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**Forest Ecosystem Services, Markets and
Investments****Note by the Secretariat***Summary*

This document is a background paper for the discussions on Forest Ecosystem Services and financing Sustainable Forest Management. It provides some specific examples of market mechanisms for trading Forest Ecosystem Services in clean water provision, recreation opportunities, biodiversity conservation, and climate change mitigation through forest-based carbon sequestration and product substitution.

I. Introduction

1. Society has come to increasingly recognize the numerous ways in which forests benefit people. Broadly termed “forest ecosystem services” (or FES), these benefits range from the provision of specific forest commodities and uses to aesthetics and the intrinsic value of maintaining healthy and diverse natural ecosystems, encompassing all of the ways in which forests provide value to people. However, many FES are never traded in the market place, and, in spite of their recognized worth, most do not have explicit monetary values associated with them. At the same time, markets have emerged as the dominant paradigm for organizing human activity in general and our relationship with natural resources, including forests, in particular. The fact that many FES remain untraded and unpriced means that they run the risk of being both underrepresented and undersupplied.

2. Better integrating FES with markets and the market economy at large is an important challenge for forest managers and society as a whole. First, a fuller accounting of FES contributions to society will facilitate their incorporation in decision making. This concern underlies the numerous calls for the use of non-market valuation techniques to valorize FES so that they can be included in the benefit-cost analyses that commonly accompany public decision processes regarding forests. Second, the recognition of FES and their incorporation in markets can attract new investments for forest management, spark innovation, and generate additional income in the forest sector, all aimed at enhancing the various benefits flowing from FES. This is the rationale behind the Rovaniemi Action Plan for the Forest Sector in a Green Economy and its call for the better use of forests in the development of the “green economy”. Attaining these goals, however, will not be easy as there are several fundamental reasons why FES are not traded, priced, or otherwise reflected in market transactions. Some of the values associated with forests are simply not compatible with the “bottom-line” calculations governing economics, and it may be unrealistic (or undesirable) to try to force them into this mold. For other aspects of FES, however, there are ample opportunities for market development and thereby for enhancing the benefits associated with them.
3. The examples presented here are not comprehensive throughout the ECE region, but meant as a starting point for discussion. A broader survey of these activities would be a valuable contribution but is well beyond the scope of this paper.

II. Some fundamental characteristics of Forest Ecosystem Services and their relation to markets

4. There are three fundamental characteristics of non-commodity FES that help explain why markets have not evolved around their provision, relegating them to the category of “market externalities.”

(a) **Many FES are public goods to at least some degree.** This means they are non-rival (one individual's consumption of a good does not affect another's opportunity to consume the good), and non-excludable (individuals cannot deny each other the opportunity to consume a good). It also means that they will generally be undersupplied by private markets, since no one person or firm can fully capture the value in FES production or the utility in its purchase and consumption. This observation, which is closely related to the free rider problem and the tragedy of the commons, is the fundamental reason markets have not evolved of their own accord for many FES. An important corollary here is that public sector policies are needed to enable markets for FES, for example through the imposition of scarcity (e.g., emissions caps in cap and trade schemes) or the creation of demand (e.g., direct public payments for targeted FES).

(b) **FES are often poorly measured or understood.** Forest ecosystems are extremely complex, as is their relationship with human populations and their welfare. Several of the most important FES were not even recognized a century ago, the role of forests in carbon balances and climate regulation being a prime example. Other FES, such as clean water provision, have long been recognized, but the specific parameters relating forest conditions to quantified outputs of the FES in question often remain unclear. And still others, such as the intrinsic value of biodiversity conservation, rely on the ever changing subjective judgements of people. While efficient private-sector markets are based on the understanding of both sellers and buyers of what exactly they are trading, market applications for FES usually must be willing to accept a more imperfect set of information, and scientific information becomes an important enabling condition.

(c) **FES are most often supplied in bundles.** Forests supply multiple FES to society, often from the same area of forest land. Though some of these FES may be quantified and priced under a given market trading scheme, the fact that they are accompanied by various and often un-defined benefits is an implicit but nonetheless essential component of the scheme. REDD+ mechanisms reflect this, where carbon credits are the traded good, but the additional benefits from forest conservation and improvement are recognized as an important side benefit. In other cases, such as conservation easements, FES may be “purchased” as a bundle, but each bundle is unique, potentially being comprised of priced commodities (e.g., timber) and various un-priced public goods (e.g., biodiversity or aesthetic qualities).

An example: carbon credit trading schemes

5. These three concepts are present in all but the simplest of FES market transactions. Consider, for example, a simple carbon credit trading scheme. In this case, government supplies the enabling condition in the form of a cap on carbon emissions. The purchaser, who must obtain carbon credits to offset emissions elsewhere funds forest management activity (through the purchase of credits from a forest management entity) based on an explicit unit price for carbon sequestration. The firm gains the right to emit the specified amount of carbon, and the general public benefits from the climate change mitigation, a true public good, resulting from the overall implementation of the emissions cap. While the buyer and seller of the carbon credit will take the unit price of carbon as determined by broader carbon markets, there may still be considerable uncertainty about the actual net amount of carbon sequestered by the project; some form of certification will be needed and even after that the estimates may still be questioned.

6. Note that the recipients of the FES, the public at large, are not directly involved in the transaction (though it is assumed that they will ultimately pay through higher prices for consumer goods). Also note that the price paid by the purchaser has no relationship to the actual value of the climate change mitigation supplied to the public. The price instead reflects the intersection of the cost of sequestering carbon through forest management on the one hand, and the value to emitters of being able to emit additional carbon on the other. The actual value of the FES benefit to the public may in fact be much higher than the price paid (or lower if the enabling policy is poorly designed). This is a very important point that applies to many different FES.

7. Another example is a carbon credit trading scheme bundled with the provision of other FES. In this case, the emissions cap still serves the purpose of providing global climate change mitigation, and the direct mechanism remains unchanged. However, the addition of bundled goods provides additional opportunities, both for the provision of enhanced public benefits, and for greater funding for forest management, either through direct government funding or through contributions from NGOs and other social actors. In addition to the assumed increase in consumer prices resulting from the carbon cap in the unbundled model, taxes and charitable contributions emerge as another potential way in which the public can pay for FES benefits in this bundled model.

8. The foregoing example serves to demonstrate some of the concepts and complexities underlying FES market mechanisms. In a general sense, these issues apply to all FES, but the details often vary. In fact, many FES payment schemes are more notable for their differences than their similarities.

III. Specific Examples of FES Market Mechanisms

Clean water — a case of avoided costs in the United States

9. New York City's Watershed Protection Program provides an example of the potential cost reductions associated with watershed management. Faced with a potential cost of \$4-8 billion to construct a new water filtration plant along with an estimated \$300 million annual operating cost, the city instituted an upland watershed management program in lieu of these investments. The program involves multiple components, most related to land conservation and management activities. Activities specifically related to forestry include: \$541 million allocated to direct land acquisition and to farm and forest easements prohibiting development; development of forest management plans for private and public forests; conservation and enhancement of riparian forest buffers; implementation of forest best management practices (BMPs); and logger training. All told, the city is estimated to have spent \$1.5 billion over a ten year period, representing well under a quarter of the estimated capital and operating costs for a new filtration plant. Similar cost reductions have been estimated for other American cities. New York City's and similar programs do not involve classic market transactions where the price of traded goods is determined in the market place. However, to the extent that private landholders (the sellers of FES) are free to engage in the programs based on the payments on offer from public entities (the buyers), these programs do involve limited market mechanisms.

Recreation — paying for use in the United States

10. Forest-based recreation is a longstanding FES that is commonly recognized in forest planning and management activities, both public and private. Private land-holders can and do sell entry permits for the use of their land, often for hunting or gathering opportunities, but whether these funds are then "reinvested" in the landscape to maintain or improve recreational opportunities is determined on a case-by-case basis.

11. For example, U.S. federal land management agencies charge a variety of direct user-fees for access to specific locations or use of specific facilities. As shown in figure 4, revenues from these fees rose from around \$180 million to \$250 million over the 2002-2011 time period, closely following changes in total U.S. GDP. A significant proportion of receipts are used in the particular administrative unit from which they originate, mainly for maintenance and enhancement of facilities. In areas experiencing very high use, certain activities may be limited. User fees, however, are defined administratively (i.e. they are not adjusted in relation to supply and demand).

12. While entry and use fees for the National Parks have been relatively uncontroversial, those for national forest lands and wilderness areas managed by the US Forest Service have faced considerable opposition from those who argue that public lands should be freely open to the public at large. Legitimacy in this case relies on the public perception that the user fees are directly related to activities supporting the provision of the recreational experience rather than simply being a rent charged by the public land management entity. Forest management may be considered an appropriate use of revenues, but only if it is seen to be targeted at maintaining landscape integrity.

Biodiversity — a bundled good

13. Biodiversity conservation is recognized as an overall public good, but there are no explicit prices, determined by either market demand or cost avoidance, associated with its provision. Conservation measures may focus on maintaining or expanding the area of certain ecosystem types or on the preservation of single species, often through habitat conservation (and specifically forest conservation in the case of forest dependent species).

14. Conservation easements are an example of a strategy aimed at the conservation of ecosystem types. Typically, a government entity or charitable organization acts as the buyer, paying private land owners an agreed upon sum in exchange for legal guarantees that the owner will forego development (or other deleterious actions) on their land for a specified period of time, often into perpetuity. Though specific FES are often targeted, conservation easements are usually pursued as true bundled goods, combining biodiversity conservation with watershed benefits, aesthetic qualities, or other FES.

15. Species banking, on the other hand, is explicitly targeted at the conservation of individual species. Motivated by policies prohibiting endangered species habitat destruction, species banking allows land owners to offset habitat destruction on their land through the purchase of suitable species habitat created elsewhere. Acres of habitat are the most common unit for trade, but other units, such as a breeding pair, may also be “banked” for credit. In any case, the conservation of the organisms in question, and not simply the maintenance of habitat characteristics, is required to maintain the validity of the traded credit. While transaction costs remain high (in terms of assessment and monitoring), species banking represents a true market approach to biodiversity conservation, and the number of banks has expanded considerably in the United States.

16. These two examples by no means exhaust the possible ways in which market mechanisms can be used to secure biodiversity. In many schemes aimed at the provision of other FES, such as clean water provision or carbon sequestration through REDD+, biodiversity conservation is recognized as an important component of a larger bundle of goods underlying the trade.

Carbon Mitigation in the United States and the European Union — a market victim?

17. The role of government in creating the policy enabling conditions for carbon trading, namely an emissions cap, was stressed in the previous discussion. In practice, however, these conditions have not been aggressively applied. To date, the United States has not implemented a national cap and trade system for carbon, and it appears unlikely to do so in the foreseeable future. The EU Emissions Trading System (ETS) does present a viable cap and trade scheme, but a combination of slack economic growth and substitution from renewable energy sources has resulted in carbon emissions reductions of their own accord, and EU ETS caps have not been stringent enough to maintain market prices in the face of these reductions. As a result, the price of EU ETS credits has fallen from a peak of close to 40 euros per metric ton in 2006 to around 7 euros today. In the United States, the Chicago Credit Exchange, which was established in part in anticipation of cap and trade legislation, discontinued trading in 2010.

18. These developments, however, do not mean that forest based carbon mitigation is a dead end. Numerous regional initiatives continue, as do voluntary credit markets that can funnel charitable donations to various carbon mitigation efforts, including forest management projects. And the EU ETS does remain in place (the current price is, in fact, twice as high as that prevailing in 2013). Moreover, a 2013 Forest trends study by Peters-Stanley et al. estimates that in 2012 26.5 million hectares of forest were conserved or created globally through the sale of 28 million tonnes (Mt CO₂ equivalent) of carbon offsets from forestry projects, at a value of \$216 million. These facts indicate that the market infrastructure continues to develop and should be able to flexibly respond should policies change in the future.

19. In any case, the behaviour of broader carbon markets is only one determinant of the ability of forest management to influence atmospheric carbon balances. REDD+ activities have secured the transfer of billions of dollars to developing countries to support forest management activities.

20. Substitution of wood for more carbon intensive construction materials (e.g., steel and concrete) or non-renewable energy sources (fossil fuels) is another means by which the forest sector can help reduce carbon emissions. To the extent that they are implemented, carbon pricing mechanisms, either through cap and trade or taxation schemes, can provide market impetus for wood substitution, but even in the absence of a substantial carbon price, policies such as renewable portfolio standards in the energy sector and LEED (Leadership in Energy & Environmental Design) certification in the building sector are promoting wood utilization in new areas. A good example here is the fact that purchasing requirements under the EU Renewable Energy Directive have driven strong increases in the production of wood pellets in the South-eastern United States, the bulk of which are exported to the United Kingdom and other European markets. As commodities, however, wood pellets and similar products do not directly carry with them the sort of bundled FES benefits associated REDD+ and similar activities. Depending on the scale of production, these commodities may exhibit negative trade-offs relative to other FES.

Moldova Soil Conservation Project

21. The Moldova Soil Conservation Project, implemented as a Clean Development Mechanism (CDM) project is afforesting and reforesting 20,290 ha of degraded state-owned or communal agricultural lands throughout the country.

22. The project is expected to sequester about 1.22 million tonnes of CO₂-equivalent (tCO₂eq) by 2012 and about 2.51 million tCO₂eq by 2017. The World Bank BioCarbon Fund will purchase emission reductions of 600,000 tCO₂eq, while the Prototype Carbon Fund purchased 1.3 million tCO₂eq under a separate agreement in 2002. In addition to the World Bank and Moldsilva (the Republic of Moldova's Forestry Agency), 384 local councils represent the participating rural communities.

23. This will allow investment not previously possible due to financial and capacity constraints of the state forest agency and local councils. The investment will prevent soil erosion and restore degraded lands as well as promote biodiversity benefits from the restored habitats of endangered flora and fauna. The newly forested area will also produce fuel wood, timber and non-timber products to meet the needs of rural communities as well as additional social benefits such as local employment in tree cultivation. The active involvement of local councils, who own about half of the land under the project, is likely to ensure sustainable management of the afforested lands once transferred back to them.

24. The project has adopted a renewable 20-year crediting period, which is expected to be extended for a further two consecutive 20-year periods, over a total project period of 60 years. The implementation cost for the project during first 11 years (2002-2012), is estimated at \$18.74 million. Moldsilva financed the implementation costs during this period and established all new plantations and maintained existing plantations on state-owned land. On communal land, the new forests were returned to the municipalities under long-term management contracts.

Afforestation with Hazelnut Plantations in Western Georgia

25. AgriGeorgia, a subsidiary company fully owned by the Ferrero Group, has developed a project to sequester carbon on previously abandoned land in a poor rural region near the Black Sea coast. The plan is to halt land degradation by creating permanent forest cover, whilst providing local communities with sustainable and long-term income opportunities.

26. The Samegrelo region was a primary supplier of fruit and nuts in Soviet times until the 1990s when the region was left with a serious lack of capacity, including deteriorating infrastructure and uncertain land tenure issues. Land abandonment and degradation

followed, aggravated over the last twenty years by slash and burn clearing for grazing and small-scale crop cultivation, deforestation of wind-breaks and illegal waste dumping leading to pollution. Investment in the region is also currently hampered by several risk factors, including those of political, social and armed conflict. Afforestation with hazelnut plantations represents a replicable model for the Samegrelo region, offering significant environmental and economic opportunities, including higher employment, income, transfer of technology and know-how.

IV. International Efforts

27. The international community has paid considerable attention to FES and to turning the challenges into opportunities and introducing payment for forest ecosystem services schemes (PES) to improve forest financing. The United Nations Forum on Forests (UNFF) addressed forest financing at its 2009 and 2013 sessions. UNFF's considerations were supported by the work of the Collaborative Partnership on Forest's Advisory Group on Forest Finance. The Advisory Group provided a comprehensive picture on the global forest financing landscape and recognized the role of and potentials in PES. UNFF invited countries to "recognize the role that forest ecosystem services play in economic development"¹. FAO's Committee on Forestry (COFO) discussed forest financing and PES in its last three sessions recognizing their role and giving guidance for countries and FAO to expedite work on this area. In 2012 COFO requested FAO to support national efforts to strengthen the financial basis for sustainable forest management including in "integrating the evaluation of ecosystem services provided by forests into national forest assessment and monitoring, forest management planning and national accounting"².

28. A great deal of follow-up work was reported on to COFO in 2014³ including several regional activities, regional and global publications and an international forum on PES in tropical countries. In addition, the State of the World's Forests 2014 discussing the socio-economic benefits from forests devoted considerable attention to the role of FES and the need for reliable information on their true volume and for proper valuation methods and policy measures to enable their introduction. In the ensuing discussion COFO invited countries to "strengthen their efforts to promote PES" and invited CPF to do so too⁴. COFO further recommended FAO to support countries in "enhancing the effectiveness of current PES programmes", "creating an enabling environment to introduce PES", as well as in sharing knowledge and raising awareness, and "valuing contributions of forests to the national economies and developing national accounting systems for supporting the effective implementation of PES"⁵.

Points for Consideration

29. Silva 2015 provides an excellent opportunity for this information exchange, and countries may wish to share their own experiences and learn from each other. Based on such an exchange the Commission and the Committee may wish to

- Invite countries to scale up their efforts in valuing FES and in introducing PES schemes;

¹ E/2013/42, Resolution 10/1, paragraph 1.f.

² COFO/REP/2012 paragraph 34.

³ Follow-up on the recommendations of the 21st session of the Committee on Forestry and the RFCs.

⁴ COFO/REP/2014/ paragraphs 34, 35.

⁵ COFO/REP/2014 paragraph 36.

- Advise countries on best practices.
30. The Commission and the Committee may also wish to request FAO and ECE to
- Support countries in their efforts in this regard;
 - Strengthen work towards collecting reliable information on FES and related payment schemes in the region.
- _____