



CONTENTS

I. IN THE PRESS	3
II. MULTILATERAL PROCESSES IN CLIMATE CHANGE	4
III. EVENTS & MEETINGS.....	4
Upcoming events	4
Eleventh session of the UNFF (UNFF11).....	4
XIV World Forestry Congress.....	4
IV. RESEARCH ARTICLES.....	4
1982-2010 Trends of Light Use Efficiency and inherent Water Use Efficiency in African vegetation: sensitivity to climate and atmospheric CO ₂ concentrations	4
Forest expansion as explained by climate change and changes in land use: a study from Bergen, western Norway. .	5
Brazil, Ethiopia, and New Zealand lead the way on climate-smart agriculture	5
Comparison of methods toward multi-scale forest carbon mapping and spatial uncertainty analysis: combining national forest inventory plot data and landsat TM images	5
Governing the design of national REDD+: an analysis of the power of agency	6
Participatory goal programming in forest management: an application integrating several ecosystem services	6
Integrating CBM into land-use based mitigation actions implemented by local communities.	6
Comparison of three ideal point-based multi-criteria decision methods for afforestation planning	7
Multilevel governance for forests and climate change: learning from southern Mexico.	7
Satellite data as indicators of tree biomass growth and forest dieback in a Mediterranean holm oak forest.....	7
Future of the main important forest tree species in Serbia from the climate change perspective	8
Molecular technologies in Serbian lowland forestry under climate changes - possibilities and perspectives	8
The capacity to cope with climate warming declines from temperate to tropical latitudes in two widely distributed <i>Eucalyptus</i> species	8
A global assessment of forest surface albedo and its relationships with climate and atmospheric nitrogen deposition	9
Carbon sequestration by different tree species in tropical dry deciduous forest of Panchmahal District (Gujarat) in India	9
Changes in winter conditions impact forest management in north temperate forests	9
NASA Land Cover and Land Use Change (LCLUC): an interdisciplinary research program.	9
Marginal effects on biodiversity, carbon sequestration and nutrient cycling of transitions from tropical forests to cacao farming systems	10
Quantifying fire-wide carbon emissions in interior Alaska using field measurements and Landsat imagery	10
An open-access method for targeting revegetation based on potential for emissions reduction, carbon sequestration and opportunity cost.....	11
Carbon sequestration and riparian zones: assessing the impacts of changing regulatory practices in southern Brazil	11
Cross-sectoral impacts of climate change and socio-economic change for multiple, European land- and water-based sectors	11
Impact of land use and land cover changes on organic carbon stocks in Mediterranean soils (1956-2007)	12
Management, growth, and carbon storage in Miombo woodlands of Tanzania	12
Forest biomass, carbon stocks, and macrofungal dynamics: a case study in Costa Rica.....	12
A step prior to REDD+ implementation: a socioeconomic study	12
An integrated conceptual framework for Adapting forest management practices to alternative futures	13
Do the rubber plantations in tropical China act as large carbon sinks?.....	13

Perceptions of forest experts on climate change and fire management in European Mediterranean forests	13
An envelope model analysis of climate change impacts on forest tree species in Romania	13
The burning question: does forest bioenergy reduce carbon emissions? A review of common misconceptions about forest carbon accounting.....	14
Should climate change make us think more about the economics of forest management?	14
Deforestation analysis in Selangor, Malaysia between 1989 and 2011	14
Economics of co-firing coal and biomass: An application to Western Canada	14
Biomass for aviation fuel production in the Fitzroy Basin, Queensland: a preliminary assessment of native and plantation forest potential	15
Native forests and climate change: Lessons from eucalypts	15
V. PUBLICATIONS, REPORTS AND OTHER MEDIA.....	16
Forest Solutions Group's Recommendations on Biomass Carbon Neutrality. Can wood & products derived from it be carbon neutral?	16
Economic valuation of ecosystem services fails to capture biodiversity value of tropical forests	16
Testing the influence of radio programs on climate change knowledge: A pilot experience from the Congo Basin .	16
Unasylva - Volume 66 2015-1/2 <i>FAO</i>	16
Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.....	17
Participatory assessment and mapping of ecosystem services in a data-poor region: Case study of community-managed forests in central Nepal	17
Regional Synthesis of Payments for Environmental Services (PES) in the Greater Mekong Region	17
Equity in REDD+: Varying logics in Tanzania	18
Assessing current social vulnerability to climate change: A participatory methodology	18
The role of women in early REDD+ implementation: lessons for future engagement	18
Imaging tropical peatlands in Indonesia using ground penetrating radar (GPR) and electrical resistivity imaging (ERI): implications for carbon stock estimates and peat soil characterization.....	18
V.I JOBS.....	19
Team Leader/ GHG Inventory Expert	19
VII. ANNOUNCEMENTS	19
Legal preparedness for REDD+	19
Greenhouse Gas Emissions from Agriculture, Forestry and Other Land Use in Latin America & the Caribbean	19
CLIM-FO INFORMATION.....	20

I. IN THE PRESS

21 March 2015 - IISD

[International Day Sharpens Focus on Forest-Climate Links](#)

Under the theme 'Forests | Climate | Change,' the family of United Nations organizations commemorated the International Day of Forests with a number of events, announcements and reports, many of which emphasized the important role of forests in climate mitigation and adaptation

20 March 2015 - FAO

[Carbon emissions from forests down by 25% between 2001-2015](#)

Total carbon emissions from forests decreased by more than 25 percent between 2001 and 2015, mainly due to a slowdown in global deforestation rates, according to new estimates published by the UN Food and Agriculture Organization (FAO) today.

18 March 2015 - IISD

[IPCC Releases Complete AR5 Synthesis Report](#)

The Intergovernmental Panel on Climate Change (IPCC) has released the complete version of the Synthesis Report (SYR) of the Fifth Assessment Report (AR5). Some of the SYR's main findings, which was released on 2 November 2014, are: human influence on the climate system is clear; more disruption to the climate leads to a greater risk of severe, pervasive and irreversible impacts; and limiting climate change is possible.

11 March 2015 - IISD

[CGIAR Members, Partners Establish Climate Research Centers in Africa](#)

The Center for International Forestry Research (CIFOR) and Germany's Karlsruhe Institute of Technology (KIT) have announced the establishment of the Congo Basin's first center for excellence in climate change research. A greenhouse gas (GHG) laboratory was established in Yaoundé, Cameroon, in 2014 and represents the beginning of the partners' effort to develop a network of expertise and facilities to strengthen climate change research across Africa

March 2015 - IISD

[FAO Publications Focus on Disaster Risk Reduction and Forestry Links](#)

On the occasion of the UN World Conference on Disaster Risk Reduction, the Food and Agriculture Organization of the UN (FAO) released a special edition of its forestry journal focusing on the impacts of disasters on forest-dependent communities and published a brochure on natural disasters, agriculture and food and nutrition security.

26 February 2015 - CBS News

[Tropical deforestation on the rise, contrary to reports](#)

Tropical forests from Indonesia to the Amazon are being lost at an astonishing rate, with a new study suggesting deforestation has intensified 62 percent in just 20 years.

9 February 2015 - The Atlantic

[The Best Technology for Fighting Climate Change? Trees](#)

When people talk about technologies that might offset climate change, they often evoke not-yet-invented marvels, like planes spraying chemicals into the atmosphere or enormous skyscrapers gulping carbon dioxide from the clouds. But in a new report, Oxford University researchers say that our best hopes might not be so complex. In fact, they are two things we already know how to do: plant trees and improve the soil.

February 2015 - IISD

[Report Reveals Forest Cover Loss in Congo Basin](#)

The Commission des Forêts d'Afrique Centrale (COMIFAC) and the Congo Basin Forest Partnership (CBFP) released the 'State of the Forest Report' for the Congo Basin highlighting the ongoing loss of biodiversity and forest cover in the region

19 January 2015 - The New York Times

[Make Forests Pay. A Carbon Offset Market for Trees](#)

IN the last 40 years, more than one billion acres of tropical forests have vanished, equivalent in size to over half of the continental United States. The rate of cutting, burning and clearing shows no signs of abating

II. MULTILATERAL PROCESSES IN CLIMATE CHANGE

No UNFCCC meetings have taken place to report on since last Clim-Fo-L issue.

III. EVENTS & MEETINGS

Upcoming events

Eleventh session of the UNFF (UNFF11)

4 - 15 May 2015, New York, United States

The eleventh session of the UN Forum on Forests (UNFF11) will consider the future of the international arrangement on forests, based on challenges and its effectiveness. The meeting will also review progress in the implementation of the global objectives on forests and the non-legally binding instrument on all types of forests. Thematic issues under consideration will include sustainable forest management (SFM) and forest law enforcement as well as cooperation and coordination. [More](#)

XIV World Forestry Congress

7-15 September 2015, Durban, South Africa

Forests are essential to life on our planet, to mitigating and adapting to climate change, ensuring adequate supply of fresh water, enhancing biodiversity and providing sustainable incomes and livelihoods, including food security. But they face unprecedented and unrelenting pressures. The 14th World Forestry Congress, hosted by the Republic of South Africa, will bring together the global forestry community to review and analyse the key issues and to share ways of addressing them. The Congress - the first to be held in Africa - is inclusive of people from all countries, regions and sectors, whether they belong to a government organization, NGO, private company, scientific or professional body, a forestry society, or simply have a personal interest in attending. The broad participation and inclusive discussion on forestry issues will facilitate their mainstreaming in global agendas on sustainable development as well as building new partnerships. [More](#)

IV. RESEARCH ARTICLES

1982-2010 Trends of Light Use Efficiency and inherent Water Use Efficiency in African vegetation: sensitivity to climate and atmospheric CO₂ concentrations

Traore, A. K.; Ciais, P.; Vuichard, N.; MacBean, N.; Dardel, C.; Poulter, B.; Piao ShiLong; Fisher, J. B.; Viovy, N.; Jung, M.; Myneni, R

Remote Sensing; 2014. 6(9):8923-8944

Light and water use by vegetation at the ecosystem level, are key components for understanding the carbon and water cycles particularly in regions with high climate variability and dry climates such as Africa. The objective of this study is to examine recent trends over the last 30 years in Light Use Efficiency (LUE) and inherent Water Use Efficiency (iWUE*) for the major biomes of Africa, including their sensitivities to climate and CO₂. LUE and iWUE* trends are analyzed using a combination of NOAA-AVHRR NDVI3 g and fAPAR3 g, and a data-driven model of monthly evapotranspiration and Gross Primary Productivity (based on flux tower measurements and remote sensing fAPAR, yet with no flux tower data in Africa) and the ORCHIDEE (ORganizing Carbon and Hydrology In Dynamic EcosystEms) process-based land surface model driven by variable CO₂ and two different gridded climate fields. The iWUE* data product increases by 10%-20% per decade during the 1982-2010 period over the northern savannas (due to positive trend of vegetation productivity) and the central African forest (due to positive trend of vapor pressure deficit). In contrast to the iWUE*, the LUE trends are not statistically significant. The process-based model simulations only show a positive linear trend in iWUE* and LUE over the central African forest. Additionally, factorial model simulations were conducted to attribute trends in iWUE and LUE to climate change and rising CO₂ concentrations. We found that the increase of atmospheric CO₂ by 52.8 ppm during the period of study explains 30%-50% of the increase in iWUE* and >90% of the LUE trend over the central African forest. The modeled iWUE* trend exhibits a high sensitivity to the climate forcing and environmental conditions, whereas the LUE trend has a smaller sensitivity to the selected

climate forcing.

Forest expansion as explained by climate change and changes in land use: a study from Bergen, western Norway.

Penniston, R.; Lundberg, A.;

Geografiska Annaler Series A; 2014. 96(4):579-589

Extensive forest expansion has taken place across Europe during recent decades. Forest expansion is also a major trend in Norway, with an annual increase of about 24.6 million m³ during 2007-11. Similar trends were found in the study area at Mt Floyen, Bergen, western Norway. Two types of forest expansion were discovered: expansion of alien coniferous tree species from plantations and spontaneous expansion of native *Betula pubescens*. Historical data on livestock grazing and climate were used to detect possible drivers of forestation. Forest expansion started in the 1970s, in a period when average July temperatures were lower than the period before. This is an indication that forest expansion was triggered by another cause than increasing summer temperatures. The area used to be heathland for livestock pasture but grazing came to an end around 1900. The area is well below the upper alpine forest limit and forestation should be expected when grazing ceased. The reason why forestation started so late is that neighbouring areas were also deforested. Forestation took place when trees planted in the 1950s began to produce seeds from the 1970s. During the twentieth century birch colonized steep slopes and still continues to do so in abandoned pastures. A distinct increase in July temperatures was found since 2000, which may increase the speed of future forest expansion. This will cause a substantial increase in uptake and storage of carbon, and will decrease the need for afforestation of new open land as suggested by some governmental bodies

Brazil, Ethiopia, and New Zealand lead the way on climate-smart agriculture

Negra, C.; Vermeulen, S.; Barioni, L. G.; Tekalign Mamo; Melville, P.; Melaku Tadesse

Agriculture and Food Security; 2014. 3(19):(15 December 2014).

As countries around the world face urgent agricultural challenges, the concept of 'climate-smart' agriculture (CSA) has been put forward to achieve climate change adaptation, mitigation, and food security synergistically. A new report explores how three countries are using integrated policy approaches to CSA and offers insights for how other countries can build CSA into their policy mix. Brazil has invested in research to support sustainable intensification while creating legal and enforcement mechanisms to protect forest areas as a response to unrestrained agricultural expansion driven by market demand. Ethiopia initiated innovative participatory watershed development programs, in partnership with numerous international institutions, which helped smallholder farmers to rehabilitate marginal land and break out of a poverty cycle. New Zealand has removed agricultural subsidies while partnering on research and development with the private sector as a way to ensure efficiency and resilience in an agricultural sector influenced by climate change and international trade dynamics. To assemble an integrated set of national policies that fosters CSA, governments will need context-specific assessments, strong multi-stakeholder institutions, coordination frameworks, and multi-scale information systems. Governments can select from an array of policy instruments ranging from regulatory mechanisms and economic incentives to public investments and educational campaigns. Many existing national policy goals and public programs designed to increase agricultural production, improve livelihoods, and reduce environmental risks can become important pillars of a national CSA strategy. Countries have obvious interests in fostering an agriculture sector that is climate-resilient, provides national needs for food, fiber, and fuel, and supports farm livelihoods. However, the incentives for national-level action toward reducing global greenhouse gas (GHG) levels are less clear in the absence of serious and shared international commitment. Integrated national CSA policies will be encouraged by clear, consistent signals from multilateral agencies, global donors, and international conventions and trade agreements that promote agriculture as a pathway for poverty reduction and food security

Comparison of methods toward multi-scale forest carbon mapping and spatial uncertainty analysis: combining national forest inventory plot data and landsat TM images

Fleming, A. L.; Wang, G. X.; McRoberts, R. E

European Journal of Forest Research; 2015. 134(1):125-137.

Accurate spatial estimation of forest carbon stocks and their spatial uncertainties at local, regional, national, and global scales is a critical step in global carbon cycle modeling and management. This study aimed at enhancing the methods that are currently used in this area by combining plot data from the forest inventory and analysis program of the U.S. Forest Service and free landsat thematic mapper image data. Three mapping methods including linear regression, sequential Gaussian co-simulation, and block co-simulation algorithm were compared with respect to the accuracy of forest carbon stock estimates obtained for a study area in Southern Illinois, USA. The results indicated that although the linear regression resulted in smaller prediction errors than the sequential Gaussian co-simulation and the block co-simulation approaches, it also produced both negative

and unreasonably large estimates, which is a serious drawback. Moreover, the sequential Gaussian co-simulation and the block co-simulation produced not only accurate carbon predictions, but also uncertainties for the local estimates. In addition, the block co-simulation approach scaled up both forest carbon stocks and the input uncertainties from finer to coarser spatial resolutions as is required for mapping forest carbon at national and global scales. Thus, the co-simulation and block co-simulation algorithms resolved an important current methodological challenge.

Governing the design of national REDD+: an analysis of the power of agency

Brockhaus, M.; Gregorio, M. di; Mardiah, S
Forest Policy and Economics; 2014. 49:23-33

This paper investigates how three aspects of governance systems, namely the policy context, the influence of key agents and their discursive practices, are affecting national-level processes of policy design aimed at REDD+, reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries. We conducted analysis in six REDD+ countries (Brazil, Cameroon, Indonesia, Nepal, Papua New Guinea and Vietnam). The paper combines three methods: policy analysis, media-based discourse analysis and policy network analysis. The paper shows that policies both within and outside the forestry sector that support deforestation and forest degradation create path dependencies and entrenched interests that hamper policy change. In addition, most dominant policy coalitions do not challenge business-as-usual trajectories, reinforcing existing policy and political structures. No minority policy coalitions are directly tackling the root causes of deforestation and forest degradation, that is, the politico-economic conditions driving them. Instead they focus on environmental justice issues, such as calls for increased participation of indigenous people in decision-making. Only in two of the six countries are these transformational change coalitions vocal enough to be heard, yet to exercise their agency effectively and to support more substantial reforms, these coalitions would need the participation of more influential policy actors, particularly state agencies that have the authority to make binding decisions about policy. Furthermore, discourses supporting transformational change would need to be reflected in institutional practices and policy decisions.

Participatory goal programming in forest management: an application integrating several ecosystem services

Aldea, J.; Martinez-Pena, F.; Romero, C.; Diaz-Balteiro, L
Forests; 2014. 5(12):3352-3371.

In this study, we propose a procedure for integrating several ecosystem services into forest management by using the well-known multi-criteria approach called goal programming. It shows how interactions with various stakeholders are essential in order to choose the goal programming model applied, as well as some of its basic components (variant, targets, preferential weights, etc.). This methodology has been applied to a real forest management case where five criteria have been selected: timber production, wild edible mushroom production, carbon sequestration, net present value of the underlying investment, and a criterion associated with the sustainability of forest management defined by the idea of a normal forest. Given the characteristics of some of these criteria, such as mushroom production, the model has been developed in two scenarios: one deterministic and another with a Monte Carlo analysis. The results show a considerable degree of conflict between the proposed criteria. By applying several goal programming models, different Paretian efficient solutions were obtained. In addition, some results in Monte Carlo analysis for several criteria show notable variations. This fact is especially notable for the mushroom production criterion. Finally, the proposed approach seems attractive and can be directly applied to other forest management situations.

Integrating CBM into land-use based mitigation actions implemented by local communities.

Balderas Torres, A.; Santos Acuna, L. A.; Canto Vergara, J. M
Forests; 2014. 5(12):3295-3326.

In 2009, the conference of the parties of the United Nations Framework Convention on Climate Change recognized the need to engage communities and indigenous groups into the systems to monitor, report and verify the results of REDD+. Since then, many countries have started to prepare for REDD+ implementation. This article reviews early experiences under development in 11 projects financed by the Alliance Mexico REDD+ located in four Early Action Areas to identify the potential integration of Community Based Monitoring (CBM). The evaluation of the projects is made based on a multi-criteria analysis which considers the potential to produce information relevant for national monitoring systems and the prospects for sustained monitoring practices over time. Results indicate there are challenges to harmonizing monitoring practices and protocols between projects since activities proposed differ greatly from one project to another. Technical specifications for integrating local data into national systems are thus required. The results of these projects can help to identify best practices for planning and implementing REDD+. Findings indicate that in general, resources and

capacities to gather, analyse and report information as part of CBM systems are in place in the projects, but usually these reside with non-local experts (*i.e.*, NGOs and Academia); however, there are notable examples where these capacities reside in the communities. If national forest monitoring systems are geared to include information gathered through locally-driven processes REDD+ should promote activities that produce local benefits, but countries would need to build local capacities for managing and monitoring natural resources and would also need to create agreements for sharing and using local data. Otherwise, national systems may need to rely on monitoring practices external to communities, which depend on the continued availability of external financial resources.

Comparison of three ideal point-based multi-criteria decision methods for afforestation planning

Estrella, R.; Cattrysse, D.; Orshoven, J. Van

Forests; 2014. 5(12):3222-3240

Three ideal point-based multi-criteria decision methods (MCDM), *i.e.*, iterative ideal point thresholding (IIPT), compromise programming (CP) and a newly-proposed CP variant, called balanced compromise programming (BCP), were applied to the Tabacay catchment in Ecuador with the aim of finding a distribution of land use types (LUT) that optimizes regional land performance. This performance was expressed in terms of several conflicting on-site ecosystem services (ESS), namely water conservation, soil protection, carbon storage and monetary income. IIPT selects the best performing LUT on a per-land unit basis, that is the assignment of a LUT to a land unit is completely independent with respect to other land units. CP and BCP, on the other hand, aim at optimizing the integrated regional performance. These methods produce a LUT distribution that is as close as possible to the absolute optimal performance that would be achieved when conflict among ESS is not considered. In general, similar results were obtained with CP and BCP. This was not the case when the results produced by these two methods were contrasted with IIPT. For most ESS under consideration, CP and BCP produced balanced results that were closer to the absolute optimal values when compared to IIPT. We conclude from our results that, when optimization of land performance at a regional scale is at stake, CP-derived models emerge as the preferable option over IIPT, especially when balanced solutions are a requirement.

Multilevel governance for forests and climate change: learning from southern Mexico.

Rantala, S.; Hajjar, R.; Skutsch, M

Forests; 2014. 5(12):3147-3168.

Reducing emissions from deforestation and forest degradation (REDD+) involves global and national policy measures as well as effective action at the landscape scale across productive sectors. Multilevel governance (MLG) characterizes policy processes and regimes of cross-scale and cross-sector participation by multiple public and private actors for improved legitimacy and effectiveness of policy. We examine multilevel, multi-actor engagement in REDD+ planning in Quintana Roo, Mexico, to find out how local perspectives align with the national policy approach to REDD+ as an integrating element of holistic rural development at territorial scale, and how current practices support procedurally legitimate MLG required to implement it. We find that there is wide conceptual agreement on the proposed approach by a variety of involved actors, in rejection of the business-as-usual sectoral interventions. Its implementation, however, is challenged by gaps in horizontal and vertical integration due to strong sectoral identities and hierarchies, and *de facto* centralization of power at the federal level. Continued participation of multiple government and civil society actors to contribute to social learning for locally appropriate REDD+ actions is likely to require a more balanced distribution of resources and influence across levels. Meaningfully engaging and ensuring the representation of local community interests in the process remains a critical challenge.

Satellite data as indicators of tree biomass growth and forest dieback in a Mediterranean holm oak forest

Ogaya, R.; Barbeta, A.; Basnou, C.; Penuelas, J

Annals of Forest Science; 2015. 72(1):135-144

Context: In the framework of climate change, decreased tree growth and enhanced mortality induced by hot and dry conditions are increasing in many forests around the world, and particularly in Mediterranean forests. Aims: Our aim was to estimate tree growth and mortality in a Mediterranean holm oak forest, using remote sensing data from MODIS. Methods: We monitored annual increases of aboveground biomass by measuring tree basal area, and we determined tree mortality by counting dead stems. We analyzed the relationships between forest growth and mortality with mean annual values of some MODIS products and meteorological data. Results: Mortality and increases of aboveground biomass correlated well with precipitation, September standardized precipitation/evapotranspiration indices (SPEI), and some MODIS products such as NDVI and enhanced vegetation index EVI. Other MODIS products such as gross primary production (GPP) and net photosynthesis, however, showed no clear relationship with tree mortality or measured increases of biomass. Conclusion: The

MODIS products as proxies of ecosystemic productivity (gross primary productivity, net photosynthesis) were weakly correlated with biomass increase, and did not reflect the mortality following the drought of autumn 2011. Nevertheless, NDVI and EVI were efficient indicators of forest productivity and dieback.

Future of the main important forest tree species in Serbia from the climate change perspective

Stojanovic, D. B.; Matovic, B.; Orlovic, S.; Krzic, A.; Trudic, B.; Galic, Z.; Stojnic, S.; Pekec, S
SEEFOR; 2014. 5(2):117-124.

Background and Purpose: Climate change is possibly the biggest 21st century challenge for the European forestry. Serbia is also under pressure, since the regions of South Europe and Mediterranean are expected to suffer the most. Main purpose of this study was to predict how distribution of several tree species in Serbia may change in the future. Materials and Methods: Our study integrates climate change scenarios for the region of Serbia together with the current distribution of forest tree species. Evaluation was performed using forest aridity index which takes into account mean temperatures and sums of precipitation of the critical months during the growing season. Distribution data of the nine most abundant tree species in Serbia (European beech, Turkey oak, Sessile oak, Hungarian oak, Pedunculate oak, Norway spruce, Silver fir, Black and Scots pine) were taken from the National Forest Inventory. Results: Significant change of bioclimatic niches is expected for the majority of the studied tree species. The most endangered will be Pedunculate oak due to the extreme change of its habitats, while drought prone species (like pines and Hungarian oak) will be less endangered. Sessile oak, Turkey oak, Silver fir, Norway spruce and European beech will be out of their 20th century bioclimatic niches before the end of 21st century according to A2 scenario. Conclusion: Our results suggest that some of the most important tree species in Serbia (Sessile oak, Turkey oak, Silver fir, Norway spruce and European beech) will be endangered by the end of 21st century. General adaption options and specific measurements for forestry sector have to be made for the region of southeast Europe due to the expected extreme change in climate.

Molecular technologies in Serbian lowland forestry under climate changes - possibilities and perspectives

Trudic, B.; Orlovic, S.; Galovic, V.; Pekec, S.; Stojanovic, D. B.; Stojnic, S
SEEFOR; 2014. 5(2):103-115.

Background and Purpose: Vojvodina province, the northern part of the Republic of Serbia, is predominantly lowland agricultural region with over 75% of arable land which in previous years, has been highly impacted by drought. The annual precipitation is lower than 700 mm and it is the limit for the growth and development of natural forest vegetation. Unfortunately, the atmospheric precipitation is still a major source of water for plant biodiversity. Taking these facts into account, it is highly recommended to primarily use the xerothermic tree species, which have a well-developed root system for "classical" afforestation. Some species from *Salicaceae* and *Fagaceae* like poplars, willows, oaks and beeches are surely the best option for afforestation in temperate zones strongly influenced by drought. Conclusions: In order to develop stress-based genomic information in *Populus* and the rest of woody plant species from Vojvodina, an integrated genetic research needs to be done. The aim of this particular paper is to analyse and summarize data regarding stress-based biotechnology perspectives in Vojvodina and to give recommendations for future forest tree breeding. Drought as a strong negative ecological factor must be carefully considered. In order to achieve sustainability, new forest management plans must consider wide approaches, from molecular to ecosystem level.

The capacity to cope with climate warming declines from temperate to tropical latitudes in two widely distributed *Eucalyptus* species

Drake, J. E.; Aspinwall, M. J.; Pfautsch, S.; Rymer, P. D.; Reich, P. B.; Smith, R. A.; Crous, K. Y.; Tissue, D. T.; Ghannoum, O.; Tjoelker, M. G
Global Change Biology; 2015. 21(1):459-472

As rapid climate warming creates a mismatch between forest trees and their home environment, the ability of trees to cope with warming depends on their capacity to physiologically adjust to higher temperatures. In widespread species, individual trees in cooler home climates are hypothesized to more successfully acclimate to warming than their counterparts in warmer climates that may approach thermal limits. We tested this prediction with a climate-shift experiment in widely distributed *Eucalyptus tereticornis* and *E. grandis* using provenances originating along a ~2500 km latitudinal transect (15.5-38.0 degrees S) in eastern Australia. We grew 21 provenances in conditions approximating summer temperatures at seed origin and warmed temperatures (+3.5 degrees C) using a series of climate-controlled glasshouse bays. The effects of +3.5 degrees C warming strongly depended on home climate. Cool-origin provenances responded to warming through an increase in photosynthetic capacity and total leaf area, leading to enhanced growth of 20-60%. Warm-origin provenances, however, responded to warming through a reduction in photosynthetic capacity and total leaf area, leading to reduced growth of approximately 10%. These results suggest that there is predictable intraspecific variation in the capacity of trees to respond to warming; cool-origin taxa are likely to benefit

from warming, while warm-origin taxa may be negatively affected.

A global assessment of forest surface albedo and its relationships with climate and atmospheric nitrogen deposition

Leonardi, S.; Magnani, F.; Nole, A.; Noiye, T. van; Borghetti, M
Global Change Biology; 2015. 21(1):287-298

We present a global assessment of the relationships between the short-wave surface albedo of forests, derived from the MODIS satellite instrument product at 0.5° spatial resolution, with simulated atmospheric nitrogen deposition rates (Ndep), and climatic variables (mean annual temperature Tm and total annual precipitation P), compiled at the same spatial resolution. The analysis was performed on the following five forest plant functional types (PFTs): evergreen needle-leaf forests (ENF); evergreen broad-leaf forests (EBF); deciduous needle-leaf forests (DNF); deciduous broad-leaf forests (DBF); and mixed-forests (MF). Generalized additive models (GAMs) were applied in the exploratory analysis to assess the functional nature of short-wave surface albedo relations to environmental variables. The analysis showed evident correlations of albedo with environmental predictors when data were pooled across PFTs: Tm and Ndep displayed a positive relationship with forest albedo, while a negative relationship was detected with P. These correlations are primarily due to surface albedo differences between conifer and broad-leaf species, and different species geographical distributions. However, the analysis performed within individual PFTs, strengthened by attempts to select 'pure' pixels in terms of species composition, showed significant correlations with annual precipitation and nitrogen deposition, pointing toward the potential effect of environmental variables on forest surface albedo at the ecosystem level. Overall, our global assessment emphasizes the importance of elucidating the ecological mechanisms that link environmental conditions and forest canopy properties for an improved parameterization of surface albedo in climate models.

Carbon sequestration by different tree species in tropical dry deciduous forest of Panchmahal District (Gujarat) in India

Pilania, P. K.; Gujar, R. V.; Panchal, N. S

Environment Conservation Journal; 2014. 15(3):101-107

Trees act as a sink for CO₂ by fixing carbon during photosynthesis and storing surplus carbon as biomass which alter through time as trees grow, die and decay. There is uncertainty about the extent of carbon stored in forests by trees. 28 species belonging to 20 families were studied to demonstrate relationship among carbon sequestration which was half the tree biomass. Total carbon sequestration was 448.044 tonnes dominated by *Tectona grandis* L.F., *Butea monosperma* (Lam) Taub and *Diospyros melanoxylon* Roxb. The deviation in carbon sequestration was observed due to girth, height, biomass, native place and economic importance of species. Statistically a positive correlation of 0.966 was found between the total number of trees and total carbon sequestration.

Changes in winter conditions impact forest management in north temperate forests

Rittenhouse, C. D.; Rissman, A. R.;

Journal of Environmental Management; 2015. 149:157-167

Climate change may impact forest management activities with important implications for forest ecosystems. However, most climate change research on forests has focused on climate-driven shifts in species ranges, forest carbon, and hydrology. To examine how climate change may alter timber harvesting and forest operations in north temperate forests, we asked: (1) How have winter conditions changed over the past 60 years? (2) Have changes in winter weather altered timber harvest patterns on public forestlands? (3) What are the implications of changes in winter weather conditions for timber harvest operations in the context of the economic, ecological, and social goals of forest management? Using meteorological information from Climate Data Online and Autoregressive Integrated Moving Average (ARIMA) models we document substantial changes in winter conditions in Wisconsin, including a two- to three-week shortening of frozen ground conditions from 1948 to 2012. Increases in minimum and mean soil temperatures were spatially heterogeneous. Analysis of timber harvest records identified a shift toward greater harvest of jack pine and red pine and less harvest of aspen, black spruce, hemlock, red maple, and white spruce in years with less frozen ground or snow duration. Interviews suggested that frozen ground is a mediating condition that enables low-impact timber harvesting. Climate change may alter frozen ground conditions with complex implications for forest management.

NASA Land Cover and Land Use Change (LCLUC): an interdisciplinary research program.

Justice, C.; Gutman, G.; Vadrevu, K. P.;

Journal of Environmental Management; 2015. 148:4-9.

Understanding Land Cover/Land Use Change (LCLUC) in diverse regions of the world and at varied spatial scales

is one of the important challenges in global change research. In this article, we provide a brief overview of the NASA LCLUC program, its focus areas, and the importance of satellite remote sensing observations in LCLUC research including future directions. The LCLUC Program was designed to be a cross-cutting theme within NASA's Earth Science program. The program aims to develop and use remote sensing technologies to improve understanding of human interactions with the environment. Since 1997, the NASA LCLUC program has supported nearly 280 research projects on diverse topics such as forest loss and carbon, urban expansion, land abandonment, wetland loss, agricultural land use change and land use change in mountain systems. The NASA LCLUC program emphasizes studies where land-use changes are rapid or where there are significant regional or global LCLUC implications. Over a period of years, the LCLUC program has contributed to large regional science programs such as Land Biosphere-Atmosphere (LBA), the Northern Eurasia Earth Science Partnership Initiative (NEESPI), and the Monsoon Area Integrated Regional Study (MAIRS). The primary emphasis of the program will remain on using remote sensing datasets for LCLUC research. The program will continue to emphasize integration of physical and social sciences to address regional to global scale issues of LCLUC for the benefit of society.

Marginal effects on biodiversity, carbon sequestration and nutrient cycling of transitions from tropical forests to cacao farming systems

Obeng, E. A.; Aguilar, F. X

Agroforestry Systems; 2015. 89(1):19-35

Cacao (*Theobroma cacao*), a perennial crop predominantly cultivated as a multi-product and multi-strata agroforestry system, has been identified as one of an array of factors behind land use changes in the tropics. Concerns have also been raised about the gradual shift from traditional cacao growing systems under diverse and dense tree canopy to lower or no-shade cover, leading to further loss of direct and functional forest ecosystem values such as protective and regulatory environmental services. This paper surveys existing literature and focuses on changes to biodiversity, carbon sequestration and nutrient cycling conditions due to a transition from natural forests to traditional lower-density agroforestry and high-density hybrid monoculture cacao systems. We derive marginal effects on selected ecosystem functions expressed as a percentage unit change in corresponding ecosystem values from a natural forest baseline scenario. Data from 16 studies conducted in Africa and the Americas show a negative trend in marginal changes in above-and below-ground carbon sequestration potential for the two cacao farming systems. The extent of marginal losses in carbon storage was comparatively higher for the monoculture than cacao agroforestry system. A general trend denoting positive marginal changes has been reported for mean species richness in soil and litter and some essential chemical and physical soil properties (Calcium, Magnesium, sand and silt) of cacao agroforestry systems compared with a natural forest baseline. The balance between negative and positive changes show that traditional cacao agroforestry systems have greater potential for conservation of ecosystem services closer to a natural forest state than monocultures.

Quantifying fire-wide carbon emissions in interior Alaska using field measurements and Landsat imagery

Rogers, B. M.; Veraverbeke, S.; Azzari, G.; Czimczik, C. I.; Holden, S. R.; Mouteva, G. O.; Sedano, F.; Treseder, K. K.; Randerson, J. T

Journal of Geophysical Research: Biogeosciences; 2014. 119(8):1608-1629

Carbon emissions from boreal forest fires are projected to increase with continued warming and constitute a potentially significant positive feedback to climate change. The highest consistent combustion levels are reported in interior Alaska and can be highly variable depending on the consumption of soil organic matter. Here we present an approach for quantifying emissions within a fire perimeter using remote sensing of fire severity. Combustion from belowground and aboveground pools was quantified at 22 sites (17 black spruce and five white spruce-aspen) within the 2010 Gilles Creek burn in interior Alaska, constrained by data from eight unburned sites. We applied allometric equations and estimates of consumption to calculate carbon losses from aboveground vegetation. The position of adventitious spruce roots within the soil column, together with estimated prefire bulk density and carbon concentrations, was used to quantify belowground combustion. The differenced Normalized Burn Ratio (dNBR) exhibited a clear but nonlinear relationship with combustion that differed by forest type. We used a multiple regression model based on transformed dNBR and deciduous fraction to scale carbon emissions to the fire perimeter, and a Monte Carlo framework to assess uncertainty. Because of low-severity and unburned patches, mean combustion across the fire perimeter ($1.98 \pm 0.34 \text{ kg C m}^{-2}$) was considerably less than within a defined core burn area ($2.67 \pm 0.40 \text{ kg C m}^{-2}$) and the mean at field sites ($2.88 \pm 0.23 \text{ kg C m}^{-2}$). These areas constitute a significant fraction of burn perimeters in Alaska but are generally not accounted for in regional-scale estimates. Although total combustion in black spruce was slightly lower than in white spruce-aspen forests, black spruce covered most of the fire perimeter (62%) and contributed the majority (67% \pm 16%) of total emissions. Increases in spring albedo were found to be a viable alternative to dNBR for modeling emissions.

An open-access method for targeting revegetation based on potential for emissions reduction, carbon sequestration and opportunity cost

Longmire, A.; Taylor, C.; Pearson, C. J.

Land Use Policy; 2015. 42:578-585

We propose a simple heuristic that uses open-access models and government data on agricultural activities to estimate total carbon emissions from agriculture, the gross carbon benefit and the opportunity cost per tonne CO₂-e from revegetating to environmental plantings or plantation forestry. We test this across ten areas of mixed land-use that represent diverse Australian agricultural systems along a rainfall transect. The local value of agricultural production was obtained from government statistics and used to estimate the current economic opportunity cost of converting cleared agricultural land to mixed environmental plantings for carbon sequestration. Gross carbon benefit from revegetation was closely related to current agricultural use, as was financial opportunity cost. These were not related simply to site productivity potential or rainfall. The proportion of land cleared for agriculture that would need to be re-vegetated to achieve a localised zero-carbon land-use scenario was calculated by the ratio of current agricultural emissions to gross carbon benefit from revegetation; this ranged from 13% to 66% for groups of agricultural industries across Australian rainfall transects. While the heuristic does not capture the detail of models built specifically for local research questions it does provide a different lens on the questions policy makers and land managers may ask about the costs and benefits of revegetating agricultural land, and provides open-access methods to guide them.

Carbon sequestration and riparian zones: assessing the impacts of changing regulatory practices in southern Brazil

Garrastazu, M. C.; Mendonca, S. D.; Horokoski, T. T.; Cardoso, D. J.; Rosot, M. A. D.; Nimmo, E. R.; Lacerda, A. E. B

Land Use Policy; 2015. 42:329-339

Despite the consensus that riparian zones are important for the conservation of biological diversity and many other ecosystem services, there are no consistent regulations for how, or if, riparian areas should be used and the size of buffer zones required. Recently, controversial revisions to the Forest Code in Brazil have been implemented which include a reduction in the width of protected riparian buffer zones required along rivers. In order to model the impact of legislative changes on ecosystem services, we used the integrated valuation of environmental services and tradeoffs (InVEST) tool to assess a 30,000 ha watershed in southern Brazil and carbon sequestration as an indicator for ecosystem services. The results demonstrate that the adoption of improved agriculture practices, development of secondary forests and especially the conversion of land into more restrictive types of land-use has a significant and positive impact on the levels of carbon sequestered. On the other hand, the easing of riparian zone requirements shows an important potential loss in carbon sequestration. More importantly, reducing the size of the buffer zone might result in land-conversion into agriculture or pasture, impacting both carbon sequestration and other ecosystem services. However, the easing of restrictions on riparian areas under the revised Forest Code might be overshadowed by changes to Legal Forest Reserve provisions which could have a much greater impact on carbon sequestration. Despite the restrictions imposed by various pieces of legislation, the loss of ecosystem services due to a reduction in the protected riparian area, as well as possible land conversion due to changes in Legal Forest Reserves, are possible unless efforts involving narrowing the gap between research and policy, effective law enforcement, and implementing attractive payment for ecosystem services programs, are put in place. We believe that introducing incentives to farmers to maintain the protection of riparian areas by implementing agroforestry systems, such as *erva-mate* (*Ilex paraguariensis*), would be beneficial socioeconomically and ecologically and should be integrated into the Forest Code.

Cross-sectoral impacts of climate change and socio-economic change for multiple, European land- and water-based sectors

Harrison, P. A.; Dunford, R.; Savin, C.; Rounsevell, M. D. A.; Holman, I. P.; Kebede, A. S.; Stuch, B

Climatic Change; 2015. 128(3/4):279-292

Understanding cross-sectoral impacts is important in developing appropriate adaptation strategies to climate change, since such insight builds the capacity of decision-makers to understand the full extent of climate change vulnerability, rather than viewing single sectors in isolation. A regional integrated assessment model that captures interactions between six sectors (agriculture, forests, biodiversity, water, coasts and urban) was used to investigate impacts resulting from a wide range of climate and socio-economic scenarios. Results show that Europe will be significantly influenced by these possible future changes with between 79 and 91% of indicator-scenario combinations found to be statistically significantly different from the baseline. Urban development increases in most scenarios across Europe due to increases in population and sometimes GDP. This has an indirect influence on the number of people affected by a 1 in 100 year flood which increases in western and northern Europe. Changes in other land uses (intensive farming, extensive farming, forests and unmanaged

land) vary depending on the scenario, but food production generally increases across Europe at the expense of forest area and unmanaged land to satisfy increasing food demand. Biodiversity vulnerability and water exploitation both increase in southern and Eastern Europe due to direct effects from climate and indirect effects from changes in land use and irrigation water use. The results highlight the importance of considering non-climatic pressures and cross-sectoral interactions to fully capture climate change impacts at the regional scale.

Impact of land use and land cover changes on organic carbon stocks in Mediterranean soils (1956-2007)

Munoz-Rojas, M.; Jordan, A.; Zavala, L. M.; Rosa, D. de la; Abd-Elmabod, S. K.; Anaya-Romero, M

Land Degradation & Development; 2015. 26(2):168-179

During the last few decades, land use changes have largely affected the global warming process through emissions of CO₂. However, C sequestration in terrestrial ecosystems could contribute to the decrease of atmospheric CO₂ rates. Although Mediterranean areas show a high potential for C sequestration, only a few studies have been carried out in these systems. In this study, we propose a methodology to assess the impact of land use and land cover change dynamics on soil organic C stocks at different depths. Soil C sequestration rates are provided for different land cover changes and soil types in Andalusia (southern Spain). Our research is based on the analysis of detailed soil databases containing data from 1357 soil profiles, the Soil Map of Andalusia and the Land Use and Land Cover Map of Andalusia. Land use and land cover changes between 1956 and 2007 implied soil organic C losses in all soil groups, resulting in a total loss of 16.8Tg (approximately 0.33Tg y⁻¹). Afforestation increased soil organic C mostly in the topsoil, and forest contributed to sequestration of 8.62 Mgha⁻¹ of soil organic C (25.4 per cent). Deforestation processes implied important C losses, particularly in Cambisols, Luvisols and Vertisols. The information generated in this study will be a useful basis for designing management strategies for stabilizing the increasing atmospheric CO₂ concentrations by preservation of C stocks and C sequestration.

Management, growth, and carbon storage in Miombo woodlands of Tanzania

Lupala, Z. J.; Lusambo, L. P.; Ngaga, Y. M

International Journal of Forestry Research; 2014. 2014:Article ID 629317

Despite the local livelihoods support function provided by miombo woodlands of Tanzania under participatory forest management, its growth still has potential for carbon storage and sequestration attractive to REDD+ initiatives. This study has revealed the average growth to be significant, despite the local community livelihoods support function. However, climate change mitigation strategy needs to be more innovative to optimize carbon storage and local livelihoods' potentials in forest-dependent communities like miombo woodlands. Carbon credits resulting from the increased carbon stock and sequestration should contribute to sustainable development. This should also help promote participatory forest management and secure miombo woodland products and services upon which billions of people depend

Forest biomass, carbon stocks, and macrofungal dynamics: a case study in Costa Rica

Rojas, C.; Calvo, E

International Journal of Forestry Research; 2014. 2014:Article ID 607372

There are few published studies providing information about macrofungal biology in a context of forest dynamics in tropical areas. For this study, a characterization of above-ground standing tree biomass and carbon stocks was performed for four different forest subtypes within two life zones in Costa Rica. Fungal productivity and reproductive success were estimated and analyzed in the context of the forest systems studied and results showed fungal dynamics to be a complex and challenging topic. In the present study, fungal productivity was higher in forest patches with more tree density but independent from life zones, whereas fungal biomass was higher in premontane areas with ectomycorrhizal dominant trees. Even though some observed patterns could be explained in terms of climatic differences and biotic relationships, the high fungal productivity observed in dry forests was an interesting finding and represents a topic for further studies.

A step prior to REDD+ implementation: a socioeconomic study

Bernard, A.; Gelinas, N.

International Journal of Forestry Research; 2014. 2014:Article ID 563021

Phase 2 of the United Nations' REDD+ climate change mitigation initiative is underway in the Democratic Republic of Congo. Meanwhile, activities are being implemented to assess the reduction of emissions from deforestation and forest degradation. REDD+ projects need to include a social dimension; thus, the aim of this research was to understand how land-use relationships vary across communities in an area where a REDD+ project is planned. Specifically, we aimed to identify the primary income-generating activities, the variation in

access to land, the potential for the development of community projects, and the implementation of alternative income-generating activities. In the summer of 2013, we assessed a REDD+ pilot project in and around the Luki Biosphere Reserve, Bas-Congo Province. We used participatory rural appraisal (PRA) methods in four communities located both inside and outside the reserve. We found that current subsistence income activities led to the destruction of forest habitat due to population pressure and a lack of alternative income-generating activities. Customary land tenures overlay statutory rights, which can often mean that community rights are threatened. To achieve their targets, REDD+ projects should consider the actual land-use patterns of local communities in order to generate sustainable income from the land.

An integrated conceptual framework for Adapting forest management practices to alternative futures

Prato, T.; Paveglio, T. B

International Journal of Forestry Research; 2014. 2014:Article ID 321345

This paper proposes an integrated, conceptual framework that forest managers can use to simulate the multiple objectives/indicators of sustainability for different spatial patterns of forest management practices under alternative futures, rank feasible (affordable) treatment patterns for forested areas, and determine if and when it is advantageous to adapt or change the spatial pattern over time for each alternative future. The latter is defined in terms of three drivers: economic growth; land use policy; and climate change. Four forest management objectives are used to demonstrate the framework, minimizing wildfire risk and water pollution and maximizing expected net return from timber sales and the extent of potential wildlife habitat. The fuzzy technique for preference by similarity to the ideal solution is used to rank the feasible spatial patterns for each subperiod in a planning horizon and alternative future. The resulting rankings for subperiods are used in a passive adaptive management procedure to determine if and when it is advantageous to adapt the spatial pattern over subperiods. One of the objectives proposed for the conceptual framework is simulated for the period 2010-2059, namely, wildfire risk, as measured by expected residential losses from wildfire in the wildland-urban interface for Flathead County, Montana.

Do the rubber plantations in tropical China act as large carbon sinks?

Song QingHai; Tan ZhengHong; Zhang YiPing; Sha LiQing; Deng XiaoBao; Deng Yun; Zhou WenJun; Zhao JunFu; Zhao JunBin; Zhang Xiang; Zhao Wei; Yu GuiRui; Sun XiaoMin; Liang NaiShen; Yang LianYan

iForest; 2014. 7:42-47

The regrowth of tropical secondary forests and plantations can not offset the carbon release caused by tropical deforestation, consequently determining net carbon losses on tropical lands. However, large uncertainties remain in relation to this assumption. Here, we used a biometric method to estimate the net dry matter production and net ecosystem production in a rubber forest, the most widespread plantation type in tropical Southeast Asia. According to biometric estimates made during the study, the ecosystem was a carbon sink ($790 \text{ gC m}^{-2} \text{ yr}^{-1}$). Net ecosystem carbon fluxes were measured by the eddy covariance method. The carbon budget estimated using the FluxNet procedure ($904 \text{ gC m}^{-2} \text{ yr}^{-1}$) was closer to the biometric estimates in comparison to a method based on data measured during neutral atmospheric conditions. Overall, when considering the whole life cycle, including deforestation of the prior-existing tropical forest, the hypothesis of plantations serving as large carbon sinks is not supported by our study.

Perceptions of forest experts on climate change and fire management in European Mediterranean forests

Raftoyannis, Y.; Nocentini, S.; Marchi, E.; Calama Sainz, R.; Garcia Guemes, C.; Pilas, I.; Peric, S.; Paulo, J. A.; Moreira-Marcelino, A. C.; Costa-Ferreira, M.; Kakouris, E.; Lindner, M

iForest; 2014. 7:33-41

Climate change has already increased fire risk in Mediterranean forests. Adaptation options related to forest fires and climate change include measures related to fuel management, fire fighting and infrastructure, as well as public awareness. The importance of each of these measures was evaluated in six Mediterranean countries in a study initiated within the COST Action FP0703 "Expected Climate Change and Options for European Silviculture". A questionnaire survey was used to document the views of foresters and forest scientists. Country differences were observed and adaptation measures related to fire fighting efficiency and public awareness were valued as more important than fuel management. Results were discussed in the light of a critical review of adaptive fire management measures with special reference to European Mediterranean countries.

An envelope model analysis of climate change impacts on forest tree species in Romania

Pacurar, V. D

Bulletin of the Transilvania University of Brasov, Series II - Forestry, Wood Industry, Agricultural Food

Engineering; 2014. 7(56 Part 2):17-24

The paper deals with possible impacts of climate changes, as described in the most recent Intergovernmental Panel on Climate Change Reports, on the most important forest tree species native to Romania. The study uses the simplest version of bioclimatic envelope, with two basic parameters (mean temperatures and mean rainfall amounts) and a rectangular shape, based on values describing species requirements. There were considered seven tree species, for which were selected 17 populations, located in various ecological regions of the country. The changes of the two main bioclimatic parameters in the selected locations, were calculated and evaluated for a total of 12 scenario-period combinations.

The burning question: does forest bioenergy reduce carbon emissions? A review of common misconceptions about forest carbon accounting

Ter-Mikaelian, M. T.; Colombo, S. J.; Chen JiaXin

Journal of Forestry; 2015. 113(1):57-68

Critical errors exist in some methodologies applied to evaluate the effects of using forest biomass for bioenergy on atmospheric greenhouse gas emissions. The most common error is failing to consider the fate of forest carbon stocks in the absence of demand for bioenergy. Without this demand, forests will either continue to grow or will be harvested for other wood products. Our goal is to illustrate why correct accounting requires that the difference in stored forest carbon between harvest and no-harvest scenarios be accounted for when forest biomass is used for bioenergy. Among the flawed methodologies evaluated in this review, we address the rationale for accounting for the fate of forest carbon in the absence of demand for bioenergy for forests harvested on a sustained yield basis. We also discuss why the same accounting principles apply to individual stands and forest landscapes.

Should climate change make us think more about the economics of forest management?

Yang Jing; McKenney, D. W.; Weersink, A

Forestry Chronicle; 2015. 91(1):23-31

Forest management agencies have budget constraints and continually face difficult questions regarding how much to invest in silviculture and when to harvest forests. Economic thought suggests these decisions should be guided by the pursuit of economic efficiency and tools like net present value (NPV) analysis. In forestry this would make use of the so-called Faustmann model and generally result in shorter rotation ages than the Maximum Sustained Yield (MSY) criterion, which is often used as a policy objective in forest management. The two approaches have caused tension and controversy between foresters and economists. Climate change is adding yet another uncertainty dimension to the forest management challenge. Global climate models suggest massive changes in climate this coming century that will surely affect forests. Here we use climate change as a backdrop to compare the MSY and Faustmann results for black spruce (*Picea mariana*) and white pine (*Pinus strobus*) in Ontario. Climate change is adding new risks to silvicultural investments. Our intent is not to "resolve" the management problem but highlight some issues and differences between the two approaches. We suggest that climate change could, or should, cause a resurgence of the debate over pursuit of intertemporal efficiency in forest management.

Deforestation analysis in Selangor, Malaysia between 1989 and 2011

Aisyah, A.; Shahrul, A. B.; Zulfahmie, M. Z. M.; Mastura, S. A. S.; Mokhtar, J

Journal of Tropical Forest Science; 2015. 27(1):3-12.

This study was conducted to map forest cover and detect forest change in Selangor using two types of the best satellite imageries available, namely, Landsat 4 TM and SPOT 5 representing the years 1989 and 2011 respectively. Both imageries had been georeferenced and geometrically corrected using ERDAS Imagine version 9.1. Supervised classification was performed to distinguish three types of forest cover, namely, forest land, peat swamp and mangrove. The results showed that forest land and peat swamp decreased 2.5% (4317 ha) and 12.7% (12,313 ha) respectively while the mangrove area increased 0.68% (210 ha) in 2011 compared with 1989. Total area for these three types of forest decreased by only 5.47% during this period, i.e. from 300,271 ha in 1989 to 283,850 ha in 2011. Expansion of mangrove in Selangor could be related to conservation practices in order to protect the mangrove ecosystem and reducing coastal erosion. Decreasing forest land and peat swamp cover could be related to agriculture intensification, development of new townships and expansion of infrastructure in Selangor. These results could be used to further investigate the greenhouse gas contribution and carbon stock associated with deforestation in Selangor.

Economics of co-firing coal and biomass: An application to Western Canada

Johnston, C.M.T. & van Kooten, G.C.

Energy Economics Volume 48, March 2015, Pages 7-17.

Co-firing biomass and coal in retrofitted power plants is an efficient means to reduce carbon dioxide emissions in the energy sector. Under IPCC reporting rules, the impacts of energy produced from biomass would not be reported in the energy sector, thereby effectively lowering the emission intensity of a power plant. In this study, a carbon tax is compared to a feed-in tariff for incentivizing conversion of coal plants to co-fire with biomass. In the application, a model of the Alberta electrical grid with an intertie to British Columbia is linked to a fiber transportation model for these provinces. Results indicate that there is an upper threshold on a carbon tax after which retrofitting of coal plants is less efficient than increasing natural gas generating capacity. This is not the case with a feed-in tariff as it specifically targets biomass energy. Although the optimal generating mix achieved with a carbon tax leads to lower aggregate emissions than the mix achieved using a feed-in tariff, it will result in higher average generating costs. Results indicate that it is optimal for Alberta to retrofit approximately 500 MW of current coal capacity (8.6%) to co-fire with biomass, although Alberta wood pellet production acts as a constraint on further conversions.

Biomass for aviation fuel production in the Fitzroy Basin, Queensland: a preliminary assessment of native and plantation forest potential

Booth, T.H., Raison, R.J., Crawford, D.F., Jovanovic, T., O'Connor, M.H., Raisbeck-Brown, N., O'Connell, D.A., Hogg, B.W., Lee, D.J.

Australian Forestry, 2014. <http://dx.doi.org/10.1080/00049158.2013.869167>

This scoping study assesses the contribution that woody biomass could make to feedstock supply for an aviation biofuel industry in Queensland. The inland 600–900 mm rainfall zone, including the Fitzroy Basin region, is identified as an area that is particularly worthy of closer study as it has potential for supply of woody biomass from existing native regrowth (brigalow and other species) as well as from new plantings. New analyses carried out for this study of *Corymbia citriodora* subsp. *Variegata* trials suggest biomass plantings could produce harvestable yield of aboveground dry mass of about 85 t ha⁻¹ over a 10-year rotation at relatively low-rainfall (600–750 mm mean annual precipitation) sites and about 115 t ha⁻¹ at medium-rainfall (750–900 mm) sites. Estimates of productivity for native regrowth suggest potential productivity should be around 40 t ha⁻¹ during the initial decade after clearing when systems are managed for bioenergy rather than grazing. In this paper, potential production systems are described, and sustainability issues are briefly considered. It is concluded that more detailed studies focused particularly on biomass production would be worthwhile, and further research requirements are briefly discussed.

Native forests and climate change: Lessons from eucalypts

Booth, T.H., Broadhurst, L.M., Pinkard, E., Prober, S. M., Dillon, S.J., Bush, D., Pinyopusarerk, K., Doran, J.C., Ivkovich, M., Young, A.G

Forest Ecology and Management 347 (2015) 18–29

The purpose of this paper is to review studies relevant to potential climate change impacts on natural stands of eucalypts, with a view to identifying not only specific lessons for the management of native forests in Australia but also some general lessons relevant to native forests anywhere. More than 800 species of *Eucalyptus* are found naturally across Australia, as well as species such as *E. deglupta* and *E. urophylla* in countries north of Australia. Eucalypts provide a particularly interesting opportunity to examine the likely impacts of climate change, as many species have been widely evaluated in trials within and outside Australia, often under conditions that are warmer and sometimes drier than those found within their natural distributions. Results from these trials indicate the intrinsic ability of particular eucalypt species and provenances to tolerate conditions that are somewhat different from those experienced within their natural distributions. Eucalypts have particularly poor dispersal capabilities, so natural stands will be generally unable to track changing climatic conditions. Therefore, in the period to the end of the present century a key issue for each eucalypt species under climate change is whether its intrinsic adaptability will be sufficient to allow it to survive where it is currently located. Their ability to survive will be affected not only by climatic, but also atmospheric changes, which will affect important processes such as photosynthesis and water exchange. Again eucalypts provide a useful group for climate change studies as their commercial significance has led to various enhanced carbon dioxide experiments being carried out, as well as detailed genomic studies. This review considers eucalypts in relation to four main areas; (i) resources and characteristics (natural distributions and introduced distributions including their adaptability/ plasticity), (ii) analysis tools (species distribution models and growth models), (iii) physiological factors (including temperature, drought and enhanced CO₂) and (iv) interactions with other species (including pests and diseases). Priorities for future research are identified. It is concluded that analyses that do not allow for the intrinsic climatic adaptability of tree species, as well as their particular dispersal capabilities, are unlikely to provide reliable predictions of climate change impacts.

V. PUBLICATIONS, REPORTS AND OTHER MEDIA

Forest Solutions Group's Recommendations on Biomass Carbon Neutrality. Can wood & products derived from it be carbon neutral?

World Business Council for Sustainable Development

The WBCSD Forest Solutions Group (FSG) says 'yes' and explains why and how in its new Recommendations on Biomass Carbon Neutrality. With these recommendations, the FSG provides a framework for understanding carbon neutrality, distills and synthesizes the complexity of the debate and outlines its significance for effective climate change policy. The FSG defines carbon neutrality as a property of wood or other biomass harvested from forests where new growth completely offsets losses of carbon caused by harvesting. Wood produced from forests with stable carbon stocks can be used without causing long term accumulation of carbon in the atmosphere. This means that forests, wood and products derived from it can be carbon neutral. Using materials, products and fuels made from forest biomass instead of more fossil fuel-intensive alternatives is one key approach to mitigating increases in atmospheric CO₂. Moreover, demand for forest products helps keep land in forests and can increase carbon stocks. Demand for wood and products derived from it help preserve forests, expand forested area and ultimately promotes sustainable forest management. Why is this relevant to climate change? The concept of carbon neutrality is important in public policy efforts to address climate change and can affect the forest-based industry. Depending on how carbon neutrality is understood and applied, policies may favor or disfavor the management of forests, the use and development of forest products and biomass in traditional and emerging applications. To help understand the debate, the WBCSD Forest Solutions Group, explains the biomass carbon cycle, illustrates the benefits of using forest products and introduces the basics of carbon accounting. It recommends a framework of how biomass carbon neutrality should be understood and applied in public policy. These recommendations align with the Intergovernmental Panel on Climate Change, which noted that over the long term sustainable forest management strategies that maintain or increase forest carbon stocks, while sustaining yield of timber, fiber or energy will generate the largest sustained mitigation benefit. [The paper](#)

Economic valuation of ecosystem services fails to capture biodiversity value of tropical forests

CIFOR

The reconciliation of biodiversity conservation, ecosystem service provision and agricultural production in tropical landscapes requires recognition of the trade-offs between competing land-uses. It is especially relevant for conservation planning to assess whether the economic value of ecosystem services is spatially congruent with biodiversity. Previous analyses have largely focused on ecosystem service provision or assumed homogeneous economic values across land uses within biomes. We relax this assumption by carrying out a spatially explicit meta-analysis based on 30 studies of ecosystem service values in tropical forests from The Economics of Ecosystems and Biodiversity (TEEB) database, while controlling for economic, environmental and methodological variables. Our results demonstrate a lack of spatial congruence between the economic value of ecosystem services and biodiversity in tropical forests. Instead, we find that economic value presents a nonlinear inverted-U relationship with site accessibility and economic activity, highlighting the importance of matching supply and demand between each ecosystem service and its beneficiaries for economic values to be realized. The implications are that conservation policies focusing solely on the economic value of ecosystem services will fail to protect biodiversity in remote and less disturbed regions. [The publication](#)

Testing the influence of radio programs on climate change knowledge: A pilot experience from the Congo Basin

CIFOR

This working paper sheds light on the impact of radio programs on the climate change knowledge of local populations in the Congo Basin. We provide an assessment of the change in knowledge of a rural village in the Congo Basin after inhabitants listened to one of the radio programs that were prepared on climate change. The document also provides potential indicators for result up-scaling. After applying a micro-economic model to a case-control experiment, both before and after exposure to one radio program, the results show an increase in knowledge of 22.3% attributable to the radio program. In addition, a series of reactions were recorded from different end users, such as other media, ministries, NGO representatives and researchers, who reacted positively to the broadcasts. We recommend the use of radio programs to increase knowledge and induce behavioral changes with regard to climate change adaptation and mitigation. [The working paper](#)

Unasylva - Volume 66 2015-1/2

FAO

This double issue of Unasylva aims to tease out the complex interrelationship between forests, trees and

disasters, and to examine the ways in which forests and trees can best be managed both to resist shocks and to protect from shocks. The issue, published to coincide with the World Conference on Disaster Risk Reduction (Sendai, 14-18 March 2015), could not be more timely. As I write, peace talks are faltering in South Sudan, and a High Level Conference on Ebola, “From Emergency to Recovery”, has just been held in Brussels, involving the United Nations, the European Union, the Economic Community of West African States, and Presidents of affected countries. Trees and forests grow slowly, and often appear as relatively stable features of our lives and landscapes. In contrast, disasters and crises strike swiftly and unexpectedly. They may not only decimate forest areas when they hit, but also wreak long-lasting environmental damage. Not all of the crises covered in this issue are recent, but the impact of all of them continues to be felt today. Forests and trees, however, can act as natural buffers against disasters and shocks. They have a powerful role to play in protecting against disasters and in reducing their impact. Indeed, the long-term perspective implicit in sustainable forest management is also a valuable approach to planning for disaster risk reduction. The articles in this issue cover a range of disasters and crises. Most refer to natural disasters, although some deal with human-induced disasters and other complex crises, all of which are closely interlinked with forests and the environment. [The publication](#)

Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change

IPCC

The Intergovernmental Panel on Climate Change (IPCC) has released the complete version of the Synthesis Report (SYR) of the Fifth Assessment Report (AR5). Some of the SYR's main findings, which was released on 2 November 2014, are: human influence on the climate system is clear; more disruption to the climate leads to a greater risk of severe, pervasive and irreversible impacts; and limiting climate change is possible. [The report](#)

Participatory assessment and mapping of ecosystem services in a data-poor region: Case study of community-managed forests in central Nepal

CIFOR

Community-managed forests (CMF) provide vital ecosystem services (ES) for local communities. However, the status and trend of ES in CMF have not been assessed in many developing countries because of a lack of appropriate data, tools, appropriate policy or management framework. Using a case study of community-managed forested landscape in central Nepal, this paper aims to identify and map priority ES and assess the temporal change in the provision of ES between 1990 and 2013. Semi-structured interviews, focus group discussions, transect walks and participatory mapping were used to identify and assess priority ES. The results indicated that community forestry has resulted in the substantial restoration of forests on degraded lands over the period of 1990–2013. Local community members and experts consider that this restoration has resulted in a positive impact on various ES beneficial for local, regional, national and international users. Priority ES identified in the study included timber, firewood, freshwater, carbon sequestration, water regulation, soil protection, landscape beauty as well as biodiversity. There were strong variations in the valuation of different ES between local people and experts, between genders and between different status and income classes in the local communities. In general, whereas CMF provide considerable benefits at larger scales, local people have yet to perceive the real value of these different ES provided by their forest management efforts. The study demonstrated that participatory tools, combined with free-access satellite images and repeat photography are suitable approaches to engage local communities in discussions regarding ES and to map and prioritise ES values. [The publication](#)

Regional Synthesis of Payments for Environmental Services (PES) in the Greater Mekong Region

CIFOR

This report synthesizes the country studies on PES schemes in Cambodia, Laos, Thailand and Vietnam □ that were prepared for a regional review □ to compare the various schemes, to assess their current status, implementation processes and lessons learned, and to draw policy recommendations relevant to REDD+. A summary discussion of the definitions of PES is provided, given that the definitional issue is raised in the individual reports. That discussion is used to present a comprehensive framework of the key design features of PES, which is then used to outline the features of the PES schemes in the four country studies before presenting a comparison of their key features and issues. Then, the key lessons learnt from the country studies and this review, as well as the policy recommendations relevant to REDD+, are derived. The countries are almost on a continuum in terms of actors implementing PES schemes, from Vietnam with a national, government-implemented scheme, to Cambodia where the government seems to be uninterested in PES, and NGOs are therefore the only implementers. The environmental services (ES) for which the schemes have been developed are quite clearly defined, but less clear is the extent (i.e. amount) that is targeted. The potential beneficiaries of the schemes are relatively clear from the country reports, but less certain is whether

there are real, objective benefits for some of the identified beneficiaries. The provision of benefits to the ES providers is unlikely to occur, or simply be viable, unless resource use or property rights are attributed to them. A related concern is that the costs of providing the ES services have not been assessed by any of the schemes. The monitoring and compliance system, information system and contracting of ES providers have only been implemented (in part) in Vietnam's scheme. [The publication](#)

Equity in REDD+: Varying logics in Tanzania

CIFOR

Equity is frequently cited as one of the key design aspects of environmental governance regimes. In the context of Reduced Emissions from Deforestation and Forest Degradation (REDD+), a forest-based climate change mitigation instrument, the manner in which "equity" is understood will be of critical importance for the impacts and acceptance of REDD + policies and initiatives. Whereas the concept has been extensively studied in the academic literature, references to equity in REDD + policy debates and documents are often vague, leaving room for various interpretations and modes of implementation. In our case study of the Tanzanian national REDD + policy domain, we provide a conceptual framework based on an institutional logics approach for analysing the various underlying rationalities in the "equity in REDD+" debate. We apply it to demonstrate how the involved policy actors draw from heterogeneous equity logics in their support for and opposition to different governance models, highlighting the importance of precise contextualization and operationalization of broad international principles in national REDD + initiatives. [The publication](#)

Assessing current social vulnerability to climate change: A participatory methodology

CIFOR

This document is designed to help researchers, practitioners and all those interested in assessing the extent and scope of local people vulnerability to climate change, the responses they currently oppose and how efficient they are. Vulnerability has been studied through the lenses of different dimensions: system and exposure units, dynamic processes, multiple threats, differential exposure, and social capital and collective action. The purpose of this framework is to grasp the social (and ecological) dynamics in the system over the past decades, in order to identify future actions for reducing vulnerability and to enhance adaptive capacity. In addition, research approaches proposed in this document can serve as a platform for dialogue as such approaches give opportunities to communities to collectively discuss their common problems related to climate change and to initiate common responses necessary to building their social capital. This document is not a manual; it is a collection of lessons learned from a number of participatory research tools, used in a logical manner, tested and refined which helped researchers and practitioners from diverse backgrounds to explore the vulnerability of local populations to climate variability and change, while strengthening their capacity building. Many tools used were borrowed from participatory research appraisal (PRA), others were developed, tested and readjusted by CIFOR and SEI researchers with extensive experience in the development of research tools in social science and in the relationship of humans to nature and the environment. [The publication](#)

The role of women in early REDD+ implementation: lessons for future engagement

CIFOR

Researchers and practitioners have amply discussed the potential of REDD+ to help or harm forest-based communities, but less attention has been paid to its gender dimensions. Safeguard policies are aimed at ensuring that REDD+ does not harm women, but interventions that do not seek to address imbalances at the outset may be doomed to perpetuate them. Based on research by the Center for International Forestry Research in 77 villages in 20 REDD+ sites across six countries, this article finds that women "even where they use forests as much or more" have been less involved in REDD+ initiative design decisions and processes than men, a situation with potentially significant implications for implementation and future outcomes. This article uses the research findings to argue that "participation", while a central demand of indigenous and other local communities more generally, is only a partial solution to addressing women's strategic needs in ways that could strengthen their position in REDD+. Rather, gender-responsive analyses are needed to understand real and perceived gender differences and anticipate risks. [The publication](#)

Imaging tropical peatlands in Indonesia using ground penetrating radar (GPR) and electrical resistivity imaging (ERI): implications for carbon stock estimates and peat soil characterization

CIFOR

Current estimates of carbon (C) storage in peatland systems worldwide indicate tropical peatlands comprise about 15% of the global peat carbon pool. Such estimates are uncertain due to data gaps regarding organic peat soil thickness and C content. Indonesian peatlands are considered the largest pool of tropical peat carbon (C),

accounting for an estimated 65% of all tropical peat while being the largest source of carbon dioxide emissions from degrading peat worldwide, posing a major concern regarding long-term sources of greenhouse gases to the atmosphere. We combined a set of indirect geophysical methods (ground penetrating radar, GPR, and electrical resistivity imaging, ERI) with direct observations from core samples (including C analysis) to better understand peatland thickness in West Kalimantan (Indonesia) and determine how geophysical imaging may enhance traditional coring methods for estimating C storage in peatland systems. Peatland thicknesses estimated from GPR and ERI and confirmed by coring indicated variation by less than 3% even for small peat-mineral soil interface gradients (i.e. below 0.02°). The geophysical data also provide information on peat matrix attributes such as thickness of organomineral horizons between peat and underlying substrate, the presence of wood layers, buttressed trees and soil type. These attributes could further constrain quantification of C content and aid responsible peatland management in Indonesia. [The publication](#)

V.I JOBS

Team Leader/ GHG Inventory Expert

Österreichische Bundesforste AG (Austrian Federal Forests), Consulting - Deadline is 15th of April 2015

EU Project: Capacity building on MRV of GHG emissions and actions in Africa. The overall objective of the project is to build capacity in the field of general climate action with regard to MRV of emissions, the preparation of National Communications, of Biennial Update Reports, of Greenhouse Gas Inventories as well as the planning, development, implementation and MRV of mitigation actions in the context of Low-Emission Development Strategies (LEDS) in 2-3 African countries. The selection of these 2-3 countries follows an in-depth analysis of current strengths and shortcomings with regard to MRV of GHG emissions in the following 8 countries: Algeria, Angola, Egypt, Ethiopia, Ghana, Morocco, Nigeria and Senegal. [More](#)

VII. ANNOUNCEMENTS

Legal preparedness for REDD+

FAO

The aim of the group is to promote an exchange of experiences between those working on REDD+ and Sustainable Forest Management legal issues and those who would like to learn more about legal reforms in the context of REDD+, taking into consideration the latest developments under the United Nations Framework Convention on Climate Change (UNFCCC). The members of the community are those working on REDD+ legal issues and include legal experts, government representatives, decision-makers and representatives from forest dependent and indigenous communities. [More](#)

Greenhouse Gas Emissions from Agriculture, Forestry and Other Land Use in Latin America & the Caribbean

FAO

Food Security and Agriculture face major challenges under climate change, in terms of expected negative impacts on productivity as well as implementation of sectoral actions to limit global warming. Agriculture's greenhouse gas emissions continue to rise - although not as fast as emissions from other human activities. Better national data on emissions from farming, livestock-raising, fisheries and forestry can help countries identify opportunities for reducing emissions while addressing their food security, resilience and rural development goals - and gain access to global funding to pursue them. The new FAOSTAT emissions database represents the most comprehensive knowledge base on agricultural greenhouse gas emissions ever assembled. Updated annually, it provides a global point of reference on emissions and mitigation opportunities in the sector. Emissions are measured in CO₂ equivalent (CO₂ eq) - a metric used to compare different greenhouse gases. [More](#)

CLIM-FO INFORMATION

The objective of CLIM-FO-L is to compile and distribute recent information about climate change and forestry. CLIM-FO-L is issued monthly.

Past issues of CLIM-FO-L are available on the website of *FAO Forest and Climate Change*:

<http://www.fao.org/forestry/climatechange/en/>

For technical help or questions contact CLIM-FO-Owner@fao.org

The Newsletter is compiled by Marc Dumas-Johansen and Susan Braatz.

We appreciate any comments or feedback.

How to subscribe/unsubscribe

- To join the list, please send an e-mail to listserv@listserv.fao.org containing the message "Subscribe CLIM-FO-L followed by your name. Leave the subject line blank.
- To unsubscribe, please send an e-mail to listserv@listserv.fao.org, leaving the subject line blank and containing the following message: Unsubscribe CLIM-FO-L followed by your name

Your information is secure - we will never sell, give or distribute your address or subscription information to any third party.

How to contribute

We welcome subscribers' contributions of news, articles, publications and announcements of events. Once on the list, to make a contribution please contact the following address: CLIM-FO-Owner@fao.org

We thank everyone for their contribution.

Disclaimer

The author does not guarantee the accuracy or quality of the content of the compiled information.

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The mention or omission of specific companies, their products or brand names does not imply any endorsement or judgement by the Food and Agriculture Organization of the United Nations.