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Evolution of Modern Forest Management Planning in the Republic of Turkey

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The Republic of Turkey has a long history of forest management that has undergone considerable change over the last 100 years due to political, economic, and social issues. For the most part, state-owned forestlands (the largest forest owner category) have been managed under plans arising from a conventional process that used classic techniques to regulate activities and allowable harvest levels. However, over the last 35 years, four different types of forest management plans have been developed (conventional and model) and applied universally or to a specific region of the country. Today, a single type of planning process is used, which emphasizes ecological and environmental conditions, multiple uses of the landscape, and social concerns. Although management and planning are evolving, implementation is challenged by a continued focus on wood production rather than on other concerns, a lack of skilled personnel and qualified decisionmakers, and other societal conflicts.

Keywords: forest management, forest planning, international forestry, sustainable forest management

The Republic of Turkey is situated at the intersection of the Asian and European continents, with about 97% of its area located in Asia. Of the forested countries along the Asian and European continental boundary, it is important from both timber production and biodiversity standpoints (Table 1). In comparison with the United States, Turkey is about 21 million acres larger than Texas, yet Texas has more forest area (about 10 million acres more) and greater forest coverage (37%) (Bentley 2012). Because mountain ranges are situated parallel to the northern and southern coasts, humid sea winds are prevented from passing into the central portion of the country; therefore, the temperature and precipitation regimes are not homogeneous across the country and change according to geographic region (Erinç 1949, Heske and Uslu 1953). For example, annual precipitation levels are low in the central and eastern parts of the country. The cities of Ankara (in the center of the country) and Erzurum (in the eastern part of the country) each receive about 15.7 in. of precipitation annually, whereas areas along the coasts receive about 27.6 in. or more of precipitation annually. This is, in part, a reason that the Black Sea (Figure 1), Marmara, Aegean, and Mediterranean (Figure 2) seaside regions are where most of the forests of Turkey are currently located. Turkey is also characterized as having a very complex geology that consists of a mosaic of several terrains (Okay 2008), and these have important effects on soil formation (Durak and Surucu 2005, Çolak and Rotherham 2006). Anatolia, the generally rough and steep Asian part of the country, is a peninsula surrounded by the Black Sea, the Aegean Sea, the Mediterranean Sea, the Sea of Marmara, and five other countries (Iran, Iraq, Syria, Armenia, and Georgia). Nearly 30% of this area has an elevation of more than 4,900 ft (Elibüyük and Yılmaz 2010).

The land area of Turkey represents the intersection of three phytogeographic zones, with species native to the Euro-Siberian, Mediterranean, and Irano-Turanian regions (Table 2). Plant diversity is rich and similar to what might be found on the entire continent of Asia, which is why this land is called *Asia minor* (Atik et al. 2010). Nearly 3,000 species of Turkish flora are endemic (Avcı 2005), and about 90% of the forests in Turkey can be considered "natural" in origin (Atalay and Efe 2010). In addition to many commercial tree species, Turkish forests also host flora that have medicinal, aromatic, and ornamental importance (World Bank 2007). In addition to natural factors, human activity has been very important in determining the current range and structure of plant and forest cover. The land now governed by Turkey has hosted several major human civilizations, from the first known

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Table 1. General statistics regarding Turkey and its forests.

Location	Between about 36°N to 42°N latitude and 26°E to 45°E longitude
Climate	Temperate
Floral species	~12,000
Land area	193.6 million acres
Forest area	52.4 million acres (about 27% of the land area)
Forest types (%)	
Coniferous	54
Deciduous	36
Mixed	10
Forest origin (%)	
High forest	73
Coppice forest	27
Total growing stock (billion ft^3)	45.50
Annual increment (billion ft^3)	1.28
Allowable cut (billion ft^3)	0.58

urban city (Catalhöyük, circa7500 BC) to the historically famous Troy and other great empires of the world, such as the Hittite, Roman, Byzantine, and Ottoman. Many cultures (Phrygian, Cimmerian, Cilician, Phoenician, Lydian, Hellenes, Urartian, and others) have inhabited these lands and have benefited from the resources that the forests provide. Scientific and historical findings show that 4,000 years ago, 60–70% of Anatolia was forested (Çolak and Rotherham 2006); however, harvesting, wildfire, agriculture, war, and misuse of land have all contributed to today's declined and degraded forest area.

Forests and Forest Use

Turkish forests that have 11–100% crown closure are defined as productive forests, whereas forests that have 10% or less crown closure are defined as nonproductive or degraded (Figure 3). About 50% of Turkish forests are considered degraded. The important coniferous tree species include Turkish pine (*Pinus brutia*) and Austrian pine (*Pinus nigra*) (Table 3); however, oaks (*Quercus* spp.) account for the largest forest area. Plantations of exotic species (Figure 4), introduced because of their growth potential, include maritime pine (*Pinus pinaster*) and Douglas-fir (*Pseudotsuga menziesii*). The majority of the total growing stock arises from high forests (Table 4) or forests with a well-developed natural structure that is generated from seed sources. The rest originates from coppice, which is dominated by oak species. The projected allowable cut for wood production, according to published forest management plans, is less than one-half of the estimated growth (General Directorate of Forestry 2006). The allowable cut accounts for illegal cuttings, the buildup of growing stock in understocked forests, and the expansion of conservation forests and protected lands (World Bank 2001). Recent estimates suggest that Turkey produces around 247 million ft^3 of logs per year and consumes nearly 283 million ft^3 of fuelwood, much of which may be harvested illegally (Sirtioglu 2010). Turkey has become the largest producer of sawn hardwood in Europe (Oliver 2011), yet is a major importer of newsprint, primarily from the Russian Federation, and logs, primarily from the Russian Federation and Ukraine (Sirtioglu 2010, Ince et al. 2011). Nearly all of the wood products are created by small-scale operations that employ, on average, 74 people (Aksu et al. 2011a).

Deciduous high forests have the largest mean annual increment (Table 5) of Turkish forests. Because a significant amount of oak forests are developed from coppice and are excessively exploited, their stocking levels can be very low; however, they have a better volume growth potential. The main reason that the mean annual increments are relatively low (and below their potential) is that the structure of forests is far from optimal, and some of the forests are very old. The average volume per unit area, 858 ft^3/acre, is low because of large areas of degraded, understocked forests. However, in productive high forests, the average volume is about 1,801 ft^3/ac, above the European average of about 1,601 ft^3/ac and the Canadian average of 1,515 ft^3/ac (Food and Agriculture Organization of the United Nations 2010). In the United States, a recent (2007) estimated average timber volume within timberland areas was 1,971 ft^3/acre, 1,829 ft^3/acre in the northeast, 1,593 ft^3/acre in the South, and 3,657 ft^3/acre in the Pacific Northwest (Smith et al. 2009). On a positive note, compared with the first Turkish inventory (completed in 1972), recent estimates of total growing stock have increased about 27% in three decades, and the total volume increment has increased about 22%.

More than 7 million people, who represent the poorest demographic in Turkey and are considered forest villagers, live in nearly 21,000 settlements in or adjacent to forests (Figure 5). These people are almost completely dependent on forest resources; therefore, forestry in Turkey is guided by a social goal of sustaining the lives of these

Management and Policy Implications

The Republic of Turkey contains a rich array of flora and hosts forests that contain wood and nontimber forest products of great importance to its citizens. Over time, the land has been heavily used, and many forests are currently considered poor in stocking and structure and in need of rehabilitation. Because most of the forest areas are considered public land and because technical capabilities of forest managers are limited at the local level, centralized forest planning is conducted to create plans for each forest enterprise area. Forest planning in Turkey currently is driven by the need to develop or maintain productive ecosystem processes and the need to address the multiple uses desired by forest villagers. Forest plans are required by law, even for privately owned land and must recognize and address these issues. However, conflicts do arise in the plan development and implementation stages because of land tenure issues. Some countries, such as the United States, contain a significant amount of privately owned forestland, and forest plans are not generally required unless they are needed to adhere to a certification program or to qualify for cost-sharing assistance. Although some countries can have a fairly strong land tenure recording system, thereby circumventing some of the plan development and implementation problems of Turkey, the evolution of planning processes in Turkey may serve as an example for regions of the world where resources are scarce (and perhaps in less than optimal condition) and where societal issues are prominent.

harvesting, thinning, afforestation, and wood product transportation activities (Guneş and Coşkun 2008).

Figure 1. A forest view from the Black Sea region, where plant composition and forest structure change along the mountains depending on elevation. (Photo courtesy of Aykut Ince.)

Figure 2. A forest view from seaside parts of the Mediterranean region, composed mainly of Turkish pine (*Pinus brutia*) and maquis, a thicket or dense evergreen shrubland. (Photo courtesy of Aykut Ince.)

people. Overall, the forest area per capita in Turkey is 0.84 acre, which is greater than that in Germany, France, and the United Kingdom, about the same as that in Slovakia, Greece, and Portugal, but lower than that in the United States, Canada, Mexico, Russia, and the Scandinavian countries (Food and Agriculture Organization of the United Nations 2010). Regulations in the forest laws support forest villagers, providing them with access to firewood and roundwood for construction demands at highly subsidized prices. The public also has access rights to forests for recreational purposes, for the withdrawal of seeds, fruits, and mushrooms, and for household wood consumption (Guneş and Coşkun 2008). In addition to these subsidies, villagers have rights to be employed (through Article 40 of the current code) in the forest sector in jobs that involve harvesting, thinning, afforestation, and wood product transportation activities (Guneş and Coşkun 2008).

Forest Tenure Structure

Forestland ownership in Turkey has had a complex and confusing history. During the Ottoman Empire (1299–1922) period, the public had the right of free access to the most of the forest areas. In essence, people could cut trees or could graze animals whenever and wherever they wanted. The first management and protection legislation was enacted in 1870, and a 1923 Forest Code was later enacted to prevent further degradation of forests. Together with other changes, privately owned forests larger than 12.4 and 7.4 acres (5 and 3 ha) were nationalized in 1945 and 1950, respectively. In 1956, the new Forest Code, which is still used in practice today, was enacted (Guneş and Coşkun 2008). There are currently three types of landownership: state, private, and public legal entities other than the state. Privatization is seen as a drawback to the public benefit and the sustainable management of forests, and thus 99.5% of the forest area in Turkey today is owned and managed by the state (Guneş and Coşkun 2008). In 25% of the privately owned land cases, cadastral surveys have not yet been completed and ownership borders are still not clear (World Bank 2007), and thus forestry managers are faced with landownership disputes, some of which cannot be resolved (Dölarslan 2009). The main reason for the failure to complete cadastral surveys arises from social pressure applied by the public (forest villagers). Interestingly, fast-growing tree plantations (poplar [*Populus* spp.] and stone pine [*Pinus pinea*]) are recognized as *farm forests* rather than *forestland* by Turkey's forest laws and thus are not subject to state control, even though they contribute about 18% of the total wood production of the country (Guneş and Coşkun 2008). Forest plans, required by law, can be prepared for forests whose owners, ownership boundaries, and management goals are clearly defined. Because at times the owners, boundaries, and goals are not very clear, the development of management plans represents a source of conflict. Management activities are especially hindered within the areas adjacent to local residential areas or villages (Baskent et al. 2005).

Table 2. Floristic regions and common tree species.

Floristic region and forest type	Major tree species
Euro-Siberian	
Broadleaf deciduous and coniferous	*Pinus nigra*, *Pinus sylvestris*, *Picea orientalis*, *Fagus orientalis*, *Castanea sativa*, *Carpinus* spp.
Humid/subhumid coniferous	*Pinus nigra*, *Pinus sylvestris*, *Picea orientalis*, *Abies bornmülleriana*, *Abies equitrojani*
Dry oak and pine	*Pinus brutia*, *Pinus nigra*, *Quercus* spp.
Shrub formation	*Pinus brutia*
Mediterranean	
Shrub formation	*Quercus coccifera*, *Quercus ilex*, *Arbutus* spp., *Pistachia lentiscus*, *Myrtus communis*
Lower Mediterranean belt forests	*Pinus brutia*, *Pinus nigra*
Aegean mountain forests	*Pinus brutia*, *Pinus nigra*, *Pinus sylvestris*, *Castanea sativa*, *Fagus orientalis*, *Tilia rubra*, *Corylus vellana*, *Quercus* spp.
Mediterranean mountain forests	*Pinus nigra*, *Quercus* spp., *Abies cilicica*, *Cedrus libani*, *Juniperus* spp., *Fagus orientalis*, *Carpinus orientalis*
Irano-Turanian	
Tree steppe vegetation	*Juniperus oxycedrus*, *Juniperus excelsa*, *Pinus nigra*, *Quercus cerris*, *Quercus pubescens*
Dry black pine, oak, and juniper forests	*Quercus* spp., *Pinus nigra*, *Pinus sylvestris*
Dry forests	*Quercus* spp., *Pinus sylvestris*
Oak forests	*Quercus* spp.

Adapted from Kaya and Raynal (2001).

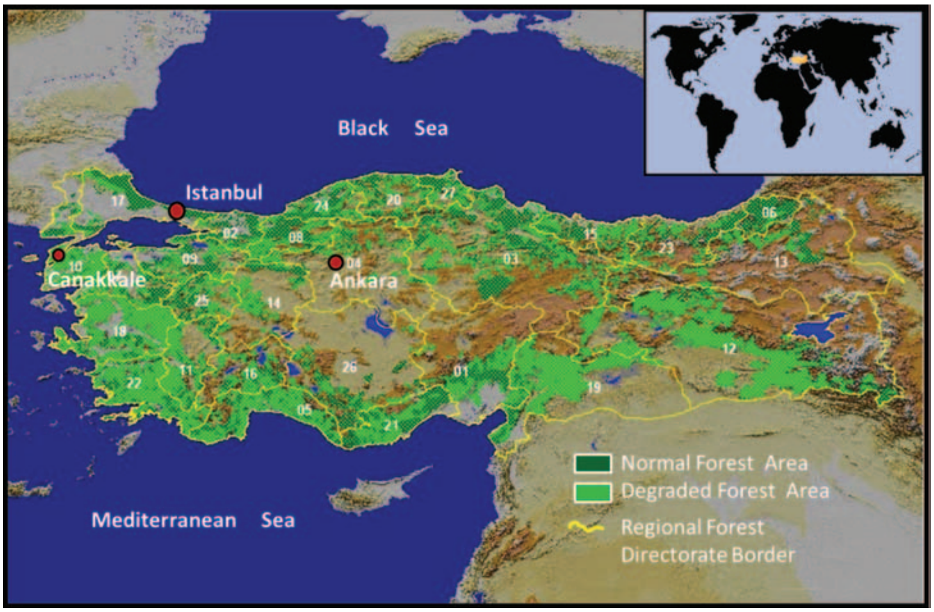

Figure 3. The distribution of productive (normal) and degraded forests in Turkey.

Forest Threats

Of the various threats that can affect the structure and character of forests, wildfire is one of the most important in Turkey. Between 1993 and 1997, about 2,000 fires occurred annually, affecting an area of about 20,800 acres (General Directorate of Forestry 2013). Actual firefighting costs (investment and recurrent) have increased from about $49 million (US dollars) in 1990 to about $68 million in 1997, even though the number and extent of fires remained relatively constant over this time (Konukçu 2001). Accidental initiation of fires (about 53%), particularly those associated with tourist visitation, is a significant cause of forest fire, especially in the Mediterranean coastal areas. Lightning causes about 10–12% of fires, and forest villagers deliberately initiate about 11–13% of fires, perhaps as protest to the closure of land for reforestation or other activities. A good portion of fires (20–24%) are of unknown or uncertain origin (Avci et al. 2009, General Directorate of Forestry 2013). Grazing is also a threat to the structure and character of forests. According to the current forest law, livestock grazing activities within forests are prohibited, yet are still practiced by some forest villagers. An estimated 11.8 million goats, 10.7 million sheep, 5.6 million cattle, and 1.6 million other animals graze in Turkish forests (Konukçu 2001). The great majority of these animals are supported by forage found in the forests, because the total pasture area of Turkey is only about 3.7 million acres, far from adequate to meet these grazing requirements. Controlled grazing, range improvement, fodder production, and stall feeding efforts and practices are lacking for reasons of tradition and economy. Heavy grazing can cause serious forest damage, particularly in forest regeneration sites and in degraded forest areas and especially on steep slopes susceptible to soil erosion. In areas susceptible to severe erosion, clearcutting is not allowed and uneven-aged management is encouraged. Illicit wood cutting and encroachment for farming are among the other important causes of degradation and productivity decrease on forestland. The unrecorded harvest is estimated to be about 177–212 million ft^3 annually (Konukçu 2001).

Forest Managerial Structure

Turkish forestry is a centralized, administrative structure consisting of a General Directorate of Forestry and 1,476 Forest Enterprise Offices (districts or management units) under the control of 218 Forest Enterprise Directorates, who are connected to a network of 27 Districts. By law, the forests managed by each Forest Enterprise Office have to be represented by a plan, which is renewed every 10 years (Baskent et al. 2008b). The national forestry program and 5-year national development plans bridge the gap between national goals and Forest Enterprise Office objectives (Türker et al. 2003). In doing so, social, economic, and environmental stability is often emphasized. For example, the manufacturing facilities in Turkey are privately owned, and they rely either on imported logs or on wood produced from private or state-owned land. Planning processes that address the product size, quality, and quantity requirements of wood processing facilities can help reduce production losses and help increase productivity (Aksu et al. 2011b). Further, traditional land use rights (e.g., grazing and logging) that are claimed and illegally exercised by local people have become a very important social pressure in both preparing and implementing management plans. To account for areas susceptible to severe erosion, timber volume contained in these areas is

Table 3. Main tree species of Turkey.

Group	Tree species	Land area (million ac)
Deciduous	Oak (*Quercus* spp.)	15.8
	Oriental beech (*Fagus orientalis*)	4.2
	Alder (*Alnus* spp.)	0.2
	Sweet chestnut (*Castanea sativa*)	0.2
	Others	0.2
Coniferous	Turkish pine (*Pinus brutia*)	13.3
	Austrian pine (*Pinus nigra*)	10.4
	Scotch pine (*Pinus silvestris*)	3.0
	Fir (*Abies* spp.)	1.5
	Juniper (*Juniperus* spp.)	1.2
	Lebanon cedar (*Cedrus libani*)	1.0
	Caucasian spruce (*Picea orientalis*)	0.7

Figure 4. A view from industrial plantations established with exotic fast-growing tree species in good sites. (Photo courtesy of Aykut Ince.)

not used in the determination of the allowable cut.

Private forest plans are prepared by the forest owners with supervision from the General Directorate of Forestry on their design (Guneş and Coşkun 2008); however, management plans for state lands are developed for each Forest Enterprise Office by a Forest Management Committee within the General Directorate of Forestry (Dölarslan 2009). Although social and economic goals are often important, Forest Enterprises Offices are allowed some flexibility in managing forest resources using principles of sustainable forest management, because broader environmental goals may guide the management of forests (Dölarslan 2009). A procedure known as *regulation of production* or *establishment of the spatial infrastructure* is used as a land classification process that distributes forest areas to their main function (economic, ecological, and social), and these areas can overlap (General Directorate of Forestry 2009), making the management situation quite complex. Some specific forest functions acknowledged in forest plans include protected areas (e.g., environmentally sensitive areas), national parks, nature parks, natural monuments, conservation areas, production forests, wildlife conservation areas, recreation areas, biogenetic reserves, gene protection forests, seed orchards, and research forests (Yılmaz 2004). The criteria for locating these functions during a mapping exercise can be plan-specific and may not explicitly be specified in published regulations. For example, production forests are those areas that have physical conditions conducive to the production of forest products, nontimber forest products, wildlife, and/or minerals in an economically beneficial manner, yet are areas in which management activities can avoid damaging the environment (Yılmaz 2004). The background for the evaluation of forest functions is generally based on locally developed criteria and indicators, some of which are still absent or unclear. As an example, the evaluation of hydrologic and erosion control functions is often based on criteria that include soil condition, parent material, ground slope, and the existence of erosion, landslides, or avalanches.

The four hierarchically dependent spatial structures recognized in the plans are the planning unit, working circle, compartment, and subcompartment (stand). At the working circle scale, management activities are considered, the allowable cut is determined, and the sustainability of resources is assessed. Because they constitute a basis for the collection of spatial information and the distribution of daily and seasonal work activities, compartments (which range in size from about 40 to 250 acres) are also called *management cells*. Site conditions can change quickly over relatively short distances; therefore, it is not always possible to manage homogeneous forest stand types and site qualities as separate compartments. As a result, they are often divided into subcompartments or stands. In Turkey, forest stands often range in size from 1.0 to 12.0 acres.

Forest Management Planning Processes

The first contemporary management plan was prepared in 1918 (General Directorate of Forestry 2007) by a team composed of Turkish and Austrian foresters. This was also the first application of the age classes method for regulating even-aged forests. Some have characterized this process as *German-led neoclassical area control management* (Baskent et al. 2008b). By comparison, Hufnagl's method of managing diameter classes (Roth 1914) was used to calculate the allowable cut from uneven-aged high forests. A 1973 forest regulation defined the main and auxiliary management methods for forests, which were based on stand form (Asan 1992), and these regulations guided Turkish forestry through 2008. These developments are important, for today about 96% of the forests in Turkey are even-aged, and some plans might suggest transitioning

Table 4. Area, growing stock, current annual increment, and allowable cut of different forest types in Turkey.

Forest type	Forest condition	Area		Growing stock		Current annual increment		Allowable cut (billion ft^3)
		1,000 acres	%	Billion ft^3	%	Billion ft^3	%	
High forest	Productive	22,090	42.2	39.861	87.6	1.056	82.4	
	Degraded	16,059	30.7	2.311	5.1	0.054	4.2	
	Total	38,149	72.9	42.172	92.7	1.110	86.7	0.398
Coppice forest	Productive	4,154	7.9	2.489	5.5	0.139	10.8	
	Degraded	10,052	19.2	0.835	1.8	0.033	2.6	
	Total	14,206	27.1	3.324	7.3	0.171	13.3	0.177
Total	Productive	26,244	50.1	42.35	93.1	1.195	93.2	
	Degraded	26,111	49.9	3.15	6.9	0.087	6.8	
	Total	52,355	100.0	45.50	100.0	1.282	100.0	0.578

Table 5. MAI per unit area of Turkish forests.

Forest type	MAI (ft^3/ac/yr)
All forests	25.6
High forests	29.2
Coppice forests	16.2
Productive forests	
High forests	47.9
Deciduous high forests	55.5
Coniferous high forests	45.6
Coppice forests	44.5

Data from General Directorate of Forestry (2006). MAI, mean annual increment.

Figure 5. A forest village adjacent to a state forest area. (Photo courtesy of Aykut Ince.)

some of these to other types of forest structure. In the last four decades, a portion of the even-aged forests have been managed using a single-tree selection system, which did not consider the biological characteristics of forests. For example, stands composed solely of shade-intolerant tree species (pines) were subjected to uneven-aged treatments that did not facilitate adequate regeneration. Although shade-intolerant species can possess silvical characteristics that accommodate uneven-aged management practices, reproductive processes and conditions, understory competition, and management actions can all influence the success of these systems (Shelton and Cain 2000, Fajardo et al. 2006). In its implementation in Turkey, many irregular and unusual forest structures occurred through the use of these treatments, and these forests are still the subject of debate among forest managers (Baskent et al. 2005). Concern over how to transition even-aged forests to an uneven-aged structure and how to maintain shade-intolerant tree species through uneven-aged management is not unique to Turkey and can be accomplished under the right conditions (Malcolm et al. 2001, Nyland 2003).

From 1918 through the mid-1980s timber production was viewed as the most important forest function and thus was the main objective of many forest plans. As a result, forest plans were monotypic, and the same management approach was used everywhere without consideration of the diverse forest characteristics of the country. Plans prepared using these conventional methods were therefore called conventional forest management planning models. The plans were revised on a 10-year cycle, and in them the annual allowable cut was based on sustainable wood production principles. However, the plans did not pay attention to the improvement of relationships between forest enterprises and the forest villagers living within the planning units. About 43% of the forests in Turkey continue to be managed with plans developed using this process.

In the 1970s, Mediterranean region planning models were introduced and applied to forests in the Mediterranean region (Asan 1989). They were developed by special planning groups to introduce new planning approaches and concepts for forests along the Mediterranean coast. These regional plans were a major step toward the sustainability of forest functions and benefits yet were also used to sustain timber production in Turkey. However, these plans did not involve nor incorporate the management of livestock and rangeland resources, important issues that needed to be addressed to ensure the sustainable management of Turkish forests. These management plans also proposed an intensive forestry direction that used an area control method for determining the allowable cut. They were prepared for the whole area of a Forest Enterprise, despite the previous conventional plans that were prepared for planning units (covering smaller areas). Some minimum rotation age principles were continued, but others were adjusted. For example, in 1977 the minimum rotation age for Turkish pine (*Pinus brutia*) was decreased from 60 to 40 years. Further, a longer planning horizon was assumed (100 years) to determine whether modeled forest policies were sustainable in the long-term and whether forest resources were sustainable as a supply for the integrated manufacturing facilities of each region.

In the 1990s, Western Black Sea region planning models were introduced. Also known as *Turkish-German collaborative projects*, Western Black Sea region planning models were prepared to address a regeneration problem that occurred in forests along the Black Sea as a result of the application of management techniques (regeneration period, rotation ages, and others) that did not consider site conditions and tree species requirements. These plans addressed stand-level silvicultural direction more than the attainment of forestwide goals and thus focused on natural sustainability of deciduous forests through stand-level decisions. These regional plans were different from conventional plans through the use of longer rotations and regeneration periods and the use of continuous cover forestry concepts (uneven-aged concepts) (Asan 1995, Baskent et al. 2005).

Although these three types of management planning processes had been used either universally or regionally to develop forest plans, a fourth process is now used universally throughout Turkey (Asan 2005). The main concept of forest management planning in Turkey today is to manage forests in such a way as to maintain biological diversity, productivity, regenerative capacity, and vitality and to fulfil relevant ecological, economic, and social functions (Eeronheimo et al. 1997). This philosophy encourages the development and maintenance of both ecosystem processes and multiple uses. Therefore, this fourth type of planning process is considered an ecosystem-based functional planning approach; others have called it an ecosystem-based multiple use forest management planning approach (ETÇAP) (Baskent et al. 2008a). In essence, the process can be perceived as either a segregation or an integration method, as this is determined based on the function(s) an area within a forest is assumed to accommodate. These functional areas need to be separated when the functions conflict with each other. If there is no major conflict among forest functions, a forest area is managed based on the dominant function, with some modifications used to recognize other functions. The perceived flexibility of the current planning process seems to have increased its applicability and acceptability among forest planners and managers. The planning process proposes treatments suitable for the function that the forests serve. In this endeavor, the planning process must use the forest structure created under the older management planning processes; therefore, the treatments applied may need to be designed in a manner to adjust structural components so that different societal goals can be met. In addition, some aspects of the process involve fairly complex assessments, which can include, for example, the determination of carbon sequestered, oxygen produced, and dust filtered (Asan 2010).

The ecosystem-based functional planning process consists of several phases. These phases are similar to planning processes used on public land in the United States (Bettinger et al. 2009). There are a few minor differences; for example, in Turkey, public input is gathered near the end of the process rather than at the beginning. After current and future conditions of forests are estimated and after plan alternatives have been developed, the outcomes obtained by the management planning groups are presented to stakeholders before preparation of the management plan report. In this participatory process, management objectives primarily relate to the maximization of wood production, resolution of social conflicts, facilitation of recreational and aesthetic goals, improvement of social welfare, and attainment of conservation targets (Baskent et al. 2008a). In a way, the management of forests in Turkey can be viewed as the management of the people who are interested in forestry. By determining functional areas and by using a participatory approach, along with technical analyses and the application of forestry techniques based on forest functions, conflicts between stakeholders (villagers, wood consumers, and nongovernmental organizations) should decrease. Although initially there were social reactions to the application of this planning process, people now generally support forestry activities because of the information they receive during the public participation in the process. However, the sustainability of forest resources tends to take precedence over the alleviation of social issues such as poverty (Guneş and Coşkun 2008).

The pursuit of ecosystem-based functional planning can be viewed as a way to introduce modern forestry organization to a country with a long forestry history. Modern land allocation methods, participatory planning processes, and the emphasis on both ecosystem function and multiple uses illustrate this evolution. One main drawback is the generally limited use of modern mathematical techniques (operations research methods), yet this was a distinct drawback of the conventional forest management planning model and Western Black Sea region planning model processes as well. On a positive note, the ecosystem-based functional planning process does not disregard experience gained through the implementation of previous planning processes. Even with this perceived evolution in thought and philosophy, there are people who believe ecosystem-based management is too utopic and that it can never successfully be applied, given a lack of certain basic data necessary for modeling multiple forest functions. However, the planning process used tends to recognize these shortcomings, and attempts are being made to integrate modern planning techniques with analytical models (e.g., operations research and functional relationships of various resources). To add knowledge and to inform the process, studies concerning the development of appropriate criteria and indicators for local planning units have been undertaken.

As an example of the extent to which ecosystem-based approaches are used, two management plans were constructed in 2009 for the Artvin-Yusufeli Forest Directorate (Yusufeli and Altıparmak Forest regions) within the framework of an international project titled "Sustainable Forest Use and Protection Project for Kackar Mountains." Further, 14 management plans were developed in 2011 and 2012 for the urban forests belonging to the Istanbul Metropolitan Municipality. In addition, three management plans were developed by the management planning groups in 2011 for the Bahceköy, Kanlica, and Demirköy Forest Directorates of Istanbul, and plans are being developed for Vize and Demirköy Forest Directorates. By the end of 2012 these planning groups will have finished four more management plans using the ecosystem-based functional planning model approach. Formal planning groups working in various parts of country are also continuing to apply the new process. Although the ecosystem-based functional planning model approach to forest planning is the only type of process used to develop plans today in Turkey, only 57% of the forest area is currently managed under ecosystem-based plans. When the conventional plan time horizon ends for a forest area, an ecosystem-based plan will be developed.

The various planning processes that have been used can be compared according to how (or whether) timber and nontimber products, social concerns, and economic values were recognized and assessed (Table 6). Interestingly, modern quantitative decision-making techniques have only been used in the development of Mediterranean region planning models. Despite simulation models developed by Soykan (1978) and others in recent years, these types of processes have not generally been put into practice. Therefore, from the standpoint of recognizing the various quantitative functional relationships that exist between competing uses of the land, none of the approaches are considered better than the others along these lines. In the plans developed through conventional forest management planning models, Western Black Sea region planning models and ecosystem-based functional planning models, the sustainable allowable cut was determined, in general, for one planning period (10 years). However, because Western Black Sea region planning model plans used silvicultural considerations in the determination of the allowable cut amount and various other planning methods for the regulation of yields (Table 6), it was usually impossible to guarantee equal wood production levels during sequential planning periods. Equal wood volume production was desired to meet wood production demands, rather than local village demands for fuelwood. In contrast, plans developed through Mediterranean region planning models determined an allowable cut over a 100-year planning horizon. The forest planning techniques used in forest planning only addressed timber production; therefore, it was nearly impossible to achieve multiple objectives by means of the conventional or the Mediterranean model plans. With a continuous forest approach, the ecosystem-based functional planning models and Western Black Sea region planning models are (were) better along these lines.

Table 6. Comparison of planning processes used in Turkey.

Process	Characteristics
Conventional forest management planning systems	
Timber product yield assessment	Age class method used in the even-aged forests; diameter class method used in uneven-aged forests; annual cutting area method is used in standard coppice forests
Nontimber product assessment	Resin and styrax products are regulated; no other services are recognized
Social assessment	General information about local forest villagers is provided in a special chapter of the plan; social pressures arising from the villagers affect the choice of regeneration areas and cutting blocks
Economic assessment	No economic assessment and feasibility provided in the plan
Mediterranean region planning models	
Timber product yield assessment	Even-aged forest management in areas determined in the previous plans
Nontimber product assessment	Resin products are regulated; aesthetic values are recognized.
Social assessment	Compared with conventional plans, the assessment is very good and provides useful recommendations to upgrade the social welfare of the nearby forest villagers
Economic assessment	Some recognition in the plan, but not adequate
Western Black Sea region planning models	
Timber product yield assessment	Stand-based planning is used; an age class method is used in even-aged forests, and a diameter class method is used in uneven-aged forests; silvicultural methods are used in the maintenance of continuous forests
Nontimber product assessment	Some consideration of recreational opportunities
Social assessment	General information about local forest villagers is provided in a special chapter of the plan; social pressures arising from the villagers affect the choice of regeneration areas and cutting blocks
Economic assessment	Not generally performed
Ecosystem-based functional planning system	
Timber product yield assessment	Separation of working circles based on forest functions rather than on tree species and site quality; an age class method with small-scale cutting areas is used to distribute harvests to whole planning units; natural regeneration techniques are used, based on shelterwood felling systems with varying rotations; an annual cutting area method is used in standard coppice forests.
Nontimber product assessment	Not generally performed
Social assessment	Social concerns are recognized during the construction of forest function maps; social pressures arising from nongovermental organizations, and other restrictive factors originating from laws and legislative arrangements are also taken into account
Economic assessment	Not generally performed

From an economic perspective, the Western Black Sea region model plans were the most expensive to develop because of more intense data collection and assessment procedures. If conventional forest management planning models were the basis of comparison, we estimate that the Western Black Sea region model plans were twice as expensive for each plan, the Mediterranean region model plans were about 80% more expensive, and the ecosystem-based functional planning model cost is about 70% more expensive. Whereas the ecosystem-based functional planning models recognize that changes in tree species, landscape condition, and forest function require different silvicultural techniques in different parts of the country, none of plans that have been prepared for Turkish forests have acknowledged regional peculiarities in marketing circumstances, transportation facilities, and managerial intensities. The value of timber and other forest benefits are not equal and vary across the country. Therefore, the content and detail of management plans should change as managerial intensity and the economic importance of the planning units changes. Further, the social benefits of forest resources change with the expectations of people living in or near the forests. Conflicts cannot be mitigated unless the opinions and desires of all people can be incorporated into management plans.

Currently, the implementation of forest plans in Turkey faces many challenges. Centralized planning is necessary because of a lack of skilled personnel and qualified decisionmakers at the local level. Compounding this issue of institutional capacity are ineffective forest protection programs, occasional poor communication with local residents, and social conflicts, and these have limited the implementation of forest plans (Başkent and Küçüker 2010), even though the planning process has evolved. Unsustainable forest use has also been noted as a problem in some areas, and it seems to partially be a function of slow forest growth rates and the continuous migration of people into forested areas (Baskent et al. 2008a). We noted earlier that local villagers have employment rights for certain forestry activities and access rights to forests for recreational purposes and for nontimber forest product collection (Guneş and Coşkun 2008). However, fuelwood and construction-grade lumber are necessary resources for many people, and access to these resources is critical. Lumber needed for the development of new buildings or the repair of others is generally available to local villagers at a cost that reflects the stumpage price of the wood and some transportation and stacking costs. Fuelwood is also made available using a variable cost and volume schedule that depends on the number of people living in a house. As an example, villagers who live in a house containing up to six people and who cut the fuelwood themselves, can acquire about five cords of wood at a cost equivalent to the stumpage price of the wood. The impact of these wood product demands on the allowable cut for each working circle will vary due to the timing of local needs and the existing supply of goods.

Conclusions

Although the Republic of Turkey is a modern society with growing worldwide economic and political relevance, the generally highly prized concepts of forest stewardship and sustainability may, in light of historic volatility and economic hardship, have wavering social reception and be extraordinarily challenging to implement. Turkey has undergone some of the most significant social changes in human history, which has had a dramatic impact on the state of its forests. The basis of forestry in Turkey was established by European foresters, and the current situation evolved from the experiences gained over more than 100 years of practice and from interactions with other countries. Further, there are many countries in Europe, Central and Western Asia, and Caucasia (e.g., Syria) (Food and Agriculture Organization of the United Nations 2013) receiving or requesting technical assistance regarding forest management planning from Turkey. Recently, the country has implemented many reforms targeting recovery and rehabilitation of its forests, yet it still faces challenges related to cultural and economic issues. In addition, logistical and organizational problems, ranging from legal issues regarding land tenure to education and training needs of foresters, are challenges to overcome. The reorganization and restructuring of the state-led forest management and planning processes are currently at their historical peak of importance for Turkish forest stewardship, and the country appears to be determined to develop and implement a nationwide contemporary, socially responsible, multicriteria-based forest management planning process. These efforts, in part, bring modern forest organization to a developing country with a long forest history. Because of the need to address local poverty, to maintain biological diversity, forest productivity, and regenerative capacity, and to fulfil relevant ecological, economic, and social functions, multiple resource values are recognized, along with the allowable cut of timber volume and the need to employ local people and provide them with a stable wood resource. Although the ecosystem-based functional planning model is now used to develop forest plans and the plans have a different set of objectives than those used on public land in the United States and Canada, there may be some aspects of these planning processes that are of interest to countries with similar land tenure situations.

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