



## The Usability of Voluntary Carbon Markets as a Financial Instrument in Turkish Forestry Sector

Ufuk Demirci<sup>1</sup>, Atakan Öztürk<sup>2</sup>, and Inci Zeynep Aydın<sup>3</sup>

<sup>1</sup>Res. Asst., Artvin Coruh University, Artvin, Turkey; <sup>2</sup>Assoc. Prof., Artvin Coruh University, Artvin, Turkey; <sup>3</sup>Res. Asst., Artvin Coruh University, Artvin, Turkey.  
E-Mail: [udemirci08@hotmail.com](mailto:udemirci08@hotmail.com)



### Abstract:

*There have been many international studies and cooperations to avoid global warming and climate change as being global disasters. As a result of these studies, to avoid these problems, bilateral, regional and multilateral cooperations, legal instruments, incentive mechanisms and international funds are developed. One of these instruments is global carbon market as a cost-effective method to combat climate change. Thanks to carbon markets, projects in renewable energy, energy efficiency, waste management and forestry sectors aiming to reduce greenhouse gas emissions can be developed at. As forests are the most important terrestrial carbon sinks and deforestation and forest degradation are the third-largest source of carbon emissions, forestry sector is one of the crucial sectors in this process. In this context, Turkish forestry sector should benefit from international markets for protection, improvement and sustainable management of forest resources. Currently, Turkish forestry sector has not taken any financial support from these markets. In this study, it is aimed to determine and evaluate opportunities provided by voluntary carbon markets for Turkish forestry sector financing.*

*Key terms: Voluntary carbon markets, regulatory carbon markets, climate change, forestry sector, financing mechanisms*

### Introduction:

Climate change is defined as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (UN 1992). Main factor for climate change is greenhouse gases emitted to atmosphere through human activities. Greenhouse gases concentration is rapidly increasing because of intense usage of fossil fuels, industrialization, unplanned urbanization, land use changes and forest destruction.

Carbon dioxide is the most important anthropogenic greenhouse gas. Terrestrial ecosystems play crucial role in carbon sequestration and contribute positively to carbon cycle. Forests are the most important terrestrial carbon sinks. The Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report concluded that the forest sector has a biophysical mitigation potential of 5,380 MtCO<sub>2</sub>/yr on average up until 2050 (Kauppi et al. 2001).

Forests play a major role in combating climate change by (OGM 2010; UN 2010);

- Being a carbon sink by absorbing carbon dioxide from the atmosphere
- Being reservoirs for carbon dioxide by storing them in tree trunk, leaves, branches and forest soil
- Being an alternative, clean energy source
- Being carbon dioxide source in case of forest fire, deforestation and degradation.

Although forests are considered as the most powerful concentrators of carbon, it is estimated that emissions from deforestation and forest degradation in developing countries accounts for nearly 20% of total global greenhouse gases emission annually. This amount is ranked at the second place after energy sector emissions (ÇOB 2010; Khan 2010).

In the context of sustainable development, forestry sector plays an essential role in climate change mitigation and adaptation process. But at the same time, forests and forestry sector is affected by climate change. Many people's livelihood is goods, services and financial gains that forests provide. For this reason, avoiding climate change effects on forests becomes more important (Demirci 2011).

Forestry sector needs financial resources to combat climate change. Within global warming and climate change mitigation and adaptation, financing is necessary in forestry sector for activities such as afforestation, reforestation and sustainable forest management aiming carbon sequestration and storing. Financing of forestry activities is usually difficult. Beside conventional finance problems, there are own problems of forestry sector financing, arising from structure of forestry activities (Tosunoğlu et al. 2009).

As awareness and social demand for national, regional and global benefits of forest resources has increased, sustainability of financial resources, needed for sustainable forest management, has become a highly controversial topic especially in less developed and developing countries. In this regard, new financial sources and instruments are being developed (Ok et al. 2013).

In this study, it is aimed to determine and evaluate opportunities provided by voluntary

Table 1. Forest financing sources and instruments

Financing Sources	Domestic	International	
Public	Governments	<ul style="list-style-type: none"> <li>• Investments by national and local governments through subsidies, soft loans, non-monetary incentives and direct investments</li> </ul>	<ul style="list-style-type: none"> <li>• Bilateral ODA (grants, recoverable grants)</li> <li>• Multilateral ODA institutions: GEF, ITTO, FAO, UNEP, UNDP, etc. and regional development banks</li> <li>• Multilateral targeted programmes (PROFOR, FLEG, CGIAR, BPF and NFP)</li> <li>• Multilateral financial institutions (IFC, IBRD and regional development banks)</li> </ul>
	Forest industry	<ul style="list-style-type: none"> <li>• Direct investments</li> </ul>	<ul style="list-style-type: none"> <li>• Foreign direct investment</li> </ul>
Private	Financial institutions and institutional investors	<ul style="list-style-type: none"> <li>• Short and long-term credit</li> <li>• Portfolio investments</li> <li>• Targeted credits</li> <li>• Insurance and re-insurance</li> </ul>	<ul style="list-style-type: none"> <li>• Short and long-term credit</li> <li>• Portfolio investments</li> <li>• Export credits</li> <li>• Guarantee instruments</li> <li>• Insurance and re-insurance</li> </ul>
	Philanthropic	<ul style="list-style-type: none"> <li>• Financial support to national NGOs and targeted beneficiary groups</li> </ul>	<ul style="list-style-type: none"> <li>• Financial support to international NGOs and targeted beneficiary groups</li> </ul>
	Conservation NGOs	<ul style="list-style-type: none"> <li>• Financial support to national NGOs and targeted beneficiaries</li> </ul>	<ul style="list-style-type: none"> <li>• Financial support to international NGOs (programme/project funding)</li> <li>• Twinning arrangements</li> </ul>
	Other NGOs	<ul style="list-style-type: none"> <li>• Financial support to national CSOs and targeted beneficiaries</li> </ul>	<ul style="list-style-type: none"> <li>• Financial support to international CSOs (programme/project funding)</li> <li>• Twinning arrangements</li> </ul>
	Payments for environmental services (PESs)	<ul style="list-style-type: none"> <li>• Watershed protection payments</li> <li>• <b>Carbon payments</b></li> <li>• Fresh water supply payments</li> <li>• Nature-based/eco-tourism</li> <li>• Landscape, recreation, and other payments for services</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Carbon payments (regulatory and voluntary market)</b></li> <li>• Biodiversity</li> <li>• Nature-based/eco-tourism</li> <li>• Bioprospecting</li> </ul>

carbon markets for Turkish forestry sector financing by presenting emerging financing sources and instruments for world and Turkish forestry sector. Within this scope, applicability of forestry carbon project types and financial opportunities that can be provided by these projects are reviewed.

### Financing Sources and Instruments in Forestry Sector

**Financing in World Forestry:** There are various financing sources and instruments for forestry sector in the world. These resources are classified as public or private and national or international. While public sources include general government revenue, revenue from state-owned forests and international official development assistances (ODA), private sources consist of forest owners, the forest industry, philanthropic funds and NGOs. Payments for environmental services (PESs) are considered as a different financing source class (Simula 2008; AGF 2012; Ok et al. 2013).

**Financing in Turkish Forestry:** In Turkey, almost 99,9% of the forest are state owned, so forestry operations are planned and executed by state forest enterprises since 1937. As being public institutions, state forest enterprises are mainly financed by state budget and public revenue resources (taxes, charges, etc. (Daşdemir 2011). There is self financing in Turkish forestry sector, as most of revenue comes from sales of wood and

non-wood forest products and services provided by forests. In Turkey combating climate change through forestry sector is financed by these self finance sources. But there are some other financial resource alternatives of forestry sector in Turkey. These resources can be classified as internal and external financial resources as shown in Table 2 (Asan 2010; ÇŞB 2011).

Table 2. Internal and external financial resources of Turkish forestry sector

Internal financial resources	External financial resources
General budget, GDF special budget, GDF working capital budget and working capital budget of MFWA	GEF, World Bank, EU funds, funds from FAO and UNDP
Contributions of non governmental organizations, natural people and legal entities for afforestation	Bilateral cooperations and joint projects with other countries
State Planning Organization's (SPO) investment expenditures for forestry projects about climate change mitigation	<b>Voluntary carbon markets</b>
SPO, The Scientific and Technological Research Council of Turkey, local authorities, R&D supports of Universities	Financial resources from NAMA and REDD+ projects
Supports as part of social responsibility projects of banking sector and other private sectors	Kyoto Protocol Flexible Mechanisms
Aids of development agencies	

Although there are such wide range of resource alternatives for forestry sector financing in combating climate change, Turkey is not benefiting from these resources at desired level in Turkey. As being one of the alternative financial resources mentioned above, carbon markets having a value more than \$140 billion worldwide, are the most outstanding opportunity for forestry sector (Demirci 2011).

### Carbon Markets

**Compliance Carbon Markets for Turkish Forestry Sector:** Three flexible mechanisms (Clean Development Mechanism, Joint Implementation and Emissions Trading) have been developed by Kyoto Protocol, which came into force in 2005 and is aiming to regulate climate change mitigation process. With these mechanisms, compliance carbon markets were formed. As Turkey was not a Party to the UNFCCC at the time the Protocol was adopted, Turkey had limited opportunity to benefit from these markets.

Yet, compliance carbon markets in such a cost-effective way, support sustainable development of developing countries such as Turkey by financing climate change mitigation activities. Owing to project realizations about renewable energy, energy efficiency, solid waste management and forestry, transition of countries to a low carbon economy becomes easier (Demirci 2011).

Although forestry projects are considered as part of the "Land Use, Land Use Change and Forestry" activities within the scope of the Kyoto Protocol, forestry projects are not at desired level yet. Turkey's unique position in climate change regime and also forestry sectors position in these markets lead Turkish forestry sector not to be able to benefit from compliance markets.

**Voluntary Carbon Markets for Turkish Forestry Sector:** Voluntary carbon markets (VCM) are the sum of all transaction of carbon credits in non-compliance markets. It comprises the reduction of GHG emissions for the purpose of selling them to voluntary users

such as individuals, firms, institutions and nonprofit organizations (URL 1).

In the current situation, Turkey is only active in voluntary carbon markets. Until September 2012, 218 registered projects, having capacity of carbon reduction of nearly 16 MtCO<sub>2</sub>e per

year have been developed (Table 3). Most of the projects are about hydroelectric and wind energy. There are also energy generation from landfill gas, geothermal and bio-gas energy projects (ÇŞB, 2012; URL, 2). But there has not been any forestry projects realized yet.

Table 1. Voluntary carbon markets project types and emission reductions in Turkey

Project Type	Number of Projects	Annual Emission Reductions (ton CO <sub>2</sub> )
Hydroelectric	124	7 181 723
Wind	64	5 603 468
Bio-gas	6	514 789
Geothermal	6	405 309
Energy efficiency	5	151 432
Landfill gas	13	2 473 093
<b>Total</b>	<b>218</b>	<b>16 329 814</b>

**Applicability of Voluntary Carbon Market Projects for Turkish Forestry Sector:**

Turkey is one of the most active players in voluntary carbon markets. If average project prices are analyzed for 2008-2010 period, it can be said that Turkey saw price increases (from \$ 9,50/tCO<sub>2</sub>e to \$ 11.2 /tCO<sub>2</sub>e and these price levels are above world average (EcoSystem MarketPlace 2010; EcoSystem MarketPlace 2011a). But the voluntary offset market in Turkey experienced several significant changes in 2012, in 2012 a larger volume of wind and hydroelectric offsets were transacted and as a result average credit prices decreased. Offsets from Turkey’s Gold Standard projects sold for an average \$7.2/tCO<sub>2</sub>e and Voluntary Carbon Standards (VCS) offsets priced at an average \$2/tCO<sub>2</sub>e in 2012 (EcoSystem MarketPlace 2013).

In 2012, offsets developed from renewable energy projects were the most popular among voluntary offset buyers. These projects were the source of 26 MtCO<sub>2</sub>e or 34% of all transacted offsets that were associated with a project type (Figure 1). Transacted volume of forestry and land-use activities increased %22 and reached 24 MtCO<sub>2</sub>e (%32). Transacted volume of afforestation/reforestation projects climbed to 8,8 MtCO<sub>2</sub>e and REDD (Reducing Emissions from Deforestation and Forest Degradation) projects were 6,8 MtCO<sub>2</sub>e in 2012 (EcoSystem MarketPlace 2013).

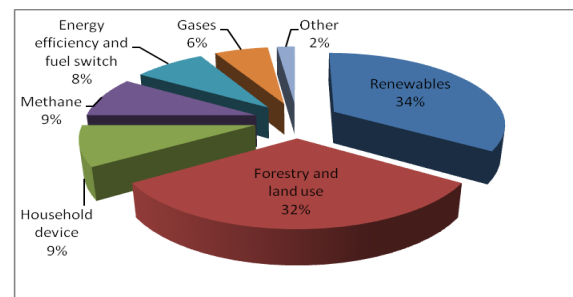


Figure 1. Voluntary carbon markets project areas in the world

Forest carbon project types can be listed as below (Chenost et al. 2010; EcoSystem MarketPlace 2011b):

- Afforestation/reforestation projects
- REDD projects
- Improved forest management projects
- Projects concerning uses of timber products
- Biomass energy projects
- Agroforestry projects

Some examples of forest carbon projects financed through voluntary carbon markets in other countries are shown in Table 4 (CIFOR 2009; URL 3). As forestland in Turkey has been increasing for decades and so there is no deforestation and forest degradation in Turkey, REDD projects in VCM is not applicable in Turkey. However, forest carbon credits about afforestation/reforestation, improved forest management, forest protection and agroforestry projects can be generated and traded in voluntary carbon markets (Table 4).

Table 2. Examples of voluntary forest carbon projects

Project Type	Location	Size (ha)	Total Reductions (TCO <sub>2</sub> e)	Applicability in Turkey
Afforestation/Reforestation	Georgia	2821	232,090	Applicable
Afforestation/Reforestation	United States	6504	1,805,795	Applicable
Afforestation/Reforestation	India	3070	1,733,753	Applicable
Afforestation/Reforestation	Tanzania	10814	3,484,835	Applicable
Improved Forest Management	Switzerland	7379	330,000	Applicable
REDD	Malawi	35910	24,683,020	Not Applicable
REDD	Brazil	6700	137,713	Not Applicable
Agro-forestry	India	3607	312,137	Applicable

In Turkey, almost half of the forests (10,4 million ha) are degraded and most of this area can be afforested and rehabilitated. As a result of such activities, carbon sequestration potential of these areas can be increased and so carbon credits can be earned and traded in voluntary markets. For instance, a comprehensive national project was realized and financed by government between the years of 2008-2012. This project was named as “National Afforestation and Erosion Control Mobilization Plan” (NAAP) and it was targeting afforestation, rehabilitation and erosion control of 2,3 million hectares in a 5 year period (2008-2012), was put into practice in 2008. It was estimated that additional 181,4 million tons of carbon will be sequestered until 2020 (ÇOB 2011).

Although such activities are financed through forest carbon markets worldwide, in Turkey none of such forestry activities contributing to carbon sequestration and so to combat climate change was financed by voluntary markets. When taken into account that, average credit price of forestry carbon projects was \$ 9,2/tCO<sub>2</sub> in 2012 (EcoSystem MarketPlace 2012), if this NAAP project was financed by carbon offsets through voluntary carbon markets, nearly \$ 1,7 billion could be acquired. Thus voluntary markets can be considered important emerging financial source for Turkish forestry sector financing.

### Conclusion and Suggestions:

Although forests play a crucial role in combating climate change, forestry sector

cannot benefit from emerging financial instruments and sources sufficiently. In recent years, demand for forestry projects has increased, but still there is not any forestry and land-use project in Turkey. As being developing and industrializing country, controlling greenhouse gas emissions rise through cost effective instruments become more important for Turkey. Herein, voluntary carbon markets as a cost effective financial instrument in combating climate offer substantially financial source for forestry sector as well as other sectors. Suggestions for Turkish forestry sector about benefiting from voluntary carbon markets as a financial source can be made as follows:

- In Turkey, there is a conception that as forests are state-owned, forestry sector expenditures has to be financed by just state budget and public revenue resources. First of all, this conception has to be changed. Not just developing countries, even developed countries try to find alternative sources for financing forestry sector. Managers of forestry sector in Turkey have to follow these developments and be willing to utilize all alternative financial sources and instruments which serve to public welfare.
- Then, essential institutional framework for participating in voluntary carbon markets should be established. In this context, responsible carbon management institutions for registration, monitoring and approving the projects should be established and legal framework should be reviewed and regulated as soon as possible (Öztürk et al. 2012).

- General Directorate of Forestry should foster forestry activities such as afforestation, reforestation and improved forest management in voluntary markets. As precondition of this, comprehensive and more realistic studies aiming national carbon sequestration potential of forests should be carried out.
- Similarly, additional carbon sequestration of afforestation/reforestation activities should be estimated and recorded. Such, these amounts can be traded and capitalized as carbon offsets in voluntary forest carbon markets.
- As half of the forest land is degraded, substantial financial sources is needed for converting this are to productive forests via rehabilitation, afforestation and reforestation activities.
- Public and private organizations which cause serious carbon emissions have to be obligated to calculate their total carbon emissions.
- These firms should be encouraged to finance forestry projects to meet their carbon emissions reductions.
- Incentives such as tax exemption and tax deduction can be given to these firms which want to finance forestry projects.

## References

- AGF, 2012. 2012 Study on Forest Financing, Advisory Group on Finance Collaborative Partnership on Forests, June 2012, <http://www.un.org/esa/forests/index.html>.
- Asan, Ü. 2010. Ormançılık Sektörü Mevcut Durum Değerlendirmesi Raporu, Türkiye'nin İklim Değişikliği Ulusal Eylem Planı'nın Geliştirilmesi Projesi, Çevre ve Orman Bakanlığı, Ankara.
- Chenost, C., Y.M. Gardette, J. Demenois, N. Grondard, M. Perrier and M. Wemaëre 2010. Bringing forest carbon projects to the market, supported by United Nations Environment Program (UNEP), UNEP Risoe Centre, the French Development Agency (AFD), the World Bank BioCarbon Fund and ONF International.
- CIFOR, 2009. Voluntary Markets for Afforestation, reforestation and Avoided Deforestation, USAID-CIFOR-ICRAF Project, Assessing the Implications of Climate Change for USAID Forestry Programs,.
- ÇOB, 2010. Karbon Piyasalarında Ormançılık Sektörüne Bakış, Çevre Yönetimi Genel Müdürlüğü, İklim Değişikliği Dairesi Başkanlığı, Çevre ve Orman Bakanlığı, Ankara.
- ÇOB, 2011. Ağaçlandırma, Erozyon Kontrolü ve Rehabilitasyon Eylem Planı 2008-2012, 2008-2009-2010 Gerçekleşme Raporu, Çevre ve Orman Bakanlığı, Ankara.
- ÇŞB, 2011. İklim Değişikliği Ulusal Eylem Planı 2011-2023, Çevre ve Şehircilik Bakanlığı, Ankara.
- ÇŞB, 2012. Türkiye'de Karbon Piyasası, Çevre Yönetimi Genel Müdürlüğü, Çevre ve Şehircilik Bakanlığı, Ankara.
- Daşdemir, İ. 2011. Ormançılık İşletme Ekonomisi, Bartın Üniversitesi Yayın No: 5, Orman Fakültesi Yayın No: 3, ISBN: 978-605-60882-3-0, Sürat Matbaacılık, Bartın.
- Demirci, U. 2011. Karbon Piyasalarının Ormançılık Sektöründe Finansman Aracı Olarak Kullanılabilirliği, Yüksek Lisans Tezi, Artvin Çoruh Üniversitesi Fen Bilimleri Enstitüsü, Orman Mühendisliği Anabilim Dalı, Artvin.
- EcoSystem MarketPlace, 2010. Building Bridges: State of the Voluntary Carbon Markets 2010 Executive Summary, Washington, USA.
- EcoSystem MarketPlace, 2011a. Back to the Future: State of the Voluntary Carbon Markets 2011, Washington, USA.
- EcoSystem MarketPlace, 2011b. State of the Forest Carbon Markets 2011 From Canopy to Currency, Washington, USA.
- EcoSystem MarketPlace, 2012. State of the Forest Carbon Markets 2012, Leveraging the Landscape, Washington, USA.
- EcoSystem MarketPlace, 2013. Maneuvering the Mosaic, State of the Voluntary Carbon Markets 2013, Washington, USA.
- Kauppi, P., R.J. Sedjo, M. Apps, C. Cerri, T. Fujimori, H. Janzen, O. Krankina, W. Makundi, G. Marland, O. Masera, G.J. Nabuurs, W. Razali, and N.H. Ravindranath, 2001: Technical and economic potential of options to enhance, maintain and manage

- biological carbon reservoirs and geo-engineering. In *Mitigation 2001. The IPCC Third Assessment Report*, [Metz, B., et al., (eds.)], Cambridge, Cambridge University Press.
- Khan, M.A. A. 2010. Türkiye'nin Ormanlık Sektörü ve Karbon Piyasası Raporu, Türkiye Hükümeti Birleşmiş Milletler Kalkınma Programı, Türkiye'de İklim Değişikliği Yönetimi İçin Kapasite Oluşturma Projesi, Ankara.
- OGM, 2010. İklim Değişikliği Kapsamında Ormanların Önemi, Kopenhag Müzakere Sonuçları, İklim Değişikliği ve Biyoenerji Çalışma Grubu, Orman Genel Müdürlüğü, Ankara.
- Ok, K., G. Kaya, Y. Güneş, S. Koçer, B. Kayacan, Ö. Eker, B. Çağdaş, Z. Koşdemir, E. Yılmaz, B. Bakır, and Ü. Turhan. 2013. Ormanlık Finansmanı Raporu, Birleşmiş Milletler Orman Forumu 10. Oturumu (UNFF10, İstanbul 2013) İçin Hazırlanan Rapor, İstanbul.
- Öztürk, A., U. Demirci, M.F. Türker. 2012. İklim Değişikliği İle Mücadelede Karbon Piyasaları ve Türkiye İçin Bir Değerlendirme, KSÜ Doğa Bilimleri Dergisi "I. Akdeniz Çevre ve Orman Sempozyumu" Özel Sayısı, s:306-312.
- Simula, M. 2008. Financing Flows and Needs to Implement the Non-Legally Binding Instrument on All Types of Forests. Prepared For The Advisory Group On Finance of The Collaborative Partnership on Forests. PROFOR, 108 pages, World Bank, Washington DC, USA.
- Tosunoğlu, Ş., M. Başar, and Y. Kılıçaslan. 2009. Sürdürülebilir Ormanlık Faaliyetlerinin Finansmanı, Anadolu Uluslararası İktisat Kongresi, 17-19 Haziran 2009, Eskişehir.
- UN, 1992. United Nations Framework Convention on Climate Change, United Nations, Fccc/Informal/84, Ge. 05-62220.
- UN, 2010. The Forest Sector in the Green Economy, Geneva Timber and Forest Discussion Paper 54, United Nations Economic Commission for Europe (UNECE) and Food and Agriculture Organization of the United Nations (FAO), Geneva, Switzerland.
- URL, 1.  
<http://www.karbonkayit.cob.gov.tr/Karbon/Files/terimlersozlugu.pdf>, İklim Değişikliği Karbon Proje ve Piyasası Terimler Sözlüğü, İklim Değişikliği ile Mücadele için Kapasitelerin Artırılması (CBCCM) Projesi kapsamında hazırlanmıştır, (Online: 16.08.2013).
- URL, 2.  
[http://www.eie.gov.tr/iklim\\_deg/emisyon\\_ticaret.aspx](http://www.eie.gov.tr/iklim_deg/emisyon_ticaret.aspx), Emisyon Ticareti, Yenilenebilir Enerji Genel Müdürlüğü, (Online: 02.09.2013).
- URL, 3.  
<http://www.forestcarbonportal.com/projects>, Forest Carbon Projects Inventory, (Online: 02.09.2013).