

# Synopsis of FAO Regional Forest Outlook Studies

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**Abstract:** In this chapter we follow the idea introduced in the previous chapters of this book on the need to better understand the conditions that enable and foster progress towards sustainable forest management (SFM) or hinder it. The prerequisite conditions defined in the analytical framework in Part I of this book (Table I 3.1) were utilised to examine the information provided by regional outlook studies published by FAO in recent years in Africa, Asia-Pacific, Latin America, Europe, Russia, and North America (FAO 2003, 2006, 2010a, 2012a, UNECE/FAO 2012a, 2012b). Our objective was to synthesise the information provided in these publications related to the prerequisite conditions. Moreover, we were interested in the future scenarios and trends highlighted in these reports. The synopsis was performed by grouping the findings into four groups of prerequisite conditions stated in the analytical framework (Part I, chapter 3). The examination was challenging due to the wide variation of conditions among countries and regions that are referred to in the outlook studies. Although it was difficult to draw global conclusions and identify clear trends, the most relevant findings are stressed in the discussions presented in the abovementioned groups and in the chapter's last section – “Concluding remarks” – which also describes the main constraints encountered in the synopsis.

**Keywords:** Forest outlook studies, sustainable forest management, prerequisite conditions, forest governance, forest livelihood, natural resources base, forest research, forest monitoring, forest trends, forest scenarios

## 3.1 Introduction

There is wide recognition of the enormous value of forests for humanity. Forests are fundamental for providing economic goods, maintaining clean water supplies, mitigating climate change, sheltering biodiversity, and supplying recreational services. An estimated 1.3 billion of the world's poorest people obtain an important part of their incomes, food, and medicine from forests. The United Nations stated in its *Non-Legally Binding Instrument on All Types of Forests* (UN 2007) that sustainable forest management (SFM), as a dynamic and evolving concept, aims to maintain and enhance the economic, social, and environmental values of all types of forests for the benefit of present and future generations (more detailed discussion on this evolving concept is presented in Part IV, chapter 2). SFM is needed for safeguarding and enhancing the positive contributions of forested areas to society. This is not a new recommendation and decision-makers at national and

global scales have repeatedly received this message for several decades. Why has it been so difficult to progress in instituting SFM, when it has been proclaimed as an imperative policy objective in many countries?

To find an answer to this fundamental question, we have postulated the need to better understand the conditions that foster progress towards SFM or hinder it. Consequently, Part I of this book presented an analytical framework that aimed at identifying some of the important prerequisite conditions for progress in SFM. This framework (see Table I 3.1) guided the local-level case study analyses presented in Part II and framed the development of the syntheses of the case studies and the analyses across cases in Part III.

In this chapter we have used the framework to examine recent United Nations Food and Agriculture Organization (FAO) outlook studies to draw out some of the future trends in different regions of the world with respect to the prerequisite conditions. These publications contain relevant information on

**Table IV 3.1 Six forest-sector outlook reports studied in the current chapter.**

Title	Publisher(s)	Region(s) covered	Publication year	Period covered	Scenarios
Forestry Outlook Study for Africa	FAO	Africa	2003	2003–2020	5 scenarios
Tendencias y perspectivas del sector forestal en América Latina y el Caribe	FAO	Latin America and Caribbean region	2006	2005–2020	Potential trends up to 2020
Asia-Pacific Forests and Forestry to 2020	FAO	Asia-Pacific	2010	2010–2020	3 scenarios
The Russian Federation Forest Sector Outlook Study	FAO	Russian Federation	2012	2010–2030	3 scenarios
European Forest Sector Outlook Study II	UNECE/FAO	Europe	2012	2010–2030	One reference scenario and four policy scenarios up to 2030
The North American Forest Sector Outlook Study	UNECE/FAO	North America	2012	2006–2030	

current status and future trends in forest management at regional levels. The knowledge is important in guiding actions that are crucial for facilitating progress in SFM.

The present chapter is based on and restricted to six regional forest-sector outlook reports published by the United Nations forest agencies (FAO and UNECE) and described in Table IV 3.1.

In addition, the following sources were used to update information and figures provided in the publications cited in Table IV 3.1: *Global Forest Resources Assessment 2010. Main report* (FAO 2010b) and *State of the World's Forests 2012* (FAO 2012b).

The outlook studies, an integral component of FAO's forestry strategy, have been aimed at assessing and analysing the status, trends, and prospects of forest and forestry in different regions. They are based on a large amount of information compiled by a group of experts who are familiar with the prevailing conditions in the various regions. The outlook studies highlight the current situation and pay attention to the new trends in the regional and global forest sectors, identifying challenges and emerging opportunities. Outlook studies take into account past and future economic, social, institutional, and technological changes. Most of them introduce an overview of future scenarios with a time horizon between 10 to 20 years into the future.

The main purpose of FAO outlook studies has been to strengthen the knowledge base of national forest organisations and consequently to provide these countries with the information required to develop appropriate forestry programs and policies, enhance the sector's contribution to socio-economic welfare, maintain environmental assets, and ensure the full range of necessary goods and services generated on a sustainable basis. The studies generally emphasise problems of poverty and environmental degradation, which adversely affect forest areas in numerous countries. They intend to support policy development and strategic planning, depict the range of choices available to forestry policy-makers, and describe alternative scenarios as a result of different choices. They have also been used in the development of strategic forest planning at regional levels.

Unlike local case studies in Part II, which mostly focus on past and current issues and developments, the UN outlook studies represent forward-looking investigations. The regional outlook reports have been examined as large continental-scale case studies to complement this book's Part II local-scale case studies and to give an overview of the expected future trends in the regions where the case studies are situated. This chapter summarises findings from the outlook studies in respect to the prerequisite conditions identified in the analytical framework presented

in Part I (see Table I 3.1). In the framework, these conditions are grouped into four broad categories:

- ◆ policies, institutions, and governance
- ◆ livelihoods, capacities, and cultural and social aspects
- ◆ natural resources base
- ◆ research and monitoring

The results presented in section 3.2 are structured according to the above categories. Each of them also contains a brief description of major continental trends, which are not predictive but rather intend to help policy-makers gain insights into the consequences of certain policy choices. Section 3.3 concisely lists few concluding remarks and a number of difficulties that prevented drawing global conclusions from these outlook studies.

## 3.2 Summarised findings from the outlook studies

### 3.2.1 Policies, institutions, and governance

Societies devise mechanisms to regulate appropriation of tangible and intangible goods and services. Conditions related to the regulatory mechanisms for forests and forestry are reflected in policies, institutions, and governance. This section includes topics ranging from land tenure and rights to forests and trees, public administration, participation, and stakeholder cooperation, long-term societal commitment to SFM, and influences of regional and global processes on forest-related policies and behaviour (Table I 3.1).

#### *Land tenure*

Based on the outlook studies, it can be presumed that clear and secure tenure forms the backbone of efficient land use and has direct bearing on forests and forestry (FAO 2010a). Uncertain land tenure discourages long-term investments and sustainable management and encourages maximisation of short-term benefits. Security of tenure is a necessary but insufficient condition to enhance incomes and lift people out of poverty. Technical and managerial skills of owners, proactive entrepreneurship, adequate financing, sufficient resources, supportive legislation, and access to markets are among the critical factors that enable SFM (FAO 2006, 2010a).

According to the Global Forest Resources Assessment (FRA) (FAO 2010b) 80% of the global forest area in 2005 was publicly owned, 18% was

privately owned and 2% ownership was classified as “other”, including unknown and disputed proprietorship. Except in Europe, public ownership is globally predominant, but the importance of public ownership varies among the regions. The area of privately owned forests has increased over the past 15 years in both Asia and South America because of the significant changes in countries such as China, Colombia, and Bolivia. The area of private forests also increased slightly in Africa and declined in North America (FAO 2010b).

Globally, it is predicted that in the next 20 years, public ownership of forestlands will remain predominant, although the area under public ownership will decrease slightly. The increase in privately owned forests will mostly occur due to new forest plantations rather than increased natural forests (particularly in Asia and Latin America). Reduction in public forests will be due to changes in tenure and decreases in forest area, while the latter is the more likely in many countries and regions (FAO 2010b). Private forests will further decline in North America due to long-term restoration and conservation strategies in the countries, which are mostly the responsibility of government agencies (FAO 2010b). In Africa, the role of the state will remain dominant, with some management rights devolved to private corporations in the high-forest-cover countries of Central Africa and to communities in eastern and southern Africa. In Asia, forest ownership and management will continue to shift as a consequence of land tenure reform in China in favour of private ownership by individuals and families (FAO 2010b). In Latin America, the area of forests under private and community ownership is expected to moderately increase (FAO 2006). In Russia, private forest ownership is unlikely to be introduced in the near future mainly because of the attitudes and social feelings of the majority of the population and of policymakers. A large part of the most productive forests in Russia is under long-term lease, which will restrain development of more efficient and flexible modern forestry contracting systems based on sound state-private cooperation. This will be difficult to reverse in the next two decades (FAO 2012a).

#### *Public administration*

Publicly owned forests can be managed by the state, communities, individuals, or the private sector. At present states manage more than 80% of public forestlands, private corporations, and institutions manage 10% and communities some 7% (FAO 2010b).

In the future the management of public forestlands in Africa and Asia-Pacific will significantly shift to the private sector, including corporate businesses, farmers, and communities. The role of gov-

ernmental institutions will change and will be limited to policy-making, regulatory functions, and the provision of goods and services that the private sector is unable or unlikely to provide (FAO 2003, 2010a).

Devolution of resource management responsibilities to lower-level government agencies and to communities, families, and individuals is expected to be a growing trend across regions. One challenging issue will be the inclusion of local people in decisions on protected area management and aligning livelihood improvement activities with conservation objectives. Involving local communities and ensuring equitable benefit distribution will be essential to sustainable protected-area management. Despite its limitations, however, the potential benefits of decentralisation and wider community participation in resource management will be increasingly recognised (FAO 2003, 2006, 2010a).

Quite a number of countries will face challenges related to the fragmentation of national environmental and forestry agendas and the involvement of numerous governmental agencies. With several departments and ministries working in related areas, coherence and coordination will become a major issue (FAO 2003, 2006, 2010a). The capability of public sector organisations will be crucial for effective and efficient planning and implementation of the new environmental and forest policies. Management for achieving several objectives should be coordinated and compromises between divergent goals need to be made, which will result in inevitable trade-offs. This task will be challenging since many forest institutions, especially in developing countries, will continue to struggle with poorly qualified staff, lack of capacities, low budgets, and poor equipment (FAO 2006, 2010a). In Africa, the decentralised governmental organisations will be more hampered by limited resources and lack of capacities than federal or national authorities. Consequently, decentralisation per se will not necessarily lead to improved management of natural resources. Corruption will continue to be an additional challenge for improving forest governance in many developing countries (FAO 2003). In Russia, decentralisation of the Federal Forestry Agency was too forceful. For instance, the formerly centralised forest guard (*lesookhrana*) structure was dissolved, which led to ecological deterioration in many forests. In the future it will likely become an agency with stronger centralisation and firmer vertical authority (FAO 2012a).

#### *Policy issues*

Further evolution of the post-industrial economic model, oriented towards the service sector, will bring about changes in forest management priorities. Provision of ecosystem services and amenity

values will gain increased attention (FAO 2012b). In the future forest policies will undergo major changes, with a significant shift away from timber-focused management to the provision of ecosystem services, poverty alleviation, and landscape approaches (FAO 2003, 2010a).

In Europe, private owners will have less-evident market incentives to sell their wood (UNECE/FAO 2012a). In Russia, foreseen instability of the legal environment will play a negative role in forest-sector development. It is predicted that the implementation of forest legislation will be improved in the Central-European part of Russia but will be challenging in remote Asian parts of the country, especially in border regions with China (FAO 2012a).

#### *Participation and stakeholder cooperation*

An increasing involvement of a wider range of stakeholders in forest management and policy formulation is expected. However, wide gaps will persist between policies and practice. Greater demands will be seen worldwide for social justice, public participation, transparency, and wider involvement of civil society and private sector organisations in forest management. Social participation will gradually and steadily increase in the preparation and implementation of forest management plans and programs, and these processes will be supported by legal changes. The activities of environmental organisations and non-governmental organisations (NGOs) encourage such participation and demand greater transparency in decisions affecting the use of state forests (FAO 2003, 2006, 2010a). In Russia, NGOs and civil society will increasingly pressure to scale up participation in public forest decision-making (FAO 2012a). In Europe, forest sector policies, institutions, and instruments are generally up to date, stable, and effective. Forest policies increasingly enjoy public support through the participatory nature of national forest program (NFP) processes. Meanwhile in Europe, the challenges posed by climate change, energy supply, and biodiversity conservation are exceptionally complex and long-term. They will require profound policy and management changes (UNECE/FAO 2012a).

#### *Enforcement of laws and regulations*

In Africa, Asia-Pacific and Latin America a number of initiatives are already underway to improve forest governance, law enforcement, and legal trade, for instance the Voluntary Partnership Agreements, implementing the EU FLEGT Action Plan. Some of the obstacles related to compliance with laws and regulations are caused by poorly designed laws, insecure land tenure systems, excessive regulations, and

growing complexity and controversy of the legislation. Additional disincentives for compliance with laws are the lack of financial and human resources of national forest services. Especially isolated forest estates will be ill-demarcated, have weak presence of government agencies, and thus suffer from poor management or virtual abandonment. Within Europe, illegal logging is not an issue of wide concern, but legality of wood imported to this continent will remain subject to strict procedures (FAO 2003, 2006, 2010a).

The global role reached by NGOs will become more critical in the future. Apart from creating awareness, they will spearhead action against illegal logging and trade of forest products, unauthorised conversion of forests, and corruption. The efforts of civil society organisations will compel governments and logging companies to comply with the principles of SFM (FAO 2003, 2006, 2010a, UNECE/FAO 2012a).

#### *Influences of regional and global processes*

Globalisations, liberalisation of trade, and market-oriented approaches, including privatisation, have produced changes in forestry and will continue to do so. These processes have had diverse impact in different regions and countries. Asian countries have been benefitting from more open economic policies. Many countries in Africa have suffered from global economic turbulence and cheap imports that undermine markets for local products.

In the future environmental issues could also change the course of forestry in various ways. With climate change being as a critical environmental issue, forests and forestry will be at the forefront of global political discussions, with considerable potential for reshaping the future of the sector. The role of forestry in climate change mitigation will largely depend on progress in arresting deforestation and degradation to enhance carbon stocks. Implementing the REDD+ mechanism alone will not resolve the problems caused by climate change but should contribute to broader SFM aims. Social and environmental activities related to climate change adaptation will play an important role in forestry's future development. Legality regulations on imported wood to European Union (FLEGT) and United States (Lacey Act) markets will significantly alter trade flows in the world. Public procurement policies and corporate decisions will produce similar effects. With a large proportion of higher value-added products for Western markets being manufactured in a few key countries, the leverage of such measures on regional trade will be significant. Europe and North America will continue to trigger and encourage major improvements in SFM policies and forest-related behaviour,

mostly in tropical forest countries (FAO 2003, 2006, 2010a, UNECE/FAO 2012a).

#### *Commitment to SFM*

Globally, the demand for forestland and forest resources will increase because of population growth, urbanisation, expansion of agriculture and cattle grazing, mining, and increasing need for employment. These factors will put pressure on forests and woodlands and make the implementation of SFM difficult even though many countries have adopted SFM as their main forest policy objective, with due consideration of the social, economic, and environmental dimensions. In the near future, the majority of countries are expected to commit to broader SFM goals (FAO 2003, 2010a). In Europe, the SFM concept has rapidly evolved over the past 20 years and will change even more in the coming two decades to comply with complicated and often-contradictory societal needs (UNECE/FAO 2012a).

### **3.2.2 Livelihoods, capacities, and cultural and socioeconomic aspects**

The way forest users interact with forests is influenced by economic, ecological, social, and cultural conditions and by the capacities of forest users. This section focuses on topics such as contribution of forests and forest resources and services to livelihoods; commercial opportunities; access to capital; security and conflict; the role of industrial forestry; and employment (Table I 3.1).

#### *Contribution of forests and forest resources and services to livelihoods*

Forests have been and will continue to be very important to forest-dependent communities, providing for basic needs such as fuelwood, housing materials, shelter, grazing opportunities, medicinal plants, and other wood and non-wood forest products. This is particularly significant during natural disasters such as floods and droughts and spread of diseases such as HIV/AIDS, which severely affect society and undermine national economies (FAO 2003, 2006, 2010a). In the next 20 years, high economic growth rates in developing countries will steadily increase demand for food, fibre, and fuel. Demand will also depend on the use of forest products in other economic sectors, such as export packaging and competitive prices on forest products in the region. The main driving forces behind export growth will be raw material and



labour costs, competitiveness, productivity, technological advances and innovations, programs to facilitate export, and domestic demand. To survive in the strengthening international commercial global contest, forest companies will be forced to use all available strategies and tactics, including higher value-added products, trade agreements, value chains, secondary processing, products diversification, and associations of producers (FAO 2006).

#### *Industrial forestry and wood energy*

According to the FRA, the total value of forest product removals in 2005 (five-year average) was USD 122 billion. About 71% of this came from industrial roundwood, 15% from non-wood forest products (NWFPs), and 14% from fuelwood. In North America, Latin America, and Oceania, industrial roundwood accounted for almost all of the value of removals. The value of fuelwood removals was particularly important in Asia and Africa, although it may be underreported in many of the outlook studies from other regions (FAO 2010b).

Also, in the future industrial roundwood will remain by far the most important output from forests (in terms of market value) at the global level and in each region, but its value will vary considerably over time and by markets due to changes in market conditions (FAO 2010b).

Global wood removals in 2005 amounted to 3.4 billion cubic meters, which currently account for about 0.7% of growing stock. About half were industrial roundwood and half fuelwood. In Africa 91% of the wood extracted from forests or woodlots is used as fuel and in Asia-Pacific, the share is more than 75%. Industrial roundwood production in Africa currently accounts for about 10% of total wood production (FAO 2010b).

In the longer run, wood removals will gradually increase globally in line with growing populations and income. Significant differences will persist between regions. Over two-thirds of wood will be used as fuelwood in Africa and Asia and less than 20% in Europe, North America, and Oceania. Most of the long-term growth in wood supply will occur in countries in Asia, Latin America, and Oceania that developed forest plantations over the past few decades. Wood supply, particularly industrial roundwood, will continue shifting from natural stands to planted forests. This could partly reduce logging pressure on natural forests in the near future (FAO 2010b).

Wood will be the foremost source of energy in Africa, primarily because of its low cost and wide availability in comparison with other energy sources. In the future, more fuelwood plantations with fast-growing tree species are expected to be established

in Africa to also supply fuel for combined heat and power plants that are expected to be built. The introduction of improved stoves will increase the efficiency of burning wood. Africa's wood products sector will be dominated by "low value adding" industries catering largely to external demand. The growth of value-added wood-processing industries will be sluggish. It is predicted that Africa will remain an importer of products such as newsprint, printing, and writing paper (FAO 2003).

Also, in the Asia-Pacific region, wood will continue to be the main source of energy in many countries. As economic growth and energy consumption in industrial and service sectors will increase, the share of wood energy will relatively decline. Energy and environmental policies can bring about important changes in the extent of wood use as many countries will attempt to reduce dependence on fossil energy sources. New technologies, such as cellulosic conversion processes for biofuel production and efficient small-scale wood gasification technologies, will have significant impacts on wood use. In general, wood supplies will be adequate to meet industrial demand, although there could be supply shortages in many localities. Production in existing plantations can be increased significantly through improved management. Wood resources outside forests are expected to increase with secure tenure and markets, which encourage the expansion of farm-based tree planting outside forests. With the exception of sawn wood, the Asian region's share in global wood-product consumption will increase considerably between 2005 and 2020. The Asia-Pacific region will also increasingly become a producer and exporter of value-added products, especially furniture, relying on imports of lower value-added items. The Asia-Pacific region will have to pay greater attention to the efficient use of raw materials and energy. It will also enhance utilisation of wood residues for local processing, energy generation, and wood-fibre recycling (FAO 2010a).

In the next two decades, Latin America will steadily increase production, consumption, and trade of most forest products. The largest increase in exports will be in the case of pulp and paper, which are among the region's major forest products exported. Remarkable growth of exports of sawn wood, plywood, and other value added products, such as mouldings, floors, and furniture will continue. Raw wood will be mainly supplied from forest plantations. Brazil and Chile will hold a prominent position in the regional and global wood production and trade (FAO 2006).

Europe will remain a net exporter of wood products. Consumption of wood energy will grow steadily, fully utilising harvest and other residues. Wood will play an important part in increasing the use of renewable energy in Europe without forest area expansion. All phases of wood supply will be

mobilised, including use of short rotation coppices on agricultural land, landscape care residues, and post-consumer wood (UNECE/FAO 2012a).

In Russia, according to the most favourable innovation scenario, it is expected that innovation technologies will increase high value-added industries. In this scenario the proposed strategy is to increase the use of wood in building as the prime industrial locomotive, which will pull the sector out of the 20-year stagnation and open the way to the downstream wood production chain. Trade of high value-added products will prevail over semi-processed wood. According to the favourable innovation scenario, the manufacturing of primary products will increase until 2030 by 1.5 to 3.3 times, depending on the product (FAO 2012a).

In North America, Canada will maintain its dominant position as the prime provider of forest products to meet the excess demands of the United States and emerging economies, especially in Asia. The United States has long been a net importer. It will remain at a disadvantage until 2030 in sawn wood, wood panels, and paper industries, with more balanced positions in round wood and wood pulp (UNECE/FAO 2012b).

#### *Non-wood forest products (NWFPs) and services related to forests*

NWFPs will mainly cater to subsistence needs of forest-dependent communities. More NWFPs are, however, expected to be commercialised and are forecasted to generate substantial incomes. Prospects for continued growth of some of the NWFPs, especially medicinal plants, are bright due to improved access to market information and technology. NWFP removals will remain important for rural development and poverty alleviation in many countries. Increased removals of the NWFP will benefit larger number of people if they are harvested sustainably, avoiding excessive exploitation (FAO 2003, 2006, 2010a).

In the future, more income will come from services related to forests. Tourism in general, and ecotourism in particular, will contribute considerably to rural development through employment and income generation in Africa and Asia-Pacific. This is, however, expected to create environmental and social problems as many popular ecotourism areas may suffer from large inflows of visitors, far exceeding carrying capacities and significantly undermining the quality of natural assets (FAO 2003, 2010a).

Watershed protection, arresting of land degradation, conservation of biological diversity, and carbon sequestration are important ecosystem services. The development of ecosystem markets will largely rely on overall social and economic development. In the foreseeable future, payments for ecosystem services

(PES) in Africa and Asia-Pacific are most likely to be funded through international transfers in most developing countries. Since ecosystem markets are in the early stages of development, their potential to become an important source of finance for SFM remains unknown and uncertain (FAO 2003, 2010a).

#### *Employment in forestry*

Employment in forestry is expected to provide significant benefits in the often-poor rural areas. Increasing employment opportunities will thus enhance the forest sector's contribution to poverty alleviation. The FRA (FAO 2010b) roughly estimated that in 2005 forestry employed about 11 million people globally. Given the unreliability of the employment figures, it is not possible to draw any robust conclusions about the current status and trends in global forestry employment. However, some data suggests that forest-related employment will likely decline in most countries and regions due to improved labour productivity through increased mechanisation and advancing technology. Given that much forestry employment is outside of the formal sector, forest work is likely to be more important for rural livelihoods and national economies than the reported figures suggest (FAO 2010b).

#### *Access to capital*

Access to capital for private and public investments, either in human capital or technology, will depend on the ability of countries or localities to attract domestic and foreign capital to the forest sector. In a globalised economy, foreign direct investment (FDI) flows will primarily be based on the expected rates of return and risk perceptions. In the forest sector, logging and associated processing will be the main areas for such investment. However, it must be kept in mind that the investment cycle is utterly different in short rotation plantations in the South and in the Northern forestry. Asia, with high savings and investment rates and with well-developed policies and institutions will continue attracting large FDI, although at a declining rate. Latin America has emerged as another attractive region for FDI. It is expected that in the near future Russia, with its growing supply of allowable wood cut and pledged improvements in the investment climate forecasted by 2018, could become another attractive destination for world forest direct industrial investments. In Russia, the New Forest Code is expected to include implementation mechanisms for the fulfilment of obligations resulting from international agreements, conventions, and protocols (FAO 2012 a). It is expected that encouraging conditions and transparency should attract invest-

ments in the forest sector and promote international cooperation (FAO 2003, 2006, 2010a, 2012a).

### *Security and conflict*

In view of high population densities and growing demands for goods and services, competition for limited natural and financial resources will intensify in many developing countries. Failure to develop efficient political processes, corruption, and poor governance will increase social conflicts, some of which will over time transform into religious, political, and ethnic conflicts. Forests overlap with some of the most underdeveloped and deprived areas in the world that are often populated by the most marginalised groups. Governmental presence will be limited in these areas and when present, can often be seen as an agent of exploitation. In the future it is expected that national forest policies and international agreements will include aspects related to the establishment of effective procedures for the management and resolution of conflicts. In order to strengthen the conservation of protected areas, it will be necessary to reconsider conservation concepts, resolve conflicts, and address demands of the communities living in or near the forest areas that have customary rights over them (FAO 2003, 2006, 2010a).

### **3.2.3 Natural resources base**

The responses of forests to external impacts are influenced by multiple human, environmental, and biophysical factors. The type of soil, weather, physiognomies of vegetation, and its natural productivity as well as the ecosystem conditions compared to its undisturbed natural state, and the resilience of species to the drivers of change are factors that highly influence how forests respond to external impacts. The same factors also affect altered natural forests, planted forests, agroforestry areas, and other types of anthropogenic forests.

This section focuses on the potential of forest and trees outside forests to provide goods and services demanded by society, considering their extension and condition, and the drivers that impact on them causing alterations in their structure and composition.

According to FRA 2010 (FAO 2010b), the world's total forest area is just over 4 billion ha and covers 31% of total land area. Figure IV 3.1 shows how the total land area and forest area of the world are allocated into the six regions considered in this chapter. Note that Asia-Pacific includes the total forest resources of Asia and Oceania. Latin America is the sum of forests of South America, Central America, and Caribbean countries. Europe and the Russian

Federation are considered independent regions. The five most forest-rich countries (the Russian Federation, Brazil, Canada, the United States of America, and China) account for more than half of the total forest area.

Deforestation implies a permanent conversion of forestland to other land uses. It is mainly caused by the conversion of forests to agricultural land, mining, cattle husbandry, expansion of urban areas, and road infrastructure. This serious socio-environmental threat shows signs of decreasing in several countries but continues at a high rate in others and is still a severe problem at the global level. According to FAO estimates, about 13 million ha of forest were converted annually to other uses or lost through natural causes in the past decade, representing one of the most challenging threats faced by the global society (FAO 2010b).

Forest area can also increase through afforestation –establishment of forest plantations in areas not forested in recent times– and natural expansion of forests. Accordingly, the net loss of forest area caused by deforestation can be reduced, a phenomenon that has been significant in several regions of the world. FAO statistics point out that the net change in forest area in the period 2000–2010 was estimated at -5.2 million ha per year. Latin America and Africa continue to have the largest net loss of forest (3.8 and 3.4 million ha per year, respectively). The area of forest in North America is stable and in Europe the forest area continues to expand. In Asia, the net gain in forest area (2.2 million ha per year) was primarily due to large-scale afforestation in China, while deforestation rates continued to be high in many countries in South and Southeast Asia (FAO 2010b).

The report of the *State of the World's Forests* (FAO 2012b) presents an optimistic view: “Time and again, forest areas have declined as populations and economies have grown. Rapid economic development is often accompanied by high rates of deforestation. Fortunately, history suggests that as countries reach a certain level of economic development, they are generally able to stabilise and then even increase the area of their forests.”

Primary forests (defined by FRA as “naturally regenerated forest of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed”), in particular tropical moist forests, include the most species-rich and diverse terrestrial ecosystems. While 36% of the world's forests are classified as primary, the area is decreasing by some 4 million ha annually, largely due to reclassification because of forest degradation caused by selective logging and other human interventions. Some countries are setting aside parts of their natural forests in which no intervention should take place. With time, these areas evolve into stands that meet the definition of



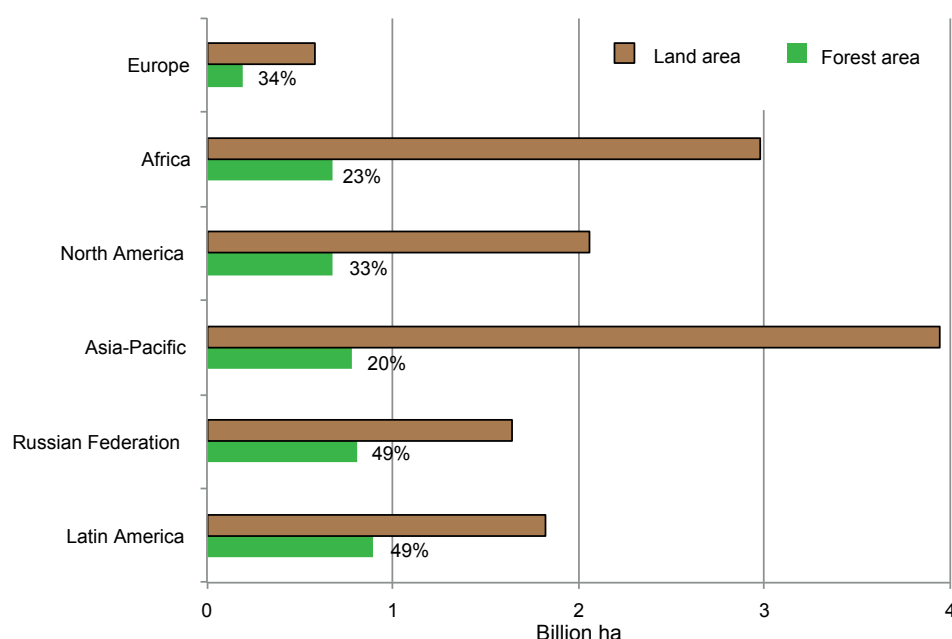


Figure IV 3.1 Total land area and forest area by regions in 2010 (data source FAO 2010b).

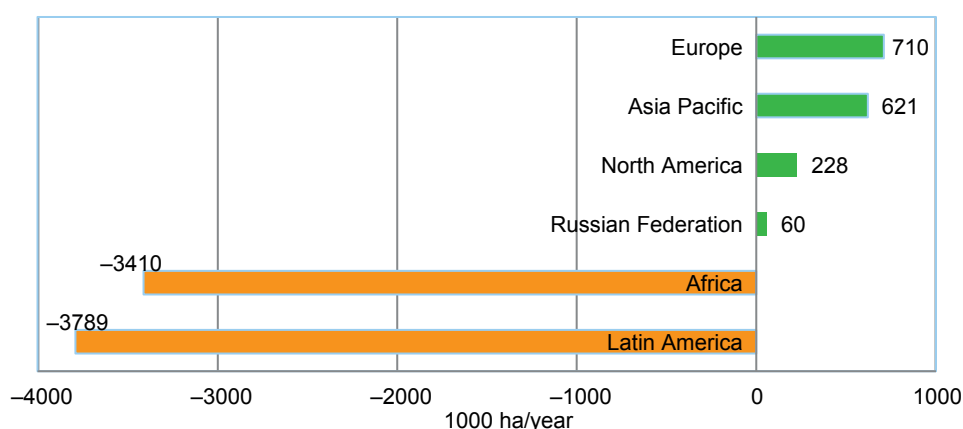


Figure IV 3.2 Annual net gains and losses of forest area by regions in 2005–2010 in 1000 ha/year (data source FAO 2010b).

primary forests (FAO 2010b).

Forests and trees are planted for many purposes and added up to an estimated 7% of the total forest area, or 264 million ha in 2010. During the past decade, the area of planted forests increased by about 5 million ha per year. Most of these forests were established through afforestation, especially in China. Wood supply (particularly industrial roundwood) is increasingly shifting from natural forests to planted forests (FAO 2010b).

Forest degradation – the loss of maintenance of biological diversity over time, biotic integrity, and ecological processes – can also have severe consequences on forests and the people who live in or close to them or benefit from them. Forest degradation often leads to decreased productivity, vitality and

health, reduction of the genetic pool, and in extreme cases, could cause the extinction of the whole resource or of some of the species. Fire, most of which is human-induced, unrestrained logging, and grazing will remain the main causes of degradation in most countries. Incidences of pests and diseases also contribute to forest degradation and low productivity. Estimating forest degradation is a complex issue. Therefore, degradation is a major but partly hidden problem, especially in more densely populated low-income countries (FAO 2010a, FAO 2010b).

In 2010, the world's estimated total growing stock was 527 billion m<sup>3</sup> or 131 m<sup>3</sup>/ha. It shows a slightly decreasing trend caused by a global reduction in forest area. However, the growing stock per hectare is increasing globally; this is particularly the

case in North America and Europe, excluding the Russian Federation. The growing stock per hectare is highest in the tropical forests of South America and Western and Central Africa, but it is also high in temperate and boreal forests. Forest degradation can severely affect and reduce growing stock (FAO 2010a, FAO 2010b).

The world's estimated carbon storage in forests is more than 650 billion tons, of which 44% is in biomass, 11% in dead wood and litter, and 45% in forest soil. Globally, carbon stocks are decreasing as a result of the forest area loss; however, the carbon stock per hectare has remained almost constant during the past decade (FAO 2010b).

The provision of ecosystem services is gaining importance globally, and large tracts of natural forests are increasingly being withdrawn from production and set aside as protected areas. The area designated for conservation of biological diversity currently accounts for 12% of the total forest area (460 million ha). Legally established protected areas cover approximately 13% of the world's forests (FAO 2010b). Management of protected areas remains problematic; encroachment and poaching of animals and plants and human-wildlife conflicts remain a major problem in many countries in Africa and Asia-Pacific. Nonetheless, protected areas remain the mainstay of biodiversity conservation and safeguards for their permanent protection are essential. Many protected areas, however, exist only on paper, especially in countries with vast tropical forest areas, due to lack of professional staff and material resources for proper control and due management. The costs associated with protected areas are typically borne locally while benefits accrue globally (FAO 2003, 2010a).

"Trees outside forests" refers to trees found on lands that are not categorised as forests or as other wooded land. They include trees found in rural landscapes (e.g. on farms, in fields, in pastures and various forms of horticulture and agroforestry systems, in hedges, along roads and streams) and in urban settings (e.g. on private or public lands and along roads and streets). The wood resources outside forests are increasing as a consequence of secure tenure and because safe markets are encouraging the expansion of farm-based tree planting. In several countries, the profitability of agriculture is declining, which is fostering a shift to less labour-intensive tree crops, especially on marginal lands with low productivity. Home gardens and tree planting under agroforestry have become important sources for industrial roundwood, fuelwood supplies, and NWFPs. Agroforestry – incorporating trees into farms – will be an essential component of global efforts both to enhance rural livelihoods and to mitigate climate change. According to FAO estimates, the potential future contribution of farm forestry through the harvesting of wood,

fruits, oils, and medicines from trees could reach about 40% of farm income in the coming decades (FAO 2003, 2006, 2010a).

When summarising the most noteworthy trends in the natural resource base, we must keep in mind the assertions expressed in the latest *State of the World's Forests* (FAO 2012b), which indicates that it has recently registered a positive trend in reducing the rampant deforestation in several regions. Despite the seriousness of the current situation, there is reason for optimism in the longer term because although deforestation is a common pattern, about half of the world's countries have halted or reversed forest loss. Nevertheless, the continuous reduction of primary forests remains a distressing reality.

As stated previously, the world's estimated total growing stock shows a slightly decreasing trend caused by a global reduction in forest area, but it is rising in North America and Europe. Conversely, the growing stock per hectare is increasing globally, which is highly important because of its impact in increasing wood production and carbon stocks. Nevertheless, carbon stocks are globally decreasing as a result of the large extension of forest area lost, and carbon stock per hectare has remained almost constant during the last decade (FAO 2010b).

Several national policies and programs have influenced the growth of planted forests on different continents, particularly in Asia-Pacific and Latin America (FAO 2006, 2010a). The rapid increase in demand for wood from these forests will continue. Forest plantations have significantly increased in productivity and their products are selling at competitive prices, facts that are stimulating investments in new planting areas. Therefore, it can be expected that the area of these forests will continue to grow on different continents, partially decreasing the pressure for timber products extracted from natural forests (FAO 2012b).

There are promising signs due to the increasing importance gained globally for the provision of ecosystem services and the clear trend in raising the number and extension of protected areas in all regions, which is expected to continue to grow. Another promising sign is the increasing interest of communities and various stakeholders in expanding the areas dedicated to agroforestry and obtaining a more integral benefit from trees outside forest.

### 3.2.4 Research and monitoring

#### *Increasing needs for research and monitoring*

Science and technology have significant impacts on the forest sector. Adequate national forest research and education capacity is essential for providing

the information and knowledge needed to manage, utilise, conserve, and enhance forest resources. The magnitude and diversity of demands on forests and the related threats and opportunities have grown significantly in recent decades in many countries. To address these new challenges, research and education systems need to provide appropriate skills and knowledge. There is an urgent need for a better understanding of the interfaces between forests, other natural resources, and social demands and for entrenching the research findings into policy agendas. However, according to FRA 2010, the number of staff in public forest institutions is decreasing and globally only approximately 21 000 professionals work in public forest research institutions. In many countries national capacities in forest research and education seem to be inadequate to support the sustainable development of the forestry sector and respond to emerging issues. Information about education and research provides a useful indication of a country's managerial, technical, and administrative capacity for SFM and its ability to adapt the forestry sector to complex challenges such as climate change (FAO 2010b).

Adoption of remote-sensing techniques, including geographical information systems and global positioning systems, will positively impact forest management in the future. The speed at which vast amounts of spatial and temporal data can be analysed and synthesised has positively impacted the progress of forest management. Improvements in the resolution of satellite imagery and the development of software to interpret images will contribute to real-time monitoring of deforestation, pests and diseases, fires, and other potentially devastating events while improving silvicultural and management practices. Particularly, monitoring data constitutes the basis for forest planning and further implementation of practical research. It also helps to quantify and map the risks linked to climate change. But it must be borne in mind that information from remote-sensing sources must be supported by more reliable data samples provided by intensive field inventories.

Another important topic that will demand renewed efforts is related to the establishment of forest plantations, which not only possess high productivity but also should be more resistant to diseases and pests. To this end, research activities on selective breeding and biotechnological applications should be increased.

In Africa, forestry institutions will remain weak, even under traditional centralised systems. Education and extension will be particularly prone to negligence, especially when resources are shrinking. Therefore, it is predicted that Africa will continue using technology developed elsewhere, including monitoring programmes. Resource limitations will probably decrease the access to advanced technol-

ogy. The technological divide that exists today between Africa and the rest of the world is therefore likely to persist and widen (FAO 2003).

Enhancing social and ecological sustainability in Asia will require major improvements in science and technological capacities. Stronger inputs from science will be necessary to change the current pattern of resource use. The focus will be on translating existing knowledge into technologies that are more energy and material efficient. These will include technologies for improving management and enhancing productivity (e.g. tree improvement), and the development of innovations for new products and processes. Remote-sensing technologies will greatly help track changes on a real-time basis. Developing commercially viable cellulosic biofuel and biorefinery technologies will have major impacts on the use of wood by 2020 (FAO 2010a).

In Latin America, the research work developed on forestry plantations will continue in the future and will focus primarily on issues related to productivity and efficient use of planted forests, topics that received significant attention in the past three decades. It can be expected that fewer efforts will comparatively be devoted in research on natural forests. It is expected that a marked growth will take place in plantations as a result of new investments in research and technology throughout the whole value chain, with influential contributions from foreign capital. High productivity and competitiveness of wood from planted forests will favour the development of the private sector with an active support from government policies. These achievements have benefitted from intensive research and genetic improvement made with the cultivated fast-growing species, particularly in Brazil and Chile. Financial benefits will guide investments in technological innovations and research on improving the competitiveness of planted forests. The use of modern assessment and planning technologies will reduce the costs of developing information management systems for forest inventory and the preparation of management plans. Digital technologies will also help increase the capability of monitoring large forest areas, which is particularly important for promoting SFM implementation (FAO 2006).

An increase in forestry research is also needed in Europe. There is, for instance, the need to better understand the complex factors that affect forest health and vitality under climate change. The focus of technological and scientific research on this continent will greatly depend on the dominant policy scenario adopted for the future development of this region, whether maximisation of biomass carbon, prioritising biodiversity matters, promoting wood energy production, or fostering innovation and competitiveness (UNECE/FAO 2012a). Also, the conflict caused by the increasing demand for biomaterials

and forest conservation must be solved in an efficient way.

Adjustments in research, training, and education programmes are required, which often require planning ahead, and frequently they demand forest institutional reforms. The importance of informing the public and establishing a dialogue on forest-related issues and priorities is frequently emphasised. Enhanced provision of information and participatory processes will also contribute to increasing the transparency of forest policies and facilitate progress towards more interdisciplinary research and education (FAO 2006, UNECE/FAO 2012a).

In Europe increased guidance and support for owners of small forest properties is urgent. National forest programmes probably need to be revised to better accommodate the role of forestry in climate change mitigation and adaptation and to incorporate specific national circumstances (UNECE/FAO 2012a). In Europe, appropriate forest monitoring is crucial to detect early changes in the health and vitality of forests, pest and disease outbreaks, and forest fires. There is also a need to monitor the success (or failure) of adaptation measures, although constraints in anticipating future trends will require reliance on “learning by doing” (UNECE/FAO 2012a).

Monitoring programmes in Russia are apparently insufficient and unreliable because they cannot accurately estimate the volumes of illegal cuts. Continuing illegal logging activities and inadequate monitoring system both cause local, national, and international tension. Monitoring and assessment issues in all scenarios are to be resolved by 2030 by increasing transparency, distant forest monitoring with aerospace methods, prevention of illegal logging, and adoption of related legal acts (FAO 2012a).

#### *Major trends in research and monitoring*

Despite the growing and important challenges facing global forest resources – such as increased demand for forest products, forestland conversion to agricultural production and expansion of urban infrastructure, impacts from climate change, and rising demands on wood for energy generation – the emphasis on scientific and technological research required to find a satisfactory solution to these major challenges is not currently evident. The same is true concerning the low incentive to promote multisectoral and multidisciplinary research, capable of providing solutions to the complex interface between limited and deteriorated natural resources and the growing socio-economic demands of contemporary society.

The gap between growing needs for scientific and technological research on forest resources and increasing pressures that affect them may be illustrated by the declining number of forest researchers

at the global scale (FAO 2010b).

Another matter of concern is the concentrated nature of current research activities, most of which is localised in North America and Europe. The meagre amount of research developed in Africa is particularly alarming: this region will continue to depend on technological solutions produced in other parts of the world (FAO 2003).

Adoption of remote-sensing techniques, including geographical information systems and global positioning systems, will positively impact future forest management. The speed at which vast amounts of spatial and temporal data can be analysed and synthesised has positively impacted forest management. Improvements in the resolution of satellite imagery, and the development of software to interpret images will contribute to real-time monitoring of deforestation, pests and diseases, fires, and other potentially devastating events while improving silvicultural and management practices.

In Asia, stronger inputs from science will be necessary to change the current pattern of resource use. Technological solutions for improving management and enhancing productivity are urgently needed (FAO 2010a).

In Latin America, the research work developed on forestry plantations will continue in the future and will focus primarily on issues related to increased productivity and efficient use of planted forests. Research on biotechnological applications will also be maintained or increased (FAO 2006). Research will also increase in Europe, but the thematic emphasis will depend on the policy scenario selected for future development (UNECE/FAO 2012a).

Monitoring data constitutes the basis for forest planning and further implementation of practical research. It also helps to quantify and map the risks linked to climate change. Reliable baselines are needed for accurately tracking the changes in forests and other natural resources. There are important attributes of forest stands that are amenable to assessment at large-scale levels (global and/or regional). However, the crucial challenge is to reliably assess multifunction forest variables at the landscape level, which is the level at which forest management decisions are adopted.

### **3.3 Concluding remarks**

Conditions among countries and regions differ widely and the difference complicates drawing global conclusions or identifying common trends. Countries and regions live through different historic stages of forestry and socio-economic development, so there are no universal recipes for solving similar problems in different countries and continents. Local responses



to global challenges are always time and place specific and depend on peculiar local or national conditions. In a like manner, examination of the prerequisite conditions for SFM in different countries and continents often results in fragmented and even contradictory findings, in which global trends are not easily seen. Often, opposite trends coexist, such as rampant deforestation and establishment of forest plantations or centralisation and decentralisation.

It should be noted that practically all regional outlook studies addressed topics related to policies, livelihoods, the biological resource base, and research. But the synthesis was not exempt from problems because FAO outlook reports did not necessarily share a common structure or methodological procedure and they had diverse forecasting horizons. Nonetheless, some general trends and future challenges were identified across the outlook studies.

#### ***Policy issues:***

Worldwide demands will grow for social justice, public participation, transparency, and wider involvement of civil society and private sector organisations in decision-making and forest-management planning and implementation.

Countries with stronger economies tend to have well-established and clear public policies, which consider market externalities caused by underestimated ecological values.

#### ***Forest management policy:***

SFM will undergo major changes, with a significant shift away from timber-focused management to the provision of ecosystem services, poverty alleviation, and landscape approaches. Management to achieve several objectives is to be coordinated and trade-offs between divergent goals need to be made.

#### ***Ownership:***

In the near future, public ownership will remain predominant, although the area under public ownership will decrease slightly. Unclear land tenure of forestland must be resolved because it is one of major problems leading to illegal cutting and land-grabbing. The management of public forestlands, however, will significantly shift to the private sector, including corporate businesses, farmers, and communities.

#### ***Institutions:***

The role of governmental institutions will shift from managing resources to policy-making, regulatory functions, and the provision of goods and services that the private sector is unable or unlikely to provide.

#### ***Decentralisation:***

The transfer of forest management responsibilities to lower level governmental agencies, communi-

ties, families, and individuals is also expected to be implemented. This task will be challenging since many local forest institutions struggle with limited human and financial resources.

#### ***Social participation:***

The involvement of a broader range of stakeholders in forest management and policy formulation is predicted to increase, especially in the preparation and implementation of forest management plans and programs. The activities of environmental organisations and NGOs encourage such participation and demand greater transparency in decisions affecting the use of forests. However, in the near future, wide gaps between policy statements and practice are expected to persist.

#### ***Influences of regional and global processes:***

A large part of forest conversion is driven by trends, policies, and actions originating from outside of the forestry sector. Globalisation, liberalisation of trade, and market-oriented approaches, including privatisation, will continue to motivate forestry changes in the future, along with environmental issues such as climate change.

#### ***Livelihoods:***

Forests will continue to be very important in providing for basic needs of forest-dependent communities. This will be particularly significant during natural disasters such as floods, droughts, and pest and disease outbreaks.

There will also be a steady increase in demand for food, fibre, and fuelwood because of higher economic growth rates in developing countries. Industrial roundwood will remain by far the most important market value output from forests at global and continental scales. Wood will be the foremost source of energy in Africa and in many Asia-Pacific countries.

In the future, more income will come from the services related to forests, such as tourism in general and ecotourism in particular, NWFPs, and medicinal plants

#### ***Natural resources base:***

The general trend implies that deforestation and forest degradation continue to be a phenomenon that seriously affects forest areas, mainly at a slightly decreasing rate.

Simultaneously, forest plantations of fast-growing species will increase to provide an increasing percentage of the raw material for the production of various forest goods.

The attention on natural forests – pristine, primary, and secondary – will continue to be relegated to the background, despite the growing interest in keeping vital forest ecosystem services. Therefore,

biodiversity conservation will continue to be an issue that will require increased attention and effort.

The importance of agroforestry systems and trees outside forests is rising, especially on marginal agricultural lands with low productivity.

### **Research and monitoring:**

Global forest resources are currently facing serious challenges and menaces such as increased demand for forest products, massive forest land conversion to agricultural production and other purposes, impacts from climate change, and rising demand for wood for energy generation and other needs. However, an obvious corresponding emphasis on strengthening the scientific research required to provide satisfactory solutions to these demands is not noticeable at the world and regional scale.

Adoption of remote-sensing techniques will have positive impacts on forest management in the future. But the valuable information produced must be supported by accurate field inventory data. Vast amounts of spatial and temporal data can be processed at high speed, and that will revolutionise forest management. Improvements in the resolution of satellite imagery and further development of software to interpret images will contribute to real-time monitoring of deforestation, pests and diseases, fires, and other potentially devastating calamities, while improving silvicultural practices and facilitating adaptive management.

The main difficulties encountered in drawing general conclusions and trends from the outlook studies are listed concisely here:

- ◆ The reference periods differ: the outlook of Africa was published in 2003 and the outlook reports for Europe, Russia, and North America were published in 2012.
- ◆ The geographical areas covered are different: some outlook studies provide a continental overview (Africa, Asia-Pacific, and Europe), but the Russian outlook refers only to the Russian Federation because of the continental scale of the country.
- ◆ The purpose and methodology used are different: two outlook studies are different from the others. The Latin America outlook includes general guidance for developing the countrywide outlooks. The North American outlook uses a modelling approach – the Global Forest Products Model (GFPM) – and focuses on trade and markets projections. Unlike other outlook studies, the report

does not aim to thoroughly discuss problems related to policy and livelihood issues, which is the primary interest and focus of the current book.

- ◆ Some outlook studies (Africa, Asia-Pacific, Europe, and Russia) include alternative future scenarios. The assumptions set out to define various scenarios differ significantly between different regional studies and make it difficult to draw on global trends.
- ◆ It is often difficult to make a clear distinction between the natures of some of the identified trends, making it difficult to understand whether these have been objectively determined based on available scientific information or rather correspond to political recommendations for adopting decisions required to meet future developments.

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