



## The Impact of Forest Fire Damages on the Total Economic Value of Forest Resources in Turkey

### Abstract

Forests like other natural resources perform a set of functions to meet the needs of people. It is usually impossible to state the monetary value of all goods and services provided by forest resources in most countries. These goods and services are generally called as non-market goods and services. Therefore, the valuation of non-market goods and services as a research area is receiving greater importance rapidly in Turkey as well as in other countries.

The sum of all values, which a natural resource has, is accepted as Total Economic Value (TEV). There is no definite and rigid rules about the components of TEV and therefore, many different approaches have been discussed about this concept. In another word, the items forming the TEV are classified into main and sub-components such as positive and negative externalities or use, non-use, option, existence and bequest values.

The negative externalities such as erosion, forest fires and illicit fuelwood consumption have a negative impact on the TEV of Turkish forest resources. The economic value of negative externalities reduce the TEV from \$US 1,071,087,995 to \$US 897,480,458. According to the result of this study, the impact of forest fire damage is 5% of total negative externalities.

In this study, the TEV concept will be reviewed briefly for Turkish forestry, and then the negative externalities of Turkish forests as its TEV components will be presented and lastly the negative impact of forest fire damages currently calculated and to be calculated by adding some new items on the TEV of Turkish forest resources will be discussed as far as possible from the social-economic and environmental points of views.

### 1. Introduction

Forests like other natural resources perform a set of functions to meet the needs of people. It is usually impossible to state the monetary value of all goods and services provided by forest resources in most countries. These goods and services are generally called as non-market goods and services. Therefore, the valuation of non-market goods and services as a research area is getting importance rapidly in Turkey as well as in other countries.

The sum of all values, which a natural resource has, is accepted as Total Economic Value (TEV). There are no definite and rigid rules about the components of TEV and therefore, many different approaches have been discussed about this concept. In another word, the items forming the TEV are classified into main and sub-components such as positive and negative externalities or use, non-use, option, existence and bequest values (Perman et al., 1995; Adamowicz, 1995; Merlo and Briales, 2000; Türker et al., 2003a).

As the forests occupy so much space in the World, forestry necessarily involves positive and negative externalities. As sustainable natural resource, forests produce many positive externalities or external economies, such as regulation of climate, conservation of biodiversity, carbon storage, erosion control and other non-wood values. Conversely such biotic and abiotic events as faulty management practices, erosion, avalanche, forest fires, are examples of negative externalities to forestry (Türker et al. 2003b).

Forest fires are one of the most important destruction factors causing the big losses of forest economics and the national economy by destroying the Turkish forest resources. About 58 % of Turkish forests are sensitive to forest fire (GDF 1999).

Although the extents of threats and damages constituted by the forest fires occurring in Turkey are extremely important, the calculation method of fire damage compensation and the relevant damage varieties subject to the compensation are quite inadequate in current application. Because the General Directorate of Forestry (GDF), which is the most important organization that all forest management activities are undertaken as connected to the Ministry of Forestry, is taking into consideration the market value of products burned in the relevant area and the costs of reforestation and extinguishing relating to the burned area in the calculation of fire compensation (GDF 1999). Therefore, there are some opinions and criticisms arisen from the target groups, which are directly or indirectly interested in forestry, especially Non-Government Organizations about the very low amount of fire damage calculated by the GDF (Türker et al., 2001).

On the other hand, forest fires, which are accepted as a negative externality of forest resource, have been thought to have a decreasing effect on the TEV of forest resources being discussed. Therefore, it is a must to accurately evaluate the fire damage on the economical value of forests. Because, the correct calculation of compensation value arisen from the fire damage is crucial task for forest manager in order to lead in to right directions. Both in Turkey and Worldwide, negative and positive externalities of forests and forestry should be determined to promote sustainable forestry and sustainable development. Forest management and administrative activities should involve these externalities. Furthermore, sustainability and multiple-use principles should be pursued (Türker et al., 2003b). In this study, the TEV concept will be reviewed briefly for Turkish forestry, and then the negative externalities of Turkish forests as its TEV components will be presented and lastly the negative impact of forest fire damages currently calculated and to be calculated by adding some new items on the TEV of Turkish forest resources will be discussed as far as possible from the social-economic and environmental points of views.

## 2. Total Economic Value of Turkish Forests

The value of Turkish forests annual outputs, calculated with all the reserves previously expressed, first of all limitation to values that have been calculated and neglect of many other values, can be summarized according to the components of TEV in Table 1.

**Table 1.** Forest Values by TEV Categories

Components of TEV	Type of Outputs	Value (\$US)	%
Direct Use Values	Wood Forest Products	449,815,000	41.9
	Non-Wood Forest Products	86,044,495	8.0
	Grazing	225,000,000	21.0
	Hunting	17,800,000	1.7
	Angling	20,148,000	1.9
	Recreation	2,000,000	0.2
Indirect Use Values	Carbon storage	158,400,000	14.8
Option Value	Pharmaceuticals	112,500,000	10.5
Existence Value	Biodiversity Conservation	1,380,000	0.1
<b>Positive TEV Components</b>		<b>1,071,087,995</b>	<b>100.0</b>
Negative Externalities	Erosion	-125,000,000	72.0
	<b>Forest fires</b>	<b>-8,607,537</b>	<b>5.0</b>
	Illicit fuelwood	-40,000,000	23.0
<b>Negative TEV Components</b>		<b>-173,607,537</b>	<b>100.00</b>
<b>TEV</b>		<b>897,480,458</b>	<b>-</b>

Sources: Türker et al. (2002a) and Bann and Clemens (2001)

As seen in Table 1, the shares of erosion, forest fires and illicit fuelwood consumption in the negative TEV components, which are the negative externalities of Turkish forest resources, are 72.0%, 5.0 %, and 23.0% respectively. In this case, the biggest share in the negative TEV components of Turkish forest resources is erosion and the second one is illicit fuelwood consumption. The impact of forest fires on the total economic value of forest resources in Turkey is about 5% of total negative externalities.

### 3. Negative Externalities as Total Economic Value Components of Turkish Forests

After mankind passed to settled life, they constitute pressure on the forests in order to expand their living area, to gain arable land and to graze their animals. Previously they see the forests as wood raw material source and easily obtainable land by cutting forests. But, today, they recognized many ecological benefits supplied by forests (SPO 2001).

Due to rapid increase in population and necessity, forest resources have been destroyed and the forest areas decreased more and more. Therefore, people are more sensitive about the benefits obtained by them from forests and the negative consequences of the destruction of forest resources by fire. Some of these benefits and losses, especially unpriced with the market price, are identified as the externalities of forestry activities (Türker et al., 2003b).

Today, due to increasing importance of forest resources, the determination of externalities in the forestry practices becomes important for the society. For this purpose, various attempts at regional, national and international levels have been realised by individuals and institutions. One of these researches is an international project called as MEDFOREX, whose findings were used for evaluations in this paper, and carried out by European Forest Institution Regional Project Centre. In the coverage of this project, it is aimed that the negative and positive externalities linked to forests and forestry in the Mediterranean Countries were evaluated from the different aspects of issue (EFI, 2000).

In the coverage of watershed management, the benefits such as erosion prevention or soil conservation, preventing floods and avalanche may be expressed among the positive externalities of forests (EFI, 2000). Consequently, most of these benefits are obtained from the losses prevented by forests.

Furthermore, there are many positive externalities provided by forests such as increasing landscape quality, carbon storage, regulating climate, increasing water quality and purification, biodiversity and providing sustainability of local ecosystems (EFI 2000). Similarly, these benefits, which are also called as environmental services of forests, are quite important especially for the sustainability of natural ecosystem balances and for preserving continuously physical and psychological health of individuals in the society.

On the other hand, the negative externalities occurred by the interferences to forests can be summarised as follow: erosion, floods and avalanche events due to poor or no forest management and the losses in the landscape quality due to increasing the intensive use of forest lands may be accepted as negative externalities.

Forest fires arisen from many different reasons, the losses such as biodiversity and landscape value occurred due to plantation forestry, the losses of recreational value arisen from poor management and intensive plantation forestry might also be accepted as negative externalities of forests (EFI 2000). Currently, the economic value of forest fire damage in Turkey has been calculated as follows (GDF 1999; Anonymous 1999):<sup>1</sup>

$$\begin{aligned}\text{General Total Loss} &= \text{the loss of completely burned wood} + \text{reforestation cost} + \text{extinguishing costs} \\ &= \$\text{US } 2,222,978 + \text{US\$ } 4,548,601 + \$\text{US } 1,835,958 \\ &= \$\text{US } 8,607,537\end{aligned}$$

With this figure, the impact of forest fires on the total economic value of forest resources in Turkey is about 5% of total negative externalities. The forest fires are also a negative externality for forest resources and forest management activities. In this case, the compensation value calculated according to current approach will indicate the minimum compensation value, although all cost items are taken into account. Because, that a forest area is destroyed by fires, it means that it will be deprived of many positive externalities such as erosion prevention, regulation of water regime, carbon storage etc. provided by that forest area (Türker et al., 2002a). Consequently, considering the positive externalities deprived as a result of forest fire, it is seen that the calculation of real compensation value is very difficult and the amount calculated shows only minimum value of compensation.

In Turkish forest management, one of the most important reasons of using such a method in calculation is that the production of wood raw material based forest products is considered and applied

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<sup>1</sup> The forest area damaged by the fires is 5804 ha. This figure was used as a quantitative indicator in calculation.

as a priority goal. Therefore, in the forest resource subject to fire damage, the calculation of wood raw material based compensation by taking into consideration the growing stock instead of multiple uses has been realised and the ecological and environmental values or externalities of forests are not added to the calculation. However, in the burned forest area, it should be considered that not only growing stock, but also many ecosystem elements such as soil, micro-organisms, game and wildlife, every kinds of plants and recreational services provided by forest resources, macroclimate etc. would be destroyed by the forest fires (Türker et al., 2001; Türker et al., 2002b).

As a result, in the calculation of current fire damage compensation in Turkish forest management, in the short run, a few items might be added to the calculation by using available inventories. In the middle and long run, other cost items can also be added to the calculation when transforming into intensive forest management practices. For this reason, firstly the production of the versatile products and services obtained from the forest resources should be determined as a management objective. Then a comprehensive inventory based on the forest ecosystem and considering the multiple use benefits should be realised. Thanks to these inventories, the occurrences related to forest fire before and after fire should be recorded by the staff of SFE in detail.

#### **4. Discussion**

The negative externalities such as erosion, forest fires and illicit fuelwood consumption have a negative impact on the TEV of Turkish forest resources. The economic value of negative externalities reduce the TEV from \$US 1,071,087,995 to \$US 897,480,458. According to the result of this study, the impact of forest fire damage is 5 % of total negative externalities. The forest fires are very important for Turkish forests because of its location in the Mediterranean region. About 58% of Turkish forests have sensitive characteristics with regard to forest fire. Regarding the rate (58%), the portion of forest fire (5%) in the negative externalities is very low. The case is a result of current calculation method. If the compensation value is calculated according to the new approach, the amount of compensation value and consequently the rate of forest fire in the negative externalities will be higher. This main objective of this study is to open the issue to discuss with other researchers and managers.

The cost of damage occurred as a result of forest fires, which bring the continuity of forest resources and the life of all life community living in the system based on forest ecosystem to an end, was calculated as \$US 8,607,537 for whole country in 1999 (GDF, 1999). However, this amount indicates only minimum damage because of the reason mentioned above.

Whereas, the non-wood forest products, especially endemic species damaged by fire, the alternative cost of labour forces used for extinguishing fire and briefly the cost items examined above are not taken into consideration in this calculation. Also to deprive of revenues from the land left as unplanted after forest fire and the share of the land under consideration in the general administration costs have not been taken into account (Türker, 2000; Türker et al., 2002). Therefore, there are some opinions and criticisms arisen from some groups, especially Non-Government Organizations which are directly or indirectly interested in the forestry, that the amount of fire damage calculated by the GDF is at very low levels, and that the damage incurred by fires need to be calculated more precisely.

Likewise, cost items not calculated in practice for forest fire damage compensation and those previously discussed are taken into consideration such as:

- The revenue not obtained from the land for the years left unplanted after fires,
- The share of the forest area burned by fire in the general administration cost, and
- The alternative costs of labour force used for extinguishing forest fire

It is seen that the damage compensation value for a forest fire occurred in Sürmene State Enterprise Forests reaches to 11.3 billion TL. This is about 11 % of the compensation value (10.6 billion TL) calculated by using current application for the model forest area burned by fire (Türker et al., 2001). The rate is about 23% in other calculation for a forest fire occurred in Torul State Forest Enterprise (Türker et al., 2002b). This is just a result of adding the three items to the compensation calculation. However, as the other items that cannot be added to the calculation because of various reasons are taken into account, the compensation value in question will reach to greater figures. The impact of forest fire damage on the total economic value of Turkish forest resources would be more than 5% of total negative externalities as the real amount of forest fire compensation is calculated by adding some new items mentioned previously according to the forest economics perspective.

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