CLIM-FO Climate Change & Forestry

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CONTENTS

I. IN THE PRESS

20 August 2014 – IISD

UNEP, UN-REDD Support REDD+ University Programmes

The UN Environment Programme (UNEP), the UN Collaborative Programme on Reducing Emissions from Deforestation (UN-REDD) and the Yale School of Forestry and Environmental Studies released a guide to strengthen the integration of REDD+ into university curriculum. The publication is intended to build in-country capacity within UN-REDD partner countries in order to identify and address research gaps.

August 2014 – UN-REDD Programme

UN-REDD Programme August Newsletter

Read the latest newsletter from the UN-REDD Programme.

August 2014 – REDD-Monitor

REDD in the news

REDD-Monitor's weekly round up of the news on REDD, organised by date with short extracts.

August 2014 – Forest Climate Change

Synthesis findings from four years of global research on REDD+

The Center for International Forestry Research (CIFOR) has just released factsheets setting out the key research findings from Phase I of the Global Comparative Study on REDD+. CIFOR launched the study in 2009. In Phase I, the overall objective was to provide REDD policymakers and practitioner communities with the information, analysis and tools they need to ensure effective and cost-efficient reduction of carbon emissions with equitable impacts and co-benefits ("3E+") – including poverty reduction, enhancement of non-carbon ecosystem services, and protection of local livelihoods, rights and tenure.

August 2014 – UN-REDD Programme

South-South Knowledge Exchange on National REDD+ Funds Management: Accessing and disbursing results-based finance for REDD+

Experts from more than 11 nations convened in Lima on 5 July to discuss accessing and disbursing results-based finance for reducing emissions from deforestation and forest degradation (REDD+).

August 2014 – Forest Climate Change

Assessing REDD+ effectiveness outside forests: What role for monitoring systems?

In Brazil, it's cattle ranching. In Indonesia it's palm oil. In Mozambique it's cross border trade. Diverse are the activities that largely drive deforestation and forest degradation in some of the world's most forested countries. So too are the policy interventions that countries have started implementing in recent years to address these activities.

25 July 2014 – The Guardian

Community control of forests could help combat climate change

Governments are failing to take advantage of a potent opportunity to counter climate change by strengthening local land tenure rights and laws, data suggests. Analysis suggests that in areas formally overseen by local communities, deforestation rates are dozens to hundreds of times lower than in areas overseen by governments or private entities. About 10-20% of global greenhouse gas emissions are attributed to deforestation each year.

24 July 2014 - WRI

Community Forests: An Undervalued Approach to Climate Change Mitigation

Deforestation and other land changes produce about 11 percent of all greenhouse gas emissions globally. A new report reveals an undervalued and often-overlooked strategy for curbing these emissions—strengthening the rights of forest communities.

23 July 2014 – Thomson Reuter Foundation

Forests gain foothold in proposed new development goals

Forests got a boost this week after a U.N. advisory group proposed that global development targets should contain a provision for their protection, restoration and sustainable management. Forests got a boost this week after a U.N. advisory group proposed that global development targets should contain a provision for their protection, restoration and sustainable management. Goal 15 recommends that the global community should "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss".

II. MULTILATERAL PROCESSES IN CLIMATE CHANGE

Bonn Climate Change Conference, 20-25 October 2014, Bonn, Germany

The Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP) will hold the sixth part of its second session from 20-25 October 2014 in Bonn, Germany. Further information on the session will be made available in due course. **More**

III. EVENTS & MEETINGS

Future of Bioeconomy in Europe

11 September 2014, Bilbao, Spain

The European forest-based sector is going through the biggest structural changes in recent history. Many of these changes originate outside the sector itself, such as the need to transform societies towards more resource-efficient bioeconomy, the new economic role of Europe in globalized world, and impact of new technologies. In the seminar 'Future of Bioeconomy in Europe', the topic will be looked at from two perspectives: from outside and within the forest-based sector. The seminar organised in connection with the European Forest Institute's Annual Conference will bring together researchers and policy makers to Bilbao, the European Forest City 2014. Check out the latest. **More**

Climate Summit 2014. Catalyzing Action

23 September 2014, UN Headquarters, New York, United States of America

The UN Secretary General's Climate Summit will be held in New York on 23 September 2014. The Summit will serve as a public platform for leaders at the highest level to (1) catalyze ambitious action on the ground to reduce emissions and strengthen climate resilience and (2) mobilize political will for an ambitious global agreement under the United Nations Framework Convention on Climate Change (UNFCCC) by 2015. "Action Areas", or bold multi-partner initiatives, are expected to be launched at the Summit. These initiatives were presented and discussed at the Abu Dhabi Ascent meeting held on 4-5 May 2014 (see https://www.abudhabiascent2014.com/) Among the initiatives to be launched is a Forest Action Area. This action area has two main thrusts: reducing deforestation and increasing forest restoration. These can make a key contribution to achievement of the goal of limiting global warming to 2o C. The Action Area promotes effective land-use policies implemented by countries, strong financial incentives created to reward emission reductions from tropical forests, sourcing of commodities from deforestation-free areas, and partnerships to achieve the Bonn Challenge of restoring 150 million hectares of degraded forest landscapes by 2020. **More**

2nd International Conference on Evaluating Climate Change and Development

4-6 November, 2014, Washington D.C, United States of America

Scheduled for November 4-6, 2014 in Washington D.C., this 2nd International Conference will tackle the difficulties linked to the evaluation of climate change and development, described by many as a major 21st century evaluation challenge. Participants for the conference are expected to be drawn equally from the global South and North to take stock of existing tools and methods but also reflect on and share experiences on emerging approaches in order to improve the practice of climate change evaluation. Efforts will also be made towards identify new and innovative ways to create an enabling environment for the demand and use of climate change and development evaluation in order to improve policy making. **More**

2014 Global Landscapes Forum

6-7 December, 2014, Lima Peru

The second Global Landscapes Forum will be held in Lima on the weekend in the middle of the 20th Conference of the Parties (COP20) to the UNFCCC. With this timing and location, this major event can draw on the presence in the city of world leaders, development experts and leading thinkers to create an influential space to position landscapes at the center of the emerging climate and development agreements. Countries are forging a successor to the Kyoto Protocol under the United Nations Framework Convention on Climate Change (UNFCCC) and, in parallel, designing a set of Sustainable Development Goals to replace the Millennium Development Goals. Connecting these two processes and multifunctional landscapes is vital if we are to overcome the complex challenges common to everyone on the planet. The two-day event will take place at the

Westin Lima Hotel and Convention Center, a 20-minute drive from the COP20 venue and in the only venue in Lima outside the COP with the capacity to support an event of this size and diversity. **More**

IV. RESEARCH ARTICLES

How countries link REDD+ interventions to drivers in their readiness plans: implications for monitoring systems

Salvini, G., Herold, M., De Sy, V., Kissinger, G., Brockhaus, M., Skutsch, M.

Countries participating in the REDD+ scheme are in the readiness phase, designing policy interventions to address drivers of deforestation and forest degradation (DD). In order for REDD + interventions to be effective, it is essential that they take into account the specific drivers that they aim to address. Moreover it is crucial to design systems that monitor the effectiveness of the planned interventions. In this article we provide a comprehensive and comparative assessment of interventions proposed by 43 REDD+ countries in 98 readiness documents. We summarize the types of interventions and assess if they are formulated referring to the drivers of DD that they are aiming to address. Based on this assessment we consider the implications for systems for monitoring effectiveness of proposed interventions. Most countries reviewed link proposed interventions to specific drivers of DD. The majority of the countries making this link have better driver data quality, in particularly those that present their data in ratio or ordinal terms. Proposed interventions focus not only on activities to reduce deforestation, but also on other forest related REDD+ activities such as sustainable forest management, which reduce forest degradation and enhance forest stocks. Moreover, driver-specific interventions often relate to drivers not only inside but also outside the forest sector. Hence we suggest that monitoring systems need to assess not only deforestation rates through remote sensing, but also degradation and other carbon stock changes within the forest, using more detailed ground level surveys and measurements. In addition, the performance of interventions outside the forest need to be monitored, even if the impacts of these cannot be linked to specific changes in forest carbon stock in specific locations.

Changing land uses and greenhouse gas emissions: a case study of an ancient city in India

Shikha Sharma; Divya Pandey; Madhoolika Agrawal

The land-use change is a recognized contributor to the anthropogenic greenhouse gas (GHG) emissions. Rising population has forced conversion of natural land uses to agriculture and human settlements. Varanasi, an ancient city, is experiencing an urban sprawl, which is leading to expansion of city boundary. A large area under forests has already been converted into agriculture. Under increasing load of waste generation, some of these agricultural lands are getting converted into dumping sites. The present study is aimed at assessing the fluxes of CH_4 and CO_2 from different land uses in Varanasi city. Sites representing land uses under forest, agriculture and landfill were identified in and around Varanasi. Forest acted as the net sink for CO_2, whereas agriculture and landfill were the net sources. All three sites, however, acted as net source for CH_4. The emission rate was lowest in forest, which is the natural land-use type in the region. The land-use conversion also affected soil properties as reflected by the modification in physical properties and nutrient contents. The study clearly indicates significant GHGs emissions associated with the formation of man-made systems.

Contrasting effects of climate change along life stages of a dominant tree species: the importance of soil-climate interactions

Ibanez, B.; Ibanez, I.; Gomez-Aparicio, L.; Ruiz-Benito, P.; Garcia, L. V.; Maranon, T

Aim: For tree species, adult survival and seedling and sapling recruitment dynamics are the main processes that determine forest structure and composition. Thus, studying how these two life stages may be affected by climate change in the context of other abiotic and biotic variables is critical to understand future population trends. The aim of this study was to assess the sustainability of cork oak (*Quercus suber*) forests at the core of its distributional range under future climatic conditions. Location: Southern Spain. Methods: Using forest inventory data collected at two periods 10 years apart, we performed a comprehensive analysis to evaluate the role of different abiotic and biotic factors on adult survival and recruitment patterns. Results: We found that both life stages were influenced by climatic conditions, but in different ways. Adult tree survival was negatively impacted by warmer spring temperatures, while recruitment was positively affected by warmer

winter temperatures. Our results also revealed the importance of soil texture as a modulator of winter precipitation effects on adult survival. With higher winter precipitation, adult survival increased in sandy soils and decreased in clayish soils. Therefore, under predicted future climate scenarios of wetter winters and warmer temperatures, the presence of cork oaks is more likely to occur in sandy soils vs. clayish soils. Biotic conditions also affected these life stages. We found a negative effect of heterospecific but not conspecific trees on both adult survival and seedling recruitment. Main conclusions: Overall, the sustainability of the studied forests will be highly dependent not only on future climatic trends, but also on their interaction with other key factors - soil properties in particular - that modulate the effects of climate on demographic rates.

Xylem formation can be modeled statistically as a function of primary growth and cambium activity

Huang JianGuo; Deslauriers, A.; Rossi, S.
New Phytologist; 2014. 203(3):831-841

Primary (budburst, foliage and shoot) growth and secondary (cambium and xylem) growth of plants play a vital role in sequestering atmospheric carbon. However, their potential relationships have never been mathematically quantified and the underlying physiological mechanisms are unclear. We monitored primary and secondary growth in *Picea mariana* and *Abies balsamea* on a weekly basis from 2010 to 2013 at four sites over an altitudinal gradient (25-900 m) in the eastern Canadian boreal forest. We determined the timings of onset and termination through the fitted functions and their first derivative. We quantified the potential relationships between primary growth and secondary growth using the mixed-effects model. We found that xylem formation of boreal conifers can be modeled as a function of cambium activity, bud phenology, and shoot and needle growth, as well as species- and site-specific factors. Our model reveals that there may be an optimal mechanism to simultaneously allocate the photosynthetic products and stored nonstructural carbon to growth of different organs at different times in the growing season. This mathematical link can bridge phenological modeling, forest ecosystem productivity and carbon cycle modeling, which will certainly contribute to an improved prediction of ecosystem productivity and carbon equilibrium.

Effects of different sampling scales and selection criteria on modelling net primary productivity of Indonesian tropical forests

Gmur, S. J.; Vogt, D. J.; Vogt, K. A.; Suntana, A. S.;
Environmental Conservation; 2014. 41(2):187-197

The availability of spatial data sourced from either field-derived or satellite-based systems has created new opportunities to estimate and/or monitor changes in carbon sequestration rates, climate change impacts or the potential habitat alterations occurring across large landscapes. However, an effort to create models is not standardized, in part, due to different needs and data sources available for the models. For example, data may have different spatial resolutions with varying degrees of complexity in regards to inputs and statistical methods. This study determines effects of 20, 15, 10, five and one km sampling resolutions on detection of changes in net primary productivity (NPP), occupancy selection criteria for areas to be included in the sample and identification of significant variables impacting NPP in Indonesia forests. Production forest designated for selective harvest was used to define the sampling areas. Variances explained by predictive models were similar across cell sizes although relative importance of variables was different. Partial dependence plots were used to search for potential thresholds or tipping points of NPP change as affected by an independent variable such as minimum daytime temperature. Applying different cell occupancy selection rules significantly changed the overall distribution of NPP values. The magnitude of those changes within a cell size varied with changes in cell size. The mean estimated NPP for production forests across Indonesia differed significantly at every sampling resolution and occupancy selection criteria. Lows ranged from 1.107 to 1.121 kg C m^{-2} yr^{-1} for the 1-km cell size for the three occupancy selection criteria with highs ranging from 1.245 to 1.189 kg C m^{-2} yr^{-1} for the 20-km cell size. The difference in NPP values between these two cell sizes for the three occupancy selection criteria extrapolates to a range in annual biomass of 132×10^6 to 66×10^6 t for the total area of production forests in Indonesia.

Modelling future changes of habitat and fauna in the Tonle Sap wetland of the Mekong

Arias, M. E.; Cochrane, T. A.; Elliott, V
Environmental Conservation; 2014. 41(2):165-175

The Tonle Sap is the largest wetland in South-east Asia and the heart of the largest inland fishery in the world. Its unique flood pulse system and annual flow reversal is a hotspot for biodiversity and productivity, as well as an essential habitat for many endangered fishes and birds. Despite predicted changes to the wetland's hydrology due to climate change and hydropower development in the Mekong, the consequent impacts on the fauna of the lake are poorly understood. A spatial modelling framework was developed to simulate the impact of potential scenarios of change using relationships between fauna and biophysical characteristics. Potential

impacts on 61 animal species with documented nutritional, conservation or ecological value were examined. A large number of species rely on gallery forest to provide important habitats for their life history, yet this area is likely to be highly impacted by permanent inundation. There is a strong synchronicity between life histories and the flood pulse; consequently continued hydrological disruptions will have a significant impact on ecosystem dynamics, imposing further challenges to conservation. Protecting areas that may become suitable for gallery forests and shrublands under a modified flood regime will be crucial to management planning and the maintenance of a diverse and healthy ecosystem.

Using spatial simulations of habitat modification for adaptive management of protected areas: Mediterranean grassland modification by woody plant encroachment

Mairota, P.; Leronni, V.; Xi WeiMin; Mladenoff, D. J.; Nagendra, H.;
Environmental Conservation; 2014. 41(2):144-156

Spatial simulation may be used to model the potential effects of current biodiversity approaches on future habitat modification under differing climate change scenarios. To illustrate the approach, spatial simulation models, including landscape-level forest dynamics, were developed for a semi-natural grassland of conservation concern in a southern Italian protected area, which was exposed to woody vegetation encroachment. A forest landscape dynamics simulator (LANDIS-II) under conditions of climate change, current fire and alternative management regimes was used to develop scenario maps. Landscape pattern metrics provided data on fragmentation and habitat quality degradation, and quantified the spatial spread of different tree species within grassland habitats. The models indicated that approximately one-third of the grassland area would be impacted by loss, fragmentation and degradation in the next 150 years. Differing forest management regimes appear to influence the type of encroaching species and the density of encroaching vegetation. Habitat modifications are likely to affect species distribution and interactions, as well as local ecosystem functioning, leading to changes in estimated conservation value. A site-scale conservation strategy based on feasible integrated fire and forest management options is proposed, considering the debate on the effectiveness of protected areas for the conservation of ecosystem services in a changing climate. This needs to be tested through further modelling and scenario analysis, which would benefit from the enhancement of current modelling capabilities of LANDIS-II and from combination with remote sensing technologies, to provide early signals of environmental shifts both within and outside protected areas.

Carbon stock distribution pattern in the Solan Forest Division (H.P.) – a case study

Sharma, D. P.
Indian Forester; 2014. 140(6):592-597

The present investigation was carried out to determine plant and soil carbon in six land-uses viz., chir pine, ban oak, deodar, other broadleaves, culturable and un-culturable distributed along altitudinal gradient from 900 to 2100 m in Solan Forest Division, Himachal Pradesh during 2006-2007. Among land uses, the un-culturable land accounted for 40.08%, chirpine 25.97%, ban oak 17.23%, other broadleaves 14.78%, culturable land 1.21% and deodar 0.70% of total carbon stock (1.66 M t). However, on per hectare basis maximum total carbon stock (274.35 t ha^{-1}) was in other broadleaves land use which was 21.12, 9.29, 1.63, 1.51 and 1.42 times higher than un-culturable, culturable, chirpine, deodar and ban oak land use, respectively. The forest area at elevation between 1200-1500 m accounted for highest per cent carbon i.e., 36.78% however, on per hectare basis, it was found to increase with increase in elevation. Dharampur forest range accounted 30.45%, Parwanoo 26.41%, Solan 22.47%, Kandaghat 11.79% and Subathu 8.84% carbon to the total carbon stock (1.66 M t). In order to exploit the carbon sequestration potential of the region, plantations of forest species should be extended to their corresponding altitudinal limit in the land area available and suitable for planting.

Soil organic carbon status of Indian forests

Velmurugan, A.; Suresh Kumar; Dadhwal, V. K.; Gupta, M. K
Indian Forester; 2014. 140(5):468-477.

Soil organic carbon (SOC) is a major component of global carbon sinks and forests being one of the most important ecosystems for storing SOC. A database of SOC estimates along with other attribute information for different forest types of India were compiled from various literature sources and normalized for 1990 using modeling approach. Different thematic maps in digital format were prepared and harmonized using standard geospatial reference. The database was linked to thematic maps and used to estimate SOC densities and stock for three depth classes (0-25, 0-50 and 0-100 cm) in geographical information system. The mean soil organic carbon density estimates for top 30 cm ranged from 22.42 t/ha in sub-tropical dry evergreen forest to 100.33 t/ha in Himalayan moist temperate forest and similar trend was observed for top 0-50 and 0-100 cm as well. Soil organic carbon stock estimates for top 30 cm ranged from 1.89 Tg C in Himalayan dry temperate to 1406.68 Tg C in tropical moist deciduous forest and comparable trend was observed for top 0-50 and 0-100 cm. The total soil organic C pools in Indian forests have been estimated as 3.72, 5.25 and 7.66 Pg C in top 0-25, 0-

50 and 0-100 cm soil depth respectively (1 Pg=1000 Tg). The present database may form inputs in models to study carbon flux and help in prioritizing areas for carbon sequestration in Indian forests.

Drought impact on forest trees in four nature protected areas in Serbia

Horak, R.; Borisev, M.; Pilipovic, A.; Orlovic, S.; Pajevic, S.; Nikolic, N
Sumarski List; 2014. 138(5/6):301-308.

Important predictions of climate change propose a correlated increase in frequency of extreme temperature and precipitation patterns. Period of extremely low precipitation occurred during the vegetation season of 2011 at four mountain forest localities of the Balkan region. Influence of this extreme event was correlated with photosynthetic and transpiration intensity, and content of photosynthetic pigments in forest populations of beech (*Fagus sylvatica* L.), spruce (*Picea abies* (L.) Karsten) and fir (*Abies alba* Mill) on four sites, with specific locality properties. Significant reductions in CO_2 assimilation along with decrease in water use efficiency, were determined by water deficit. It seems that drought occurrence will influence forests in site specific manner, having the most negative impact on forest populations located in the altitude proximity of mountain reefs and peaks. This process leads to decrease in tree mass and reduced forest cover on such sites. Such environmental conditions will lessen possible acclimation of trees to elevated atmospheric CO^2 concentration and upward migration to higher altitudes determined by global temperature increase.

Can the Matang Mangrove Forest Reserve provide perfect teething ground for a blue carbon based REDD+ pilot project?

Ammar, A. A.; Dargusch, P.; Shamsudin, I
Journal of Tropical Forest Science; 2014

Mangroves provide a variety of ecosystem services and are among the most carbon-rich forest types on earth. While much attention has been given in policies and scientific literature to the opportunities mangrove blue carbon can potentially provide for climate change mitigation, sustainable development and ecological conservation, little attention has been paid to identifying a location that can serve as a conducive site for the development of a climate change mechanism. This paper proposes to address this gap by analysing the advantages of integrating a blue carbon based REDD+ pilot project at the Matang Mangrove Forest Reserve. The Matang Mangrove Forest Reserve is an interesting case study because it is a large contiguous mangrove forest area (40,466 ha) that has been primarily managed for the production of charcoal for more than a century and has been well managed to achieve favourable outcomes for local communities and ecological health. It is also one of the most studied mangrove forests in the world. However, of late, there have been clear evidences of drastic deterioration in the provision of several of its ecosystem services. REDD+ could offer the Matang Mangrove Forest Reserve an alternative management tool to formulate an enhanced sustainable forest management plan. On the other hand, the unique characteristics and structure of the mangrove forest reserve could serve as a conducive pilot project site for the development of the climate change mechanism into a reliable and effective climate combating tool. The proposed blue carbon based REDD+ pilot project could potentially be a crucial building block in the development and implementation of Malaysia's National REDD+ Strategy.

Carbon partitioning in subtropical *Pinus roxburghii* forest, Solan, India

Shah, S.; Sharma, D. P.; Tripathi, P.; Pala, N. A
Journal of Tropical Forest Science; 2014

This study was carried out in subtropical chir pine forests covering 33 compartments in two forest ranges of Solan district of Himachal Pradesh, India. Non-destructive method for biomass estimation was adopted for trees whereas harvest method was used to determine the biomass of understorey vegetation, i.e. herbs and shrubs. The total ecosystem carbon density was 247.87 t ha^{-1}. Carbon partitioning in different components of the chir pine forest ecosystem were ranked in the order of soil layer (190.89 t ha^{-1}) > vegetation layer (51.13 t ha^{-1}) > detritus (5.85 t ha^{-1}). More carbon was recorded in soil than vegetation with a soil: vegetation ratio of 4.4. Less carbon stock in vegetation and detritus may be attributed to the fact that in the Indian Himalayan region, the dependency of communities on forests is causing their over exploitation and degradation. This emphasises the need for the conservation of these forests as a potential contender for carbon credit claims under ongoing international conventions and protocols.

Operationalizing the definition of forest degradation for REDD+, with application to Mexico

Morales-Barquero, L.; Skutsch, M.; Jardel-Pelaez, E. J.; Ghilardi, A.; Kleinn, C.; Healey, J. R.;
Forests; 2014. 5(7):1653-1681

The difficulty of defining and quantifying forest degradation is a major constraint in the implementation of the international mitigation mechanism Reduced Emissions from Deforestation and Forest Degradation (REDD+).

Our aim is to develop an operational framework for defining and quantifying forest degradation at a local level for early REDD+ projects and for national REDD+ programmes, through a ground level approach. We critically review and discuss national and international definitions of forest and of forest degradation, and then analyze the main difficulties in making these operational, evaluating the key elements and threshold values that are used, and contextualizing them using Mexico as a case study. We conclude that, given the lack of historical biomass data and the limited capability for monitoring degradation using remote sensing, forest degradation is best measured against a local benchmark that represents areas of low or no degradation that have comparable biophysical characteristics. Use of benchmarks of this type could offer a quick-start option for local assessment and construction of reference levels for forest degradation. These could be refined as more data become available and could eventually be integrated into national monitoring systems.

Large-scale mapping of carbon stocks in riparian forests with self-organizing maps and the k-nearest-neighbor algorithm

Suchenwirth, L.; Stumer, W.; Schmidt, T.; Forster, M.; Kleinschmit, B

Among the machine learning tools being used in recent years for environmental applications such as forestry, self-organizing maps (SOM) and the k-nearest neighbor (kNN) algorithm have been used successfully. We applied both methods for the mapping of organic carbon (Corg) in riparian forests due to their considerably high carbon storage capacity. Despite the importance of floodplains for carbon sequestration, a sufficient scientific foundation for creating large-scale maps showing the spatial Corg distribution is still missing. We estimated organic carbon in a test site in the Danube Floodplain based on RapidEye remote sensing data and additional geodata. Accordingly, carbon distribution maps of vegetation, soil, and total Corg stocks were derived. Results were compared and statistically evaluated with terrestrial survey data for outcomes with pure remote sensing data and for the combination with additional geodata using bias and the Root Mean Square Error (RMSE). Results show that SOM and kNN approaches enable us to reproduce spatial patterns of riparian forest Corg stocks. While vegetation Corg has very high RMSEs, outcomes for soil and total Corg stocks are less biased with a lower RMSE, especially when remote sensing and additional geodata are conjointly applied. SOMs show similar percentages of RMSE to kNN estimations.

Options for a national framework for benefit distribution and their relation to community-based and national REDD+ monitoring

Skutsch, M.; Turnhout, E.; Vijge, M. J.; Herold, M.; Wits, T.; Besten, J. W. den; Balderas Torres, A

Monitoring is a central element in the implementation of national REDD+ and may be essential in providing the data needed to support benefit distribution. We discuss the options for benefit sharing systems in terms of technical feasibility and political acceptability in respect of equity considerations, and the kind of data that would be needed for the different options. We contrast output-based distribution systems, in which rewards are distributed according to performance measured in terms of carbon impacts, with input-based systems in which performance is measured in term of compliance with prescribed REDD+ activities. Output-based systems, which would require regular community carbon inventories to produce Tier 3 data locally, face various challenges particularly for the case of assessing avoided deforestation, and they may not be perceived as equitable. Input-based systems would require data on activities undertaken rather than change in stocks; this information could come from community-acquired data. We also consider how community monitored data could support national forest monitoring systems and the further development of national REDD+.

Aleppo pine vulnerability to climate stress is independent of site productivity of forest stands in southeastern Spain

Rio, M. del; Rodriguez-Alonso, J.; Bravo-Oviedo, A.; Ruiz-Peinado, R.; Canellas, I.; Gutierrez, E

Forest management adaptation to climate change requires identifying the previously most vulnerable stands and the possible climate impacts on forests. This study evaluates whether site index, as an indicator of forest productivity, is related to climate-growth responses and assesses the way in which local site factors modulate climate-tree growth relationships. Tree-ring width series and soil characteristics were obtained from six *Pinus halepensis* stands with different site indices and similar climate. Dendrochronological methods were used to compare tree climate-growth responses among sites and to study temporal trends in inter-annual growth variability and climate-growth relationships (before and after 1970). The influence of topographic and soil features on tree growth was assessed by means of partial least squares. Stands with low site indices tended to present higher mean sensitivities and greater percentages of missing rings, this relation being modulated mainly by clay percentage and nutrient status in soil. Climate is the major Aleppo pine radial growth driver in the study area with similar growth-climate relationship among sites. Radial growth was mainly influenced by

spring temperature and precipitation and previous autumn-winter precipitation. This relationship was stronger after 1970 than before this year, showing also a 2-month advancement of the most influential climate variables after 1970, from May to March. These results and the increasing temporal trend found in mean sensitivity after 1970 highlight the vulnerability of these stands to climate change. Site index was not found to be directly related to stand vulnerability, although local site factors modulate in part the tree-growth response.

Start of the dry season as a main determinant of inter-annual Mediterranean forest production variations

Maselli, F.; Cherubini, P.; Chiesi, M.; Gilabert, M. A.; Lombardi, F.; Moreno, A.; Teobaldelli, M.; Tognetti, R
Agricultural and Forest Meteorology; 2014. 194:197-206

Recent investigations have highlighted the dependence of Mediterranean forest production on spring rainfall. The current work introduces the concept of the start of the dry season (SDS) and performs a three-step analysis to determine the effect of SDS on Mediterranean forest production. Seven forest zones of Tuscany (Central Italy), which present differently pronounced Mediterranean features, are considered. First, a statistical analysis investigates the influence of spring water budget on forest Normalized Difference Vegetation Index (NDVI) inter-annual variations during July-August. The analysis is then extended to assess the impact of inter-annual SDS variability on forest gross primary production (GPP) simulated by a NDVI driven parametric model, modified C-Fix. These simulations lead to rank the considered forest types according to the relevance of SDS in regulating inter-annual GPP variations. The application of similar statistical analyses to detrended tree ring-width time series of typical Tuscany forests confirms the existence of an eco-climatic gradient in the functional relevance of SDS. The influence of SDS on tree growth is attenuated moving from Mediterranean arid to temperate humid environments. These findings are examined and interpreted from an eco-physiological viewpoint taking into consideration the peculiarity of Mediterranean forest ecosystems. Next, relevant implications are discussed in view of the possible consequences of ongoing climate change.

The effects of elevated atmospheric humidity on soil respiration components in a young silver birch forest

Kukumagi, M.; Ostonen, I.; Kupper, P.; Truu, M.; Tulva, I.; Varik, M.; Aosaar, J.; Sober, J.; Lohmus, K
Agricultural and Forest Meteorology; 2014. 194:167-174

The predicted increase in precipitation at northern latitudes is an important factor affecting the functioning of forest ecosystems, yet the influence of increased atmospheric humidity on the forest ecosystem carbon cycle is still largely unknown. Our objectives were to determine the effect of elevated atmospheric humidity on soil respiration in silver birch (*Betula pendula* Roth.) plantations in a Free Air Humidity Manipulation experimental facility (FAHM). Soil respiration was monitored monthly from May to October, in 2008 and 2009 in three control and in three misting plots; soil temperature and soil moisture were measured simultaneously. Fine-root and rhizome biomass of the understory was measured by sequential soil cores. Soil microbial biomass and basal respiration were measured using manometric respirometers. After the first two years of manipulation, humidification led to lower soil respiration. Soil temperature was the main factor influencing seasonal dynamics of soil respiration, describing up to 75% of the total variation of soil respiration. Soil moisture had a weak negative effect on soil respiration. Humidification caused a remarkable increase in below-ground biomass and the production of the understory, and a 28% increase in the basal respiration of microbes. However, above-ground biomass and root turnover rate of the understory were almost unchanged. Hence, elevated atmospheric humidity significantly affects carbon cycle of deciduous forest. However, further studies are necessary for a better understanding of soil respiration response to changes in atmospheric humidity, in order to predict carbon balance in changing climate conditions.

Evidence for environmentally enhanced forest growth

Fang JingYun; Kato, T.; Guo ZhaoDi; Yang YuanHe; Hu HuiFeng; Shen HaiHua; Zhao Xia; Kishimoto-Mo, A. W.; Tang YanHong; Houghton, R. A
Proceedings of the National Academy of Sciences of the United States of America; 2014. 111(26):9527-9532

Forests in the middle and high latitudes of the northern hemisphere function as a significant sink for atmospheric carbon dioxide (CO_2). This carbon (C) sink has been attributed to two processes: age-related growth after land use change and growth enhancement due to environmental changes, such as elevated CO_2, nitrogen deposition, and climate change. However, attribution between these two processes is largely controversial. Here, using a unique time series of an age-class dataset from six national forest inventories in Japan and a new approach developed in this study (i.e., examining changes in biomass density at each age class over the inventory periods), we quantify the growth enhancement due to environmental changes and its contribution to biomass C sink in Japan's forests. We show that the growth enhancement for four major plantations was 4.0-7.7 Mg C.ha^{-1} from 1980 to 2005, being 8.4-21.6% of biomass C sequestration per hectare

and 4.1-35.5% of the country's total net biomass increase of each forest type. The growth enhancement differs among forest types, age classes, and regions. Our results provide, to our knowledge, the first ground-based evidence that global environmental changes can increase C sequestration in forests on a broad geographic scale and imply that both the traits and age of trees regulate the responses of forest growth to environmental changes. These findings should be incorporated into the prediction of forest C cycling under a changing climate.

Forest cover dynamics analysis and prediction modeling using logistic regression model

Rakesh Kumar; Nandy, S.; Reshu Agarwal; Kushwaha, S. P. S
Ecological Indicators; 2014. 45:444-455

Forest cover conversion and depletion are of global concern due to their role in global warming. The present study attempted to study the forest cover dynamics and prediction modeling in Bhanupratappur Forest Division of Kanker district in Chhattisgarh province of India. The study aims to examine and analyze the various explanatory variables associated with forest conversion process and predict forest cover change using logistic regression model (LRM). The forest cover for the periods 1990 and 2000, derived from Landsat TM satellite imagery, was used to predict the forest cover for 2010. The predictive performance of the model was assessed by comparing the model-predicted forest cover with the actual forest cover for 2010. To explain the effects of anthropogenic pressure on forest, this study considered three distance variables viz., distance from forest edge, roads and settlements, and slope position classes as explanatory variables of forest change. The highest regression coefficient (beta =-26.892) was noticed in case of distance from forest edge, which signifies the higher probability of forest change in areas that are closer to the forest edges. The analysis showed that forest cover has undergone continuous change between 1990 and 2010, leading to the loss of 107.2 km^2 of forest area. The LRM successfully predicted the forest cover for the period 2010 with reasonably high accuracy (ROC=87%).

V. PUBLICATIONS, REPORTS AND OTHER MEDIA

REDD+ Finance in the European Union. Options for scaling-up near term support

Climate Focus

The European Union (EU) is a strong supporter of international action on REDD+, but lacks a coherent strategy on how to mobilize the resources required to reduce emissions from forests at the requisite scale. This paper, prepared in collaboration with The Nature Conservancy and with the support of the Norwegian Agency for Development Cooperation, presents options on how to mobilize REDD+ finance in the EU in the short to medium term. The paper identifies a broad range of potential options for scaling-up finance - encompassing both public and private finance flows as well as both market and non-market options - before presenting a more in-depth assessment of two options considered most promising by EU stakeholders consulted as part of the project. **The publication**

Securing rights, combating climate change. How strengthening community forest rights mitigates climate change

WRI

This publication analyzes the growing body of evidence linking community forest rights with healthier forests and lower carbon dioxide emissions from deforestation and forest degradation. It presents a compelling case for expanding and strengthening community forest rights based on evidence drawn from comparative studies, advanced quantitative research, case studies, and original deforestation and carbon analyses by the World Resources Institute. The findings center on examples from 14 forest-rich countries in Latin America, Africa, and Asia. Together, these countries contain about 323 million hectares of government-recognized community forest—68 percent of the estimated total in all low- and middle-income countries—as well as large areas of community forests without legal or official recognition. Our analysis focuses on the links between legal community forest rights (or lack thereof), the extent of government protection of those rights, and forest outcomes. **The publication**

Forests in a Changing Climate: A Sourcebook for Integrating REDD+ into Academic Programmes

UNEP

Forests have long been regarded as critical ecosystems for their importance in terms of biodiversity and benefits for local communities. Recently a focus on forests and their role in mitigating climate change has led to the development of the REDD+ mechanism: 'reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks'. A rational development paradigm seeks to build and maintain natural capital, and aims to transition to the sustainable management of forests. REDD+ can identify strategic options for improved land-use and better forest management, and transform the current development paradigm, drawing on science based evidence and technical advice. Consequently there is a demonstrated need for increased knowledge and expertise on all aspects of REDD+ including sustainable land management in forests and forest-related ecosystems. 'Forests in a Changing Climate: Sourcebook for REDD+' is designed to give an overview of the key topics related to forests and climate change, under the overarching and evolving REDD+ narrative. The purpose is to facilitate the integration of this new knowledge domain into multi-disciplinary University programmes. The sourcebook provides case studies and detailed references in each module, and can be used comprehensively or selectively in the design and delivery of academic programmes related to REDD+. **The publication**

Sustainable Development Goals: a forest module for a transformative agenda

IIED

Forests (and landscapes with trees) are such an important part of a number of different Sustainable Development Goals that we recommend working towards a transformative 'forest module'. The module improves on the more limited current focus on sustainable forest management, deforestation and reforestation targets. It makes explicit the diversity of targets needing inclusion and resolution in order to create an nabling environment that would yield much greater sustainable development outcomes for forests, landscapes and livelihoods. With the negotiation phase nearing, our assessment of the UN Open Working Group's zero draft finds a strong set of goals and targets, yet with several potentially serious trade-offs and missing issues. Application of our modular approach can help negotiators seek coherent outcomes across the goal framework and enable integrated implementation at the national level. **The publication**

Vietnam. Mapping REDD+ Finance Flows 2009-2012

Forest Trends

Forest cover in Vietnam is estimated at 13.8 million hectares—a number which has increased significantly since the 1990s, due to a recent surge in reforestation efforts leading to increases in plantation forest. Despite this, extensive deforestation and degradation remain, particularly along the Central Highlands and Central Coast, and within the south of the country. Therefore, the government of Vietnam is currently working to lower regional deforestation rates through a number of multilateral agreements and national policies that support REDD+ activities. Forest Trends' Vietnamese consultants, in close coordination with the Vietnam REDD+ Office (VRO) and the Vietnam Administration of Forestry (VNFOREST), tracked $US72.4 million in REDD+ commitments, of which US$14.9 million have been disbursed. This report discusses these commitments and other findings. **The publication**

V.I JOBS

Consultant for National Forest Monitoring System and REDD+ Reference Levels

FAO – deadline for application is 7th of September 2014

FAO is looking for a consultant to provide support for the implementation of the Bangladesh UN-REDD National Programme. **More**

VII. ANNOUNCEMENTS

No announcements this month.

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.

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