18th Commonwealth Forestry Conference

Book of Abstracts

18th Commonwealth Forestry Conference, Edinburgh

Restoring the Commonwealth's Forests: Tackling Climate Change

Edinburgh International Conference Centre, Scotland. 28 June - 2 July 2010

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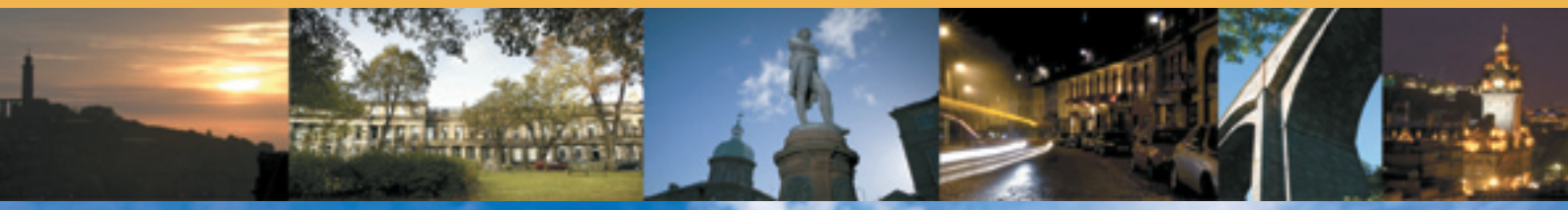

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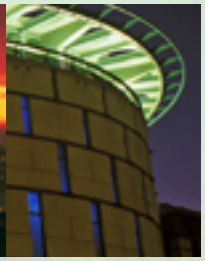

Contents

Invited Speaker Abstracts

The abstracts in this section were submitted by those invited speakers who opted to prepare one. This was not a requirement. Full papers and/or presentations will be included in the Conference proceedings.

Abstracts all appear in the form in which they were submitted. Any opinions expressed are those of the authors and are not necessarily endorsed by the organisers.

Tuesday 29 June

Session 4 - Learning From Each Other

CANADA

Jim Farrell, *Assistant Deputy Minister, Canadian Forest Service, Natural Resources Canada, Government of Canada, Canada*

Canada's forests have always been shaped by natural disturbances including forest fires and pests but there is increasing evidence of the effects of climate change. Scientists predict increased temperatures across Canada's forest regions, the northern movement of prairie-like climates, increased forest fires, the wider distribution of forest pests, and changes in the range of forest species. Over 20 management options have been identified to help forest policy makers and practitioners adapt to climate change and further work is planned. The need to incorporate climate change considerations into sustainable forest management will require significant changes to the role of forest managers and to the forestry institutions which train and support them.

RWANDA

Frank Rutabingwa, *Director General, National Forestry Authority, Rwanda*

Rwanda is a land locked country in the East African Region between latitude $1^0$04í and $2^0$51í south and longitudes $28^0$45í and $31^0$15í east. It surface area is 26.338km^2. Rwanda relief is hilly and mountainous with an average altitude of 1700metres, the highest point is Mt. Karisimbi 4507 metres above sea level. The average temperature is 18.5^0c and average rainfall is about 1,250mm per annum. The population is estimated at 10.1million people with average density of 387person/km^2 which exerts enormous pressure on the natural resources especially, forests.

The country is divided into two river basins, the Nile and Congo ñ it also forms part of the Albertine Rift in the western arm of the African Rift Valley. Forests in Rwanda, can be classified as humid afro-montaine, savanna woodlands and plantation forests. Natural and manmade forests cover a total area of 330,576ha of which 215,739ha is natural forests and 114,837ha plantations. Trees on farm and small woodlots cover another 222,520ha; altogether become 553,098ha of tree cover which amounts to 21% of the total country area. Due to the high population density, continued dependency on agriculture and wood fuel, the forest sector faces serious challenges of governance which has reduced the forest area significantly. The degradation of forests was made worse by the war and genocide that left a million people dead and many more displaced which in the process destroyed large areas of forests.

Aware that forests are a key component of life support system in view of both products and services they provide, the new government of National Unity made environment rehabilitation conservation a major priority and; instituted a comprehensive national tree planting programme to rehabilitate and increase forest cover. In addition, all remaining natural forests were protected either, as gazette national parks or forest reserves and today extractive human activities in the natural forests are totally prohibited.

Extractive activities are only allowed in plantations forests and woodlots. The predominant among them is eucalyptus spp which accounts for about 80%.

Despite being small and population pressure, Rwanda is endowed with rich and diverse ecosystems which make the forest sector a great contributor to the economic development of the country namely:- through varied wood products and tourism. Rwanda is home to the famous mountain gorillas and this has made tourism a major foreign exchange earner and net contributor to the national economy after tea.

Overall, the governance and management of the forest resources is enshrined in the Vision2020 and EDPRS(the Economic Development and Poverty Reduction Strategy. The vision recognizes the imbalance between the populace and available natural resources and calls for increasing the country forest cover to 30% by 2020. It sets targets of reducing wood energy consumption from 94% to 50% by 2020 and reducing soil erosion significantly for sustainable agriculture. In the medium term, the EDPRS sets targets to increase the forest cover to 24% by 2012, rehabilitation of degraded critical ecosystems and intensification of agroforestry to 85% of farmland and the involvement of the private sector in forestry for value addition activities. By doing so, it is believed Rwanda will be able to achieve an economically, ecologically balanced sustainable development.

TANZANIA

Felician B. Kilahama, *Director of Forestry and Beekeeping Division, Ministry of Natural Resources and Tourism, Dar-Es-Salaam, Tanzania*

Tanzania experienced serious land degradation following overgrazing and other human activities that led to removal of forest and woodland cover in some areas of Dodoma and Shinyanga Regions. The Government in the 1970s and in 1980s decided to take prompt actions to rehabilitate and restore the seriously affected parts starting with Kondoa District in Dodoma followed by Shinyanga Rural District. The objective was to reclaim degraded lands and improve agricultural and livestock keeping productivity by primarily enabling the local farmers to adopt effective land husbandry practices and by making better use of space both above and below the soils.

Wednesday 30 June

Session 8 - People and Forests: Sharing Knowledge

FORESTRY EDUCATION, LEADERSHIP, INSTITUTIONS AND THE FUTURE

M. Hosny El-Lakany, *Director International Programme, Faculty of Forestry, University of British Columbia, Canada*

The forestry profession and forestry education face a dilemma. Unlike almost any other profession the interest in the subject matter is growing at unprecedented rate at all levels from local to global driven mainly by the global climate agenda, while enrolment in forestry post-secondary education is declining. With a few exceptions, forestry schools in are being abolished, annexed or absorbed by other departments. Some are trying to maintain their existence under different names such as environment, sustainability or natural resources. Changes are taking place mainly in response to dwindling enrolment with consequent reductions in public funding.

Some of the reasons for declining enrolment in forestry higher education include: a) Economic down-turn in the forestry sector with perceived weak opportunities for employment among students; b) Unfavourable public perception of forestry as a profession synonymous with forest destruction (logging is bad word); c) Imbalance in the forestry curricula with large doses of sociology leading to employers` convection that forestry graduates don`t have the right mix of skills ; d) Indirect role of forestry in global contemporary development agendas; e) Weak international and national forestry professional associations.

Forestry education will regain its status as relevant, viable and attractive for students only when forestry schools and forestry graduates resume the leadership of forestry in global and national agendas assisted by governments, professional associations, NGOís and the private sector. Foresters should realize that collaboration with other sectors is fundamental for their recognition. Forestry institutions need serious outreach strategies to improve their public image and market their graduates.

Compared to several other professions, professional forestry associations have failed to protect the profession and have reached for non-foresters to be licensed to practice forestry. There is a confusion between being inclusive and protecting professional integrity. Professional associations and governments should encourage and support their employees to seek continued education both in emerging subjects and in depth knowledge of certain topics. Forestry school should be prepared to provide continuing education courses.

Finally, the future of forestry is not bleak. On the contrary, once the global economy picks-up momentum that spells over national economies, forestry industries regain markets and forest economic, environmental and social values are managed professionally, there will be more needs for professional foresters.

EDUCATION AND TRAINING FOR FORESTRY AND FOREST PRODUCTS INDUSTRIES IN MALAYSIA

Mahmud Hj Sudin, *Dean, School of International Tropical Forestry, University of Malaysia Sabah (UMS), Malaysia*

The sustained contribution of the forestry sector in the Malaysian economy warrants the human resource to be well equipped with relevant education and training ranging from vocational to tertiary levels. Government agencies such as Forestry Departments, Timber Industry Board or Association and Forest Research Institute and also some forestry enterprise including plantation companies have conducted various training on technical aspects of forestry. For training at tertiary level, two universities were established namely Universiti Putra Malaysia (UPM) and Universiti Malaysia Sabah (UMS) to train human capital in forestry. Additionally, some specific training related to engineering aspects of wood industry such as adhesive and coating, and furniture design and technology are also conducted in other institutions of higher learning in the country. The development and changes in forestry and education-industry linkages are discussed.

PERSPECTIVES OF STUDENTS ON COMMONWEALTH FORESTS: A GLIMPSE INTO THE FUTURE

Julius B. Adewopo, *Graduate Student, University of Arkansas, U.S.A., CFA Liaison Officer, International Forestry Students Association (IFSA)*

The budding professionals in the forestry sector are the main drivers of the anticipated changes and advancement in forestry practices. The International Forestry Studentsë Association (IFSA) provides a veritable platform for collaboration, interaction, and information exchange among global forestry students. IFSA is strategically positioned and geared to recognize, and promote the role of the next generation of people who will be driving forward and delivering change in the future within the Commonwealth and beyond. Through the adoption of survey tools and e-forums, forestry students from diverse backgrounds have provided inputs and perspectives on broad issues appertaining to the past, present, and future of forestry in the Commonwealth. Based on descriptive summaries of studentsí perspectives, the overall picture indicates a positive outlook for the future, while climate change and environmental consciousness were considered to be paramount factors that will determine the sustainability of our forests and the long-term relevance of forestry profession. An understanding of the persuasions and convictions of the younger generation is critical for the design of productive approaches, as we make conscious efforts to raise new breeds of leaders in the commonwealth forestry sector.

Wednesday 30 June

Session 9 - People and Forests: Raising Standards

FORESTRY PROFESSIONAL BODIES, A VIEW FROM A NEW ZEALAND FORESTER

Andrew McEwen, *President, New Zealand Institute of Forestry, New Zealand*

Changes observed over a forestry career of more than 40 years are examined to identify features that might assist forestry professionals to cope with changes over the next decades. ssues facing forestry professional bodies are described and the case is made for such bodies to take a broad view of forestry and to embrace all forestry professionals rather than combine membership to professional foresters. It is suggested that more forestry professionals should adopt the commonly accepted registration standards and procedures that other professional bodies use.

After discussing aspects of the current image of forestry, the paper identifies some examples of global issues that could benefit from more professional forestry input. Suggestions are made for greater cooperation between forestry professional bodies.

The paper ends by asking how prepared forestry professionals are to put aside vested interests to deal with a worst case scenario regarding the security of the planet and our own long-term future.

Session 10 - People and Forests: Engaging Communities

CREATING WOODLANDS FOR WILDLIFE AND PEOPLE IN SCOTLAND

Sir Michael Strang Steel, *Scottish Forest Alliance, UK*

The Scottish Forest Alliance is a unique collaboration between BP, Forestry Commission Scotland, RSPB Scotland and Woodland Trust Scotland. The shared vision is to practise sustainable forestry and, over the next 200 years, to create nearly 11,000 hectares of new native forest habitats in Scotland, bringing far reaching benefits for wildlife and people.

There are 14 sites in all, including a range of habitats, which will sustain functioning ecosystems and support a rich diversity of life. The Case Study looks at how the project came about and how the Alliance operates in practice, what has been achieved to date, and the long-term benefits for people and wildlife in Scotland.

The Case Study also outlines the Alliance's programme of research into the forest biodiversity and carbon uptake by new native woodlands, which will continue throughout the 200 year project lifetime.

FACILITATING COMMUNITIES TO RESTORE FOREST LANDSCAPE FUNCTIONS AS A LIVELIHOODS STRATEGY- A CASE OF BENET COMMUNITY, MOUNT ELGON, UGANDA

Barbara Nakangu Bugembe, *Senior Programme Officer, IUCN Project Office, Uganda*

IUCN is implementing the Livelihoods and Landscape Strategy (LLS) in the Benet area of the Mount Elgon Region, Uganda, where communities took center stage in directing on what and how the restoration of the Benet landscape would take place. IUCN played the external facilitator role using participatory processes to plan, monitor and guide the work.

This paper documents field experiences and shows how, for years, the indigenous Benet People of Mount Elgon have suffered the effects of severe landscape degradation that negatively impacted on their livelihood security and needs. The deterioration of the landscape affected crop yields, access to clean water, fuel wood. This is a serious concern for the community as it drove them into greater poverty. It also impacted negatively on the neighbouring Mount Elgon National Park, which has become the source of most of the goods and services that had been lost from the agricultural landscapes. But this was done illegally resulting in increased conflict between the community and the park authorities. Through LLS, IUCN facilitated a process that allowed communities to harmonise and consolidate their knowledge, as they identified and understood what they get from their landscapes and what it means for each one of them for both their livelihoods and the sustainable management of the forests. A participatory planning process was undertaken to determine what needed to be done to ensure both improved livelihoods and sustainable forest management. From this process of discussion and facilitation, which was very important for local ownership, the communities better understood and appreciated the value of the landscapes to their livelihoods and the need to restore and better manage them. But there were barriers that hindered them from implementing their agreed to and necessary actions. Some barriers were known, as they were also socially or institutionally accepted, but individual community members didnít feel they had the power or knowledge to deal with some of the identified issues. LLS supported communities to identify these issues that seemed to be beyond the management of the community, and facilitated a process that showed and equipped communities to address of them.

For example they analyzed that free-ranging livestock over the landscape during the dry season was a known and normal societal practice, yet the majority of the community indicated this as a barrier to landscape restoration. LLS facilitated a process that helped the community to decide how to address this problem by choosing the options to develop land care regulations (through a by-law) to address this issue. This was agreed on by the entire community. Once the process to facilitate the by-law development was completed, it unlocked and motivated the community to plant trees at a rate that had never been experienced there. This led to the start of a process to restore 1,000 ha of Benet landscape and a number of goods and services are beginning to emerge. In addition, the Park authorities now had a greater trust with the community, and entered into collaborative forest management agreements with them to locate bee-hives in the Park and restore degraded areas of the National Park. This provides examples of how livelihood improvement and conservation can be linked to achieve a win:win situation. This paper will share these field experiences, the lessons, successes and challenges of the process.

Thursday 1 July

Session 12: Delivering REDD+: From Copenhagen to Cancun

INTRODUCTION TO REDD +

Genevieve Patenaude, *Forest and Carbon Management, The University of Edinburgh, UK*

The potential to mitigate global carbon emissions through the management and protection of forests and woodlands is huge. Forests cover about 30% of the global land area, store 45% of the terrestrial biosphereís carbon and more than 1.6 billion people, including a significant numbers of the worldís poor, rely on them for their livelihood. Yet, forests are being degraded and destroyed at an alarming rate. The largest losses are observed in tropical forests of the developing world. Between 2000 and 2005, roughly 13 million hectares of forest disappeared annually. REDD+ is an attempt to provide a framework attempting to address this crisis.

While the need to reduce global deforestation and forest degradation is urgent, addressing this need poses numerous challenges. These stem from the complexity of the problem itself, the different national circumstances and the multiple drivers of deforestation and forest degradation. The difficulties in reaching an agreement on REDD+ exemplify this. Despite these, REDD+ emerged from Copenhagen as a point of consensus. Fast Start funds are now close to $4.5billion and there is agreement that 20% total fast start will be allocated to forests.

Yet, REDD+ financing, coupled with weak governance, is a combustible combination with potential to increase the risks of conflict around the issue of forests and a further degradation of forest assets. Hence, a combination of financial incentives, improved MRV and better governance must enable governments, the private sector, foresters and farmers to conserve forests and help to ensure that poor people are not deprived of their livelihoods. A more coherent framework for forest governance, markets and ecosystem services would bring social, economic, as well as climate benefits, to millions of marginal poor people.

To stimulate innovative thinking for reaching a global consensus on REDD+, cross-fertilisation and the breakdown of disciplinary barriers is needed. To do so, platforms aiming at engaging actors with diverse interests and perspectives are needed. The Commonwealth Forestry Conference (CFC), which brings researchers, business leaders, and policy makers in one single location provides such a platform. One of the central elements and strengths of the CFC is its ability to help share experiences and information, but importantly to help find solutions.† The countries, organisations and communities of the Commonwealth have the potential to learn from one anotherís successes and failures, helping them to tackle issues such as REDD and climate change and to build a foundation for mutual understanding and progress. I therefore propose to capitalise on this to facilitate discussions and collaborations on REDD+ across institutions and disciplines. The aim of the event will be to summarise, explore and stimulate innovative thinking by building on available expertise, resources, networks, and technologies. The event will focus on **delivering REDD+ now**. To achieve this aim the day will have a mixture of high level plenary presentations in session 12, followed by presentations, panel discussions and structured workshops, some running in parallel to the sessions of the CFC.

UPDATE ON UN-REDD PROGRAMME: FORESTS AND CLIMATE CHANGE

Ravi Prabhu, *Senior Programme Officer, Forests and Climate Change, UN-REDD Programme* & Timothy J. B. Boyle

In the fight to reverse current deleterious trends in greenhouse gas emissions (GHG), opportunities to contribute to these efforts based on reducing emissions from forests have attracted global attention and increasing support. Known as REDD+, these efforts focus on reducing deforestation and forest degradation, enhancing or conserving forest carbon stocks and the sustainable management of forests as a whole. This paper presents an overview of the current status of efforts to realize REDD+ as an instrument to combat GHG under the United Nations Framework Convention on Climate Change. These efforts include the work of various country led initiatives, especially the emerging Interim-Partnership on REDD+, the UN-REDD Programme and World Bank hosted Forest Carbon Partnership Facility and Forest Investment Programme and relationships among all of them. Focusing in particular on the work of the UN-REDD Programme, the paper discusses two country case studies from the Democratic Republic of Congo and Viet Nam to illustrate opportunities and challenges faced by countries as they build their capacity to offer significant reductions in GHG emissions from forests. It concludes by weighing options and opportunities for REDD+ in the near future.

NORWAY'S REDD LEADERSHIP

Hans Brattskar, *Ambassador and Director, Government of Norway's International Climate and Forest Initiative*

The Government of Norway's International Climate and Forest Initiative finances efforts to strengthen the international support system and provide examples on how REDD+ may work in practice. We support multilateral initiatives such as the Forest Carbon Partnership Facility, the Forest Investment Programme and the UN-REDD Programme. In addition to this, we cooperate more closely with countries such as Guyana, Tanzania, Brazil and Indonesia. Norway's International Climate and Forest Initiative has financed several reports on REDD+-related issues, and has participated in international working groups such as the Informal Working Group for Interim Financing for REDD+. On May 27th this year, Norway hosted the Oslo Climate and Forest Conference 2010, where a REDD+ partnership of more than 55 countries was established.

Through a coordinated approach, international efforts on REDD+ will pull in the same direction, ensure early actions on REDD+, and make the establishment of an effective, efficient, and predictable incentive structure under the UNFCCC possible.

Thursday 1 July

13.1 Delivering REDD+: from Copenhagen to Cancun

FINANCE AND INVESTMENTS

Christopher Webb, *Manager, Sustainability and Climate Change, PricewaterhouseCoopers/Carbon Markets and Investors Association, UK*

The financial needs for REDD+ are such that we are unlikely to achieve the emissions reductions required without private sector finance. However at present we are seeing very little private sector finance directed towards REDD+ activities. This presentation will outline why this is the case, and provide some views on how likely these may be overcome and possible solutions.

SOCIO-ECONOMY, POLICY AND GOVERNANCE

James Mayers, *Head, Natural Resources Group, International Institute for Environment and Development (IIED), UK*

The combination of new forest 'land grabs' for food and fuel production and old problems - of rights in the wrong hands and capabilities not matched to need - has spurred many to voice the necessity of focusing forestry in a new way. And with REDD and other forest climate strategies presenting opportunities and a few dangers, these voices are getting much louder. Effective, integrated, on-the-ground approaches to forest management are key, but elusive - partly because of a failure to check forest governance that marginalises the local stewards who could potentially solve the challenges.

Governance of forests - or who gets to decide what about forests, and how - is at the heart of prospects for both social justice and sustainable forest management. Major changes in 'who gets to decide, and how' will be needed to make REDD work, yet so far many REDD readiness approaches are loud on what needs to be analysed and consulted on, but silent on how to bring about the major changes necessary in policy and capacity to be 'ready'. Examples will be given from IIED work with partners - on how 'real readiness' is beginning to be addressed in Ghana and Mozambique, and on how learning groups in 10 countries of Africa and Asia have made progress on the kind of locally controlled forestry that will be needed for effective REDD.

EARTH OBSERVATION AND TECHNOLOGIES

Stephen Ward, *GEO Forest Carbon Tracking, Australia*

The intergovernmental Group on Earth Observations (GEO) launched a Forest Carbon Tracking initiative in 2008, recognising that robust measurement, reporting and verification (MRV) systems are a fundamental forerunner to potential inclusion of forests in future international climate change agreements. These MRV systems are dependent on the sustained supply of satellite Earth observations to provide the wall-to-wall coverage required to address issues of leakage, additionality, and permanence. GEO is providing an interim framework for coordination on MRV issues, involving governments, space and forest agencies, research scientists, FAO, and early adopter countries. Initial activities have involved:

- developing methods and protocols for data acquisition, processing, interoperability and accuracy assessment;

- working to improve the flow of satellite observations and methods for integration with ground data;

- setting up a number of National Demonstrators (initially 7) as large-scale trials and proof of concept, and through the Committee on Earth Observation Satellites (CEOS) agencies stimulating coordinated acquisitions of satellite data for these demonstrator areas in 2009 and 2010.

The presentation will review the activities and progress of the GEO-led coordination, including the recent steps moving from the preliminary tasks to definition and planning of an operational global system - known as the Global Forest Monitoring Network (GFMN). The GFMN is envisaged as a global network of national systems based on worldwide data access, methods for achieving interoperability between satellite observations for forest monitoring, and eventually integration of satellite, ground data and models that can provide both time series consistency in national carbon accounting systems as well as comparability between national systems.

Oral Abstracts

O-1 WHERE DO WE GO? DEVELOPING RESILIENT FUTURE FORESTS: A CASE STUDY FROM BRITISH COLUMBIA, CANADA

Harry Nelson[1], Anne Helene Mathey[1], Craig Nitschke[1,2]
[1]University of British Columbia, Vancouver, Canada, [2]University of Melbourne, Melbourne, Australia

Climatic changes increase the complexity of the problems already facing forest managers. Climate change introduces not only the increased risk of disturbances associated with insect infestations (such as Mountain Pine Beetle in British Columbia) and fire but also changing climatic conditions that can affect the distribution of forest species across the landscape. Both changes affect the ability of forest managers to not only maintain timber supply but also to achieve their environmental objectives over the long term.

One of the challenges facing decision makers and stakeholders is identify possible adaptation strategies and then select ones that can best meet their objectives, taking into account the complexity of forest management under climate change (where there are already complex interactions between biophysical process and management objectives even before taking into account the uncertainty introduced by climate change). By combining current knowledge with an innovative model (that bridges aspects of both ecological modeling with its emphasis on processes and the spatial pattern of landscape elements along with traditional management optimization models), we have developed a decision support tool that can be used to explore the effectiveness of different proposed adaptation strategies. We then show how it can be used by assessing proposed management strategies (such as changing harvest priorities and utilizing different species) in meeting forest management objectives and reducing potential vulnerabilities for a six thousand square kilometer forest management area in Northern British Columbia. We draw upon current research into the projections of the future regeneration potentials of the dominant tree species and projections of new geographic positions of biogeoclimatic zones. We argue this modeling approach (although not necessarily the specific tool we have developed) is key component in increasing adaptive capacity by increasing the understanding of how well different strategies might perform across multiple objectives (given the uncertainty associated with climate change).

O-2 FOREST RESTORATION TO IMPROVE HEALTH AND RESILIENCE AND REDUCE FIRE RISKS IN NATURALLY GRASSY FOREST ECOSYSTEMS

Peter St.Clair, Vic Jurskis, *Forests NSW, Casino, NSW, Australia*

Large areas of forest in temperate Australia are suffering chronic decline in health. Much of the affected area is expected to become more arid, exacerbating forest decline and fire risks.

Exclusion of frequent low intensity fire from fire dependent forests and woodlands results in changes in the physical and chemical properties of soils including acidification and nutrient imbalances. Eucalypt roots are affected leading to chronic decline and altered ecological interactions with competitors, pests, parasites and diseases. Fuels build up in weight and vertical profile, and seasonal flammability is altered increasing fire risks and leading to the ëmegafire' phenomenon.

Restoration programs can be ineffective or even counterproductive if they focus on secondary factors and symptoms of decline or attempt to restore elements of ecosystems rather than restoring healthy ecosystem processes. Some examples of successful and unsuccessful conservation or restoration measures in temperate Australian forests and woodlands are discussed.

Effective restoration can improve forest health and productivity and reduce fire risks by restoring natural resilience, reducing fuels loads and vertical profiles and increasing discontinuity in fuels.

Restoration at a landscape scale will require broad community support involving public and private landholders and various community groups. In Australia, Landcare groups and District Bushfire Management Committees can support and implement restoration programs. The Bushfires Cooperative Research Centre has increased interstate knowledge transfer and capacity building in Australia, however there is scope for improvement nationally and internationally.

O-3 IMPACT OF CLIMATE CHANGE ON "SUNDARBAN", THE LARGEST MANGROVE FOREST: WAYS FORWARD

Syed Azizul Haq,PEng
National Housing Authority, Dhaka, Bangladesh

The Sundarban is the biggest mangrove forest in the world where about 425 species of trees and herbs and about 246 species of animals, including the Royal Bengal Tiger exists. Sundarban, a World Heritage Site, covers about 4.2 part of Bangladesh where forests cover only 10.2 per cent of the land area. The forest encompassing 600,000 hectare offers more than 400,000 hectares of forest, the remaining part comprising water bodies mostly flowing toward the sea at the south. This mangrove forest generally bears the salt-tolerant ecosystem excepting some amongst which about 85.67 crore Sundari (Heritiera fomes) trees are sweet water loving. These trees are now on the verge of extinction primarily due to suffering from top-dying disease caused mainly due to increasing salinity in surrounding waters.

Depletion of forest cover is portending of climatic disaster again climatic disasters portent depletion of forest. Climate change due to global warming will be causing annual temperature rises of 0.4 degrees Celsius in Bangladesh and resulting in greater frequency and intensity of cyclonic storms. The sea level will also be rising by 4 millimeters every year. These phenomenon will cause rise in saline water and decrease in the sweet water flow in the Sundarban.

In the Sundarban balanced growth of flora and fauna had been occurring by mingling of fresh water of the Ganges and the salty sea water of the Bay of Bengal. But the balance is now being threatened and siltation is increasing due to decreasing downstream flow of its tributary rivers running through and around. Increasing water flow particularly in dry periods is proved to be the only answer to mitigate the crisis. Construction of a barrage at the upstream might be the only option to store water for the dry spells along with other tools for adoption in these regards.

O-4 INCREASING RESILIENCE TO CLIMATE CHANGE OF A KENYAN BIODIVERSITY HOTSPOT THROUGH FOREST RESTORATION

Winfred Musila[1], Mathias Oesker[2], Robert Gliniars[2], Henning Todt[2], Helmut Dalitz[2]
[1]National Museums of Kenya, Botany Department, Nairobi, Kenya, [2]University of Hohenheim, Institute of Botany (210), Stuttgart, Germany

Kakamega forest, the eastern-most relic of the guineo-congolian forest is one of the biodiversity hotspots in Kenya. Despite its high biodiversity value, Kakamega forest has extensively been disturbed in the past resulting to high levels of fragmentation and degradation. Todate it is characterised by a mosaic of secondary successional vegetation of degraded forest, shrublands and grasslands. The rate of recovery of the degraded forests has been very slow especially in areas where the scale and extent of past human disturbance was severe. Following the observed climatic impacts on forests, the long-term capacity of Kakamega forest to maintain its biodiversity and associated rates of supply of goods and services is of great concern. A restoration program aimed at planting native tree species in order to accelerate recovery of the degraded areas and connect formerly joined forest fragments and has been initiated. This restoration initiative will generate forested areas and increase resilience of Kakamega forest to climate change. An experimental approach has been adopted to identify priority species for planting, appropriate planting strategies and site selection. A mix of at least fifty native tree species have been planted over the last two years and their growth rate monitored on a monthly basis. In one experiment the effect of soil density and mulching on seedling survival and growth of 10 species was assessed on a degraded grassland. Highly significant differences were recorded in seedling survival and growth among the species. Highest mortality was recorded for Erythrina abyssinica. Results from the restoration experiments will be presented.

O-5 BEYOND FOREST RESTORATION FOR CLIMATE-CHANGE MITIGATION AND ADAPTATION

Peter Duinker, Camilo Ordonez
Dalhousie University, Halifax, Nova Scotia, Canada

Restoration implies targets for ecosystem conditions based on historical conditions. At a coarse level, this may mean putting forests back in places where humans have changed them into non-forest ecosystems such as farms, towns, industrial parks and roads. At a finer level, it may mean turning degraded forests back into forests with integrity. The latter requires a detailed characterization of integrity - what ecosystem conditions define a forest with integrity? In North America, many people have advocated forest ecosystem conditions that might have been present before European immigrants arrived in large numbers. If the future climate were to match conditions back then, the analogue might work. Because of the prospects of climate change, we argue that historical forest conditions may not represent useful targets for forest restoration. Considering that both urban and rural forests in Canada contain trees that grow for many decades and even a few centuries, any trees established today will grow into a changing climate. According to some assumptions that have strong possibility of actually occurring, that climate change may be dramatic, with significant warming, increased storminess, and other changes. In our view, forest restoration should be explicitly forward-looking, and not backward - perhaps "prostoration" is a better moniker. This may mean establishing non-native tree species that may be matched much better to the changing climate than are native species, an approach known as anticipatory planting. The full package of silvicultural practices used in a specific area needs to be rethought in the context of raising forest resilience in the face of a changing climate. If this is not done, and historical analogues for forest restoration persist, there is every chance that forests worldwide will provide fewer benefits to humankind, including the key function of storing carbon and mitigating climate change.

O-6 MITIGATING CLIMATE CHANGE BY RESTORING DEGRADED FOREST AREAS IN CAMEROON

Akompab Ebainjuiayuk Benjamin
Forest and Landscape, University of Copenhagen, Copenhagen, Denmark

Forest restoration has been an important process in the past decades due to increasing concerns over the continuous forest loss. In the year 2000, the World Bank estimated that the annual deforestation rate in Cameroon ranged from 0.4 to 1.0 percent. Slash -and- burn agriculture and fuel wood demand were responsible for 90 percent of deforestation while tropical timber harvesting was the primary cause of degradation contributing to decline in biodiversity. In the South west province of Cameroon for example, vast forest areas are continuously been cleared for agriculture while the adoption of the classical system characterized by the conversion of forestlands into plantations is predominant in both privately and publicly owned land. The loss in forest habitat due to destruction and degradation by human events triggers animal and plant species loss. This decline in the health and ecological integrity of the forests as well as the increasing concerns about climate change associated with the present management system requires a nature based approach in restoration.

This paper addresses the need for a shift in paradigm in forest restoration from the traditional classical forestry practice to a more multifunctional nature based forestry approach. The paper focuses on the dynamics of forest conversion in the South west region of Cameroon. The objectives are to (1) provide a synthesis of the current situation that characterizes the restoration and management of forests in this part of Cameroon (2) discuss how future restoration measures could be transformed to mitigate the impacts of climate change (3) draw examples from European case studies and discuss the tools required to bring about the transformation. This paper argues that the current forest management in Cameroon is classical and needs a transformation in order to address the needs of the society and respond to the effects of climate change.

O-7 THE DEMAND FOR CLIMATE CHANGE MITIGATION IN GHANA'S FORESTED REGIONS

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Mitigating the effects of climate change in Ghana implies extra costs over and above business as usual. To adapt, each household must bear some opportunity cost. For a developing country like Ghana, this means more stress on the already low incomes of citizens apart from the squeeze on public resources. Hence, the low adaptive capacity for climate change in Ghana.

This paper investigates through the Contingent Valuation Method the extent to which Ghanaians are prepared to bear the cost of climate change mitigation within Ghana's forested regions. It assesses through sectoral analysis the willingness to pay for climate change mitigation by residents of Kumasi, Ghana's second largest city and as well a nerve centre for Ghana's forestry sector.

Willingness to pay values were refined beyond the cheap talk approach to employ a certainty approach, thereby eliminating hypothetical bias. This ensures that real willingness to pay is not overstated. High willingness to pay coupled with good quality education not just on climate change provides incentives for forest conservation. The welfare implications of climate change are also emphasized.

O-8 CARBON SEQUESTRATION BENEFITS OF NEW NATIVE WOODLAND EXPANSION IN SCOTLAND

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Native woodland expansion is a key objective in the Scottish Forest Strategy with a specific intent of enhancing the contribution of forestry to climate change mitigation. The Scottish Forest Alliance has established fourteen sites, with long-term sustainable management plans, for the creation of native woodland. A primary objective is to yield information on site specific changes in carbon, as woodlands develop, through research driven monitoring that provides robust data for the enumeration of changes in carbon stocks in both vegetation and soils.

The development of a repeatable sampling and reporting structure for gains in above ground carbon sequestration, directly attributable to the development of native woodlands across Scottish Forest Alliance sites will allow, over the 200 year lifetime of this unique partnership, permanent and verifiable gains in woodland carbon sequestration. The assessments are further underpinned by a robust and repeatable soils sampling methodology which enables soil carbon stock changes to be verified with a mean detectable difference of around 20%. Initial site carbon stock contained within carbon rich soils is between 93 and 100% of the initial carbon store. The baseline assessments highlight the significant potential for changes in soil stocks to effect predicted above-ground carbon sequestration gains, and the importance of soil carbon conservation to ensure woodland carbon capture is maximised.

To date in excess of 3.4 million trees have been planted across Scottish Forest Alliance sites with an area of 4600ha of new native woodland creation since 2002. This effort is predicted to result in woodland capture of 377830 tonnes of carbon (equivalent to nearly 1.4 million tonnes of CO_2) over the first 100 years of the project, and deliver a verifiable carbon offset of 220000 tonnes of carbon. These figures equate to an average carbon offset potential in excess of 50 tonnes of carbon per hectare of newly established forest.

O-9 MITIGATING CLIMATE CHANGE: WHAT ROLE THE COCOA FARMER IN WEST AFRICA CAN PLAY?

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West Africa will suffer a reduced productivity of rain-fed agriculture as a result of climate change. Although, land preparatory methods for agriculture production are major contributors to climate change, adaptive and agroforest methodologies are avenues for reducing emission through agricultural-related deforestation. The rehabilitation of degraded cocoa farms through the introduction and maintenance of shade canopies in cocoa plantations has the potential to contribute to climate change mitigation, yet few studies have documented ways of encouraging the smallholder cocoa farmer in West Africa to engage in such ventures. Restoration of degraded cocoa farms is a medium- to long-term engagement that involves rational thinking and economic analysis by farmers. In such an instance, a national initiative that seeks to increase productivity of cocoa farms has the potential of reducing the need for extensification. In addition, maintaining shade canopy over cocoa farms in a perennial system is an evolving option for diversifying farm income while contributing to long term carbon sequestration. Backed by innovative policies, such innovative adaptive methodologies have the potential to change behavior in farming systems and increase forest cover in the sub-region, thus increasing carbon sequestration potential of the sub-region. This paper reviews the mechanisms under which smallholder cocoa farmers could serve as significant contributors to the international effort of mitigating climate change through the rehabilitation of degraded cocoa farms

O-10 CLIMATE CHANGE AND URBAN FORESTS: TOWARD A FRAMEWORK FOR URBAN SUSTAINABLE FOREST MANAGEMENT

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Developing and implementing an urban forest sustainability framework is important to sustain of the myriad services and benefits that urban trees provide. With the advent of climate change, these frameworks must be groomed to fit all considerations associated with a changing climate. However, urban forest sustainability frameworks so far have been characterized by a simplistic operational interpretation of attaining a sustainable urban forest through the biophysical health of trees. This kind of framework ignores the cross-boundary, cross-scale and cross-institutional issues associated with climate change. A warmer planet would ignite unpredictable weather patterns and socioeconomic changes that would in turn affect urban trees in different ways. We argue that to address the potential ravages of climate change and to come to terms with a deeper understanding of urban forest sustainability, a more comprehensive urban forest sustainability framework is needed. This framework should address all the values associated with urban forests, their scales in time and space, their jurisdictional specification and cross-jurisdictional planning and cooperation, their property rights and ownership patterns, and qualitative as much as quantitative approaches to measuring urban forest sustainability. The long list of urban forests' biophysical and socioeconomic functions that may be threatened by climate change, the mitigation opportunities urban forests provide, and the techniques to make urban forests resilient to such change should all be core considerations of such a framework.

O-11 CLIMATE CHANGE ADAPTATION THROUGH SUSTAINABLE FOREST MANAGEMENT: A CASE STUDY OF SUI RIVER FOREST RESERVE, GHANA

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Climate change is one of the greatest environmental, social and economic threats the world has ever faced. Developing countries are the most vulnerable because of their high dependence on forest resources and their limited capacity to adapt to a changing climate. Using the **Pressure-State- Impact- Response** (PSIR) **Framework**, the paper examines causes and impacts of climate change of the Sui River Forest Reserve, the coping strategies of the people around the reserve, and the role of SFM on climate change mitigation and the ability of the fringe communities of the Sui River Forest Reserve to build adequate adaptation capacity and resilience to improve their livelihoods. The results of the study indicate the population around the reserve has adopted various adaptation strategies to improve agriculture, biodiversity conservation, and water resources management to minimize the impacts of the climate change. It also reveals that climate change can effectively be mitigated through SFM. An effective implementation of SFM will provide ample opportunities for forest-dependent communities around Forest Reserves to significantly improve their livelihoods. The paper however, stressed that a piecemeal approach to the management forests will undermine the adaptation capacity and resilience of the forest fringe communities and thereby leads to an increase in climate change impacts. The study underscores the necessity for integrating climate concerns into development planning for long term achievement of Ghana's development goals.

O-12 ACCESS TO DATA: CHALLENGES IN DATA MANAGEMENT IN SUPPORTING FOREST RESTORATION AND CLIMATE CHANGE MITIGATION

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Vast quantities of data of many types and in many formats: statistical, geospatial, imaging, audio etc., are now available to forest scientists in support of research and decision making, especially in the fields of forest restoration and climate change mitigation; and data production is growing exponentially. However, its full value is lost, perhaps permanently, without proper management systems to ensure its long-term accessibility, cataloguing and preservation. These traditional responsibilities of librarians are now being harnessed in conjunction with those of IT and subject specialists in formulating data management plans in many major institutions worldwide.

This paper examines the practical steps necessary to create an effective data management plan, covering the entire life cycle of a dataset. Topics covered include: data types and quantities; needs and rights of users and owners, and security issues; funder requirements and obligations; choice of retention periods; software and visualisation or other tools needed to create and use the data; documentation and naming conventions; identifiers and file formats; backup and storage; transcription and version control; standards and ontologies; sharing and integrating data; and ethical and copyright issues. Leading sources of support and advice are identified, and the opportunities for creating new support networks for data gathering projects ranging from the field to the laboratory are analysed. The establishment of data management teams encompassing a variety of skills is recommended in all project planning.

O-13 ANALYSING FOREST SUSTAINABILITY UNDER VARIOUS CLIMATE CHANGE SCENARIOS: A CASE STUDY IN NORTHERN SCOTLAND

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One of the major challenges for forestry in the 21st century is how to ensure, measure and assess forest sustainability. The Northern Tosia (Tool for Sustainable Impact Assessment) project is focussed on developing tools for assessing the sustainability of forest based activities in rural areas. The Scottish case study, one of four formed within the project, is based on Inshriach Forest within the Cairngorms National Park. This case study examined how management options due to changing climatic conditions impact a number of sustainability indicators and enterprises dependant on the forest.

The case study first assessed the current structure and proportion of 5 Forest Management Alternatives (FMAs). These describe a range of clearly identifiable forest management strategies with their associated forest operations and range from Forest Nature Reserve to Intensive Wood Biomass Production.

The percentage share of Forest Management Alternatives varied according to the following four scenarios:

1. Business as Usual, i.e. the current management regime.

2. Climate change increasing the intensity of biotic threats, along with a parallel target of forested land being restored to broadleaves.

3. Restoration of intensive forested areas to a more “natural” system in order to increase both biodiversity and attractiveness for tourism.

4. Responding to climate change mitigation policies as woodfuel industries increase their demand for wood chips.

The impact of these scenarios was measured against various sustainability indicators including Gross Value Added, Greenhouse Gas Emission and Carbon Stock, Forest Biodiversity, Employment, and Recreation.

The aggregated indicator results from the completed analysis were presented to various stakeholder groups representing a range of industrial, environmental, and community enterprises. A multi-criteria analysis was performed from the viewpoint of each stakeholder group. This allowed for a comprehensive review of how the proposed changes in forest management might affect the diverse priorities of each group.

O-14 LONG TERM BIODIVERSITY PLANNING AND MONITORING OF NEW NATIVE WOODLANDS

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The restoration of native woodlands is one of the key conservation objectives in Scotland set out in both the Scottish biodiversity and forest strategies, and also contributes to climate change mitigation and adaptation. The Scottish Forest Alliance (SFA) is engaged in regenerating 10,000 hectares of native woodland habitats at 13 key sites across Scotland. Demonstrating the value of the SFA sites for biodiversity requires monitoring of sites development over a sufficiently long time period to assess ecosystem function. The objectives are to yield information on changes in biodiversity as the new woodlands develop to inform management planning, and to allow the SFA to assess progress in achieving biodiversity objectives.

This includes the development of a strategic approach to the planning and management to achieve better integration between woodlands and other valued habitats as a means of enhancing biodiversity at the landscape scale. The Integrated Habitat Network (IHN) modelling approach will support this by providing a strategic framework for functioning habitat networks across the SFA sites, notable the Great Trossachs Forest. Habitat networks are a configuration of habitats that allows species to move and disperse through the landscape on key woodland and open habitat types.

The outputs of the first of a series of planned periodic surveys that will quantify changes as woodland at the sites develop over the next 100 years. Data from plots nested within section squares have been used in a pattern analysis to determine the relationships between different vegetation and species groups. The monitoring will identify interesting species, unusual patterns of biodiversity and their interrelationships between vegetation communities. This will improve the ability to predict future trends in floral and faunal development, particularly the impact of increasing tree cover and the progressive development of woodland ecosystems on each site and across the landscape.

O-15 OPPORTUNITIES FOR FOREST FINANCE UNDER THE INTERNATIONAL CLIMATE CHANGE REGIME

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The international climate change regime has the potential to increase revenue available for forest restoration projects in Commonwealth nations. There are three mechanisms which could be used to fund forest projects aimed at forest conservation, forest restoration and sustainable forest management. The first forest funding opportunity arises under the clean development mechanism, a flexibility mechanism of the Kyoto Protocol. The clean development mechanism allows Annex I parties (industrialised nations) to invest in emission reduction activities in non-Annex 1 (developing countries) and the establishment of forest sinks is an eligible clean development mechanism activity. Secondly, parties to the Kyoto Protocol are able to include sustainable forest management activities in their national carbon accounting. The international rules concerning this are called the Land-Use, Land-Use Change and Forestry Guidelines. Thirdly, it is anticipated that at the upcoming Copenhagen negotiations that a Reduced Emissions from Deforestation and Degradation (REDD) instrument will be created. This will provide a direct funding mechanism for those developing countries with tropical forests. Payments made under a REDD arrangement will be based upon the developing country with tropical forest cover agreeing to protect and conserve a designated forest estate. These three funding options available under the international climate change regime demonstrate that there is potential for forest finance within the regime. These opportunities are however hindered by a number of technical and policy barriers which prevent the ability of the regime to significantly increase funding for forest projects. There are two types of carbon markets, compliance carbon markets (Kyoto based) and voluntary carbon markets. Voluntary carbon markets are more flexible then compliance markets and as such offer potential to increase revenue available for sustainable forest projects.

O-16 FINANCING RESTORATION OF CASUARINA TREES FOR DUNES STABILIZATION AND EROSION CONTROL IN INHAMBANE (MOZAMBIQUE)

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Forest legislation in Mozambique indicates that restoration of degraded areas falls under the State's responsibility; however the government realizes that this activity can be done also by other stakeholders. In this regard, the Ministry of Agriculture through your Forest Department is seeking for a mechanism which can finance other institutions for working in forest restoration, but with assurance that the activity will be accomplished. In this type of outsourcing scheme, the area to be restored is identified by the Forest Sector authorities, at district, provincial and/or national levels and a bid is launched to identify and choose institutions interested in working on that area.

A pilot project was carried out in Inhambane province with objective of restoring casuarina trees (Casuarina equisetifolia) in the coastal zone. Casuarina were planted in the past for stabilizing dunes movements along the coastal line, but due to the exploitation for fuelwood and decay of trees, the population were decreased. The forest sector have contracted entrepreneurs to produce seedlings and planting casuarinas trees along the coastal area to restore the plants in order to stabilize the dunes and helping in erosion control.

More than 50 000 trees were produced and an area of about 50 ha were planted, during the first year of the programme, although it was find that is necessary to monitor better how the trees are growing. This financing scheme, so far, is producing good results, because the seedlings are being produced and plants taken to the field with monitoring of forest authorities, while when the responsibility were totally under the forest sector there were always some excuses to justify the unachievement of proposal targets.

O-17 CREATING BOTTOM OF THE PYRAMID FORESTRY BUSINESS SOLUTIONS TO: REFORESTATION, CLIMATE SECURITY, POVERTY ALLEVIATION AND SUSTAINABLE INDUSTRIAL SUPPLY CHAINS

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In July 2008, lucrative packages offered by forest industries to induce poor farmers in deforested land to grow trees were significantly underperforming in one of Indiaís poorest States Orissa. With a view to increasing carbon sequestration activity a study was conducted to consider how this might be changed.

A methodology incorporating the Implicate Change Dialogue approach unveiled a clearer picture of the obstacles to trade. These largely resulted from the imbalance of power and capacity between individual farmers and forest industries, and the experiences that many of the farmers came to expect as a result. The Implicate Change Dialogue process changed the power between the parties during exchanges and identified paths to greater trade that were supported by both farmers and industries.

The result is a business concept in which:

1) 8,000 poor farmers would own a forestry business that establishes 8,000ha on degraded agricultural land and generates a contribution margin[1] of **£40 to £55 million** at current values over the first 20 years (an average Internal Rate of Return **(IRR) of 26% -31%)**; and £77 to £118 million in the second 20 year cycle.

2) The programme would sequester **2.4 million tonnes CO_2** over the first 20 years and 4.8 million tonnes in the second 20 year cycle.

3) Forest product **industries would have a greatly increased sustainable local supply** of produce; so reducing: imports, transport costs and further CO_2 emissions.

4) A replicable model would be established that can make a major contribution to reforestation, poverty alleviation and climate security

The paper describes the process that generated this outcome and the experience of bringing the business to life.

[1]Contribution margin is equal to the sales revenues received minus the variable expenses e.g. tree planting, management and harvesting costs.

O-18 A UGANDAN MODEL FOR ENGAGING THE PRIVATE SECTOR IN COMMERCIAL TREE GROWING

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The need for tree plantations has never been greater in Uganda, with the natural forests no longer able to support the demand for timber, fuelwood and poles. Part of a recent forest sector reform process (including a new Forest Policy and Act) was the promotion of private sector investment into tree plantations: well-meaning words which often do not translate into results on the ground. Since 2004, however, a model for engaging the private sector in commercial-scale tree planting has evolved and proved highly successful in attracting investment into forestry plantations. To progress so quickly from the classical state-dominated forest sector (with a poor record for planting and managing plantations over the past 40 years) to the current scenario of 75% of the country's 25,000 ha of plantations established since 2004 by private investors and with serious plans (mostly small-medium sized private farmers) to establish over 50,000 ha over the next five years, is an achievement other countries might want to take note of. This paper analyses how this has come about: detailing the evolution of the process as well as analysing the challenges encountered along the way - including the important sustainability issue. Key elements have been the application of sound plantation silviculture combined with effective technical support. A commercial, ërésults orientated' approach and the application of an innovative communication strategy have also been important. The overall impact of the plantation development underway in Uganda - in terms of reducing pressure on the remaining natural forests, mitigating climate change and on poverty alleviation - is also objectively discussed since these are key reasons why the Government of Uganda and international donors are continuing to support the process.

O-19 RESTORING THE INDIAN FORESTS THROUGH MICROFINANCE

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India has embarked upon a community involvement process to restock it's forests(40% of which are degraded to a crown density of less than 0.4) through an Indian version of community forestry called Joint Forest Management(JFM). People,s participation is structured through specially established local village level institutions called Village Forest Councils (VFCs).But the success of the Joint Forest Management program lies in the provision of alternative livelihoods to woodcutters and grazers. This article presents how the forest department of a southern state of India devised a potent tool of microfinance promotion by VFCs for weaning the forest dependents while implementing a Japan Bank for International Cooperation funded 100 Million US $ Joint Forest Management Project. Each VFC is provided a grant of 12000 US $ for provision of productive loans to the forest dependents. The term Microfinance has been applied as some VFCs arrange for insurance of members and purchased cattle. The collection, processing and sale of Non Timber Forest Products is also done by the VFCs.A field study was undertaken in 27 program villages in the Tamilnadu state. Recovery and recycling of VFCs' fund were rated on a scale of 0 to 1. Forest protection and regeneration status of each programme village were also rated on a scale of 0 to 1.Data showed that there is a direct correspondence between the microfinance working and the forest protection.

The paper concludes that the degraded Indian forests can be restocked by providing microfinance to villagers through a people's representative body-the Village Forest Council. The forest department was successful in this unusual task of promoting microfinance even in villages where formal microfinance institutions have failed, which corroborates an earlier finding that microfinance is more workable and successful if it is properly packaged in a locally suitable development program.

O-20 FORESTRY EDUCATION IN AFRICA. STATE AND PROSPECT, OUTCOME OF DISCUSSION AT THE NORTHERN AFRICAN REGIONAL MEETING

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There has been attention drawn to the importance of forest and forest resources in the recent time, due to the role forest play in protecting the climate. However the problem of climatic change should be addressed through approaches that emphasize sustainable management of forest. This was the rationale behind the adoption of FORESTRY EDUCATION IN AFRICA as theme for Northern African Regional Meeting of International Forestry Students Association held from 21st to 23rd of April 2009 in Akure, Nigeria.

The meeting enlisted participation of students from different parts of Africa to discuss the challenges confronting the promotion of forestry education in the continent. Speakers were invited to make presentations and the students also expressed their views and narrated their experiences. Some never heard of forestry before they were offered admission into the university some were forced by their parents to study forestry while others were compelled to opt for forestry because they needed to get into a university. The major problem has been the inadequate awareness about forestry as a discipline. This is major imposing challenges bedeviling forestry education in Africa

The academic curriculum of African universities is an area that needs attention. Attempts were made by universities to increase the intellectual rigor of forestry degree based on the assumption that lack of technical know-how is responsible for problem of high rate of deforestation.

The meeting was concluded by stressing the need for massive public enlightenment on forestry education and its prospects, need for forestry education to be repackaged to make it more competitive in terms of student enrollment and future career options, there is need to review the curricula of forestry departments in African universities, investments in infrastructures and equipment in forestry institutions must be increased substantially and forestry education in Africa must graduate from theory based learning process to needed practical training

O-21 PROFESSIONALISING THE FOREST SERVICE-INDIAN PERSPECTIVE

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Forestry is a major land use next to agriculture. Development of forestry progresses as a source for sustaining ecological balance. Above all, providing subsistence needs of firewood, fuel, fodder, small timber and various minor forest products for a large section of rural people in and around forest areas has been one of the primary objectives of forestry activities. The increasing importance accorded to the forests for their role in providing multiple benefits and their help in protecting the environment led to the creation of Indian Forest Service and was given the status of an All India Service

Tremendous changes have taken place in the practice of forestry profession over the years. Forest Management in India is in a transitory stage moving from traditionally centralized state control forest management to decentralize local community based, participatory forest management. In traditional system of control, regulations and policing the forests have alienated the people from developing a sense of belonging to the forest. It has developed an attitude of apathy and lack of any concern for forest protection and conservation in the people living in adjacent to the forest areas. This has resulted in the continued degradation of forest resources and unsustainable forest utilization. In the last few decades, increasing realization of the fact that forests not only provide multiple benefits to mankind but also help in conserving the environment has created global concern for their protection and preservation

Realizing all these pressures on forests and the present conditions of the forests, the role of the foresters has changed from mere protectors of forests and generators of revenue to that of conservationists, meeting the basic needs of the people, executing developmental programme for them and managing the forest with peoples' participation over the last few years.

O-22 RESTORING DEGRADED LAND IN THE SHIRE VALLEY: LESSONS FOR COMMUNITY LED INITIATIVES THAT LINK RESTORATION AND THE DEVELOPMENT OF SUSTAINABLE LIVELIHOODS

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The changing climate is already affecting Malawi: the majority of Malawians are rural, poor and dependent on subsistence agriculture. Malawi's Shire Valley is highly vulnerable to these climate hazards and deforestation in the catchment has reduced the catchment's capacity to ameliorate floods and droughts, whilst increased sedimentation is impacting on irrigation and HEP generation. The restoration of the forests in the catchment is seen as a priority for climate change action in Malawi's national adaptation plan. This reflects a situation common to many commonwealth countries where a high deforestation rate (Malawi's is estimated at Deforestation rates of 2.8% the highest in southern Africa) is coupled with high bio-energy dependency. This paper presents evidence from a Government of Malawi/EU funded programme working in Malawi's Shire Valley to link the restoration of degraded forest lands to local livelihoods and climate change mitigation. It provides valuable lessons for how a combination of multiple-use trees (Jatropha curcas, Azadirachta indica (neem), and Moringa oleifera) has the potential to yield significant restoration and livelihood benefits. The trees are planted by householders as live-fencing and in fields as an agro-forestry system, as well on land previously degraded by refugees fleeing the Mozambique civil war in the 1990's. The three species provide multiple products, including providing bio-fuel, food, firewood, organic fertilizer, natural pesticide and soap. The programme has linked the producer farmers to markets and farmer-to-farmer extension approaches have been successful in seeing rapid uptake of the system. Valuable lessons for similar community restoration initiatives include: engendering a self-help approach (as opposed to the typical ëhand-out' mentality), creating the market pull to build financial sustainability and devising a planting system that is flexible enough to enable restoration to support sustainable livelihoods - building both environmental and social resilience to climate change in the Shire Valley.

O-23 ASSESSMENT OF FOREST RESTORATION INITIATIVES UNDERTAKEN BY VILLAGE COMMUNITIES IN HAZARIBAG WEST FOREST DIVISION, STATE OF JHARKHAND, INDIA

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Joint Forest Management has been initiated as a participatory and bottom up programme to regenerate and manage India's forests. As a result, there are more than a hundred thousand forest protection committees managing about thirty two percent of the total forest area of the country.

This paper analyses the key factors which led to the development of village level institutions for forest restoration in Hazaribag west forest division of Jharkhand state. Socio-economic and forest survey through field visits, questionnaires, interviews and discussions with officers and front line staff of the state forest department were carried out in nine villages. Enabling conditions such as economic and cultural interests, skills and capacities, population dynamics, literacy, forest dependency, accessibility to forest resources, caste structure and livelihood variability were examined in detail together with the existing forest governance systems such as village forest management and protection committees, government and non-government agencies. A comparison of the past and present scenario along with the changes in policy, practices and outcomes is provided in this paper.

It was found that where the villagers themselves had evolved social regulations to ensure sustained utilization and protection of forest resources, the condition of forests was very good. The study concludes that independent, autonomous and decentralized community based institutions backed by appropriate policy and legal instrument can be effective local governance systems that have the capacity to restore forest conditions and to increase productivity and supply of forest products in an equitable way.

O-24 PARADISE REGAINED BY ETHICAL ALLIANCE OF HILL FARM WOMEN: A CASE STUDY OF SUSTAINABLE MANAGEMENT OF COMMON PROPERTY RESOURCES AND SOCIAL ENTREPRENEURSHIP

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The present case study refers to the local initiatives of groups of illiterate farm women belonging to poor sections of the society with meager annual family income of less than US$200. This is the success story of farm women in Indian Himalayas. The idea of forest protection and development emerged amongst the farm women due to growing resource scarcity and vulnerability of the livelihood avenues. It was a local initiative and isolated effort towards the direction of long awaited forest protection in India. There were conflicts, social pressures and social exclusion of these women by the villagers for their efforts of protecting forests.

Recognition was given to their endeavor and women were encouraged to work for larger area with the responsibility of conventionally state owned forestry activities. Cash incentives were provided for this supportive activity which strengthened their meager farm incomes. This also opened vistas for regular income addressing thereby their cash requirements leading further towards poverty reduction.

The societal set up of the inhabitants is male dominated whereby the major decisions are finalized by the male counterparts. However, due to these visionary initiatives of a group of farm women, recognition was received from the government, family members, adjoining villagers and relatives. It was reported that being marginal farmers, these women were earlier socially excluded, but this venture led to their final inclusion. It could therefore break the century old isolation of women folk and finally led to gender equality amongst the participating villagers.

The success story will be presented in detail along with the models of social entrepreneurship replicated in other similar parts of the country.

O-25 RURAL WOMEN EMPOWERMENT AMIDST FOREST RESTORATION IN OMO FOREST RESERVE (SNR1) IN NIGERIA

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Women comprises of a larger percentage of those living below the poverty line. Women are more often overlooked as potential contributors to forest restoration, and to the ecosystem. This study presents rural gendered empowerment activities and its impacts on forest restoration in Omo Forest Reserve, Ogun State, Southwestern Nigeria. Qualitative and quantitative data were collected using semi-structured interviews and participant observation from rural inhabitant in 31 enclaves. The forest reserve was divided into three major land use types: Plantation, Natural forest and Fallow land. Based on the analysis, women in the rural areas constitute approximately 65% of the farm labor force. The fallow land in the forest reserve allocated to farmers to farm account for 70% of agricultural production and forest restoration through one or the other agroforestry practices. Recommendations are given for enhancing the integration of a gender perspective in forest restoration not only from agroforestry practices but through other rural community environmental development programmes.

O-26 COMMUNITY KNOWLEDGE GARDEN: A PARTICIPATORY APPROACH OF RESTORATION AND CONSERVATION OF FOREST BIODIVERSITY TO SUSTAIN LIVELIHODS OF TRIBAL COMMUNITIES IN EASTERN HIMALAYAS

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Arunachal Pradesh situated in Eastern Himalayas is an abode of 26 major tribes (dominating are Adi, Nyshi and Monpa) across five ecosystems (alpine to subtropical). It is considered one of the biodiversity hot-spots of the world. In recent past, State Government was providing the subsidised inputs to promote commercial agriculture in community forest areas. This policy coupled with continuous socio-political changes in social systems (closure to towns) has threatened sustainability of forest resources and livelihoods of forest dependent dominant tribes. This paper demonstrates about an innovative approach and successes made in mobilising poor tribes, harnessed their ecological knowledge and energy of indigenous institutions in restoring and enhancing conservation of forest biodiversity through community knowledge gardens (CKGs). Numbers of CKGs have been established among the Adi, Monpa and Nyshi tribes at East Siang, West Kameng and Papumpare districts of Arunachal Pradesh, respectively. The central idea of CKG in restoring and conserving forest biodiversity lies upon the knowledge and initiative of the local healers, elders, food expert women and traditional and formal ecological experts. These members select the degraded land(s) at clan and individual levels, and also priorities, select and domesticate plants species from community forest to the degraded lands in order to expand the areas under community forest. In the CKG, first priority is given to RET (rare, endangered and threatened) and species that are important for food, ethnomedicines and cultural usage. Through CKG approach, more than 30 forest species has been domesticated and restored among the dominant tribal communities. Now, the self help groups of these communities have been empowered with the formal trainings to sustain their CKGs and improve livelihoods with value added plant products based on CKGs.

O-27 COMMUNITY ENGAGEMENT IN SUPPORT OF FOREST LANDSCAPE RESTORATION: THE EXPERIENCE OF THE INTERNATIONAL MODEL FOREST NETWORK

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Model forests have been developed in more than 50 sites around the world over the past 15 years. They are landscape in scale and animated by partnerships that are as complex as the landscapes they inhabit - reflecting forest, biodiversity, mining, recreational, agricultural, and multiple other values. Their objective is to translate policies of sustainability into practice in ways that reflect the unique circumstances (resource endowment, tenure, history, culture) of the landscape in question. With the exception of a globally shared framework of principles and attributes, model forests are highly non-prescriptive, with local stakeholders and communities defining and delivering a varied program of action that reflects their interests and priorities.

Notable model forest achievements have been in areas of governance, participatory stakeholder engagement and conflict mitigation; sustainable economic opportunities; integrating protected area values into larger landscapes; influencing policy; science and research; and others.

Forest restoration activities are highly varied across the network, dealing with issues such as reducing fragmentation to enhance biodiversity values; creation of ecological corridors to strengthen ecosystem integrity as well as eco-tourism opportunities; and reforestation on highly degraded landscapes. In addition to the intrinsic values of these activities, a notable feature of them is that they all reflect choices made by local communities as full partners in the fate of these landscapes. They have shown themselves to be durable, cost-effective, and long-term in perspective. The presentation will highlight how this model of stakeholder interaction has successfully demonstrated ecosystem-based management in practice and in ways that have supported successful forest landscape restoration (i.e. in Argentina, Brazil, the Philippines, and Canada), among other achievements. This model of stakeholder interaction, as well as the peer-to-peer and site-to-site networking supported by the IMFN may provide opportunities for the Commonwealth forestry community to strengthen collaboration in support of forest restoration and other objectives.

O-28 RESTORING THE CONNECTIONS: PEOPLE AND FORESTS

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80% of Scotland was once native woodland, but barely 2% remains. This has transformed the relationship between people and forests, cutting the economic, social and emotional ties which once bound them together.

A 200 year initiative by the Scottish Forest Alliance (SFA) [1] to create over 10,000 hectares of new woodland in Scotland is helping to rebuild these vital connections at 14 sites across the country - providing jobs, encouraging recreational enjoyment, growing understanding of the value of forest restoration and attracting long-term funding for it. In 10 years, this ambitious programme funded by BP has supported 200 jobs, attracted almost £12m of additional finance, and will pay for 200 years of scientific research.[2]

The public is encouraged to participate various ways - through improved access (new path networks and interpretive trails), community involvement in forest planning and planting, job creation and education. Examples will highlight new approaches, such as using theatre and arts projects to involve local communities and young people.

Now the SFA is embarking on its most challenging initiative yet. The Great Trossachs Forest is a 16,650 hectare landscape-scale project that will create 4,400 hectares of newly planted and naturally regenerated woodland within an hour or two's travelling time of Scotland's densely populated Central Belt. This offers a unique opportunity to re-engage the urban population with forests and their role. The project has funding to work with deprived communities in Glasgow, which suffer some of the worst health in the developed world. The project will raise awareness of the valuable forest resource on their doorstep and its role in providing people with clean water, clean air and the chance of a more healthy and active life. This reconnection will inspire people to visit and generate a sense of ownership and care.

O-29 RESTORATION OF DEGRADED FOREST LANDSCAPE IN EASTERN UPLAND OF BANGLADESH USING COMMUNITY MANAGEMENT PRACTICES

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Chittagong Hill Tracts (CHTs) in south-eastern Bangladesh represent the most significant upland watersheds of the country which is inhabited by 13 indigenous communities living in forests and using them for livelihood. Decades of government mismanagement such as clear-felling of trees for establishing monoculture plantations has destroyed the natural forest ecosystem that supports community subsistence farming called jhum, which led to agricultural intensification in the hills causing environmental degradation. In a highly degraded forest landscape, a few community-managed landscapes called Village Common Forests (VCFs) occur in smaller watersheds that contain rich biodiversity, headwaters of streams and natural springs. The objective of the study was to study potential of the livelihood strategies and conservation practices of the VCF communities in rehabilitation of degraded hilly watersheds. A structured questionnaire survey was administered with 140 households from 13 villages in the VCF areas of Rangamati and Banderban to study household livelihood, and a few selected VCFs were visited for physical survey. Bamboos are the most important forest produce in the livelihood of VCF communities that are harvested all year round. Trees of the native hardwood species which are rare elsewhere in the hills are protected in VCFs, VCF homesteads and agroforestry plots. Cultivation of rice paddy occurs in jhum, hill terraces and slopes, and in valleys and plain land. Among the vegetables the most common are a few typical land races of cucurbits grown in the hill agroforestry plots. Among the fruits, jackfruit, mango, banana, pineapple and papaya are the mostly grown. Communities actively conserve perennial water sources for use in household and farming activities. They strictly maintain seasonality in harvesting of forest produces, which is good for resources conservation. The resource management practices of the VCF communities have a strong potential for rehabilitating degraded forest landscape in CHTs that government agencies should evaluate.

O-30 COMMUNITY PARTICIPATION IN RESTORING AUSTRALIAN FOREST LANDSCAPES

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Australia has a long history of communities actively protecting and restoring forests on both public and private land. The Landcare movement, which has been going for more than 20 years, involves local communities working with land owners to protect and restore natural forest environments. Other not for profit community organisations, such as Greening Australia, engage the community in vegetation management to protect and restore the health, diversity and productivity of Australia unique landscapes. This paper examines the national, regional and local work of communities engaged in restoring Australian forest landscapes in a changing climate.

The Australian Governmentís Caring for our Country initiative seeks to achieve an environment that is healthy, better protected, well managed and resilient. This initiative provides funds for land owners, community organisations, regional natural resource management bodies for programs that address clearly defined outcomes and targets related to safeguarding Australia's natural resources and maintaining sustainable farming systems in a changing climate.

The national and sub-national governments in Australia provide funding for natural resource management, but governments can not achieve the scale of restoration required without community support and participation. Landcare and Coastcare are the umbrella movements under which thousands of community groups work in partnership with governments, the corporate sector and landowners to implement forest restoration and protection programs all around Australia.

The paper will include case studies, such as Greening Australiaís ACT Land Keepers project, which has engaged 3,950 volunteers and 56 rural land managers in the protection and reestablishment of native vegetation following devastating bushfires in 2003.

O-31 IMPACT EVALUATION OF COMMUNITY FORESTRY IN NORTHWEST PAKISTAN: THE LIVELIHOODS AND INSTITUTIONAL PERSPECTIVE

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Deforestation rate in Pakistan is very high. One of the common assumptions is that this (deforestation) is due to forest overuse by the local communities living in and around forest areas. The research conducted in Pakistanís mountain regions indicated that the people indeed are dependent on forests for fuel-wood and for timber to construct/repair their houses. In addition, farmers attempting to increase their cultivable land are often tempted to push back the edges of forests. Nevertheless, the top-down and non-participatory forest management strategies are reported as one of the major causes of deforestation. In order to counter these practices, and influenced by dominant development discourses, the government of Pakistan has adopted the strategy of joint forest management (JFM) in view of ensuring forest restoration on sustainable basis. This paper presents analysis and insights from the research conducted on ìinstitutional-organizationalî and ìlivelihoodsî perspective of JFM initiatives in the mountainous regions of Northwest Pakistan. Sustainable livelihoods framework developed by DfID was used for livelihood analysis. The paper argues that the most serious problem of this donor and state-led initiative towards community forest management is the underlying distrust between local communities and the state officials. Colonial and postcolonial historical perspective is needed to be studied to explain this predicament. It was also found that the JFM has been introduced as a means for local development (i.e. including not only forestry, but local development as well ñ which essentially is their main livelihood concern), however in actual practice, only forest protection/restoration is on the agenda of the forest officials and the local people see no immediate incentives of ëparticipationí that would ensure their livelihoods security.

O-32 COMMUNITY-BASED PERI-URBAN FOREST RESTORATION PROGRAMME: A CASE STUDY IN AMBILIPITIYA, SRI LANKA

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Establishment of community-based forest plantations in lands used for long-term shifting cultivation practices by the farmers in peri-urban areas in Ambilipitiya was the main approach of forest restoration programme. Farmers were granted temporary rights to cultivate agricultural crops for four years until the lands were covered by the tree canopies. The objectives of the study were to examine the present status, to analyze the main impacts, and to make suggestions to promote forest restoration programme. The study was conducted through a field survey of the selected farmers. It is revealed that the farmers were allocated with average 0.4 ha of land to grow Teak together with field crops. In addition to the planting materials and the technology, the farmers were provided with financial incentive, and training both significantly sufficient for the maintenance of agroforestry system. During the tenure period of the programme farmers earn average Rs. 15,335 per month from cultivated crops which give significant benefits for the farmers as main economic impacts. Under the social impacts, increased expenditure for children's welfare; control of illegal activities; promotion of communal harmony; and increased household food supply are significant. Farmers have significantly negative social impacts with the loosing of financial benefits presently enjoying, after termination of their tenure. Future risk and uncertainty of finding alternative livelihood opportunities has also become a significant negative impact. Farmers have recognized the soil erosion control; flora and fauna conservation; improvement of biodiversity as significant positive ecological impacts. It could be concluded that the even with greater ecological and economic impacts during the initial stage, discontinuing enjoying benefits, and risk and uncertainty of the farmers in future livelihoods would be challenges for sustainability of forest restoration programme. Community managed multipurpose forestry with greater degree of dynamism and flexibility would responds to the challenges.

O-33 UNDERSTANDING THE EFFECTS OF COMMUNITY FORESTRY IN GREAT BRITAIN

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In the UK forest cover has risen from 5% to 12% in the last one hundred years. Yet there are still widespread public concerns about deforestation, and attention has shifted from the extent of forest cover to its location and quality, in providing social and environmental benefits. Community forestry can make a significant contribution in this. Currently the discussion and experience of community forestry in the UK is active, but complicated by the wide variety of meanings and applications that have arisen in its twenty year history. Community forests and woodlands have been established through policy-led approaches which address regeneration of socially and environmentally deprived areas; community-led approaches which can be economically, aesthetically or ideologically motivated; and conservation-led approaches through which environmental NGOs seek to achieve their objectives through interaction with local communities.

Some are woodlands owned by active groups motivated by cooperative ideals and green economics; others are attractive places to walk the dog, owned by the parish council and maintained by volunteers; others are zones demarcated by planners where extra incentives are offered for new woodland establishment and public access, to address post- industrial malaise. Whatever their origins, the various forms of community forestry contribute to a wider range of social and environmental aspirations, including healthier more sustainable communities, increased local reliance on renewable energy, and climate change mitigation and adaptation. To add to the complexity, this diversity has arisen in the context of four national administrations (Scotland, England, Wales, Northern Ireland) each with its own forest and social policies. In this paper we aim to disentangle the emerging array of models for community forestry. We present a typology based on criteria drawn from the international literature, including ownership, management decision-making, access, use rights, community organisation and capacity, cultural meanings, knowledge and learning processes. This allows us to develop a range of 'models' for community forestry. We then review the available evidence (both qualitative and quantitative) to link each model with particular outcomes, and to provide more specific recommendations to support the involvement of communities with local woodlands.

O-34 ROLE OF PARTICIPATORY MODELLING IN REDUCING COMMUNITY CONTROVERSY SURROUNDING THE EXPANSION OF PLANTATION FORESTRY

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The implementation of a Participatory Modelling process proved to be effective in reducing community controversy surrounding expansion of the hardwood plantation forestry industry in a case study of the Upper Clarence catchment in north-eastern NSW, Australia. Controversy over natural resource management issues for the selection of a suitable case study area was initially gauged using a scoping survey, and then further insights developed from semi-structured interviews with key informants within the community, followed by public meetings.

Stakeholder analysis and mapping were used to predetermine power relations and local politics that needed consideration throughout the participatory modelling process with a voluntary Participatory Advisory Committee formed to address issues raised, and explore scenarios with the aid of visual modelling environments and expert speakers to fill knowledge gaps deemed important to participants in the social learning process. Participants actively engaged in data collection, discussion and problem solving, finding the process improved collaborative relationships and provided a vital link between research institutions and the community. Early intervention in the expansion of the plantation hardwood industry provided an opportunity for the community to provide input towards sustainable development that encouraged local employment, suitable site selection for a processing mill, and land management practices that minimised impacts to local socio-ecological systems.

A final survey evaluating the success of the PM process suggested the most important criteria to participants were an equal opportunity to contribute fairly to the process, developing a shared understanding of dynamic systems through combining social capital with creditable scientific knowledge, a time and cost efficient process, and participants remaining till the end of the process in a friendly and supportive environment. This paper reflects on lessons learnt through a robust and rigorous evaluation of a participatory modelling case study to address a need for research rigour established through a review of literature.

O-35 JOINT FOREST MANAGEMENT, DEFORESTATION AND LOCAL PEOPLE PARTICIPATION A CASE STUDY IN WEST BENGAL, INDIA

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Forests play an important role in mitigating climate change. In India Joint Forest Management (JFM) has emerged as an important intervention in management of forest resources. The primary objective of JFM is to ensure sustainable use of forests to meet local needs equitably while ensuring environmental sustainability. Under Joint Forest management (JFM) village communities are entrusted with the protection and management of nearby forests. The effective involvement of village communities in evolving sustainable forest management systems has been looked upon as an important approach to address the long-standing problems of deforestation and land degradation in India. India has implemented a very large Joint Forest Management (JFM) program covering nearly 85,000 villages and more than 17 million hectares. Under JFM, the village community gets a greater access to a number of Non Timber Forest Products (NTFPs) and a share in timber revenue in return for increased responsibility for its protection from fire, grazing and illicit harvesting.

The objective of the paper is to examine how Joint Forest Management (JFM) helps to restore the degraded forest land involving the local people participation in the conservation and management of forest. This paper is an empirical study based on data collected through field survey. This study covers two villages- Kolaberia and Kalyanpur- located in Sonamukhi forest area in the District of Bankura of West Bengal, consisting of 65 households in 2008. The results of the case study revealed that illegal felling of trees has been stopped and the non-timber forest products have impacted on the livelihood of the villagers. But the NTFPs which are the important contributors to the livelihood of villagers are neglected by the West Bengal Forest Department (WBFD). This paper has important policy implication for forest conservation, sustainable forest management practices, and rural development, environmental sustainability.

O-36 ENHANCING WOMEN PARTICIPATION FOR FOREST RESTORATION IN HILLY REGIONS OF INDIA

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The author studied level of women participation in forest restoration in two hilly regions of Haryana State, India, namely, Shivalik and Aravali hills where 300 women respondents were selected through stratified random sampling to ensure that all sections of the village society were represented. Most of the respondents were poor with high dependency on forest resources.

The level of participation of women in forest restoration was assessed through their attendance and contribution in decision making at the meetings of village level organisation. The study results showed that only 13% of the women came to attend such meetings and about 54% of such women attended the meetings for full time while the rest left in between, and out of those who remained present throughout, only 7% participated in discussion. Thus only about 0.5 % of the women members of the village level organisation participated in discussion and decision making. Further, the women who participated in discussion were generally from richer families who did not represent the interest of poor families. The reasons for poor participation of women were i) majority of the women were not informed about meetings; ii) illiteracy constrained women in articulating their views; iii) because of parda (veil) system, the women hesitated to attend meetings with males; iv) women's views were not respected by men.

The study suggested that following measures can enhance participation of women: i) capacity building through appropriate training; ii) ensuring quick and tangible benefits for women; iii) ensuring women that their views will be respected; iv) appointment of female extension staff and arranging separate meetings for women

Forest restoration helped in meeting subsistence needs for fuelwood and fodder, besides carbon sequestration, and made water available for irrigation that increased agricultural production and contributed towards poverty alleviation of the poor.

O-37 REHABILITATION OF STATE FORESTS FOR THE BENEFIT OF COMMUNITIES IN SOUTH AFRICA

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Forest restoration includes re-establishing the presumed structure, productivity and species diversity of the forest originally or potentially present at a site. In time the ecological processes and functions of the restored forest should closely match those of the original or potential forest. Climate change on another note, has always been a natural process but in recent years human activities have aggravated it, leading to potentially drastic effects. This is an urgent and critical challenge facing humanity, threatening socio-economic and environmental processes that cannot adjust at the same pace.

Forests and trees are the centre of socio-economic development and environmental protection of the African continent, yet Africa is one of the most vulnerable regions to climate change. This is a serious threat to poverty eradication programmes and the environment. In the forest sector there is an urgent need to develop and implement forest-based strategies for responding to climate change on the continent.

South Africa is restoring and increasing afforestation through greening programmes, participatory forest management and community forestry to improve livelihoods and address poverty. This is also a mitigation and adaptation measure for climate change. This strategy also links to agrarian reform and food security initiatives.

O-38 COMMUNITY BASED ADAPTATION OF TRIBAL WOMEN TO CLIMATE CHANGE IN SEMI-ARID RAJASTHAN, INDIA

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The effects of climate change on indigenous peoples are evident from various studies. This paper presents an empirical result of the impacts of recurring droughts on indigenous communities in the semi-arid districts of western India. It examines the root causes of drought in this region, indigenous people's perceptions of drought-related vulnerabilities in relation to climate change, and relevant action to combat the problem. Further, the author analyse the adequacy of policy response and community adaptation strategies. Briefly, the study shows that several policy options failed to reflect the development of the area leaving indigenous peoples vulnerable to climate change. It shows that tribal community based adaptation initiative to mitigate the effect of lack of finance after crop damage from drought and their sole dependence on forests (as safety net) has been overcome through women's self-help groups in the villages. The paper concludes with recommendation that community based adaptation should be identified and prioritized in the policy for implementation of drought-risk reduction activities.

O-39 PROJECTED IMPACTS OF CLIMATE CHANGE ON FORESTS WITHIN A SMALL ISLAND COMMONWEALTH STATE

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According to the Inter-governmental Panel on Climate Change (IPCC) 4th Assessment Report, small islands, such as those in the Caribbean, have characteristics which make them especially vulnerable to the effects of climate change, sea-level rise and extreme events. Forest ecosystems are crucial to these islands through the provision of basic ecosystem services such as the regulation of local rainfall, temperature and humidity levels, as well as erosion control and the recycling and storage of freshwater supplies. In addition, they also provide secondary benefits such as timber, recreation and eco-tourism which are important to the economic and social well being of the citizens of these states. Further, forest cover buffers against natural hazards such as tropical storms and high rainfall as well as anthropogenic disturbance resulting from infrastructure development. Overall, loss of forests on these islands often results in more severe impacts than similar losses on continents due to intensified interactions of various activities within a limited climate and geographic space, and to the loss of endemic species and rare ecosystems. Even so, there is an acute paucity of knowledge about: (i) the potential impacts of climate change upon the plant communities within these forests; and (ii) management strategies that can be adopted to ensure continued survival of these communities. Since 2005, 240 plotless Rapid Botanical Surveys were conducted across all the vegetation types of the small island of Trinidad. In these surveys, all vascular plants within the landscape were collected, identified and recorded. Multivariant analyses of these data have been used to define communities within Trinidad forests and provide baseline information for future research. The responses of these communities to projected climate change scenarios will be modelled to detect spatial and compositional shifts, whilst management strategies will be defined based on these results.

O-40 VOLUNTEERING AND FOREST RESTORATION: HOW PARTICIPATION CAN HELP CHANGE INDIVIDUALS, COMMUNITIES AND SOCIETY

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At a time of mainly negative news about the environment and global warming etc, the opportunity to make a positive contribution to help reverse past deforestation or environmental damage is attracting increasing numbers of people. Participation in the practical work of forest restoration can be an inspiring and empowering experience for individuals, sometimes with life-changing effects. Engagement with forest restoration projects provides an opportunity for people to become familiar with the forest ecosystem and its functioning. This helps to directly address one of the core issues underlying many of modern society's problems - the disconnection of people from the rest of Nature. At the same time, harnessing the enthusiasm, commitment and skills of volunteers can make a significant contribution to forest restoration projects, which are often labour-intensive, thereby helping to keep costs down. Engaging volunteers can also help to build a constituency of support for restoration projects, and provide access to a wider range of skills, resources and local knowledge. Trees for Life is the leading organisation in Scotland which engages volunteers in forest restoration, and has been running volunteer programmes to help restore the Caledonian Forest for almost 20 years. Our partnership with Forestry Commission Scotland over the past two decades has enabled thousands of people to take part in restoration work. Drawing on the experiences of the hundreds of people who spend a week or more volunteering each year, this presentation will outline the benefits derived by individuals as a result. It will also feature case studies of changes that have occurred in communities and wider society as a consequence of actions and projects initiated by people after taking part in forest restoration volunteer projects. It will conclude with some recommendations for how to successfully and attract and retain volunteers in restoration work.

O-41 COMMUNITY BENEFITS FROM FOREST RESTORATION: A CASE STUDY OF NIVAS BLOCK, MANDLA, MADHYA PRADESH IN INDIA

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Community forestry has taken root in the country with degraded forests being protected and regenerating. Joint Forest Management (JFM) has provided several direct and indirect benefits to the people. It has addressed the issues of poverty reduction, livelihood, empowerment of rural communities and restoration of forests.

This paper is a casestudy of what community participation can do in restoring degraded forest clad hills in Nivas block on its own. With the introduction of JFM in 1991, Manikpur village and other surrounding villages in the block work hard for restoring nearby forests. Now these restored forests are dense and provide wood fuel, fodder, several other NTFPs like bamboo, fruits, mushrooms and medicinal plants which were not available earlier. After thinning operation on trees, lops and tops are distributed free for use as fuel and other agricultural purposes, fodder and grasses are also available free of cost. Fruits like aonla (Emblica officinalis) and bael (Aegle marmelos), tendu leaves of tendu (Diospyros melanoxylon) are collected for cash income. A number of medicinal plants are now growing and are used for medication. The distribution of benefits is on equitable sharing basis with each household receiving benefits.

Initially the study was done in 1994 and methodology followed was PRA in which communities analyse conditions and suggest changes.

After fifteen years, temporal changes have revealed that devolution of powers and management can lead to sustainable development and improvement of forests as well as improving the livelihood conditions of the people living in the vicinity.

O-42 FOREST RESTORATION THROUGH TRADITIONAL INSTITUTIONS IN NIGERIA: CHALLENGES AND PROSPECTS

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Forests are of great importance to mankind in terms of the tangible and intangible benefits they provide. In addition to providing timber and non-timber forest products, forests are also of great value in mitigating climate change, protecting watersheds, and maintaining environmental integrity. As a result of rapid growth in human population, more pressure is being put on the forests, thereby leading to widespread deforestation and forest degradation. The demand for more land for agriculture, urban development and industrialisation is making the forest estate to shrink, thereby threatening the livelihoods of people living in and around the forests. The local and poor forest dwellers are very vulnerable to the impacts of deforestation and forest degradation, as their very means of livelihood is jeopardized thereby increasing their level of poverty. In the past, many of these communities had traditional institutions which regulate access to natural resources for local livelihoods and how responsibilities for conserving ecosystems were assigned. These institutions helped to reduce the arbitrariness of actions by individuals and consequently reduce conflicts. Unfortunately, the institutions have either become very weak or completely wiped out of existence. In this paper, the challenges faced by the traditional institutions in forest restoration are highlighted. The paper also considered the prospects of reviving these traditional institutions with a view to strengthening them for forest restoration.

O-43 THE FOREST RIGHTS ACT: COMBINING FOREST CONSERVATION WITH HUMAN DEVELOPMENT

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Sustainable management and conservation of natural resources can be ensured only if there are incentives for their stewardship by local communities. This is particularly true for forest areas inhabited by tribals and other forest dwellers where they are critical stakeholders. Their abject poverty are both cause and consequence of deforestation, more so of the precious biodiversity and fragile ecosystems that many of the natural forests embody and whose restoration is difficult, if not impossible.

The majority of 84.7 million tribals in India are forest dwellers. There needs to be a clear understanding about the complementarity between health of the forests, related ecosystems and their sustainability on the one hand and the well-being and human rights of the forest dwellers and forest-fringe villagers on the other. It is in this context that the recent Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (Forest Rights Act) should be seen and leveraged for the benefit of all. The historic Forest Rights Act (FRA) provides rights to tribals over the land they have been staying on for generations.

The paper analyses the institutional framework of the Forest Rights Act and its implications for the welfare of the target groups and of the State's land use and forest resource management scenarios. The Paper also covers the realities on the ground, the status of the tribal and other forest dwellers, the status of ownership transfers, It contains case studies on displacement of thousands of tribals by Vedanta Alumina a UK based mining company in the poorest state of Orissa which is rich in mineral resources in the territory of forest dwellers. Hence the need for restoration of forests. The paper concludes that FRA is not in conflict with FCA, and that conservation and development can be combined.

O-44 DEVELOPING A NEW GENERATION OF FORESTRY INSTITUTIONS: USING COMPLEXITY AND SYSTEMS APPROACHES TO BUILDING INSTITUTIONS THAT CAN COPE WITH CHANGE AND UNCERTAINTY

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Climate change poses unprecedented challenges to forestry institutions: a new generation of institutions are required that can manage within a context of constant, but unpredictable change. The challenges facing forestry institutions will be systemic, complex, and uncertain. Transformational, systemic changes will be required to enable forestry to fulfil what may be an increasingly important role in society. Forestry institutions generally manage resources on long timeframes and are traditionally resistant to change, but lessons from change processes in commonwealth countries show how support can be provided to build the next generation of forestry institutions. Traditional planned change approaches (unfreeze-change-refreeze) are insufficient to support change under complex, uncertain conditions. Using systemic approaches to support institutional development, focuses on the organisation's human system, their interactions, self organisation and innovation from which new ways of working can emerge. Drawing from recent change experiences for forestry institutions in three commonwealth countries - Uganda, South Africa and Kenya - an analysis is made of the key constraints to coping with change and uncertainty, and approaches to support the emergence of new structures and systems that build capacity for managing these. The findings show the critical role of training and capacity building as a tool to disrupt the ënorm' and build momentum for change from within; how new interactions can create opportunities for innovation and how engaging with organisational culture is critical to opening up an organisation to look at its challenges in new ways. The paper looks at the role of the manager, the internal and external change agents in supporting the next generation of foresters. It concludes that for the Commonwealth to build forestry institutions that can manage climate change uncertainty, change must be embraced and managed as part of the norm, requiring flexible, adaptive and ëentrepreneurial' organisations and cooperative (as opposed to competitive) institutional relations.

O-45 POVERTY AND INSTITUTIONAL MANAGEMENT STAND-OFF: A RESTORATION AND CONSERVATION DILEMMA FOR MANGROVE FORESTS OF TANZANIA

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Although the mangroves of Tanzania are reserved by law, the capacity to effectively enforce this institution has remained far from reach. This incapacity has progressively made it easier to exploit the forests as cheap sources of wood and land for other uses as the forests deplete at severe proportions, with little public notice. Often, actions of the poor coastal rural communities who depend on mangroves for their daily livelihoods are blamed for the loss. In contrast though, the scholarly belief that unless mangrove forests are strictly in the domain of state property, their fate is an inevitable ruin is increasingly being offset by the emerging positive view about human proclivity for caring and nurturing common resources. Traditional and community based forest management is increasingly viewed as an alternative to state control and appropriate institutional arrangement for ensuring sustainable management of common resources because it brings about decentralization and meaningful participation. While community based management has attracted much international attention, it has however not yet been robustly implemented for mangrove forests in Tanzania. This paper argues therefore, that nationalization of mangrove forests has not been successful in reversing mangrove overexploitation and degradation. The experiences have instead been the frictions between the rural poor and the state, where the former deems to be deprived of their livelihoods. In this conflicting interface, restoration initiatives are stalled as desperate rural poor who know nowhere else to make a living continue to plunder on and live at the expense of mangrove forests. Furthermore, the paper provides an overview of the exemplary ground situation of the mangroves initiatives in Tanzania where policy failure, weak or dysfunctional institutions and little participatory awareness and self commitment are ruining not only the naturally regenerating mangroves but also the meagre restoration initiatives tried so far.

O-46 FOREST RESTORATION AND ARMED CONFLICTS: CHALLENGES AND POLICY OPTIONS FOR INDIA

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Forest restoration need not be a unmixed blessing in practice. Due to both foreseen and unforeseen factors restored forests can turn into hot-beds of armed conflict thus defeating the very purpose for which they were created. Dense forests help to provide scope for guerilla warfare strategies which non-forest land seldom provide. Amongst many developing countries with such bad experience is India which is facing bitter conflicts in its forested areas and restored forests in six states of India are currently affected by such conflicts. They include Jharkhand, Orissa, West Bengal, Madhya Pradesh, Andhra Pradesh and Chattisgarh. Many of such States have performed very well under the programme of the Joint Forest Management (JFM). The present paper is based on the experience of West Bengal on restored forests in the district of Paschim Midnapore where JFM is considered to be a success story. The district of Paschim Midnapore has a total area coverage of 1323.88 (thousand hectares) with 12.9 per cent as forest coverage. It is in Midnapore that the success of Arabari JFM experiment coupled with the social forestry programme led to its scaling up and its global proliferation.

Based on case studies, time line of events and stylized facts, the paper discusses that though the forest restoration practices under JFM are a necessary condition for forests to grow they need not be a sufficient condition for sustainable forest development. Timely interventions, continuous assessments, reflection and monitoring are crucial for reforested areas and strengthening of socio-economic position of local communities and their empowerment is a much larger issue and should be a pre-requisite for forest restoration strategies. Neglect of local communities and their livelihoods can only endanger restored forest areas and add to their vulnerability and hence make such areas vulnerable to divisive forces.

O-47 WHY THE CHANGE AFTER A CENTURY: KENYAN EXPERIENCE ON INITIATIVES TO CHANGE FORESTRY MANAGEMENT APPROACH

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For over a century Forestry Management in Kenya has been through command and control approach. It took a while for the country to start initiatives to change the century old management approach. The process is at cross-roads with community, civil society and Donors taking a lead in pushing the process though with divergent agenda. The government accepted the change principally to address forest degradation while the key agenda for the others was to address poverty. There are several initiatives towards supporting the change but this presentation will be limited to experiences from three projects which have been implemented with national impacts and have created a momentum for change. These projects are: Arabuko-Sokoke Forest Management and Conservation Project (ASFMCP), Forest/Range Rehabilitation and Environmental Management Strengthening (FORREMS) and IFRI. The projects have shown that: change does not occur in one day, realistic changes are achievable with multi-stakeholder participation and facilitation, change in community is directly proportional its impact on their livelihoods, communities are aware of what needs to be done to facilitate the changes but bureaucracy and poverty remains a challenge. For change to occur communities including other stakeholders need to be empowered and forest management decentralized. Change needs to be supported by institutions. Good governance in such institutions is critical for change. As change takes time to be realized, the change agents need to come up with short term projects that can act as incentives to the community to remain committed. Such projects include nature based enterprises that contribute to community livelihood. These projects should be started in government's forest as well as adjacent private farms to mitigate forest degradation. The projects reviewed show that there is high expectation that change in forest management approach in Kenya will contribute to improved forest condition and better livelihood for participating community members.

O-48 DECENTRALIZED FOREST MANAGEMENT: IMPLICATIONS ON TRIBAL COMMUNITIES OF RAJASTHAN IN INDIA

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Many developing countries in the southern hemisphere with low forest covers realized the significance of ëparticipation' of locals in sustainable forest management. This led to shift from centrally managed government ëscientific forestry' top-down approach towards decentralized participative forest governance in early 1990s. Decentralization reforms facilitate implementation of people's participation in forest management and devolve decision-making power. However, research studies from other forested developing countries also indicate that not all situations are amenable to decentralization and participation.

In this empirical research paper, we assess the existing participatory practices of the decentralized forest management on poor forest-dependent tribal women in western India. We highlight the impact of change in forest governance from the perspective of the country's marginalized ethnic minority communities, known as the Scheduled Tribe. India's struggle in implementing the tribal decentralization policy and devolving resources to panchayats (village institutions) are two folds. That is, how to serve interest of stakeholder pluralism, whilst ensuring at the same time local democratic devolution of constitutional power.

Findings from our research study in semi-arid degraded forest land with predominant tribal population indicate success as well as challenges of new mode of forest governance. Decentralized forest management facilitate regeneration of forests. The main limitations are state holds controls over ëwho' can access and participate. It raises question of participation, unless decentralization concept shifts towards discretionary decision-making and transition of tenure rights evolve an inclusive approach. The paper concludes equitable, secured, clear forest policy is key requirement to success for India's participative forest management.

O-49 PROTECTING JAMAICA'S FOREST RESOURCES, ONE LOCAL FOREST MANAGEMENT COMMITTEE AT A TIME

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The Local Forest Management Committee (LFMC) is a creature of statute and the brainchild of the drafters of Jamaica's Forest Act of 1996. On a strict reading of the Act, the LFMC is supposed to assist the Forestry Department with the management of all or part of a forest reserve or forest management area. One of their core functions is to assist in the design and execution of forest conservation projects within these reserves or management areas.

The creation to date by the Jamaican Forestry Department of Seven (7) LFMC's has served to encourage public participation in the restoration of lands adjoining forested state-owned properties. The concept of the LFMC has gained traction in many rural border communities as these individuals see the direct correlation between the protection of the forest and the generation of wealth via the establishment of viable livelihood projects.

The structure provided by the LFMC has become an incentive to community members with common interests to come together in order to access grant funding for projects geared towards building their capacity to develop and maintain financially sustainable initiatives. A prime example of this is the Cockpit Country LFMC which has approximately 150 members and which through the assistance of the Forestry Department and other local and international partners identified several money making mechanisms to sustain its members. These include a historical tour, a medicinal plant nursery and a cottage industry to name a few.

The expected outcome of these initiatives is that these persons who might otherwise have seized the opportunity to illegally remove natural resources from the forests to fulfill their economic needs, would view them instead as a source of income not from the illegal activity, but by maintaining and protecting its very integrity.

O-50 FOREST RESTORATION IN THE UK: A NON-GOVERNMENT PERSPECTIVE

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Forest cover in the UK is low (12%) compared with the European Union average (37%). More than half of forests are of non-native species planted mainly during the twentieth century for timber. The most important forests - 'ancient woodland' - cover just 2% of the land area.

The UK is a largely urban population with few people working on the land (less than 1% are farmers). Many people have lost any sense of connection with woods and forests and this has an impact on the way in which they understand and value them.

The Woodland Trust believes that there is a need for doubling native woodland cover in the UK. This is founded on the need to ensure adaptation for biodiversity and for people, and to improve opportunities for access to forests as a way of connecting people with the environmental necessities of the 21st century.

The paper outlines the priorities for forest restoration from the perspective of the UK's largest non-governmental woodland organisation. Adopting a landscape scale rather than a purely site focused approach is advocated as the best way to create resilient ecosystems to support biodiversity, but also create forest ecosystems which will help human society adapt to change.

The benefits of functioning forest ecosystems are well known, (protection of soils, flood alleviation and water quality, improving air quality, carbon sequestration and storage) but benefits to human beings (places for physical recreation, mental relaxation, cultural inspiration, community cohesion, urban regeneration) need to be more strongly stated.

The paper outlines the role of a non-governmental organisation in supporting both practical action and advocacy, and in providing ways in which people can value woods and trees, and to enable and support people to take action for woodland.

O-51 MAKING THEM WORK BETTER: CAPACITY BUILDING OF WOMEN FRONTLINE STAFF THROUGH GENDER SENSITIVE FOREST GOVERNANCE

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The State Forest Departments (SFDs) in India are armed with frontline staff working at the cutting edge of the forest hierarchy to protect, manage and have direct interface with various stakeholders in the forestry sector. Frontline staff has been traditionally male dominated but Andhra Pradesh, the fifth largest state in the country having significant forest cover took lead in recruiting women frontline staff on 30% reservation basis from 2003 onwards. However, Andhra Pradesh Forest Department (APFD) is facing the problem of low productivity of the women staff. This work presents various factors at different levels affecting the performance of women staff, critical concerns arising out of it and implications of low performance on forest management through diagnostic workshops, focused group discussions, personal interviews, perception & attitude survey, and constraints analysis. The findings are presented in tables and charts with relevant analysis. The work allocation disparities, lack of proper working environment, lack of gender sensitivity in administration, general perception of the society and communities toward women working in non-traditional jobs, low physical fitness and self confidence levels among women staff, and non-compatibility of personal life with professional life were found to be important factors affecting the efficiency and work output of women staff. The study suggests that APFD should look into gender policy, gender analysis and gender reporting areas for bridging the gaps and bringing positive change in perceptions and attitudes within the organization. Training and capacity building should be done in a focused way to improve skills and knowledge at technical and professional levels besides aiming at overall personality development. APFD should also provide proper work environment, opportunities and support framework to the women staff so that they can work effectively and contribute to the organization as well as the forestry sector.

O-52 REDUCED EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION: INSTITUTIONAL PERSPECTIVES ON OPPORTUNITIES AND CHALLENGES IN THE CONGO BASIN

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Tropical forests in developing countries have a central role to play in international policies designed to mitigate climate change through maintenance and enhancement of carbon stocks in forests. Forest rich countries in the Congo Basin, have the opportunity to benefit from the new policy, currently being negotiated, known as Reduced Emissions from Deforestation and Forest Degradation (REDD or REDD+). REDD, however, presents many challenges in implementation at the international, national and sub-national level. This research analysed the perspectives of the institutions of the state, private sector and civil society involved in forest and climate change issues on the opportunities and challenges of REDD in three countries; Cameroon, Central African Republic and the Democratic Republic of Congo. A qualitative approach was used in data collection and semi-structured interviews were conducted with representatives of formal national, regional and international institutions. Interview data was supplemented by a review of relevant documents, strategies, press releases and government statements. Results showed that knowledge of specific policy details was limited, but respondents were optimistic that REDD could contribute to forest conservation, economic development and reduction of poverty. The importance of resolving issues of forest access and tenure were recognized and respondents hoped that REDD would precipitate the process. Given the importance of the forest to the livelihoods of local people, it is important that they participate in institutional arrangements for implementation of REDD. Civil society actors in these countries will have a key role to play both in capacity-building and monitoring in such governance arrangements. It is essential that any REDD policy be accompanied by investment in rural agriculture to facilitate the transition away from the traditional system of shifting cultivation. Investigation into practical alternatives to shifting cultivation could be funded with some of the initial ëbridging' funds from the international community.

O-53 STRENGTHENING CAPACITY BUILDING IN THE FORESTRY DEPARTMENT OF PENINSULAR MALAYSIA IN MEETING EMERGING FORESTRY ISSUES

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Capacity building has been widely accepted as the "process of developing and strengthening the skills, instincts, abilities, processes and resources that organizations and communities need to survive, adapt, and thrive in the fast-changing world". As with any other organizations, Forestry Department of Peninsular Malaysia (FDPM) is also concerned with organizational capacity building, which is reflected in almost any aspect of organizational work, covering, amongst others, improved governance, leadership, mission and strategy, administration (including human resources, financial management, and legal matters), program development and implementation, fundraising and income generation, diversity, partnerships and collaboration, evaluation, advocacy and policy change, marketing, positioning and planning. The Department is also concerned about individual capacity building, particularly crucial in relation to leadership development, advocacy skills, training/speaking abilities, technical skills, organizing skills, and other areas of personal and professional development. Generally, capacity building is the element that gives fluidity, flexibility and functionality of a program/organization to adapt to changing needs of the population. This paper, therefore, endeavor to share the concern of the existing top management of the FDPM with regard to the efforts of the current capacity building and restructuring of the organization in early 2009 resulting in the current FDPM organizational structure. The paper will also highlight several initiatives undertaken by the FDPM in order to further strengthen the current efforts in capacity building in meeting emerging forestry issues.

O-54 'DIS WOOD KYAN DUN': INTENDED AND UNINTENDED CONSEQUENCES FOR LOGGING AND REDD OF THE COMMON BELIEF IN INEXHAUSTIBLE NATURAL TROPICAL FOREST IN GUYANA

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Tractor logging of the tropical rainforest in Guyana began in the late 1960s. 2-year and ~25-year logging concessions now cover 6.6 million ha, out of a national total of ~16.9 million ha. ~1.7 million ha are in titled indigenous lands. Some of the remainder is in formal conservation areas, some areas have been claimed by indigenous peoples since 1966, and some of the rest could be licensed for logging. Guyanese holders of logging concessions do not enjoy the huge (30 per cent) advantage in direct logging costs which has been negotiated in secret foreign direct investment arrangements by Asian-owned loggers at the highest levels in Government, so Asians now control legally and illegally between 70 and 98 per cent of the long-term concessions. In spite of censorship of data by the national forest service, it is evident that over-cutting of the preferred flooring and furniture timbers, and export to India and China of unprocessed logs, has increased. This is contrary to the industrialization policies of the nation and of the Party-in-Power.

However, a potential rival money earner has emerged in REDD schemes, and REDD+ for ìavoided deforestationî. The President of Guyana wishes to claim donor funds for reductions in emissions of forest carbon and simultaneously continue the carbon-emitting logging and mineral mining. He has also exaggerated the threat of future deforestation, although there is no evidence of demand for clearing of the forest standing on some of the most ancient and infertile soils on the planet. Initial proposals for a REDD reference scenario based on the country-wide 1950s aerial photography have been replaced by proposals based on these exaggerated threats.

The history and current state of this paradox are explored, with some interim lessons for future REDD negotiations.

O-55 "WE DON'T DO ANNUAL REPORTS NOW". DOCUMENTING TRENDS IN THE STATE OF FOREST MANAGEMENT IN PUBLIC FOREST ASSETS AND PRIVATE FOREST ENTERPRISES. HOW REDD MIGHT MAKE A POSITIVE DIFFERENCE.

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In late colonial times, and championed by the Empire Forestry Conference, great emphasis was placed on year-to-year comparative data to show progress in forest management. Such data were compiled into the annual departmental reports, which now constitute invaluable records of past achievements as well as failures. The contents of major libraries show that such systematic recording and reviewed publication has been abandoned in many countries, even when the forest law specifies that annual reports shall be produced and submitted to parliamentary scrutiny.

Does it matter that systematic national recording no longer takes place? Do intermittent returns to FAO and ITTO, plus sporadic consultancy reports, provide an adequate substitute? Are not the important markers of progress captured through criteria and indicators for sustainable forest management, either through government-backed schemes or through independent evaluations against forest certifications standards? And with the advent of schemes for trade in sequestered or emitted forest carbon, which require in principle very detailed assessments of the effects of forest management, are we not quite sufficiently informed about progress and regression in sustainable forest management (SFM)?

Annual and semi-annual reports from national forest services which are received into the libraries of the International Institute of Tropical Forestry in Puerto Rico and the Department of Plant Sciences (ex-OFI) at Oxford UK are analysed for trends. The changing nature of reporting on national forest management is analysed for Guyana, where the government has reduced the amount and utility of information, apparently to prevent critical analysis of illegal activities. The adequacy of reporting on specific enterprises is examined for the FSC certification system. The implications of forest carbon accounting for REDD are discussed.

O-56 THE EFFICACY OF FOREST LAW ENFORCEMENT AND ECONOMIC INCENTIVES TO PREVENT ILLEGAL LOGGING IN DEVELOPING STATES LESSONS LEARNED FROM IN AND AROUND TWO CONSERVATION AREA OF NORTH-EAST BANGLADESH

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Forest law enforcement has long been considered as the most useful approach to prevent illegal logging and widely practised amongst the nationals. However their efficacy and role to prevent illegal logging has questioned very often particularly in the tropics where there exists a complex socio-political context favored by chronic poverty and unemployment. Rehabilitation of illegal loggers through providing better access to various alternative income generating (AIG) opportunities is quite a new approach that has been adopted experimentally in some forest areas of Bangladesh. I conducted an exploratory survey to realize the effect of forest law enforcement and economic incentives to prevent illegal logging in two conservation areas in the north-eastern Bangladesh where government brought some illegal loggers under such approach. I interviewed a total of thirty recognized illegal loggers between early 2007 to mid 2009 following a semi-structured questionnaire. Additionally, some informal interviewees were taken from local forest officials and political leaders. Both qualitative and quantitative data were collected. Study suggested that, enforcement of customary forest law has no or very little impact on overall situation; even in some cases it has further worsened the condition as some illegal loggers continued their activity just to manage the cost of their court fees. In contrast, economic incentives under various AIG schemes were found very effective to handle this adverse situation as the both frequency and amount of illegal timber harvesting were considerably reduced compared to earlier period in both areas. The numbers of case filed against illegal logging were also reduced between 35% to 60%. Some other major factors hindering the situation identified wereó inappropriate forest law and inadequate forest staffs, political pressures and greediness, high demand of timber attributed by comparatively lower prices locally, high number of saw-mills in forest vicinity, easy transportation networks and lack of conspicuous forest boundary.

O-57 CLIMATE CHANGE, FOREST RESTORATION AND PAYMENT FOR ECOSYSTEM SERVICES

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Payment for Ecosystem Services (PES) is an innovative approach towards tackling climate change by using financial incentives to reduce emissions from deforestation and degradation. It is timely to examine how PES schemes are progressing and adapting to new opportunities. The paper deliberates upon PES approach to forest restoration and the various contexts in which it has been applied. An important need is to be flexible and adapt to lessons learned and changing circumstances.

PES can concomitantly benefit buyers and sellers and improve the resource base. Costa Rica pioneered such PES in developing countries by establishing a programme of payments. Its 1996 forestry law explicitly recognizes four forest ecosystem services: carbon fixation and sequestration, hydrological services, biodiversity protection, and scenic beauty. Through financial and legal mechanisms, local, national and international beneficiaries of forest services compensate those who protect them.

Indian judiciary instituted a compensatory afforestation mechanism. It collects funds from “buyers” to finance the restoration of forests and related ecological and aesthetic landscapes. This mechanism moved into implementation mode in 2009 with a corpus fund of over 2.2 billion US dollars and will release resources for forest restoration equal to the interest earned.

Drawing upon case studies, especially from Commonwealth countries, the paper concludes that the potential for PES to concurrently support sustainable development and forest restoration depends upon governance system and design of particular payment schemes. Participation of environmental services suppliers and buyers is enhanced through enabling policy and institutions.

Since climate change shall impact the capacity of forests to provide vital ecosystem services, the projected socio-economic consequences will be severe, more so for forest-dependent communities vulnerable to climate variability. PES strategies and schemes thus need to be designed to promote holistic and contextual approach to forest restoration, ecosystem services, human wellbeing, and climate change adaptation and mitigation.

O-58 ECONOMIC VALUATION, GREEN ACCOUNTING AND PAYMENT FOR ENVIRONMENTAL SERVICES - GEARS OF THE TOOLKIT FOR TACKLING IMPACTS CLIMATE CHANGE IN HIMALAYAN FORESTS OF INDIA

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Himalayan forests of India spread over twelve states of India contain 12.2% of total geographical area with 32.6 % forest cover of the country. The forests though provide a wide array of provisioning, regulating, cultural and supporting services which are mainly enjoyed free by the downstream states and by the global communities and also face complete green felling Supreme Court of India causing decline in local benefits. Thus the policy processes have created more fiscal disabilities and constrained the states to generate more revenues from their forests. Further the forest ecosystems of Himalayan states play a very significant role in both mitigation and adaptation of climate change and also offer considerable amount of insurance value related to ecosystem resilience i.e. ecosystem capacity to absorb shocks and re-organize so as to maintain its essential structure and function by maintaining ecosystem infrastructure. The paper argues that the main reason behind such plight is the lack of recognition of value of forest ecosystems in the markets and then in the national accounting system with the result that they are degraded or lost as decisions are made without full knowledge of their value. It uses total economic value and opportunity costs estimates of these forests to claims compensation from central planning agencies and amount of expenditure required for restoring degraded areas in forests using many guidelines for regenerating complete forest ecosystem. It stresses that various countries have been edging on cash crops of coffee, coco and cotton but now also have the potential to add another crop i.e. carbon and suggests ëforest carbon’ payments through carbon credits or REDD payments. All these gears if pooled in would form a very strong toolkit for restoring commonwealth forests for handling the problems of climate change.

O-59 CAN COMPENSATION FOR TROPICAL FOREST 'ECOSYSTEM SERVICES' HELP REDUCE VULNERABILITY TO CHANGES IN CLIMATE AND LAND USE?

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The value of forest resources to humankind is reaching the top of the agendas of both policy and science. Tropical forests are central to this debate because of their impact on climate and their response to climate change. They provide fundamental ecosystem services at multiple geographic scales including resource-poor communities that may be vulnerable to changes in climate and/or forest cover. Here, we combine climate predictions for S. America and Africa, and their relationship with land use (restoration/deforestation/management), in order to examine ëpayment for ecosystem services' (PES) scenarios that might operate in national, regional or larger-scale economic systems, but that are also acceptable to local communities. As an example we use the experience of a current UK-NERC & DFiD-funded project designed to develop capacity to implement such a program of ëcommunity compensation' for forest conservation and restoration. We quantify the potential for large-scale climatic impacts of changes in rain forest cover on key economic sectors such as agriculture and energy, and how this understanding can be linked to natural resource management for the benefit of forest-based communities. We examine how expertise in individual countries (e.g., Mozambique, Ghana, Brazil) or regions (East or West Africa, tropical South America) may be exchanged, and where successful PES methods have a structure that can be generalised or, instead, where they are location- and tradition-specific. This subject area is rapidly developing in concert with UN and other international climate and economic policy, for which we provide specific context.

O-60 RUBBER PLANTING FOR FOREST REHABILITATION AND ENHANCEMENT OF COMMUNITY LIVELIHOOD: A COMPARATIVE STUDY IN THREE SOUTH ASIAN COUNTRIES

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Currently in Southeast Asian uplands, there is an agricultural transition underway from subsistence production based on shifting cultivation to commercial production based mainly on small-scale rubber (Hevea brasiliensis) cultivation which supports stabilizing shifting cultivation and livelihood options for poverty reduction. In this study, we examine to what extend rubber planting help to rehabilitate forest land degradation and enhancement of community livelihood. Relevant data were gathered from three south Asian countries (Bangladesh, India and Sri Lanka) through key-informant's interviews, semi-structured household interviews, plantation visits and synthesis of secondary information.

Substantial quantity of land has been brought under rubber plantations in three countries but there are differences in terms of stock, growth and livelihood impact. Current tree stock and growth revealed that plantations in India and Sri Lanka seem normal and growing satisfactorily. Strong institutional supports in terms of necessary training to farmers, regular monitoring and maintenance, application of timely and regular silvicultural practices such as weeding, watering, fertilization and gap filling, timely disbursement of money for plantations maintenance, and overall farmer's awareness about the benefits of rubber attributed to the satisfactory plantations conditions in both countries. Due to engagement with rubber plantations, farmers' livelihood enhanced through access to and formation of livelihoods capital. Once they were shifting cultivators, many of them have given up shifting cultivation and diversified their livelihood strategies through home gardening, irrigated farming and livestock husbandry.

Being a pure monoculture, rubber plantations would have high risks in terms of plantations failure and price fluctuation. Recommendation is made to establish a mixed cropping system with other economic plants such as fruits, medicinal plants, timber, etc. that will enrich local biodiversity and provide short and long-term sustainable benefits to the farmers.

O-61 FOREST PROTECTION AND LIVELIHOOD: AN INVESTIGATION APPLYING DISCRETE DEPENDENT VARIABLE MODELS

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'Sal (Shores robusta)' forest is the only plain land forest in Bangladesh which has been exploited to a threatening extent to the environment for the last couple of decades. The Forest Department undertook reforestation program with the association of NGOs and rehabilitated many people in the encroached area. They were given encroached forest land for reforestation with other necessary support such as high quality seedlings, training and financial support as well. At the beginning of the establishment protecting the newly replanted forest was a concern for the Forest Department as theft and illicit logging was one of the major problems causing exploitation. The Forest Department assumed that proper protection can help minimize over-exploitation of newly planted forest as well as the existing forest. The Forest Department also hypothesized that the demographic attributes of the stakeholders may affect the protection activities. This study focuses on how reforestation affects sustainability issues along with identifying the variables that affect the protection activities. The sample size of the study was 356 which were selected by using simple random sampling method. The model analyzes forest protection aspects using discrete dependent variable models (Logit and Probit). The study also compared two models for better identification of the variables affecting the intension of protection by the stakeholders. The livelihood indicators were examined using non-parametric statistics with respect to income factor. The findings of the study show that there is a significant change in livelihood as well as in the environmental aspects. The decision of protection is affected by the age, family size, and education. The study recommends that the involvement of rural poor can be useful for increasing the forest cover of the country undoubtedly but demographic improvement is one of the main key issues that can stop people from premature logging to ensure sustainability.

O-62 CLIMATE CHANGE: ALSO AN OPPORTUNITY FOR POVERTY ALLEVIATION

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For the small farmers the high associated costs for tree planting, are not promoting this activity, unless there is a mechanism which could compensate those costs. There are voluntary mechanisms which are buying carbon offsets coming from the carbon services provided by growing trees, and it can be a potential source of investment capital, to be used for promoting development productive forestry systems.

In Mozambique, there is a project where people are benefiting from sale of carbon offsets to voluntary carbon markets. These carbon offsets has been marketed by Envirotrade Limited (a United Kingdom based company) and sold to buyers who wish to invest in poverty alleviation, biodiversity conservation and climate change mitigation in Mozambique. The project are developing forestry and land-use practices that promote sustainable rural livelihoods in participation with rural communities in a way that raises living standards through the generation and sale of verifiable carbon emission reductions.

The project is located in Nhambita, in the central province of Sofala, where the farmers has been paid for investing in sustainable, economic viable and productive agroforestry systems, and in change the activities are providing carbon sequestration from the atmosphere, contributing at some extent for stabilizing Earth's climate. Plan Vivo is the scheme in use in this project to assure to the buyer that the carbon offset bought has been really sequestered. The project have started in 2004/2005 and so far there are more than 1 000 families involved, which have planted more than 20 000 trees in approximately 1 500 ha. More than US$80 000 were used to pay the farmers directly and US$20 000 for the established Community Fund

O-63 INITIATIVES OF NABARD IN RESTORING DEGRADED LANDS WITH COMMUNITY PARTICIPATION THROUGH AFFORESTATION AND REFORESTATION (AR) ACTIVITIES UNDER WATERSHED APPROACH IN INDIA

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NABARD in 1990s initiated a programme to reduce poverty and improve the standard of living of people through watershed development under which various activities viz. soil and water conservation, crop management, fodder development, livestock management including afforestation activities with people's participation were undertaken. The Afforestation activities under Kyoto Protocol can demonstrate a win-win situation from the point of view of climate change and sustainable development. After meeting the rules, revenue generated from sale of carbon credits from AR projects offer huge potential for diversifying Indian agriculture and increase the livelihood base of Indian farmers. Under watershed approach NABARD has developed 1.3 million hectare area till June 30, 2009 in 17 Indian states with mainly grant assistance of Rs.6601 millions (1 Pound Sterling=INR 78). Initially it initiated watershed development under Indo-German watershed development project in Maharashtra, Gujarat and Rajasthan States. Later on in 2000, a watershed development fund was created with a contribution of Rs. 1000 million each by Indian Government and NABARD. It has been estimated that around 5% of watershed areas are under tree plantation which accounts for 65,000 hectares and are eligible for Carbon Emission Reduction (CER). Generally under well managed AR projects, 20 tone carbon emission per ha is reduced. Based on this assumption 65,000 ha area under AR will be responsible for reducing a total of 1.3 million tone carbon emission. NABARD has appointed a consultant to undertake detailed studies on this so that actual CERs of these plantations can be estimated for obtaining carbon credit and mitigating climate change.

O-64 EXPERIENCES OF A RESEARCH INSTITUTE IN FOREST RESTORATION PRACTICES IN NIGERIA

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In the middle of global economic fluctuation, food insecurity, poverty, diverse environmental related problems associated with climate change, increased human population and their over dependence on forest resources particularly in developing countries culpable of declined and aggravate forest depletion, many actors in Africa both in private and public sectors had encouraged the idea of judicious management of forest and its resources. One of such public sector in Nigeria is the Forestry Research Institute of Nigeria. This paper reports the activities championed by the institute within its mandates particularly in the area of forest conservation and management in the six ecological zones the country is divided into to recuperate the nations' ecological integrity known of typical tropical region. This quest for environmental service led to the established permanent plots and diverse forest practices pioneer by the institute in and around ecologically sensitive and degraded areas across the country. Efforts are however not complimentary with achievement during monitoring and evaluation stage. This was the reason why this research was conducted to investigate the reason(s) for the failure recorded. Inability of the institute to harmonize the benefiting communities at the beginning of the practice was major as demonstrated in their refusal demonstrated through diverse irrational utilization of all the areas including its resources. From this investigation and experience learnt, this paper was prepared to provide guidelines for the acceptance of forest restoration practice and its sustenance in developing countries where sustainable forest management has been grossly inadequate and poorly implemented. It was concluded that for the practice to be sustained, reliable measures on how to transform the practice into viable communities' participation capable of empowering pro-poor in Nigeria and similar areas through communities' adaptive strategies from the planning stage was very crucial.

O-65 A 5-YEAR PILOT PROJECT FOR AVOIDING DEFORESTATION AND RESTORING WOODLANDS IN AFRICA

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We describe a pilot project aiming to develop sustainable land use and rural development in the buffer zone of the Gorongosa National Park in Sofala Province, Mozambique, linked to carbon payments for forest and woodland-related activities. Its duration was five years, from 2003 to 2008. We established baselines at the onset of the project, against which the effect of project activities could be assessed. These include surveys of the socio-economic status of the community (ii) inventory of forests and their carbon stocks (iii) measurement of rates of change in land cover, especially the rate of loss of woodland (iv) carbon and nitrogen stocks in soils and (v) a baseline survey of charcoal making, which, combined with slash and burn agriculture, is a major contributor to the loss of woodlands. Project activities were: (i) establishing agro-forestry practices on farms where slash and burn agriculture was hitherto the normal practice (ii) training local people to reduce the loss of woodland by adopting a woodland management regime that includes fire control (iii) developing micro-enterprises including furniture-making, bee-keeping and horticulture. Carbon revenue has been received world-wide from individuals and organisations who seek to offset their carbon emissions. After five years, there is clear evidence that over 1000 farmers are planting trees, that the trees are surviving and growing according to the expectation. Records are being kept. Woodlands are being actively managed and fire control measures are in progress. A repeat socioeconomic survey (made by visiting households in 2004 and 2008) shows employment has increased from 8.6% to 32%, and that 73% of households raise commercial crops compared to 23% previously. There has also been a development of social capital, with a measurable increase in literacy and the development of a business ethos with associated practical skills.

O-66 USING REMOTE SENSING TO MAP FOREST COVER CHANGE IN SAVANNA WOODLAND: A CASE STUDY IN MALAWI

Gemma Cassells, Iain Woodhouse, Genevieve Patenaude
University of Edinburgh, Edinburgh, UK

Malawi, a landlocked country in southeast Africa, is one of the poorest countries in the world. Projections based on primary forest loss experienced between 1990 and 2005 suggest that all primary forest in Malawi will be degraded or deforested by 2020. Because of this, there is much interest in forest resource mapping and assessment, particularly with regards to implementing any proposed Reductions in Emissions from Deforestation and Degradation (REDD) mechanism. Technologies such as remote sensing provide a unique opportunity to monitor and map forest cover change on spatial and temporal scales not otherwise possible. In order for REDD to work in Malawi, there is a need to first map forest cover change in order to calculate baselines for any carbon credits or ecosystem services payments. This paper will present results from forest cover change mapping across Malawi using a variety of satellites including radar and optical data. The most suitable methods for mapping Malawiís heterogenous savanna woodland will be identified, with Malawi serving as a case study to inform future policy making decisions at the global scale. The results of these analyses can also be used as a benchmark to help quantify the success of future carbon offsetting schemes, improve protection of forest reserves and national parks through specific targeting of resources, and be used in conjunction with other socio-economic data to help monitor the success of the National Forest Programme.

O-67 RELIABLE FOREST CARBON MONITORING - APPLYING A PARTICIPATORY EVIDENCE-BASED FRAMEWORK TO VALIDATE THE KNOWLEDGE BASE

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Agreement on a reliable international finance mechanism for Reduced Emissions from Deforestation and Degradation (REDD) is being negotiated within the United Nations Framework Convention on Climate Change. With credits globally valued at up to 30 billion US$ per year, carbon credit accounting under REDD will almost certainly mean that the quality of forest measurement and monitoring systems will need to improve. Many countries may need to invest heavily in monitoring systems in order to participate in the REDD mechanism. The choice of which system to adopt should be guided by good science. There is a growing body of scientific and technical information on ground based and remote sensing methods of forest carbon measurement. However, the adequacy of different national systems for forest carbon measurement under REDD has not been fully evaluated. An international participatory initiative was undertaken to analyse the relevant literature systematically using an evidence-based framework of the type widely regarded in medicine and other policy areas as the gold standard for evidence evaluation. An international group of 37 people representing different areas of specialization collaboratively framed a review question and agreed a protocol to enable published and unpublished literature on methods of forest carbon measurement and assessment to be reviewed systematically. Experiences from the scoping phase are presented and implications for the final results of the systematic review are discussed in the context of the demand for evidence-based policy and participatory decision-making by governments, and the lack of high quality syntheses of the evidence base in forestry in general and forest monitoring in particular. The project demonstrates a multidisciplinary participatory approach to the analysis of complex and often contradictory science and suggests that the approach may be applicable to, and generate benefits for, decision making more widely within the forestry and natural resources management fields.

O-68 ACHIEVING FOREST RESTORATION AND SOCIAL DEVELOPMENT THROUGH REDUCING EMISSIONS FROM DEFORESTATION AND DEGRADATION IN MALAWI

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As governments move towards an international agreement for Reducing Emissions from Deforestation and Degradation (REDD) in developing countries, there continues to be uncertainty over how such a mechanism might overcome socio-economic and governance constraints to achieve significant emission reductions that facilitate forest restoration and social development. The paper is based on a study undertaken around the Malosa Forest Reserve in southern Malawi using data collected from household surveys, participatory rural appraisals and semi-structured interviews with forest users and forestry professionals. The findings indicated that large disparities in food, energy and livelihood security, both at household and community level, were the central cause of forest degradation within the Reserve. It is highly likely that communities will continue to encroach on the Reserve as current agricultural yields do not meet their nutritional requirements. Also, casual workers in the communities suffer from high food insecurity and have a small asset base, so they often resort to forest degrading activities (e.g. charcoal production) to maintain their livelihoods. Forest restoration using REDD would need to address each of these socio-economic issues to ensure the permanence of emission reductions and this is likely to present challenges for project implementation. The opportunity cost of charcoal production, a dominant driver of forest loss in the Reserve, is US$9.7 per tonne of CO2 emitted. Therefore current market price trends suggest that REDD-financed restoration has the potential to provide economically attractive livelihood alternatives for producers and a viable investment for foreign investors. The paper concludes that for REDD-funded restoration to be effective in Malawi it will need to be pro-poor; incorporate equitable benefit sharing mechanisms that adequately compensate affected stakeholders; and be economically attractive to both investors and local communities. The lessons from this study have relevance for all Commonwealth countries with tropical forests.

Poster Abstracts

P-1 UNDERSTANDING PLANTATION TRANSFORMATION AND UNEVEN-AGED STAND MANAGEMENT USING A SIMPLE SIZE-STRUCTURED MODEL

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Concerns about biodiversity and the longterm stability of forest ecosystems have lead to changing attitudes with respect to plantations. These artificial communities are ubiquitous, yet provide reduced habitat value in comparison to their naturally established counterparts, key factors being their high density, homogeneous spatial structure, and evensized/ aged nature. However, transformation (manipulation of plantations to produce stands more reminiscent of the natural state) represents a major challenge for forest managers, and the shift from evento

Unevenaged stand management is far from simple.

A sizestructured model, which implements simple rules to simulate the growth and fate of individuals in a spatial arena, is presented. This allows generic aspects of the temporal evolution of single species forest stands (from plantation to “oldgrowth” state) to be identified. The model is parameterised and validated using plantation and seminatural data from Caledonian Scots Pine (Pinus Sylvestris L.) stands.

This deeper understanding of the population dynamics allows robust recommendations for diverse unevenaged stand management objectives to be made. Approaches to optimising the process of transformation are considered, in addition to questions relating to biomass yield and carbon storage in an unevenaged (“continuous cover”) context.

P-2 URBAN TREE COVER AND CLIMATE CHANGE ADAPTATION IN THE UK

Hilary Allison
Woodland Trust, Grantham, UK

Around 80% of the population of the UK lives in urban areas, and worldwide the figure has now passed 50%. Urban tree cover is an essential element in to the provision of ecosystem services and climate change adaptation; in particular the impact on urban heat island effect, air quality, health, surface water flooding and energy conservation.

Despite this urban tree cover is deteriorating in some urban areas and the opportunities for expanding cover are being missed. Socially disadvantaged groups are particularly poorly served by urban tree cover and are also the groups most vulnerable to many of the impacts of climate change and most likely to benefit from an improved environment.

Restoration of urban tree cover can also provide opportunities for public engagement and greater community cohesion; from community woodland groups to participation in tree planting and community street tree schemes.

This paper reviews the current state of tree cover in urban areas in the UK and the evidence in support of an expansion of tree cover, including trees in streets, parks and urban woods and in the development of green infrastructure. Examples are given from the UK.

There are real costs associated with failing to act to protect and expand urban tree cover, and real savings and advantages in the use of urban tree cover for adaptation. The paper suggests that with climate change as the key policy drivers across many sectors public policy the case for restoration of urban tree cover is compelling and urgent.

P-3 USING REMOTE SENSING TO MAP FOREST COVER CHANGE IN SAVANNA WOODLAND: A CASE STUDY IN MALAWI

Gemma Cassells, Iain Woodhouse, Genevieve Patenaude
University of Edinburgh, Edinburgh, UK

Malawi, a landlocked country in southeast Africa, is one of the poorest countries in the world. Projections based on primary forest loss experienced between 1990 and 2005 suggest that all primary forest in Malawi will be degraded or deforested by 2020. Because of this, there is much interest in forest resource mapping and assessment, particularly with regards to implementing any proposed Reductions in Emissions from Deforestation and Degradation (REDD) mechanism. Technologies such as remote sensing provide a unique opportunity to monitor and map forest cover change on spatial and temporal scales not otherwise possible. In order for REDD to work in Malawi, there is a need to first map forest cover change in order to calculate baselines for any carbon credits or ecosystem services payments. This paper will present results from forest cover change mapping across Malawi using a variety of satellites including radar and optical data. The most suitable methods for mapping Malawiís heterogenous savanna woodland will be identified, with Malawi serving as a case study to inform future policy making decisions at the global scale. The results of these analyses can also be used as a benchmark to help quantify the success of future carbon offsetting schemes, improve protection of forest reserves and national parks through specific targeting of resources, and be used in conjunction with other socio-economic data to help monitor the success of the National Forest Programme.

P-4 RESTORATION OF A DAMAGED URBAN FOREST PARK IN HALIFAX, CANADA

Peter Duinker[1], Robert Leblanc[2], John Simmons[3], Peter Bigelow[3], Edward Versteeg[2], Stewart MacMillan[3]
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Point Pleasant Park is a 70-hectare urban forested landscape in the south end of the Halifax peninsula, Nova Scotia, Canada. The Park is heavily used by Haligonians mainly for walking, jogging and dog-walking. An ice storm and a beetle outbreak damaged significant portions of the ca. hundred thousand mature trees in the Park in the 1990s. In September 2003, Hurricane Juan blew down some three-quarters of the remaining trees. Following the cleanup, the Park re-opened to the public in June 2004. Park users expressed strong desires to get the forest back. An intensive planning process in subsequent years yielded the Park's first-ever comprehensive plan. Along with programs for shoreline stabilization, visitor management and protection of cultural heritage, a sustainable forest management (SFM) program was created. We present the principles used in forest restoration, as well as the values, objectives, indicators, targets and actions elaborated for the forest. Raising forest resilience in the face of a changing climate was an overriding theme in designing the SFM program for Point Pleasant Park. The comprehensive plan, finished in October 2008, won both local praise and a few national awards.

P-5: REHABILITATION OF STATE FORESTS FOR THE BENEFIT OF COMMUNITIES IN SOUTH AFRICA

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Forest restoration includes re-establishing the presumed structure, productivity and species diversity of the forest originally or potentially present at a site. In time the ecological processes and functions of the restored forest should closely match those of the original or potential forest. Climate change on another note, has always been a natural process but in recent years human activities have aggravated it, leading to potentially drastic effects. This is an urgent and critical challenge facing humanity, threatening socio-economic and environmental processes that cannot adjust at the same pace.

Forests and trees are the centre of socio-economic development and environmental protection of the African continent, yet Africa is one of the most vulnerable regions to climate change. This is a serious threat to poverty eradication programmes and the environment. In the forest sector there is an urgent need to develop and implement forest-based strategies for responding to climate change on the continent.

South Africa is restoring and increasing afforestation through greening programmes, participatory forest management and community forestry to improve livelihoods and address poverty. This is also a mitigation and adaptation measure for climate change. This strategy also links to agrarian reform and food security initiatives.

P-6 USING SATELLITE RADAR DATA TO MONITOR WOODY BIOMASS OVER AFRICA

Edward Mitchard[1], Patrick Meir[1], Sassan Saatchi[2], Iain Woodhouse[1], France Gerard[3], Grace Nangendo[4], Simon Lewis[5], Ted Feldpausch[5], Natasha Ribeiro[6], Casey Ryan[1], & Mat Williams[1]
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Regional-scale above-ground biomass (AGB) estimates of African savannas and woodlands are highly uncertain, despite their covering the majority of the land area of the continent, and their huge importance both as providers of ecosystem services and as a highly dynamic component of the carbon cycle. In addition, at a smaller scale, there is a need for reliable and low-cost ways to measure changes in the woody biomass of forest, woodland and savanna areas for forest preservation and management. It has been hoped that satellite remote sensing might provide this, but optical satellite data is often blighted by cloud cover, and relationships between variables and AGB can be poor and region specific.

There has been hope that radar remote sensing data may provide stronger and more consistent relationships between a remote sensing variable (in this case backscatter) and AGB. To test and develop this theory, we collected field inventory data from 253 plots at four study sites in Cameroon, Uganda and Mozambique, and examined the relationships between field-measured AGB and cross-polarized radar backscatter values derived from ALOS PALSAR, an L-band satellite sensor. The relationships were highly significant, similar among sites, and displayed high prediction accuracies up to 150 Mg ha_1 (±_20%). AGB predictions for any given site obtained using equations derived from data from only the other three sites generated only small increases in error. The results suggest that a widely applicable general relationship exists between AGB and L-band backscatter for lower-biomass tropical woody vegetation. This relationship allows regional-scale AGB estimation, required for example by planned REDD (Reducing Emissions from Deforestation and Degradation) schemes, and will enable the production of more accurate biomass maps, helping us to understand the carbon balance these dynamic ecosystems.

We also present an example from Cameroon of using this relationship between radar backscatter and AGB to quantify changes in AGB over an 11-year period by using L-band radar data from the JERS-1 satellite from 1996. This shows that radar data can be used to monitor changes in biomass, and repeat passes from the same sensor should enable deforestation, degradation and woody encroachment to be monitored accurately.

P-7 ANALYSING FOREST SUSTAINABILITY UNDER VARIOUS CLIMATE CHANGE SCENARIOS: A CASE STUDY IN NORTHERN SCOTLAND

Stefania Pizzirani, Barry Gardiner, David Edwards, Mike Smith
Forest Research, Roslin, Midlothian, UK

One of the major challenges for forestry in the 21st century is how to ensure, measure and assess forest sustainability. The Northern Tosia (Tool for Sustainable Impact Assessment) project is focussed on developing tools for assessing the sustainability of forest based activities in rural areas. The Scottish case study, one of four formed within the project, is based on Inshriach Forest within the Cairngorms National Park. This case study examined how management options due to changing climatic conditions impact a number of sustainability indicators and enterprises dependant on the forest.

The case study first assessed the current structure and proportion of 5 Forest Management Alternatives (FMAs). These describe a range of clearly identifiable forest management strategies with their associated forest operations and range from Forest Nature Reserve to Intensive Wood Biomass Production.

The percentage share of Forest Management Alternatives varied according to the following four scenarios:

1. Business as Usual, i.e. the current management regime.

2. Climate change increasing the intensity of biotic threats, along with a parallel target of forested land being restored to broadleaves.

3. Restoration of intensive forested areas to a more “natural” system in order to increase both biodiversity and attractiveness for tourism.

4. Responding to climate change mitigation policies as woodfuel industries increase their demand for wood chips.

The impact of these scenarios was measured against various sustainability indicators including Gross Value Added, Greenhouse Gas Emission and Carbon Stock, Forest Biodiversity, Employment, and Recreation.

The aggregated indicator results from the completed analysis were presented to various stakeholder groups representing a range of industrial, environmental, and community enterprises. A multi-criteria analysis was performed from the viewpoint of each stakeholder group. This allowed for a comprehensive review of how the proposed changes in forest management might affect the diverse priorities of each group.

P-8 STATUS AND POTENTIAL OF BIOFUELS IN INDIA AND THEIR ROLE IN MITIGATION

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Biofuels developments initiatives through setting up new energy plantations has potential of reclaiming wastelands and restoration of under stocked forest area of the country besides mitigating the climate change impact and generating opportunities to enter the world carbon market. The promotion of biofuels as efficient and clean alternatives to fossil fuels can be an instrument to overcome the barriers and constraints in energy development of the country. In line with the requirements relating to biofuel development, Government of India targeted to meet 20% of the total diesel requirement using biofuels by 2011-12, besides formulating ambitious programmes and policies viz National Biodiesel Mission, National Biodiesel Policy 2005. A potential of 36 Mt of Certified Emission Reduction of Carbon Dioxide (CERs CO_2) equivalents has been estimated for bio-energy based activities by replacing 8.5 Mt of fossil fuels in the country. The potential of biofuels in climate change mitigation, issues and legal frameworks, review of existing policies, need elaborate analysis to shape future strategies of biofuel developments in India. The present paper recommends strategies regarding biofuel developments and as a source of overcoming emerging energy needs and mitigation.

P-9 REDIRECTING ACADIAN FOREST MANAGEMENT FOR RESILIENCE IN THE FACE OF CLIMATE CHANGE

James Steenberg, Peter Duinker
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Global climate change is increasingly relevant in managing Canada’s forests sustainably. Forest managers are faced with the necessity of incorporating climate change into forest management plans. The formulation and evaluation of potential management strategies to contend with expected impacts of climate change will be necessary to reduce forest-sector vulnerability. The Halifax Regional Water Commission manages forest watersheds for the purpose of supplying clean water to much of the Halifax Regional Municipality. The purpose of this study is to characterize the future forest structure of the two principle watersheds supplying the Halifax Regional Municipality using simulation modelling and to develop a framework of adaptive forest management recommendations. A combination of expert consultation and field data collection will be used to refine, calibrate, and validate the spatially dynamic landscape disturbance model LANDIS-II prior to the incorporation of climate change scenarios into model simulations. Final model-based analysis will inform framework development dedicated to improving watershed resilience in the face of future climate change. This is a forest management scenario where the principal objective is the maintenance of water quality as opposed to timber production and therefore offers a unique opportunity to implement cutting-edge silvicultural practices and adaptive forest management focused on climate change resilience.

P-10 HOUSEHOLD LEVEL ADAPTATION TO CLIMATE CHANGE A STUDY ON THE FOREST DEPENDENT COMMUNITIES IN THE DROUGHT PRONE AREA OF WEST BENGAL, INDIA

Jyotish Prakash Basu
West Bengal State University, Kolkata, West Bengal, India

There are two main responses to climate change. One is adaptation and other is mitigation. Adaptation is gaining importance in the climate change policy arena, as people feel that climate change cannot be totally avoided and mitigation policies take time before being effective. Trees are not just carbon stores. Forests are home to the people who are entirely or partly dependent on forests for their livelihood. In India 700 million rural populations directly depend on climate-sensitive sectors like agriculture, forest and fisheries and natural resources for their subsistence and livelihood. In addition to providing traded goods, hydrological and atmospheric services, and soil protection, forest provide water, food, medicines, shelter, and resources of livelihood for the communities that live in and around the forests. This paper attempts to study the household level adaptation strategy to climate change. The objective of the paper is to examine the adaptative response to the households in order to cope with the adverse effect of climate change. This paper is an empirical study based on data collected through field survey. This is an empirical paper based on field survey data. Two villages and 65 households in 2008 have been taken into the analysis in the drought prone area of West Bengal. The results of the study revealed that the households followed the adaptative measures like migration; microfinance through the formation of Self-help Group (SHGs), participation of women in forestry, water harvesting, accessibility of non-timber forest products and agro-forestry. In addition, this paper also examines the socio-economic conditions of the sample households who are dependent on forest resources for livelihood. In this paper governmental policies including forest policy and developmental policies are addressed in combating the adverse effect of climate change. This paper has important policy implication for forest conservation, sustainable forest management practices, and rural development.

P-11 JOINT FOREST MANAGEMENT, DEFORESTATION AND LOCAL PEOPLE PARTICIPATION A CASE STUDY IN WEST BENGAL, INDIA

Jyotish Prakash Basu
West Bengal State University, Barasat, India

Forests play an important role in mitigating climate change. In India Joint Forest Management (JFM) has emerged as an important intervention in management of forest resources. The primary objective of JFM is to ensure sustainable use of forests to meet local needs equitably while ensuring environmental sustainability. Under Joint Forest management (JFM) village communities are entrusted with the protection and management of nearby forests. The effective involvement of village communities in evolving sustainable forest management systems has been looked upon as an important approach to address the long-standing problems of deforestation and land degradation in India. India has implemented a very large Joint Forest Management (JFM) program covering nearly 85,000 villages and more than 17 million hectares. Under JFM, the village community gets a greater access to a number of Non Timber Forest Products (NTFPs) and a share in timber revenue in return for increased responsibility for its protection from fire, grazing and illicit harvesting.

The objective of the paper is to examine how Joint Forest Management (JFM) helps to restore the degraded forest land involving the local people participation in the conservation and management of forest. This paper is an empirical study based on data collected through field survey. This study covers two villages- Kolaberia and Kalyanpur- located in Sonamukhi forest area in the District of Bankura of West Bengal, consisting of 65 households in 2008. The results of the case study revealed that illegal felling of trees has been stopped and the non-timber forest products have impacted on the livelihood of the villagers. But the NTFPs which are the important contributors to the livelihood of villagers are neglected by the West Bengal Forest Department (WBFD). This paper has important policy implication for forest conservation, sustainable forest management practices, and rural development, environmental sustainability.

P-12 RESTORING FORESTS, PROMOTING CARBON SEQUESTRATION - SUSTAINING LIVES IN RURAL COMMUNITIES IN GHANA

Glen Asomaning
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Wild fires in the early 1980s destroyed very rich forests in the transition zone of Ghana. Local communities with the support of the Ministry of Lands and Natural Resources of Ghana are undertaking forest restoration activities of these degraded forest reserves to prevent the recurrent incidence of wild fires and also to promote the sequestration of carbon.

The goal of this study, a Master of Science research, was to assess real and potential benefits of this restoration activity to the community. Secondly, recognising the strong variation among the carbon sequestration potential of different species, regions and management even within a relatively small geographic area, field work was undertaken to assess the actual carbon storage potential of the stands. Stratified clipping method of biomass assessment was adopted to study carbon stocks of six, 13, 19 and 31 year old plantation stands. Estimates of 19.38, 21.59, 34.28, and 52.04 Mg C per hectare were found for stands for the various ages respectively.

The main income for the respondents was wages earned from engaging themselves in the plantation. This was found to range from US $35 to US $40. Extra income was generated from sale of agricultural produce from farming the same lands which increased average monthly income to US $75 and increased food security in the process. This amount may seem small but provided the only source of livelihood for many of the respondents. Energy needs of a greater part of the community were met from the plantations that would otherwise have been met from nearby natural stands of forest thereby keeping adjacent forest intact.

Adequately designed and implemented therefore, paid plantations on degraded lands involving local communities can sustain livelihoods, avoid deforestation and restore forest cover and forest density and provide an opportunity for carbon sequestration purposes in rural communities.

P-13 EXPOSITION OF "SENSE OF PLACE" AS A STRATEGY FOR FOREST CONSERVATION IN RURAL NIGERIA

Uchendu Chigbu
Technical University of Munich, Munich, Germany

Nigeria lost more than 37 percent of its forest reserves in the past 15 years as a result of illegal logging, incessant bush burning, fuel-usage and forests-clearing for farming and other land uses. The consequences have proved to be dire to the country, especially in the rural areas where most of the countryís forest resources are located. Conserving and restoring the country's forest reserve requires collective and decisive action from all stakeholders, but especially from the rural people. This research seeks to characterize the relationship between deforestation and place-attachments formed by people in rural Nigeria, with the objective of showing that there is a qualitatively significant relationship between deforestation and the place-attachments rural people have in their immediate environment, vice versa. This will be done via the deconstruction of "sense of place" as a social-cultural factor in rural resource management and creation of a model for its incorporation as a strategy in forest conservation in Nigeria. On the basis of the theory of rationality, the research emphasizes on the culture consequence of forest conservation and makes recommendations on how the place-attachments concept can be applied as a boost to forest conservation in order to maintain better environmental protection and rural development in Nigeria.

P-14 PUBLIC PARTICIPATION IN FOREST RESTORATION: A UK PERSPECTIVE

Hilary Allison, Mike Townsend
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Forest cover in the UK is low (12%) compared with the European Union average (37%). More than half of forests are of non-native species planted mainly during the twentieth century for timber. Around 80% of the UK population lives in urban areas with few people working on the land (less than 1% are farmers). Many people have lost any sense of connection with woods and forests and this has an impact on the way in which they understand and value them.

Part of the role of the Woodland Trust is to create opportunities for participation in forest restoration as a way of ensuring that people value trees and forests and the services they provide, and to encourage active engagement with the natural environment. In particular involving children in tree planting is seen as important in nurturing an understanding of both trees and forests, and wider environmental issues and concerns.

The poster display will outline the projects and techniques from around the UK used to encourage participation including;

- Tree for All - a campaign aimed at giving every child the chance to plant and tree
- Woods on Your Doorstep - the planting of 250 community woods to mark the new millennium
- Community Woodland Network supporting community action for woods
- Tree planting projects with the Guides and the Scouts
- Planning for real and participatory techniques such as appreciative inquiry

P-15 ENHANCING ADAPTIVE CAPACITIES OF TRIBAL COMMUNITIES AGAINST CLIMATE CHANGE BY INTRODUCING AGROFORESTRY PLANTATIONS ON WASTELANDS IN INDIA- A CASE STUDY

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Koraput district is the hub of tribal population of India. The people are poor, illiterate and make a living through traditional crop cultivation and gathering forest products. Ballarpur Industries Limited (BILT) encouraged them to grow Eucalyptus on their wastelands for purchase after five years and assisted 600 farmers by providing credit. Although BILT had lent Rs. 9.56 million (1 Pound Sterling=INR 78), the demand of fund grew, hence it approached NABARD for funding for rehabilitating 2000 hectare wastelands. The senior author visited the area and held discussions with the officials of BILT, the farmers and NGO. It was observed that the wastelands of small landholders were used for raising Eucalyptus clonal plantations at spacing of 3.0 m x 1.5 m which could fetch them an income of Rs.0.1million per hectare. NABARD agreed to provide credit but faced problem in funding the farmers directly, hence suggested them to form a cooperative. Thus the farmers formed "Patneswari Agriculture Co-operative", increased their equity to twenty times, becoming eligible for availing of NABARD credit. For sustainable management, we recommended BILT to include three techniques viz. to mix at least 25% other species like Acacia, Bamboo etc to avoid monoculture ; recommended to include agricultural crops and thirdly to bring the project under Clean Development Mechanism. The recommendations were accepted and initially NABARD approved a project of 400 ha, which will improve the adaptive capacities of the tribal communities to climate change by conserving soil, water and biodiversity, sequestering carbon, bringing additional benefit through carbon credit and intercropping.

P-16 MANAGING STINGLESS BEES FOR FOREST CONSERVATION: A CASE STUDY OF KAKAMEGA RAINFOREST

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The number of people living in poverty is ever increasing and the rate of poverty growth continues to rise. Poor people often have no option but use the environment in non-sustainable ways. A degraded environment cannot sustain continued use of its natural resources and hence cannot sustain food production, wild animals or natural pollinators. Itís against this background of non-sustainable use of environment and alternative strategy to develop linkages between diversity of resources and sustainable livelihood through income generation options that this project was initiated on stingless bee farming for forest conservation. Enormous challenges face Africa while striving to balance the conservation of the natural resources and improving the livelihoods of the people. Stingless bee keeping is an activity that is highly suitable for local communities living adjacent to buffer zones around protected areas. It provides rural people with additional income from marketing the highly-valued native bee honey and improved fruit and seed production of many of their subsistence crops; while at the same time providing protection to the native bees that have an important ecosystem function as pollinators of local flora. As these species nests in tree-hollows, for its natural reproduction it is dependent on older trees in the forest. This makes stingless bees very vulnerable for deforestation and habitat fragmentation as these processes diminish nest-sites and food plants of the bees during the destructive honey harvesting. Comparatively little attention has been given to these threatened and valuable bees. Little is known of their biology, behavioral and domestication in Africa. This study identified stingless bees found in Kakamega rain forest and their nesting preferences and developed a rational hive for domestication and colony multiplication.

P-17 FOREST CONSERVATION AND POVERTY ALLEVIATION THROUGH JOINT FOREST PLANNING AND MANAGEMENT IN KARNATAKA, INDIA

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The Karnataka Forest Department had experienced that the damage to the forests has increased over the years due to various forms of biotic interferences. Several measures like increase in staff, communication network and intensive patrolling did not yield the desired results. Realising this, Government implemented “Karnataka Sustainable Forest Management and Biodiversity Conservation Project” from 2005-06 and run up to 2012-13 under Joint Forest Planning and Management (JFPM) mode. The project is being implemented in the entire state with some variations in models on plantation of tree species. Key components of this project are promotion of Village Forest Committees (VFCs) and Self Help Groups (SHGs) and creating a link between them for mutual benefit of improving the degraded forest land and livelihood status of villagers. Against this background, the present study was conducted to evaluate the performance of the VFCs and SHGs. 1,039 VFCs and one SHG under each VFC were selected for the study. The pre tested schedules were used to assess the performance of VFCs and SHGs. The participatory method was employed to assess the performance of VFCs & SHGs and data were collected through personal interview method and focus group discussion meetings with VFC and SHG members. The study revealed that 35% and 49% of the VFCs belong to “good” and “very good” category respectively indicating JFPM process activities were effective in building social capital and creating JFPM awareness among the villagers. The findings also disclosed that VFCs have been instrumental in creating social fencing around their village forest areas and controlled collection of forest resources. The sense of ownership towards the forests has increased and deliberate fires and encroachment of forest land for cultivation have comedown significantly. SHGs micro finance has contributed significantly in facilitating household access to credit and moderately in creating alternative livelihood opportunities.

P-18 PRAGMATIC APPROACH TOWARDS FOREST RESTORATION ACCEPTABILITY

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Uncontrolled anthropogenic activities for human socioeconomic needs and life sustenance by majority within poverty line in developing countries had resulted to environmental resources conflict in the developing countries over the years. This environmental unfriendly action continue to open the natural protection blankets consequently causing ecological imbalance, constant exposure human particularly the vulnerable in the region to numerous health hazards that are not quickly noticed. Globally, some concurrent health risks had been scientifically proved associated with extremes of climate change. Pragmatic communities approach capable of forest restoration scheme acceptability was investigated among the supporting zone communities in Opara Forest Reserve (The King’s Forest) in Oyo State, Nigeria which serves as an international biodiversity corridor between Nigeria and the republic of Benin using communities’ appraisal studies. The findings revealed the need of the scheme’s sponsor to focus on communities’ free-will participation which will embrace maximum support, building trust of the integrated volunteers and people in this communities’ to achieve perpetual forest restoration scheme. This paper emphasis on collaboration with relevant institutions, agencies and community representatives for necessary scheme adoption, proper monitoring and networking capable of wildlife habitat protection, environmental amelioration and poverty reduction through legitimate carbon trades rather than enforcement. It was concluded that for this scheme to be successful in areas of ecological interest, rigorous efforts and timeless service are required for attitudinal change, responsiveness mechanism and maintenance traditions of the host community.

P-19 SUSTAINABLE EXPLOITATION AND REGENERATION OF FORESTS FOR INDUSTRIAL WOOD RAW MATERIAL IN A CLIMATE CHANGE ERA: NIGERIA IN PERSPECTIVE

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The upsurge in human population has put pressure on forests to meet high demand for timber and other wood products. The consequences are widespread forest degradation and decimation with various adverse effects on climate and the environment. This paper, examines ways of engendering sustainable exploitation and regeneration of forests for industrial wood raw material in the face of climate change in Nigeria. The proposed approaches include dedication of considerable areas of land to forestry, intensive establishment and sustainable management of industrial forest plantations, wood-based industries commitment to securing sustainable source of wood supply, adoption of appropriate technologies, integrated forest protection system, research and training. Recommendations and conclusion are made that the government should critically review the National Forestry Policies and synchronises it with the national industrial policies in order to facilitate private sector participation in forest estates and wood-based industries development; appropriate technologies that generate little waste and capable of recycling waste should be employed for timber harvesting, wood processing and preservation; wood-based industries should, in collaboration with individuals and communities with vast areas of land, be involved in forest regeneration and protection programmes; research should be given due attention in being adequately funded by government and wood-based industries for sustainable forest management to be a reality and veritable means of mitigating climate change in the country.

P-20 THE IMPERATIVES OF SUSTAINING NATURAL FOREST MANAGEMENT IN NIGERIA

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Forest is basically a composite natural resource of multiple benefit to man. Until very recently, the value of a tract of natural forest was often estimated from only the density of economically desirable timber tree species that were present, while much more valuable non-timber resources especially edible and medicinal resources, and invaluable environmental services rendered were ignored. Consequently, there has been widespread conversion of considerable areas of natural forest that were poor in timber tree species, but immensely stocked with edible and medicinal items and other non-timber products which are raw materials to cottage industries, to much less valuable monoculture forests, degraded farmlands and other forms of landuse. This paper therefore, discusses the imperatives of sustaining natural forest management, which include provision of food and medicine, biodiversity and natural heritage conservation, enhancing clement climate, protection of sources of water and erosion prevention, and sustainability of livelihood and trade in non-timber forest products. The recommendations made include intensive conservation of the remaining areas of natural forest, concentration of timber production on degraded and marginal lands by establishing forest plantations of fast-growing tree species, adoption and development of organized agroforesty production systems and use of alternative products to wood should be encouraged in being made available in abundance and affordable.

P-21 SUBMERGED SMARTWOOD: ANALYZING AN INDUSTRY WITH ASPIRATIONS TO PROMOTE SUSTAINABILITY

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Up to 35,000 square kilometres of forest containing 300 million trees may have been submerged through the creation of artificial lakes and reservoirs worldwide, with an estimated market value of US $50 billion. The underwater logging industry has developed new technologies to recover this ‘lost’ wood from still-standing trees. The timber from this resource is marketed as sustainably sourced rediscovered wood. This study discusses the Canadian companies at the heart of the industry and in particular the case of Lake Volta in Ghana. An underwater logging company contracted with the Ghanaian government in 2007 to clear the trees from the lake and to sell the timber on international wood markets or develop local craft industries. Interviews with forest resource experts and analysis of archival forest inventory data for the submerged region indicate that there are likely to be sizable quantities of secondary species with low market value for western timber markets but high value in local and artisanal craft markets. In particular, the research that informs this paper examined the marketing focus on the environmental and social benefits of this lost timber resource. Interviews with industry experts revealed a general belief that regardless of the consequences for the ecology of the lake, the environmental claim can be legitimated based on the fact that recovered wood reduces harvesting pressure on land-based forest resources. This argument would have implications for the industry’s ability to attract carbon credits under a REDD finance mechanism which is established to provide the appropriate revenue streams to encourage changes in forest resource use. The claims for alleviating poverty in lakeside communities may be stronger.

P-22 GENDER ISSUES IN FOREST CONSERVATION MANAGEMENT IN GARHWAL HIMALAYAS, INDIA

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The total forest cover of India constitutes 20.64 % of the geographic area and plays a significant role in biodiversity protection, global environment conservation, landside prevention and soil preservation, headwater conservation, material production and poverty alleviation. The lack of awareness about the role of forests in preserving environment in the hilly region of Garhwal Himalayas where forests meet nearly 40% of the energy needs in the form of fuel wood has resulted in widespread forest destruction until 1973. There was no institutional structure in the country specially designed to create consciousness and to educate people regarding intangible benefits of forests. Nearly, one-third of poor women are directly involved in collecting fuel wood, fodder and other Non Timber Forest Products from forests. At the instance of local habitants of this region, the 'Chipko Movement' (to stick) was launched to arrest forest degradation and logging in 1973. The earlier gullible rural women understood the fact that if the hill soil washed away due to deforestation, it will cause landslides, floods and silting in the rivers below the hills. When the woodcutters were scheduled to appear, several women rushed into the forest and clung to the trees. The woodcutters, shouting and abusing the women, threatened them with guns. The women in turn threatened to die with them. This approach of involving and educating the local women in the protection and management of forests proved to be a great success in India. The sustainable forest management in the area was not possible without their active involvement. This small movement dominated by women has become a national call to save forests. Today, the school children use words, songs, skits, dances, prayers, paintings, slogans and even a fancy dress to covey one simple message - without trees earth will be a wasteland.

P-23 RESTORING THE CONNECTIONS: PEOPLE AND FORESTS

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80% of Scotland was once native woodland, but barely 2% remains. This has transformed the relationship between people and forests, cutting the economic, social and emotional ties which once bound them together.

A 200 year initiative by the Scottish Forest Alliance (SFA) [1] to create over 10,000 hectares of new woodland in Scotland is helping to rebuild these vital connections at 14 sites across the country - providing jobs, encouraging recreational enjoyment, growing understanding of the value of forest restoration and attracting long-term funding for it. In 10 years, this ambitious programme funded by BP has supported 200 jobs, attracted almost £12m of additional finance, and will pay for 200 years of scientific research.[2]

The public is encouraged to participate various ways - through improved access (new path networks and interpretive trails), community involvement in forest planning and planting, job creation and education. Examples will highlight new approaches, such as using theatre and arts projects to involve local communities and young people.

Now the SFA is embarking on its most challenging initiative yet. The Great Trossachs Forest is a 16,650 hectare landscape-scale project that will create 4,400 hectares of newly planted and naturally regenerated woodland within an hour or two's travelling time of Scotland's densely populated Central Belt. This offers a unique opportunity to re-engage the urban population with forests and their role. The project has funding to work with deprived communities in Glasgow, which suffer some of the worst health in the developed world. The project will raise awareness of the valuable forest resource on their doorstep and its role in providing people with clean water, clean air and the chance of a more healthy and active life. This reconnection will inspire people to visit and generate a sense of ownership and care.

P-24 FOREST CERTIFICATION AND SUSTAINABLE FOREST MANAGEMENT CRITERIA & INDICATORS - INDIAN AND DEVELOPING COUNTRY PERSPECTIVE

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Public concern for the environmental issues is beginning to take more of a center stage in global economy and trade policy. SFM has become obligatory due to environmental and ecological concerns.

Countries not having their own C&I may be obliged to draw upon those established elsewhere. In this situation, interests of other countries will be automatically thrust upon the defaulting country even if these may not be tailored to meet their national interests. India has developed its C &I with the help of ITTO, but the main constraint is their implementation at field level, i.e., Forest Management Unit (FMU). Although India has been able to revise the policy and legislation, but often there are serious constraints in their implementation, primarily due to system wide problems. Often what happens in the forestry sector is largely decided by what happens outside the sector.

There are however issues which need to be dealt with about trends and prospects for certification in developing countries. Constraints in this slow process include inflexibility of certification standards, failure to recognize the broader local land use issues, conflicts and incompatibility between legal settings and certification standards. It has to be noted that certification needs and possibilities of the developing countries are different from developed countries. For most of the developing countries, certification is more a market requirement imposed by importers which is difficult to comply but has to be adopted to remove trade barriers. Although certification is an important instrument for assuring SFM and legality of timber trade, it has not been operationalized in most of the developing countries. The growing green consumerism is an opportunity and challenge for trade and certification of their forest products, which must not be missed.

P-25 RESOLUTION OF ADI COMMUNITY: RESTORATION AND CONSERVATION OF BIOCULTURALLY IMPORTANT AND ENDANGERED TREE SPECIES AT BIODIVERSITY HOT-SPOT IN EASTERN HIMALAYAS

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Arunachal Pradesh- being a biodiversity hot-spot in eastern Himalayas, host tremendous biocultural diversity. Numbers of tribal communities (26) of this state who own and manage their community forests depend on it to sustain their biocultural diversity. However, the ever-mounting population and increasing commercial agriculture caused threats to some of plants resources being conserved in the community forest which are considered key species in food-chain and livelihoods of tribal communities. This article presents the results of participatory action with Adi community and efforts being made in conserving semi-endeared forest biodiversity through passing a resolution by customary court of Adi (Kebang) and plantations in jhum lands. In selected villages, Adi people have identified Dekang (Gymnocladus burmanicus)- a newly discovered plant species from India, as the bioculturally, ecologically and economically important tree species to be conserved at war foot. Dekang grows at range of 150-200 amsl in subtropical ecosystems and has been in the traditional usage among Adi tribe since the time immemorial. Its pods are used in hunting deers, boars, used as shampoo and soap, in curing dermatological disorders and are integral part in barter system while exchanging food resources with other sub-tribes of state. Dekang is reported to be semi-endangered species in other parts of world, and in last 40 years a dramatic decline in plant population has been noticed in the community forests owned by Adi community. Looking to this an important issue, a resolution was passed by the Kebang in 2007 to ban illegal felling of Dekang's tree, developing and approving protocols for sustainable use of Dekang and incentive based proposal to enhance its plantation and conservation. A significantly impact of resolution and community efforts in increasing plant population of Dekang tree has been recorded in community forests of Adi community.

P-26 THE ECOLOGICAL AND CULTURAL ROLE OF SACRED FORESTS - NODES OF RESILIENCE AND RESTORATION INTHE FACE OF CLIMATE CHANGE

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Sacred forests and other sacred natural sites are probably the oldest protected areas on the planet. Sacred forests range in size from small groves to extensive forested landscapes. Numerous examples of sacred forests are found in many countries across the globe, including much of the Commonwealth. Some are national icons; many are unknown and invisible, while many have been incorporated into modern protected areas systems.

Of crucial importance is the fact that sacred forests are rooted in their local communities and are linked to local spiritual leadership whether they are, for example, indigenous shaman or Buddhist or Christian monks. Thus sacred forests are strongly socially and culturally rooted and accompanied by a set of strong nature related ethics. One of these ethics is that sacred forests are usually managed with restricted use and strong social prohibitions. They, therefore, resemble the IUCN category of strict Nature Reserve. As a consequence they often have very high biodiversity values. Sacred forests have proven to be very resilient and have survived hundreds and in some cases thousands of years of long-term social and environmental change. In recent times these changes are, however, overwhelming even the most resilient areas. Recent evidence indicates the rapid and alarming destruction of many sacred forests in situations of rapid economic development and modernity. This paper reviews recent developments with regard to the understanding of the biological and social values of sacred forests. It identifies ways in which sacred forests can be supported as focal points of cultural and biological resilience as well as nodes of restoration for both mitigation and adaptation to climate change. An action plan for sacred forests is identified that will support their traditional custodians and other concerned parties, contribute to conservation strategies and provide them with support and resources for recovering degraded and even lost scared forests. Rooted in their faith communities sacred forests can therefore be a call to action in countering the impacts of climate change.

P-27 COMMUNITY BENEFITS FROM FOREST RESTORATION: A CASE STUDY OF NIVAS BLOCK, MANDLA, MADHYA PRADESH IN INDIA

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Community forestry has taken root in the country with degraded forests being protected and regenerating. Joint Forest Management (JFM) has provided several direct and indirect benefits to the people. It has addressed the issues of poverty reduction, livelihood, empowerment of rural communities and restoration of forests.

This paper is a casestudy of what community participation can do in restoring degraded forest clad hills in Nivas block on its own. With the introduction of JFM in 1991, Manikpur village and other surrounding villages in the block work hard for restoring nearby forests. Now these restored forests are dense and provide wood fuel, fodder, several other NTFPs like bamboo, fruits, mushrooms and medicinal plants which were not available earlier. After thinning operation on trees, lops and tops are distributed free for use as fuel and other agricultural purposes, fodder and grasses are also available free of cost. Fruits like aonla (Emblica officinalis) and bael (Aegle marmelos), tendu leaves of tendu (Diospyros melanoxylon) are collected for cash income. A number of medicinal plants are now growing and are used for medication. The distribution of benefits is on equitable sharing basis with each household receiving benefits.

Initially the study was done in 1994 and methodology followed was PRA in which communities analyse conditions and suggest changes.

After fifteen years, temporal changes have revealed that devolution of powers and management can lead to sustainable development and improvement of forests as well as improving the livelihood conditions of the people living in the vicinity.

P-28 SPATIAL CHANGES INFORESTS AND ITS IMPACT ON THE ECONOMY OF PRIMITIVE BAIGA TRIBE IN CENTRAL INDIA

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Baigas are one of the most primitive forest tribes. Their culture, traditions and economy are interwoven with forest. This symbiotic relationship has been recognized earlier.

Over the years, the Sal forest ecosystem where this tribe resides has been severely disturbed due to deforestation and severe heartwood borer attack in 1997 when large patches of forests had to be cleared.

A study was undertaken to find out the extent of spatial changes in forests and its effect on the economy of Baiga tribes, level of their dependence on forests and to assess the impact on their life quality and livelihood.

Field surveys were undertaken to find the changes in composition, regeneration status and distribution. To find out the impact of deforestation on the tribe, surveys were undertaken in identified core and peripheral areas having concentration of the tribe. Current level of dependence was quantified using structured schedules. On going development programmes were also assessed.

The study revealed that in the core areas, Baigas were still dependent on forests for their basic requirements like food, fuel, medicines, housing, etc. Collection of forest products for cash income was continuing, although the number of days spent in collection of non timber forest products and income had reduced.

The forests resource base was slowly shrinking and initial observations revealed that micro climate of the ecosystem was changing. Non timber forest products have declined. Agriculture is still subsistence based and most of the land is rainfed. Many forests based enterprises like bamboo basket making, rope making, broom making are facing acute problems of scarcity of raw materials. Declining sal forests have led to marginalization of the community. However, some development works have been initiated which are community based and also income generated from them has benefitted the community.

P-29 DEVELOPING A FOREST RESTORATION PROJECT IN CHALLENGING CIRCUMSTANCES TO BENEFIT LOCAL COMMUNITIES: A KENYAN EXAMPLE

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The Enoosupukia Trust Land occupies about 8,000 ha of severely degraded forest on the Mau escarpment in Kenya. The Trust Land is part of the controversial Mau Forest Complex, the single most important water catchment in the Rift Valley and western Kenya. Before the 1970s, Enoosupukia Trust Land was forested, boasting a rich biodiversity of wild animals and indigenous vegetation. Since then, civil and tribal unrest have led to the breakdown of local governance, land management, and environmental protection and policing systems, which, along with population increase, have led to forest degradation. Communities in the area suffer high livelihood insecurity, which is exacerbated by the degraded condition of the Trust land and adjoining areas. The Trust Land is managed by Narok County Council, which has expressed a desire to rehabilitate the forest in the area. The Clinton Climate Initiative identified the Enoosupukia area as a possible pilot site for a project aimed at protecting and enhancing forest resources by carrying out activities that benefit local communities and that could be eligible for attracting carbon investment. Local enthusiasm for such a project exists, but the current range of tenure situations, fractured local governance structures and isolation of communities in the area from most institutions, make this a difficult prospect. This talk will discuss the difficulties faced, and solutions implemented, by the project during its first year of development.

P-30 DEVELOPING A NEW GENERATION OF FORESTRY INSTITUTIONS: USING COMPLEXITY AND SYSTEMS APPROACHES TO BUILDING INSTITUTIONS THAT CAN COPE WITH CHANGE AND UNCERTAINTY

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Climate change poses unprecedented challenges to forestry institutions: a new generation of institutions are required that can manage within a context of constant, but unpredictable change. The challenges facing forestry institutions will be systemic, complex, and uncertain. Transformational, systemic changes will be required to enable forestry to fulfil what may be an increasingly important role in society. Forestry institutions generally manage resources on long timeframes and are traditionally resistant to change, but lessons from change processes in commonwealth countries show how support can be provided to build the next generation of forestry institutions. Traditional planned change approaches (unfreeze-change-refreeze) are insufficient to support change under complex, uncertain conditions. Using systemic approaches to support institutional development, focuses on the organisation's human system, their interactions, self organisation and innovation from which new ways of working can emerge. Drawing from recent change experiences for forestry institutions in three commonwealth countries - Uganda, South Africa and Kenya - an analysis is made of the key constraints to coping with change and uncertainty, and approaches to support the emergence of new structures and systems that build capacity for managing these. The findings show the critical role of training and capacity building as a tool to disrupt the ënorm' and build momentum for change from within; how new interactions can create opportunities for innovation and how engaging with organisational culture is critical to opening up an organisation to look at its challenges in new ways. The paper looks at the role of the manager, the internal and external change agents in supporting the next generation of foresters. It concludes that for the Commonwealth to build forestry institutions that can manage climate change uncertainty, change must be embraced and managed as part of the norm, requiring flexible, adaptive and ëentrepreneurial' organisations and cooperative (as opposed to competitive) institutional relations.

P-31 CUSTOMARY CONSTRUCTION OF LAND IN SOUTH-EASTERN NIGERIA: IS IT AS MUCH ABOUT TREES AS PEOPLE?

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From customary perspectives, land is not simply the physical earth. It is a complex interplay of the physical and spiritual earth, historical pasts and futures of the physical earth and its resources; spaces below and above it; and ancestral ties to the physical earth. The centrality of land to rural living is tied to its resources and traditional practices. Rituals related to the appeasements of ìevilî or ìgoodî forests, customary flora-and-fauna conservations, rain-making and incantations are tied to land. People stand at the centre of all these. What about the trees? Is it as much about trees as people?

The research showcases customary tenurial practices and narratives within the Igbo ethnic group. Focused information was collected through interviews from informed elders of the rural communities of the five geopolitical states of South-eastern Nigeria. The position of trees within the customary construction of land was determined and used to highlight the forest restoration strategies of the people. These strategies were weighted on the scale of todayís forest restoration demands and recommendations were made on how they can be improved for sustainability.

P-32 REFORMING THE UNITED NATIONS FORUM ON FORESTRY

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The United Nations Forum on Forestry is in need of reform. Reform of the institutions is desired by many sectors of society and is most likely required in order to attract future United Nations operational funding. The forum should be reformed to perform one of the roles described below:

The institution recognises its inability to create binding legal commitments and forest targets. Instead the forum focuses on acting as a coordinator for global international and intergovernmental programmes on Forests. Within this new role the institution focus on aligning the research priorities of major global forest initiatives and implementing a streamlined singular reporting framework that can be used to meet most international reporting requirements. In this coordination role the body would identify thematic areas of regulation and focus on connecting relevant stakeholders with the forest governing body most useful to them.

The institution wins back the respect of its members and stakeholders by taking a hard line approach and creating a specific programme of work, binding commitments and binding targets. This type of action will be controversial and it likely that a number of parties will withdrawn from this type of process. The withdrawal of these members will allow the programme to move forward and develop. These parties may then be induced back into the regime at a later date by market and non-market incentives. The forum could follow in the lead of the climate change regime by creating binding commitments for developed countries in its first commitment period with a view to increasing capacity within developing countries so that future commitment periods create obligations for these parties.

P-33 FOREST RESTORATION AND LOCAL CHALLENGES IN DEVELOPING ASIA: POLICY IMPLICATIONS FOR SUSTAINABLE FOREST RESTORATION - CASE STUDIES FROM CAMBODIA, CHINA, INDIA, LAO PDR AND NEPAL

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The significance of forest restoration and its contribution towards sustainable development stands out as one crucial issue for developing Asia. Though developing Asia improved upon its forest restoration the current situation also indicates that the future of Asia's forests is much threatened through its over-use, vested interests, rapid urbanization and bloody conflicts.

The present paper draws lessons from 5 case studies from developing Asia - China, Cambodia, India, Laos and Nepal. The case study from Cambodia shows how forests constitute a crucial source of food security and livelihoods and how flux of policies and lack of governance can arrest forests from re-generating. China's case study demonstrates how selected types of forest restoration may be led by pure private/State interests and may bypass opportunities for local empowerment and ownership. The case study from India is based on a thickly forested area where basic needs of forest communities neglected for decades now constitute a fertile ground for extremist movements so as to make forest management vulnerable. The case study from Laos shows how pristine and rich forests can be assigned by the state to private contractors for felling, which not only hampers the resource base of local communities but also imply lack of interest of the state at forest regeneration. Nepal's case demonstrates how forest restoration can be socially meaningful as led by poor groups with state support.

Based on the case studies, the paper draws key lessons as follows:
(i) Regenerated forests are resource bases which could be hot-beds of conflicts and run the risk of self-destruction if not overseen through good governance;

(ii) Forest communities' livelihoods and food security issues are critical to forest management and require their close examination;

(iii) A process of empowerment of local communities and continuous monitoring could help restore forests to survive threats.

P-34 POSTER SUSTAINABLE LIVELIHOOD FROM COLLECTION AND PRIMARY PROCESSING OF MEDICINAL PLANTS THROUGH CAPACITY BUILDING IN CENTRAL INDIA

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Medicinal plants play a significant role in the livelihood of rural communities living near forest fringe areas. These medicinal plants are used in curing ailments and also a source of livelihood. Often communities engaged in collection of medicinal plants do not get adequate returns due to inappropriate technique of harvesting, lack of proper processing and storage and also due to lack of knowledge about marketing of medicinal plants.

The processing methods and techniques used are traditional, tedious and inferior quality of products are obtained. A project on demonstration and extension of village level primary processing, grading, drying and storage techniques of medicinal plants was undertaken from 2006 to 2009 for dissemination of harvesting and processing techniques on medicinal plants to rural communities. It was funded by the National Medicinals Plants Board.

The project was implemented in 15 districts of the state where a number of field trainings were given to cluster of villages to build capacity of rural communities for sustainable livelihood.

Medicinal plants species were selected region wise so that local communities would benefit. The instructional strategies were through live demonstration of medicinal plants parts, their harvesting and processing techniques, field manual giving methods and monitoring. Training was given for 26 medicinal plants. Marketing of medicinal plants parts and value addition were also given. Women evinced keen interest as 68 per cent of processing work is done by them.

The outcome of the trainings on capacity building was that new opportunities for opening of processing units and value addition have come up at village and block level. Communities have started using sustainable harvesting and processing methods. It is felt that this will generate more livelihood opportunities.

P-35 FACTORS INFLUENCING TRIALLING OF AGROFORESTRY IN SMALLHOLDER FARMING IN ZAMBIA

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Research has shown that agroforestry has potential to improve land productivity and increase crop yields to enable subsistence farmers move out of poverty. In addition, implementing agroforestry would reduce pressure on existing forests and curb forest destruction. However, despite research and extension efforts, not many farmers have adopted agroforestry technologies. In Zambia, agroforestry research was started in the late 1980's and later introduced on-farm in 1992 and through extension in 1997. We investigated the influence of household and institutional factors by conducting a field survey and face-to-face interviews of 388 random farmer households in four districts of eastern Zambia where agroforestry is promoted and practiced. Logistic regression was used for data analysis. The results show that trialling of agroforestry is very low within the study area. For instance, 44.9 percent of respondents had trialled improved fallows whereas only 21.4 percent of the sample had trialled biomass transfer. Despite the low trialling rates, the retention rate among farmers who had trialled was high (over 70 %).Results further show that trialling of improved fallows and biomass transfer was influenced by different factors. In the case of improved fallows, it was significantly influenced by having appropriate skills, availability of tree seed and direct contact with researchers, while biomass transfer was influenced by extension visits, radio programs and direct training of farmers by researchers. Training was found to influence trialling of both improved fallows and biomass transfer technologies. Results show that farmers who had been trained in agroforestry were more likely to trial agroforestry technologies. This study establishes trialling as the most important step to improving agroforestry adoption. Therefore understanding factors that influence farmers to trial is crucial to ensuring that many farmersí trial and can adopt agroforestry.

P-36 YAMUNA RELIGIO-BOTANICAL GARDEN: A SENTIMENTAL APPROACH TO INVOLVE COMMUNITY IN CONSERVATION OF FORESTS

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Himachal Pradesh - The land of Gods and Goddesses, with mountainous terrain, fragile ecology and varying altitudinal zones and diversified climatic conditions is a home to rich biodiversity. Thus a pioneer attempt has been made by setting up a Religio-Botanical Garden on the banks of River Yamuna in Himachal Pradesh, India, so that the people can appreciate and associate themselves with forests. It was through the worship of plants only, that man attempted to approach and appease God. Among the various natural objects of adoration, trees are the best companions. There are very few religious ceremonies of the Indians, which can be completed without the usage of plants. The religious importance can further be visualized in different activities from birth to death. Keeping in view the importance of plants in the Indian culture the models pertaining to various religions practiced in India viz. Christianity, Muslim, Hinduism, Buddhism, Sikhism and Jainism have been established in the Botanical Garden. Navgraha Van depicting nine planets with Sun at the centre with associated plant species, Rashi Van portraying twelve zodiac signs and their associated plant species, Nakshtra Van showing twenty seven constellations with associated plant species have been developed in the forest area spread over an area of 55 acres. 360 species of trees, shrubs, herbs and climbers have been introduced in the area. The garden will ensure series of intangible benefits and serving not only as a gene pool but also extend religio-recreational spot for spiritual peace and motivate them to rear trees in their private lands and also to protect forests in government owned lands. The garden is also providing study area for environmentalists, foresters, botanists, landscape architects, students and plant lovers. The people are visiting this area and forest department is supplying plants of their choice.

P-37 ROLE OF PARTICIPATORY MODELLING IN REDUCING COMMUNITY CONTROVERSY SURROUNDING THE EXPANSION OF PLANTATION FORESTRY

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The implementation of a Participatory Modelling process proved to be effective in reducing community controversy surrounding expansion of the hardwood plantation forestry industry in a case study of the Upper Clarence catchment in north-eastern NSW, Australia. Controversy over natural resource management issues for the selection of a suitable case study area was initially gauged using a scoping survey, and then further insights developed from semi-structured interviews with key informants within the community, followed by public meetings.

Stakeholder analysis and mapping were used to predetermine power relations and local politics that needed consideration throughout the participatory modelling process with a voluntary Participatory Advisory Committee formed to address issues raised, and explore scenarios with the aid of visual modelling environments and expert speakers to fill knowledge gaps deemed important to participants in the social learning process. Participants actively engaged in data collection, discussion and problem solving, finding the process improved collaborative relationships and provided a vital link between research institutions and the community. Early intervention in the expansion of the plantation hardwood industry provided an opportunity for the community to provide input towards sustainable development that encouraged local employment, suitable site selection for a processing mill, and land management practices that minimised impacts to local socio-ecological systems.

A final survey evaluating the success of the PM process suggested the most important criteria to participants were an equal opportunity to contribute fairly to the process, developing a shared understanding of dynamic systems through combining social capital with creditable scientific knowledge, a time and cost efficient process, and participants remaining till the end of the process in a friendly and supportive environment. This paper reflects on lessons learnt through a robust and rigorous evaluation of a participatory modelling case study to address a need for research rigour established through a review of literature.

P-38 SYSTEMATIC REVIEWING AS A MEANS OF EMPOWERING KNOWLEDGE TRANSFER

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The systematic review process has proved remarkably effective in assisting the application of good science in medical care since first developed by the Cochrane Collaboration in the 1990's. Its library of systematic reviews has become one of the most cited sources of evidence world-wide in the medical research literature. Similar collaborations have followed, covering crime and justice, education and social welfare (Campbell) and environmental policy and practice (Collaboration for Environmental Evidence).

In forestry, decision-makers need to draw on an extremely wide range of information, data and analysis, in multiple languages and varying digital formats, often with inconsistent or inadequate metadata. Important historical data may not exist in electronic form and can be hard to locate and use. As a result, decision making and policy formulation may be undertaken without access to the best relevant information, leading to sub-optimal outcomes; resources may be wasted in duplicating research, gaps in research knowledge can go unnoticed and the setting of research priorities can be haphazard and based on subjective assessments.

A global collaboration on Cochrane lines could develop a common approach to the use of existing forestry research in supporting forest restoration policy and practice. By drawing on techniques of systematic review and international communication developed by the other collaborations, it could produce a world-wide network of review groups covering all areas of forest science which would each develop systematic reviews; a network for libraries working with the review groups to facilitate information sharing; and an openly accessible library of review outputs, providing 'good answers to good questions' and greatly facilitating effective knowledge transfer.

This paper will outline how such a system would function, and progress being made towards its establishment.

P-39 IMPACT OF REFORESTATION ON THE ABUNDANCE OF ECONOMICAL MEDICINAL PLANTS

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People living in the mountainous areas of northwest Pakistan are heavily dependent on the forest resources for their livelihood, which resulted in most of the forest area under severe threat of overexploitation. Among these recourses, medicinal plants play a key role in the socio-economy of local people. However, forest degradation greatly reduced the abundance of medicinal plants. Some of the formerly forested degraded areas have been reforested with the aim to provide fuelwood to locals and reduce pressure on remaining natural forests. The objectives of our study are (a) to compare the abundance and worth of medicinal plants between reforested and degraded land and (b) to explore influential reforested stand structural variables on the abundance of medicinal plants. Randomly five plots have been selected in each of two land use types, on which we analyzed various variables of ten highly economical medicinal plants. Variables such as frequencies, densities and cover of most of medicinal plants were significantly increased on reforested sites compared to degraded sites. Frequencies and densities of highly valuable species such as *Valeriana jatamansi*, *Bergenia ciliata* and *Paeonia emodi* were many-fold higher on reforested sites. On reforested plots, tree basal area came-up with the most influential variable positively correlated with the abundance of the aforementioned economical species. In conclusion, reforestation of degraded sites can strongly increase the abundance of medicinal plants and may thus contribute to the livelihood of local people and protect the remaining natural forest resources.

P-40 THE USE OF REMOTE SENSING FOR SUSTAINABLE FOREST MANAGEMENT IN GLEN AFFRIC

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The forest monitoring has gained special interest because the importance of forests in the Earthís carbon cycle has been increasingly recognized. In Britain, approximately 80% of the carbon stored in the terrestrial vegetation is found in forests and woodlands. With the modern remote sensing systems, they provide huge images that correspond to forest terrains. An effective forest monitoring is essential to provide a reliable evaluation of the spread and health of Glen Affric forest for sustainable forest management.

The Glen Affric site was chosen because of its extensive and diverse semi-natural woodlands of native Scots Pine and covers a variety of topography. The retrieval of the biophysical properties of forests is also of crucial interest for the understanding of environment change.

Therefore, the understanding of the scattering mechanisms and radar backscatter behaviour of the plantation and semi-natural forests in Glen Affric are presented. Three major scattering mechanisms are decomposed and the scattering behaviour are explained using the scattering model. Distinct signatures between the two different forest types using ALOS PALSAR full polarimetric data at L-band were also demonstrated. Regression analysis was also carried out between biomass and backscatter polarization signals. Higher correlation coefficients had been obtained between cross-polarized backscatters and biomass compared to the co-polarized backscatter. Further investigation was carried out to determine the effect of physical structure of the stands on radar backscatter and the relationship between the biomass and backscatter coefficient.

P-41 TRANSFORMING HUNTING CEREMONY INTO FOREST RESTORATION: A CASE STUDY FROM DALMA WILDLIFE SANCTUARY, STATE OF JHARKHAND, INDIA

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India with 698 tribes comprising of 82 million people has the largest tribal population in the world. Tribal communities are mainly the forest dwellers who have accumulated rich knowledge of the use of various forests and its products. Though every tribal ritual has its own rationality, the annual ceremonial hunting is a challenge to forest restoration efforts. Dalma wildlife sanctuary of Jharkhand state witnesses this traditional hunting festival every spring when around 20 000 tribal people climb up the Dalma hills with bows and arrows.

The forest managers have been trying to search for ways that halt the degeneration of both the environment and the tribal's way of life. Jharkhand forest department together with non government agencies has launched several awareness programmes like street plays, puppet shows, traditional sport tournaments, music, dance, get-togethers among tribal villagers to campaign against indiscriminate killing of wild animals. Several groups of local people have been formed who persuade the tribal to abstain from hunting while performing the traditional worship of their deity.

Field visits including visits during the festival and discussions with stakeholders along with study of tribal way of life were carried out between April 2004 and May 2009. It was observed that hunting incidences have decreased exponentially. This paper analyses the factors that transformed the tribals from hunters to protectors.

The study concludes that change in the attitude of the forest officials from coercion to persuasion has been the major factor which has paid dividend in the form of transforming traditional hunting ceremony into a celebration of natural resources with the overall aim of protecting nature and perpetuating customary living style.

P-42 VOLUNTEERING AND FOREST RESTORATION: HOW PARTICIPATION CAN HELP CHANGE INDIVIDUALS, COMMUNITIES AND SOCIETY

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At a time of mainly negative news about the environment and global warming etc, the opportunity to make a positive contribution to help reverse past deforestation or environmental damage is attracting increasing numbers of people. Participation in the practical work of forest restoration can be an inspiring and empowering experience for individuals, sometimes with life-changing effects. Engagement with forest restoration projects provides an opportunity for people to become familiar with the forest ecosystem and its functioning. This helps to directly address one of the core issues underlying many of modern society's problems - the disconnection of people from the rest of Nature. At the same time, harnessing the enthusiasm, commitment and skills of volunteers can make a significant contribution to forest restoration projects, which are often labour-intensive, thereby helping to keep costs down. Engaging volunteers can also help to build a constituency of support for restoration projects, and provide access to a wider range of skills, resources and local knowledge. Trees for Life is the leading organisation in Scotland which engages volunteers in forest restoration, and has been running volunteer programmes to help restore the Caledonian Forest for almost 20 years. Our partnership with Forestry Commission Scotland over the past two decades has enabled thousands of people to take part in restoration work. Drawing on the experiences of the hundreds of people who spend a week or more volunteering each year, this presentation will outline the benefits derived by individuals as a result. It will also feature case studies of changes that have occurred in communities and wider society as a consequence of actions and projects initiated by people after taking part in forest restoration volunteer projects. It will conclude with some recommendations for how to successfully and attract and retain volunteers in restoration work.

Author Index