented towards sustainable forest management, 76 countries formulated or adjusted forestry policies, and 69 countries (mainly European and African countries) revised laws on forestry. More than 1.6 billion hm^2 forests had been provided with forest management program to actively implement sustainable forest management, forestry becomes an important evaluation indicator of global sustainable development. Adjustment of national forestry policies mainly includes (1) formulating national forestry development plan and key forestry engineering plan; (2) focusing on key and priority fields of climate change, sustainable forest management, protection of biological diversity, protection of forests and vulnerable ecosystem, prevention and control of desertification, and protection of natural forests; (3) Establishing environment service to realize market-oriented mechanism and adopting other economic means to increase government financial investment, expand fund input channel and increase fund input, encourage participation of private sectors and local communities, and develop technologies favorable for environment; (4) formulating and improving policies and relevant incentive measures favorable for environment. Some developing countries take forestry development as major approach to shake off poverty. Forest ownership is gradually transferred from central authorities to local government, traditional organizations or communities. Multilateral and bilateral co-management related to forests is increasing, and international organizations play important role in global forest management.

2.5 Forestry sci-tech research Forestry sci-tech researches of every country place environmental and ecological problems at the priority position, such as forest biological diversity, water quality, and relationship between soil productivity and climate change, recovery of degraded ecosystem and environment-friendly technologies. These provide theoretical and technological support for global issues. In addition, researches on technologies and international rules about forestry related international trade also have considerable development, such as it has established and improved international intellectual property right rules, gene safety management, technical rules for new variety protection, and trading rules for information technology products, and import and export standard and license system of forestry products. In the 1990s, a new forestry sci-tech revolution emerged. Constant development new high technologies, especially information technology, biological technology, new material technology, nanometer technology, remote sensing technology and space breeding technology, exert huge impact on forest resource management and forestry development. Constantly innovating ecological felling and cultivation upgrade technology and ecological recovery technology provide effective approach for forest management ecosystem and rapid recovery of degraded ecosystem. Development of information technology, especially network technology and communication technology, lays a solid foundation for scientific management and digital management of forests, and promotes fine, machining, automation and informationization of forest management. In forestry product processing field, constant deepening of processing technology and formula for wood and non-wood forestry products bring high added value products. Large number of new high forestry technological enterprises drives constant optimization of forestry structure. Development of high technology promotes scientific knowledge and technology to permeate and flow into forestry field, and expands diversified forestry product market and trade. Besides, forestry management and economy receive considerable progress, and scientific knowledge and research findings widely influence formulation of forestry policies.

3 Hot issues and trends of global forestry development

3.1 New orientation of forest and forestry in background of green development Development of green economy to realize green growth is one of hot issues in recent years. In February

2011, the 9th Session of the United Nations Forum on Forests (UNFF9) put forth important function of forestry in developing green economy, and it should place forestry in priority field. In the same time, United Nations Environment Programme (UNEP) issued the Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication, which is the first research report on green economy, incorporating forestry into one of top 10 sectors related to development global green economy. In June 2012, United Nations Conference on Sustainable Development (RIO + 20) took green economy as theme of the conference. In September 2011, at the First APEC Meeting of Ministers Responsible for Forestry, Chinese president Hu Jintao clearly stated forestry should become important force for green growth.

Green economy is characterized by coordinated development of resource, environment and economic society; combination of economic ecology and social benefits; green and ecology of economic activities; favorable for improving human well-being and promoting social equity; significantly reducing environmental risk and ecological scarcity. It is a new development path based on sustainable development and ecological economics. Forestry plays leading role in development of green economy: forestry builds ecological foundation and material foundation for green economy, so it is basic sector of green economy; forestry plays special role in responding to climate change, and in improving social welfare and reducing poverty. In recent years, some countries also put forward ideas of developing green economy. The United States takes green new deal to promote development of green economy; the EU proposes revitalizing local economy with green economy; Japan plans to become the global first low-carbon green country; China advocates scientific development, builds resource-saving and environment-friendly society, and stresses people first and improves people's livelihood. In the framework of green development, the status of forest is defined as fundamental national wealth, welfare, and national security. In other words, forest is the foundation of green development.

3.2 Function of forestry in responding to climate change receives much concern and forestry concept is being reconstructed Both developed and developing countries have issued series of forestry policies and measures to respond to climate change. UNFCCC (1992), *Kyoto Protocol* (1997) and *Bali Road Map* (2007) confirmed status and functions of forest in emission reduction and foreign exchange increase. Forestry subject becoming central topic of international negotiation in recent years is also a new highlight in negotiation at Copenhagen Summit on Climate Change. This Summit passed the Copenhagen Accord, to call upon establishing mechanism like *Reducing Emissions from Deforestation and Forest Degradation plus Conservation* (*REDD* +). At present, REDD + focuses on tropical deforestation. With further implementation of REDD + and increase of finance, more forest types and operating protection activities will be incorporated. In addition, the concept of low carbon development is promoting people to rethink and review concept of traditional forestry and sustainable forestry, leading to forestry concept tending to reconstruction. There are a lot of new concepts, such as low carbon forestry, low carbon afforestation, low carbon operation, carbon sink afforestation, and bio-diesel forest, *etc*. The essence of new forestry concept includes: reorientation of social status and functions of forestry; expansion of forest operating target and reform of selection standard; formulation of forest management and afforestation; developing biomass energy industry; reviewing obsolete policy in process of forest utilization; reviewing traditional idea in consumption field.

3.3 Sustainable forest management becomes the alobal trends of forest development and multi-functional forest will become major framework of forest resource In1992, United Nations Conference on Environment and Development issued series of documents, such as *Agenda* 21, *Declaration of Principles on Forest*, and *Convention on Biological Diversity*. All of these documents contain requirements for strengthening protection of forest resource, proper use of forest, and sustainable forest management. From then on, sustainable development becomes a global target, and sustainable forest management becomes important direction of forestry development. Countries have reached common understanding on forest problems and sustainable forest management. Forest sustainability refers to state of productivity of forest land and biological diversity of forest not reducing with time. Sustainable forest management is a new measure taken for constantly producing products and services for human beings and realizing sustainability of forest in this state. To respond to climate change, multi-functional forest with permanent forest as major part is becoming major framework of forest resource. Essential feature of multi-functional forest is to pursue natural forest ecosystem which is formed not purely by nature. Specifically, secondary forest oriented towards multi-functional forest becomes major point of global forest management. However, natural forest and tropical forest are major parts of global environmental protection. Artificial forest has made great contribution to timber demand, but it also exerts negative influence on ecological environment. Thus, new generation artificial forest oriented towards integral ecosystem becomes future development direction.

3.4 Development of forest resource assessment reveals real value and contribution of forest Products and services of forest ecosystem directly and indirectly make contribution to national economy and human well-being. For 20 years, substantial researches have promoted people to incorporate evaluation of forest ecosystem service value into accounting of national economy. Many countries attempt to conduct environmental economic accounting, including forest ecosystem service. According to a global environmental economic accounting survey made by United Nations Committee of Experts on Environmental – Economic Accounting (UNCEEA) in 2006 – 2007, 84% developed countries, 34% developing countries and 27% transition countries have environmental economic accounting projects. Value assessment and green accounting have made direct contribution to innovating value concept of

forest. People start to realize other value of forest apart from timber production. As a result, it stimulates investment of government and social maintenance, makes theoretical preparation for marketization of forest ecosystem service and establishing economic compensation mechanism. In addition, it provides scientific basis for formulating macro policies, forest tenure circulation and multiple target forest management.

3.5 Forest biomass energy is new hope of alternative energy As a type of extremely important biomass energy, forest is only second to coal, oil, and natural gas. Besides, forest features clean, safe, renewable and not grabbing land with agriculture or grabbing grain with people. Thus, forest biomass energy is called the most hopeful new energy. In recent years, relying on advantage of rich species resources, forest biomass energy becomes new force and plays the increasingly important role in development of biomass industry. At present, development of international forestry biomass energy takes on following trend: In policies, American – European countries and most other regions are seeking ways of developing forestry biomass energy, have issued various support policies, and formulated forestry biomass energy utilization plan. In technologies, many countries have carried out researches on energy plant and its cultivation technologies, and set up new energy bases through seed introduction and cultivation, such as "oil plant botanical garden" and "energy farm", and put forward new concept of "energy forestry". In processing technologies, apart from traditional ethanol, biomass power generation and particle fuel, biological diesel and cellulose ethanol become new hot spot of research and development, which provide wider development space for forestry biomass energy. Therefore, in the situation of countries grabbing commanding height of biomass energy, forestry biomass resource is an important foundation stone for accelerating great-leap-forward development of China's biomass industry, and also a core element of circular economic development in China.

3.6 Combating with illegal logging and related trade becomes important content of international politics and forest product trade At present, the world is making effort to combate with illegal logging and related trade, and most countries have issued some policies and measures, including *US Lacey Act Amendment* and *EU Timber Regulation*. These measures target at illegal timber and related products, but some provisions reflect trade protectionism. Thus, it will place psychological pressure on suppliers, purchasers, importers and exporters, consequently influencing normal trade. Illegal logging and related trade are mainly caused by unreasonable international economic order, enterprise driven by benefits, poverty of forestry communities, not strict law enforcement and management of timber producing countries. According to the principle of common but differentiated responsibilities in global environment management, every country should assume common responsibilities, and should bear respective responsibilities according to its ability and condition.

3.7 Forest certification be comes a new tool to promote sustainable forest management Forest certification is a market-based mechanism for promoting sustainable forest management. It is launched by non – governmental environmental protection organizations after realizing policy error in improving forest management, inadequacy of intergovernmental organization in solving forest problems, and failure to prove product origin. Forest certification rose from the 1990s, and received rapid development in recent 2 decades. It is widely accepted by government, nongovernmental organizations, retailers, producers and finance companies and market. By now, there are two international forest certification systems: Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC). More than 30 countries have established their own forest certification systems, including China, USA, Canada, Japan, Malaysia, Indonesia, *etc*. By March 2012, more than 390 million hm^2 forests in more than 80 countries have passed certification, accounting for 9.6% of the global forests.

Forest certification assures consumers that the wood products that they wish to purchase are produced from a well-managed forest. Through independent evaluation of forest management, forest certification is expected to link green consumers with forest management departments seeking higher benefits through improving forest management level and increasing market share. Forest certification is based on market and relies on trade and international market. Forest certification is exerting influence on development of forestry and forest product industry. Researches have shown that forest certification will exert important influence on social, environment and economy of forest operation; forest certification improves environment service of forest, improves health and safety situation of workers in forest zones, alleviates conflicts between forest managers and surrounding regions, and guarantees land ownership and use right of certified forest; forest certification promotes market access of products, improves enterprise image, and fosters cooperation of private departments, government and non-governmental organizations.

3.8 Forest culture becomes new carrier of rebuilding harmonious relationship between human beings and forest Forest is the cradle of human beings. However, since industrial revolutions, social development of human has brought series of ecological and environmental problems, such as dramatic shrink of forests, reduction of land fertility, decrease of biological diversity, global warming, and environmental pollution. Facing deteriorating survival environment, people have to review the relationship between human and forest. At present, developed countries have entered post-industrial development stage. Focusing on forests and caring the earth have become common appeal of the international society. Under this background, forest culture becomes new carrier of rebuilding harmonious relationship between human beings and forest. Now, forestry developed countries pay close attention to forest cultural construction, organize multidisciplinary research teams to conduct theoretical and practical researches on forest culture from historical change, religious belief, traditional customs, and physical and mental health of people. China has long history

culture, rich natural landscape and strong ethnic and folk customs, local cultural deposit, which provide solid foundation for construction of forest culture. In this new historical period and trend, it is especially necessary to further enhance forest cultural construction, and promote development of forest culture through making plans, improving policies, innovating mechanisms and strengthening support, *etc*.

3.9 Taking the responsibilities of environmental protection and national development becomes the core of forestry related international convention and the common requirements of international society From the 1920s, international society started formulation of environmental protection laws. Especially after the United Nations Conference on the Human Environment held in Stockholm in 1972 and the United Nations Conference on Environment and Development held in 1992, a lot of international conventions related to forest environment were concluded, including *Ramsar Convention on Wetlands*, *Convention on International Trade in Endangered Species of Wild Fauna and Flora*, *International Tropical Timber Agreement*, *Agenda* 21, *Declaration of Principles on Forest*, *Convention on Biological Diversity*, *United Nations Framework Convention on Climate Change*, *Kyoto Protocol*, and *United Nations Convention to Combat Desertification*, *etc*. Taking responsibilities of environmental protection and national development becomes the core of forestry related international convention. Environmental protection oriented towards protection of biological diversity, wetland protection, prevention and control of desertification, is receiving more and more attention of international society and countries. In recent 30 years, forest problem has attracted unprecedented attention and takes on international trend. The 1992 United Nations Conference on Environment and Development put the forest problem to a new height, and finally formed the *Agenda* 21 and *Declaration of Principles on Forest*. Focus of international society about forest issue is mainly on international convention on forest. For this, international society has reached extensive common understanding that international society must make joint effort, pay highly attention to and promote protection and sustainable forest management. Through efforts of all sides, UN Economic and Social Council passed *Non-legally Binding Instrument on All Types of Forests* in 2007. Any action taken by the international society in forest issue will exert certain influence on forest protection and sustainable management in China. As a large developing country, China also has responsibility and duty to protect global environment and forest resources, and should participate in major related discussion, cooperation and exchange in active attitude. Since 1946, China has concluded or participated in 40 major international environmental contentions, including the above mentioned conventions related to forest issue.

3.10 Acceleration of forestry globalization development fosters new international forestry Nowadays, economic globalization is developing further, trade liberalization trend is irreversible, revolution of new high technology is speeding up, and global and regional cooperation is in the ascendant. In particular, with increasingly prominent of global environmental problem, the connection of forestry with economic development, climate change and international environmental protection activities is closer and closer. This promotes people to review forest from the global perspective and rethink development path of world forestry. In the new situation, with acceleration of globalization, forestry development of any country is inseparable from the world. It needs sharing development opportunity and jointly dealing with various challenges. It can be said that globalized new forestry has become inevitable trend of global forestry development. This not only provides China with unprecedented opportunity for forestry development, but also brings huge challenges. China's forestry management should fully understand international rules, follow new concept of global forestry development, and constantly adjust and optimize forestry policies, to constantly improve its contribution to regional and global forestry development.

References

[1] Bernhard Wolfslehner, Harald Vacik and Manfred J. Lexer. Application of the analytic network process in multi-criteria analysis of sustainable forest management[J]. Forest Ecology and Management, 2005, 7(207): 157-170.

[2] FAO. [2010-05-08]. state of the world's forests 2009[OL]http://www.fao.org/docrep/011/i0350e/i0350e00.htm. [2010-10-08].

[3] FAO. 2007. State of the world's forests 2007[R]. Rome: Food and Agriculture Organization of the United Nations. (in Chinese).

[4] FAO. 2006. Global forest resources assessment 2005--The progress of the realization of sustainable forest management[R]. Rome: Food and Agriculture Organization of the United Nations., 147: 21. (in Chinese).

[5] IPCC. 2007. Climate change 2007 - mitigation of climate change[M]. Cambridge University Press, Cambridge.

[6] XU B, ZHANG DC, *et al*. Worldwide hot issues of forestry 2010[M]. Beijing: Science Press, 2011: 3-25. (in Chinese).

[7] XU B, ZHAO J, LU WM. The way to develop forest certification in China [J]. Green China, 2005(10M): 25-28. (in Chinese).

[8] The Project Team of China's Sustainable Development Forestry Strategic Research. 2003. The research of Chinese sustainable forestry development strategies · Forest issues[M]. Beijing: China Forestry Publishing House. (in Chinese).

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[11] WANG XJ, CHEN HZ. Study on the relationship between soil chemical properties of tea garden and tea quality in the Three Gorges area of the Yangtze River[J]. Chinese Journal of Plant Ecology, 1994, 18(3): 253-260. (in Chinese).

[12] RUAN JY, WU X. Productivity and quality response of tea to balanced nutrient management including K and Mg[J]. Journal of Tea Science, 2003, 23(S): 21-26. (in Chinese).

[13] WANG P, ZHAO ZZ, WANG JG, *et al*. Hazard assessment on heavy metal pollution in surface soil from tea gardens of Wuzhishan[J]. Agricultural Science & Technology, 2011, 12(3): 426-428, 455.

[14] LIU ZF. The use of forest resource and second investigative resources to calculate the forest growth rate[J]. Journal of Anhui Agricultural Sciences, 2011, 39(12): 12311-12313. (in Chinese).