International Conference on Forest Landscape Restoration under Global Change

A CONTRIBUTION TO THE IMPLEMENTATION OF THE BONN CHALLENGE
"Synthesising and sharing globally available forest-related scientific knowledge"

San Juan, Puerto Rico, 6-9 June 2017

Conference Report

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1. Introduction and Objectives of the Conference

With an estimated 25% of the global land surface degraded to some extent, and about 15% considered appropriate for forest landscape restoration (Global Map of Opportunities on FLR – GPFLR) , there is significant potential for restoring landscapes at a large scale by using trees and other woody vegetation. Forest Landscape Restoration (FLR) aims to improve the landscape for people and for biodiversity, through several approaches – agroforestry, tree planting, natural regeneration, connecting forest fragments, etc. and has the potential to contribute to climate change mitigation and adaptation by increasing productivity of landscapes, enhancing the resilience of forest ecosystems, and reducing the vulnerability of forest-dependent human communities.

With the launch of the Bonn Challenge global policy initiative, calling for the restoration of 150 million hectares of deforested and degraded lands by 2020, political support for restoring degraded lands has significantly increased in recent years. This Challenge seeks to actively engage states to achieve progress on their existing international commitments under the UN Convention on Biological Diversity Aichi Target 15, UN Framework Convention on Climate Change REDD+ goal and the Rio+20 land degradation target, all intended to lead to carbon richer landscapes that are bio-diverse, economically more productive and resilient against climatic vulnerabilities. Restoring degraded forests and forest landscapes has also become an important component within the 2030 Sustainable Development Agenda through various sustainable development goals (SDGs). To-date a total of 148 million hectares has been committed under the Bonn Challenge for restoration.

Over the past ten years, considerable efforts have been underway by the science and technology community in promoting forest landscape restoration in all regions of the world. IUFRO has been an active member of the Global Partnership on Forest and Landscape Restoration (GPFLR) since its inception. Given the scale and complexity of forest landscape restoration challenges worldwide, there is a clear need to further enhance the collection and synthesis of scientific knowledge from different regions aimed at gaining new insights and promote interactions between science, policy and practice.

The international conference held in Puerto Rico on 6-9 June 2017 aimed at providing outputs useful for three major target audiences:

- Practitioners: identification of workable approaches and activities for FLR at national and local scales;
- Policymakers: recommendations on enabling governance and policy frameworks for forest landscape restoration at national levels; recommendations on international cooperation for further enhancing large-scale FLR implementation;
- Scientists: identification of existing knowledge gaps, additional research needs and new insights into FLR implementation; and the way forward for closer cooperation between scientists and practitioners in support of FLR implementation.

The results will contribute to major forthcoming international events in 2017, including the IUFRO 125th Anniversary Conference in Freiburg, Germany, in September 2017; The Conference of the Parties 2017 of the UN Framework Convention on Climate Change; the Convention on Biological Diversity Meeting in 2017; and the Global Landscape Forum in Bonn, Germany, in December 2017.

The Conference comprised two distinct events as follows:

- Knowledge-sharing Workshop "Translating global FLR policy into local action" held on 6-8 June 2017, with 60 forest scientists and experts from around the world;

- Ministerial-level Policy Dialogue: "Shaping policy for FLR implementation" held on 9 June 2017 with ministers and government officials of five countries and two inter-governmental organisations discussing policies needed for effective restoration on the ground.

In the knowledge-sharing workshop a total of 60 experts from five continents (i.e. 30 countries) participated representing forest research, academia, practitioners and international institutions and NGOs. The ministerial-level policy dialogue was attended by ministerial representatives of El Salvador, Germany, Malawi, Rwanda, USA, World Bank and the Food and Agriculture Organisation of the United Nations (FAO).

The results of the knowledge-sharing workshop and the ministerial-level policy dialogue, including all presentations and summaries of the discussions, are presented in this report. The full versions of the oral presentations, as well as posters, are available for download on the IUFRO-SPDC website at
https://www.iufro.org/science/special/spdc/flr/flrconf/.

2. Knowledge-sharing Workshop

This section provides an account of all sessions and presentations of the workshop organised according to the programme. For each presentation a brief note on the main content and the link to the full presentation is given.

2.1 Opening of workshop

Moderated by **Andreas Bolte** of the v. Thünen Institute, Germany, this session aimed at setting the stage for the knowledge-sharing workshop on forest landscape restoration implementation. In his welcome remarks **Ariel Lugo**, Director of the US Forest Service's International Institute of Tropical Forestry (IITF) expressed his appreciation to IUFRO, the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) and all participants for selecting Puerto Rico and his institute as the venue for this one-week forest landscape restoration conference. In recent history, Puerto Rico has experienced significant changes in land management opening various options for large-scale restoration of native tropical vegetation. In view of this opportunity, over the years the IITF and its many associated forest scientists have undertaken extensive research on many aspects of forest restoration including long-term field plot monitoring of vegetation recovery and development. Given the wealth of experience gained with forest restoration research in Puerto Rico, Lugo underscored the relevance of holding this forest landscape restoration conference at the IITF in Puerto Rico.

Horst Freiberg, in welcoming the participants on behalf of the BMUB, highlighted the importance of scientific knowledge and experiences to support the global movement on forest landscape restoration. Since the inception of the Bonn Challenge policy initiative in 2011, a lot of political momentum has been generated at the global and regional scales in support of broad-based restoration of degraded landscapes with forests and trees. As the movement is increasingly focusing on implementation on the ground, it is now important to utilise and build on scientific knowledge, research results and practical experiences of restoring land that has been generated by the forest science community over the past decades. Freiberg closed by remarking that exchanging and further complementing such knowledge in different contexts is essentially the purpose of this conference.

In his opening remarks **John Parrotta**, US Forest Service and Vice President of IUFRO, welcomed the participants to this scientific workshop – a truly IUFRO event – with many forest scientists participating from different regions and countries of the world. He expressed his satisfaction with a rich programme of presentations, posters and a field trip on the third day of the workshop. On behalf of IUFRO he also thanked John Stanturf (Coordinator of the IUFRO Working Party on Restoration of degraded sites) for leading the scientific programme of the workshop, and the staff of the International Institute of Tropical Forestry for hosting and organising the event. Special thanks were also

extended to BMUB for providing generous funding for the event routed through IUFRO's Special Programme for Development of Capacities (SPDC).

In his key note address "Integrated landscape approaches to forest landscape restoration", **José J. Campos Arce**, Chairperson Board of Trustees CIFOR, Costa Rica, presented the concept of landscape governance and management as the underlying concept for restoring ecosystems on a larger scale as intended by forest landscape restoration. Starting from the fact that landscapes are complex and unique social constructs, integrated landscape and forest landscape approaches are essentially about processes and outcomes involving a wide range of actors. Restoration is a long term process that demands shared vision among stakeholders, negotiated interventions to manage trade-offs and synergies as well as adaptive management. The latter is particularly important in view of continuously ongoing changes in the social and biophysical environment. In order to be successful, collaboration is needed to work across social, political and scientific disciplinary boundaries. In this context, collective action and governance are key factors for large scale effective restoration. Overall, healthy landscapes are fundamental for our future. Efforts towards forest landscape restoration do not seek to replace existing institutions or processes, but to connect them. Key elements in this process include multiple objectives, stakeholder involvement and dialogue and adaptive management. Restoring landscapes for multiple purposes is about negotiation and collaboration that embraces a diversity of solutions depending on the local context. In the long-term we need to arrive at a smarter social organization process for collaborative management of natural resources.

https://www.iufro.org/download/file/27691/6474/00_JC_JJ_Campos_FLR_Puerto_Rico_June_2017_pdf/

2.2 Long-term experience of landscape restoration

Moderated by **Bastiaan Louman**, CATIE, Costa Rica, the session highlighted the need to conceptualise forest landscape restoration as a long-term undertaking, in order to yield sustainable outcomes. Landscapes are multi-functional; they are not defined just by what is found within a geographical space. A landscape is also defined by outside actors and factors that shape the landscape and most landscapes are affected by globalization. Besides internal landscape dynamics, landscapes are also influenced by external factors such as transportation, migration, global trade, consumer preferences elsewhere, international agreements, investors and climate change.

Yeo-Chang Youn, Seoul National University, Republic of Korea in his talk on "Policy integration for reforestation in the Republic of Korea" presented the main drivers responsible for deforestation and landscape degradation in the Republic of Korea in the early 20th Century. Given the inter-linkages of forests with society it is important that policies for forest landscape restoration are integrated with policies of other sectors of the economy. This integration will depend on adequate political support, a positive attitude of people towards reforestation programmes and a certain level of economic growth or improvement in people's livelihoods.

https://www.iufro.org/download/file/27692/6474/01_YCY_ReforestationPolicyIntegration_YOUN_pdf/

John Parrotta, US Forest Service elaborated on the "Role of planted forests for biodiversity conservation and restoration: Build it and they will come?". He demonstrated that likely impacts of planted forests on biodiversity depend on what they are replacing. Biodiversity impacts are caused by several biophysical and socioeconomic factors operating at the landscape level, therefore, the context in which forest plantations are established and managed is critical. Planted forest options differ in their potential to deliver benefits to people as well as their potential biodiversity impacts. Overall, planning and silvicultural management decisions for all types of planted forests have the potential to yield "win-win" outcomes for biodiversity conservation and restoration, provision of ecosystem services and direct livelihood benefits to people – depending on the initial conditions, and the processes and methods applied (including to secure local engagement).

https://www.iufro.org/download/file/27693/6474/02_JP_Planted_forests_and_biodiversity_Parrotta_pdf/

In his talk on "Forest and ecosystem service rehabilitation in the anthropocene: lessons from contrasting landscapes in Costa Rica", **Bryan Finegan**, CATIE, Costa Rica, presented results of research related to functional traits and ecological modelling in Costa Rican forests established during past reforestation and rehabilitation efforts. The forests are vulnerable to expected changing climate and increasingly sensitive to fire, demonstrating the need for a holistic approach to rehabilitation and restoration to support climate mitigation and adaptation. This experience also highlights the need for close monitoring when planning and implementing restoration actions.

https://www.iufro.org/download/file/27694/6474/03_BF_Finegan_IUFRO_San_Juan_2017_pdf/

In wrapping up this session, some of the **lessons learned** from long-term restoration experiences are both biological and social. Restoration interventions, either under anthropogenic or non-anthropogenic control, can be successful. Protecting and restoring the soil is critical for facilitating restoration, particularly replenishment of soil organic matter. The level of soil degradation determines species composition, and introduced species can colonize without intervention. Natural processes, such as seed dispersal, colonization and self-organization, are restoration assets. Humans cannot replace, and should avoid suppressing, natural processes. The methods employed depend on the site-specific situation and socio-economic context. In addition, FLR is a long-term endeavour accumulating benefits often after several decades. To be successful, FLR needs to be integrated with other sectors, designed with well-defined objectives and realistic baselines for monitoring and evaluation, as well as recognise the uncertainty under global change.

2.3 Governance of forest landscape restoration

Moderated by **Sabine Reinecke**, University of Freiburg, Germany, the session explored options for changes to policy frameworks, tenure systems and institutional arrangements, in order to enable large-scale FLR implementation.

Stephanie Mansourian, Mansourian.org, Switzerland, elaborated on the question "Why is governance important for FLR implementation?" Governance encompasses a diversity of aspects, including notably people at all levels, mechanisms by which people make decisions, tools used to facilitate decision-making and structures to reach and implement those decisions. The governance process influences FLR in many ways. It may be both a challenge for FLR and a solution as both processes – governance and FLR - inter-relate in space and time. To date, little attention has been given to governance in FLR. Yet, this should be prioritized at all levels of science, policy and practice. There are clear challenges to ensuring governance is a solution for FLR, including a lack of understanding, limited research and different time scales between the urgency of FLR and longer term governance processes.

https://www.iufro.org/download/file/27697/6474/04_SM_Smansourian_Puerto_Rico_FLR_June_2017_pdf/

The programme continued with a presentation by **Rene Zamora-Cristales** of the World Resources Institute (WRI) on the "Initiative 20x20: a country-led effort to change the dynamics of land degradation in Latin America and the Caribbean" highlighting why forest landscape restoration is important in Latin America. The need to maintain and improve agriculture productivity is seen as one of the major driving factors of the evolution of the "20x20 Initiative", emphasising the importance of governance as well as public and private financing arrangements. Currently, participating countries are moving from political commitment to implementation by developing national FLR plans and strategies.

https://www.iufro.org/download/file/27698/6474/05_RZ_Zamora_Initiative20x20_PuertoRico_pdf/

Ernest Foli from the Forest Research Institute of Ghana presented on "Land tenure and access to land for forest landscape restoration in Ghana". Following past efforts to reduce deforestation, the government of Ghana now seeks private sector support and participation in achieving its committed targets under the Bonn Challenge.

However, access to land remains a challenge, particularly due to protracted chieftaincy and land disputes caused by poor maps and poor records that make conversion from deeds to titles very difficult or almost impossible. Revising policies and regulations, including the decentralization of land title registration to enable farmers to demarcate and register lands and trees on their farms to secure their ownership of land; avoiding multiple issuance of land title certificates by the Land Title Registry; involving local government authorities in land allocation, and revising tree tenure arrangements to vest ownership of naturally occurring timber trees of Forest Reserves in the communities, are all considered essential for long-term investment for forest landscape restoration in the country.

https://www.iufro.org/download/file/27699/6474/06_EF_Land_tenure_and_access_to_land-FOLI_v2_pdf/

Lessons learned from this session is that a lack of understanding and limited research on governance issues represent challenges to ensuring governance as acts as a solution for FLR. Failures in governance, including unresolved land tenure and access rights to natural resources, as well as perverse incentives and contradictory policies, are often the underlying causes of land and forest degradation. Perhaps the greatest challenge is the disparity in time scales, between the urgency of restoring degraded land and the longer time it takes to address governance issues. Ultimately, governance should lead to transparent rules and should result from a fair participation of all actors. International commitments have to be linked to locally-accepted goals and aspirations, in order to successfully implement FLR on the ground. For the sake of long-term ecological, economic and social benefits for many, FLR inevitably has to deal with conflicts of interest and seek fair ways to designate losers and minimize resistance. The way forward is to fully consider legitimate claims to landscapes in planning, be it with economic incentives, the rule of law, education, and/or capacity building.

2.4 FLR project planning and monitoring

This session was moderated by **Michael Kleine**, IUFRO Headquarters, addressing planning and monitoring tools including effective evaluation that require structured and organised FLR processes at the national and local levels.

Chetan Kumar, IUCN presented on "ROAM: a collaborative framework to help landscape planning and decision-making for FLR". The Restoration Opportunity Assessment Methodology (ROAM) has been developed over the past years as a methodological framework to identify and prioritize FLR opportunities at the national and subnational levels. It is a stepwise, iterative, flexible process adaptable to national and subnational contexts. The planning tool brings together people to identify, negotiate, and implement FLR activities for restoration. Thus far, ROAM activities have been applied in 26 countries helping to operationalize the Bonn Challenge commitments. Also, a new tool – called the Bonn Challenge Barometer is being developed to profile and track country progress on the Bonn Challenge pledges. This protocol will be designed with input from six pilot countries.

https://www.iufro.org/download/file/27700/6474/08_CK_ROAM_IUCN_IFURO_pdf/

Promode Kant from the Institute of Green Economy, India, elaborated on "Local level planning and design of FLR projects" highlighting that following national planning (e.g. ROAM) a systematic yet flexible approach needs to be employed by FLR facilitators and actors that helps navigate through the rather complex processes of stakeholder engagements, including agreeing on local priorities and concrete plans about the desired changes and promoting understanding and cooperation. Employing a consistent hierarchy of goals, objectives, and activities allows for actual work in the field to commence. Examples from a wide array of projects (in Rwanda and India) were presented, ranging from straightforward improvement of degraded forest landscapes by single forest owners to very complex

undertakings involving many stakeholders working towards a more sustainable land-use through restoration with the necessary transformation of actual business models affecting the entire rural community.

https://www.iufro.org/download/file/27703/6474/09_PK_PKant-Local_level_planning___design-PuertoRico-Final_pdf/

The session then moved on to the subject of FLR monitoring through a presentation by **Faustine Zoveda**, FAO, entitled "Towards harmonized and cost-effective monitoring frameworks for FLR." FAO is currently leading the development of a collaborative road map on FLR monitoring to support and align monitoring of progress on FLR implementation efforts globally. More specifically, this activity aims at reviewing needs and opportunities for FLR monitoring; taking stock of available tools and approaches, including sharing of examples of application; and identifying gaps and priority actions to move forward. Ongoing activities include the preparation of a guidance document led by WRI/FAO; setting up of a knowledge-platform containing specific modules on FLR monitoring; elaboration of a concept note for development of a community of practice; and the organisation of a first webinar on FLR monitoring in 2017. Overall, the road map will encourage and support countries and in-country actors, and other relevant partners in monitoring FLR at all scales.

https://www.iufro.org/download/file/27704/6474/10_FZ_Monitoring_Roadmap_IUFRO_20170605_pdf/

In his presentation on "Participatory monitoring and forest landscape restoration" **Manuel Guariguata** of CIFOR analysed the opportunities and challenges associated with involving local communities in monitoring progress in forest landscape restoration. Participatory monitoring is a system that involves stakeholders from multiple levels – especially local people – in a meaningful way in the design, collection and analysis of monitoring data leading to decision-making about the progress and success of forest restoration initiatives. Local involvement is necessary for long-term restoration success as it creates a sense of ownership, buy-in and trust; increases speed and effectiveness of local decision-making; and catalyses social learning and adaptive management. A participatory monitoring system can face challenges with regard to involvement of a dedicated, centralized government-led platform as well as in balancing national versus local needs and goals.

https://www.iufro.org/download/file/27706/6474/11_MG_Manuel_Guariguata--IUFRO_Puerto_Rico_pdf/

The session underlined well-known **lessons learned** that landscapes are complex and unique social constructs and as such, integrated landscape and forest landscape approaches require adequate planning and monitoring tools at the national and local levels. Past experience with broad-scale restoration has shown the importance of defining and reconciling multiple objectives, a process that begins with well-defined goals. There are many available tools for project planning at different scales, but in many cases these may need to be adapted to support FLR implementation. Key messages on FLR project planning and monitoring approaches include the need for local involvement and integration of national, sub-national and local planning with implementation in a flexible and adaptive manner in order to achieve long-term success; full integration of multi-level monitoring of FLR as an obligatory part of FLR projects; the combination of remote sensing and terrestrial measurements to know why something succeeded or failed; and the need to select indicators (including those representing drivers of restoration success) at the right scale that answer the right questions and can be done with available resources.

2.5 Getting started with restoration

Shira Yoffe of the US Forest Service moderated this session which highlighted basic processes that need to be pursued at the beginning of forest landscape restoration activities. Implementing an FLR project requires turning goals into clear and measurable objectives and actions, and to understand the feasibility of interventions in the target landscape.

Robin Chazdon, University of Connecticut/World Resources Institute, USA, elaborated on "Enhancing the role of natural regeneration in large-scale forest and landscape restoration" and shared her research with harnessing the potential for natural regeneration of forests that can greatly reduce the costs of FLR while offering a wide range of environmental and social benefits to multiple stakeholders. Given the ambitious restoration goals and commitments under the Bonn Challenge and the New York Declaration on Forests it is unlikely that these will be achieved without a major global effort to promote natural regeneration. Enabling and protecting naturally regenerating forests under the appropriate biophysical and social conditions requires development and application of new policies, governance structures, and assessment methodologies. Compared to plantations of native or exotic tree species, environmental benefits of natural regeneration include enhancement and conservation of local native biodiversity and genetic diversity; increased resilience to climate shocks; and production of diverse and locally sourced timber and non-timber products.

https://www.iufro.org/download/file/27707/6474/12_RC_Chazdon_Puerto_Rico_FLR_Conference_pdf/

The presentation on "Framework species approach to restoring tropical forests" by **Stephen Elliott**, Chiang Mai University, Thailand, concentrated on some of the aspects of successful establishment of new trees in restoring tropical forest ecosystems. Since most of the accessible land is already claimed for agriculture, restoration sites are often remote and inaccessible and thus we need to automate forest restoration tasks such as by using drones for collecting and dropping seeds as well as carrying out automated weeding and monitoring. In addition, further research is required to better understand seed dispersal, in view of the extirpation of large seed-dispersing animals over wide areas and in order to develop effective direct seeding techniques as cheaper and easier alternatives to tree planting, particularly in remote areas.

https://www.iufro.org/download/file/27708/6474/13_SE_Bonn_Challenge_and_Global_Change_ELLIOTT_et_al_170605_compressed_pdf/

Bastiaan Louman, CATIE presented recent research on "Factors that affect uptake of tree conservation and planting in agricultural farms in Costa Rica". In studying the question why farmers in Costa Rica contributed to a general increase in tree cover, a number of factors could be identified showing a strong trend towards social, cultural and human barriers that negatively affect the willingness to plant trees. To this end, in today's rural communities, social, human and cultural factors are important to strengthen local innovation systems and creating an enabling environment for the restoration of tree cover in agricultural landscapes. Depending on the state and process of development in the various counties of Costa Rica, both incentives (e.g. payment for environmental services) and regulations (e.g. land use change prohibition) are insufficient and need to be accompanied by promoting the value of forests and trees, providing technical assistance and empowering local leadership.

https://www.iufro.org/download/file/27709/6474/14_BL_adoption_factors_Bastiaan_Louman_pdf/

With his presentation on "Integrating trees in agricultural landscapes with agroforestry" **Lars Graudal**, World Agroforestry Center (ICRAF) and University of Copenhagen, Denmark, provided insights into agricultural systems with trees, especially highlighting the interaction of agriculture and forestry involving farmers, livestock, trees and forests at multiple scales; the focus on 'polycultures' with trees to produce food, fibre, fuel, timber and other products; and generating environmental services such as shelter, soil and water conservation, carbon sequestration and biodiversity.

Although global tree cover on agricultural land has increased over the past decades with more than 43% of all agricultural land under some form of agroforestry approaches, the contribution to total tree cover at global scale from agroforestry needs to be enhanced. Therefore, agroforestry and trees in mosaic agricultural landscapes can be among the major tools to achieve large scale restoration, providing huge environmental and economic benefits. Proper context matching at species and genetic levels and mobilization of the 'biodiversity' resources can be

considered an important and urgent matter to achieve the ambitions of the Bonn Challenge and other international commitments under the 2030 Sustainable Development Agenda.

https://www.iufro.org/download/file/27710/6474/15_LG_Graudal_short_version_IUFRO_FLR_Conference_PR_June_2017_pdf/

Ariel Lugo, International Institute of Tropical Forestry, Puerto Rico, USA, in his presentation on "Restoration Outcomes: Decades Later" shared his rich experience with various ecological and silvicultural aspects of long-term forest restoration in Puerto Rico. Due to agriculture expansion in the 18th and 19th centuries, the forest of Puerto Rico had lost nearly 90% of its original area. Forest recovery started in the 1950s because of a decision to stop agriculture activities, resulting in large tracts of land being restored either with or without human interventions. Highlights in this restoration process show that planting of monocultures can contribute to achieve diversity in the landscape depending the state of degradation; canopy closure in regenerating forests is a key moment in the restoration process both environmentally and biologically; the level of soil degradation determines species composition of future stands; and that several of the introduced species colonized new sites without human intervention.

https://www.iufro.org/download/file/27711/6474/16_AL_Restoration_IUFRO_Workshop_pdf/

This session provided a number of restoration experiences critical for getting started with larger-scale forest landscape restoration. Main **lessons learned** include that natural regeneration and passive restoration can and should play a larger role in FLR; ecological restoration with native species can reach a high status of biodiversity and ecosystem services in a short period of time; active approaches range from applied nucleation, clusters, framework species, to traditional row planting; the choice of method depends on degree of degradation of soil and vegetation, restoration objectives and available resources; as well as challenges that are financial, logistical (seed challenge), and associated with leadership and technical capacity.

2.6 FLR implementation approaches

Moderated by **Jorge Quesada Díaz**, Ministry of Environment of El Salvador, this session demonstrated that a wealth of knowledge and experience on technical and socio-economic aspects of restoring forests and landscapes has been accumulated over time. Understanding, further developing and applying this knowledge will help to fast-track large-scale FLR implementation.

Johannes Schwegler, Fairventures Worldwide FVW GmbH, Germany, shared practical experiences with "Rehabilitation of degraded land with native tree species in Central-Kalimantan". Based on the philosophy that demand for wood should be one of the driving forces to rehabilitate land using trees, the project in Indonesia pursues integration along the value chain ranging from forest plantation, logistics, processing companies, product designers, traders and eventually to consumers. The project works with small-holder tree growers mainly using Sengon or Albizia (*Paraserianthes falcataria*), a fast growing tree species native to Southeast Asia. Connecting the tree growers to companies and markets, while creating and sharing knowledge available with everyone in the sector, leads to shared action for developing new lightwood markets for added value products, and thus makes short-rotation, small-holder tree plantations feasible and profitable on the ground.

https://www.iufro.org/download/file/27712/6474/25_JS_1706_IUFRO_FLR_Puerto_Rico_Faierventures_pdf/

Ilse Hennemann, Wageningen University & Research, The Netherlands, presented on "Landscape governance capacity framework - a framework for assessment and strategic guidance of landscape initiatives". FLR takes place in a complex socio-economic and biophysical environment which is characterised by multiple landscape services and functions; multiple stakeholders pursuing different objectives, conflicting interests and power imbalances; networks across political-administrative and sector boundaries; and the potential of creating new institutional arrangements.

All these elements are embedded in a unique "place". Given this complexity, landscape governance is seen as a prerequisite for successfully restoring forest landscapes. The landscape governance capacity framework is a tool that allows to obtain better insights into strengths and weaknesses of a particular landscape and to identify capacities needed for FLR implementation.

https://www.iufro.org/download/file/27713/6474/26_IH_FLR_conference_-_LG_framework_pdf/

Ongoing efforts in Ethiopia on "Building productive landscapes: Experience from Northern Ethiopia" were reported by **Agena Anjulo Tanga**, Ethiopian Environment and Forest Research Institute. Following a strategy to build a climate resilient green economy involving the agriculture, forestry, energy and technology development sectors, the Ethiopian Government has embarked on large-scale reforestation programmes in various parts of the country. Given the limited water availability, significant changes have been achieved in the landscape through moisture harvesting techniques and tree planting with the help of public participation and mobilization of rural communities, a key factor for success in land rehabilitation. In the long-term, reforestation is expected to improve groundwater recharging at upper catchments resulting in improved stream flow and thus water availability in the lower catchment areas.

https://www.iufro.org/download/file/27714/6474/27_AA_Building_Productive_Landscapes_Ethiopian_Experience_pdf/

Robert C. Ong, Sabah Forestry Department, Malaysia in his presentation on "FLR through conservation and sustainable forest management in Sabah, Malaysia" shared long-term experiences with forest landscape restoration through conservation and sustainable forest management in Malaysia's Eastern State of Sabah. Following intensive timber exploitation in the forests of Sabah until the late 1990s, Sabah gradually transformed its forestry sector from a solely timber-based industry to a more diverse sector based on sustainable natural forest management, nature conservation and plantation forestry through reforestation and rehabilitation of degraded areas. Aspects such as eco-tourism, environmental education, non-timber forest products and wildlife conservation have gained in importance and contribute to a diversification of income. After more than 20 years, almost 50% of the permanent forest estate (PFE) (or 26% of the total landmass of the State) is totally protected or under some form of conservation management. The latter also extends into oil palm plantations where conservation measures such as re-establishing of riparian reserves along rivers are implemented. Key initiatives also include 100 % certified sustainable palm oil by 2025 (i.e. jurisdictional certification); a 25-year landscape level management plan for the PFE; state-wide assessment of high conservation value (HCV) forests; and conservation financing through external investors.

https://www.iufro.org/download/file/27715/6474/28_RO_Puerto_Rico_Talk_2017_pdf/

In his presentation on "Managed tropical forests: Why do they matter in restoration programmes?" **Plinio Sist**, CIRAD, France, presented research results from long-term monitoring and experiments in logged-over tropical forests in Africa, Latin America and Southeast Asia. Given the fact that logged forests already extend over a major proportion of the tropical forest area they represent key ecosystems to be preserved, restored and sustainably managed. Such forests are capable of rapid recovery towards levels of carbon stocks and biodiversity close to those recorded in old growth forests. Restoration programmes must promote sustainable multiple use of managed tropical forests by reconciling nature conservation and economic use of the forest resources for the benefit of society. To this end, it is essential to better understand the resilience of the so-called "degraded forests" through promoting research collaboration between different permanent plot networks which monitor the dynamics of primary, managed, secondary forests and of agroforestry systems.

https://www.iufro.org/download/file/27716/6474/29_PS_IUFRO_Puerto_Rico_Sist_pdf/

Sabin Ray, World Resources Institute, USA, emphasised the importance of "Understanding social landscapes" as an important element in addressing landscape-level challenges. Social landscapes made up of actors, rules and practices are complex social constructs and are as important as biophysical landscapes. Mapping of social landscapes involves analyses and research into various aspects including answering questions such as which actors are involved; how they are linked, how influential they are; and what are their goals. Besides face-to-face meetings of actors, increasingly "networks in the cloud" such as social media become influential in providing input to mapping and analyses of social landscapes. Overall, utilizing networks will be a key to unlocking a modern forest landscape restoration movement.

https://www.iufro.org/download/file/27717/6474/30_SR_Social_Landscapes_Puerto_Rico_Pres_pdf/

Opportunities through biotechnology as a means of reintroducing important tree species was explained by **Douglass F. Jacobs**, Purdue University, USA, in his presentation entitled "Restoring keystone species through biotechnology". Given the current situation of increasing threats to forests by introduced pests and pathogens, there is the need to preserve and re-introduce so-called keystone species which have a disproportionate impact on an ecosystem and its functioning when compared to their abundance. Reintroduction of such species offers FLR an added opportunity to help meet targets of the Bonn Challenge, while simultaneously restoring species. Although ensuring insect and disease resistance in forest trees is complicated, advances in biotechnology have made reintroduction feasible. Because societal and ecological barriers to FLR with threatened species remain, the most effective is policy that confines the spread of pests and pathogens.

https://www.iufro.org/download/file/27718/6474/31_Jacobs_FLR_2017_Puerto_Rico_COMPRESSED_pdf/

The session demonstrated that successful forest landscape restoration requires consideration of many different aspects in order to better understand effective ways and means to restore land. Major **lessons learned** include the need to integrate forest landscape restoration into the whole value chain of products and services; better understanding landscape governance and its various instruments (including social landscapes) as essential elements for successful FLR implementation; creating productive landscapes including agriculture, agroforestry, production forests, and protection of native forests so as to achieve sustainability; well-managed logged-over tropical forests recover faster than degraded secondary forests; and reintroducing extirpated keystone and foundation species using biotechnology and traditional breeding is an opportunity in forest landscape restoration.

2.7 FLR and climate change adaptation

This session, moderated by **John Parrotta,** US Forest Service, focussed on the relationship and interaction between forest landscape restoration and climate change. The need for restoration will increase due to extreme climatic events, rising temperatures, and land use change. The goal of adaptation is to decrease vulnerability and increase resilience to global change.

In his presentation "Strategies for adapting FLR to climate change" **John Stanturf**, US Forest Service, explained the different approaches that can be used in forest landscape restoration to adapt to climate change. Themes common among the strategies are using adapted genotypes, resistance to pathogens, managing herbivores to ensure adequate regeneration, species and structural diversity at stand and landscapes levels, and connectivity and reduced fragmentation. Novelty can also be intentionally introduced in terms of non-native provenances, species, or genetically-modified organisms. Anticipatory adaptation is intermediate in tolerance of novelty and might accept a climate-adapted, non-native species, especially if it provided ecosystem services lost by the decline or extirpation of a native species. Intentionally introducing climate-adapted species analogous to lost natives would constitute transformational adaptation.

https://www.iufro.org/download/file/27719/6474/32_JS_Stanturf_Strategies_for_adapting_to_climate_change_pdf/

Andreas Bolte, Germany presented an overview on "Adaptive measures- a view from global regions". Although forest restoration and adaptation are global issues, successful implementation of adaptive measures need extensive participation at the regional and local scale. The IUFRO Task Force on Forest Adaptation and Restoration under Global Change provides both a network and an information system to make best use of local knowledge and experiences about adaptive measures at the global scale. An open access database includes local information about priority targets and factors of success or failure with adaptive measures, and will allow development of best practice approaches at a regional scale.

https://www.iufro.org/download/file/27720/6474/33_AB_Bolte_et_al_Adaptive_Measures_pdf/

In his presentation "Forest stand management regimes under changing environmental conditions" **Jürgen Bauhus**, University of Freiburg, Germany, emphasised the importance of healthy and vital trees for delivering ecosystem services from restored forests in changing environmental conditions. Tree vitality and forest ecosystem stability can be strongly influenced through silviculture (including site preparation and weed control) and stand density management in order to enhance their tolerance against stress and disturbance. Because of future uncertainties in environmental conditions and societal aspirations, more compositionally and structurally diverse forests promise a better provision of ecosystem services than monoculture-like forests. Hence forest restoration should not be left to amateurs. From establishment to the management of mature stands, it requires an extensive knowledge base and adequate management capacities to ensure that resources allocated to restoration efforts are used efficiently to provide ecosystem services from these new forests.

https://www.iufro.org/download/file/27721/6474/34_JB_Bauhus_FLR_Puerto_Rico_pdf/

R. Kasten Dumroese, US Forest Service, in his presentation on "Assisted migration: intentionally moving species or populations to mitigate changes in climate" explained about approaches that actively support the migration of tree species as another option in the climate mitigation tool box. In practical terms, this involves moving populations of a species, expanding a species range, or translocating the species over a long distance as a measure of last resort. Such considerations are based on research findings indicating that by the end of this century, most landscapes will have climates incompatible with current vegetation. Risks associated with assisted migration include effects on the receiving and the donor ecosystems as well as failures of establishment. Uncertainties are both ecological and economic, but are highly context specific.

https://www.iufro.org/download/file/27722/6474/35_KD_Dumroese_-_IUFRO_Assisted_Migration_pdf/

In the final presentation in this session **Palle Madsen**, University of Copenhagen, Denmark reported on research about "Seeking provenances/species that will be better adapted to future climate". The project provides a collaborative platform between European forest scientists and counterparts in Iran working together to address the issue of whether native broad-leaved and conifer trees in Iran would present a better gene pool for trees to be cultivated in the Baltic region of Europe. Given the rather low tree species diversity in Northern Europe, risks are high that under the expected changes in climatic conditions in Europe, native species might not survive. Therefore, an increase in tree species' diversity is needed to support adaptation for the future, as well as to spread the risks related to upcoming climatic stressors. To this end, ongoing research includes – amongst others - provenance trials, DNA characterization of species in Iran, exchange of genetic material and sharing of knowledge and technology related to forest research, management and silviculture.

https://www.iufro.org/download/file/27723/6474/36_PM_Puerto_Rico_Wedn_7_June_2017_Palle_Madsen___See
king_provenances__pdf/

This session on forest landscape restoration and climate change adaptation addressed a wide range of problems that forests may face in the future due to changing environmental conditions. **Lessons learned** from the presentations

include the basic fact that extreme weather events and man-made land use change will add additional degraded ecosystems to the area needing restoration. Strategies for adapting to global change have many commonalities but tolerance to novelty separates them. Past restoration approaches were successful based on simple approaches that may not be adapted to today's complexity as examples in the Black Forest of Germany or the landscape in Jutland, Denmark, show. Degraded sites require the most intensive treatments and complexity requires that we keep options open. Assisted migration is a tool to adapt to global change but must recognize effects on receiving and donor ecosystems. Refugial populations may provide germplasm at species, provenance or gene levels needed for trees adapted to future conditions. It is likely that notions of native species and "local is best" will be challenged by the need for "better adapted" restored forest landscapes.

2.8 Investing in FLR implementation

Investors have different motivations for investing in forest landscape restoration and therefore different expectations of returns. Moderated by **Till Pistorius**, Unique Forestry and Landuse Consulting, Germany, the session highlighted aspects of financing FLR as a matter of matching investor goals with environmental and livelihood needs.

Faustine Zoveda, FAO, with her presentation on "Financing strategies for Forest and Landscape Restoration (FLR)" introduced participants to aspects of investing into restoration of degraded lands. Potential sources of funding include climate finance, private sector, development cooperation, non-governmental and environmental funding, state budgets and non-traditional sources such as crowd funding. The more degraded the landscape, the higher the costs of restoration and the risk of investment; and different investors accept different levels of risks. In order to attract funding for restoration activities aiming to achieve more sustainable land use, several streams of approaches are needed and include mainstreaming FLR in state budgets; setting up of appropriate financing mechanisms; engaging the private sector; building alliances and partnerships; and thus creating a market place for FLR.

https://www.iufro.org/download/file/27724/6474/37_FZ_Financing_strategies_IUFRO_20170606_pdf/

In his presentation on "Coordinating finance for FLR across sectors" **Louis Wertz**, EcoAgriculture Partners, USA elaborated on the question on "How do we get to sustainable landscape investing?" A clear distinction is to be made between two different investment types; i.e. enabling investments include multi-stakeholder platforms; strategic planning and coordination, and training; landscape assessments, monitoring impacts, as well as policies and financial incentives. In contrast, asset investments aim at agricultural practices or value chain activities; enterprises, industries using natural resources and products; green infrastructure and greening built infrastructure, as well as natural resource restoration of productive lands. To maximize return on investments, integrated landscape planning must be a key component of FLR implementation. Investment coordination is a responsibility of a good integrated landscape management platform; and tools and training for investment-readiness at the landscape level, and for the coordination role, are needed urgently.

https://www.iufro.org/download/file/27725/6474/38_LW_Coordinating_Finance_Across_Sectors_for_Landscape_Restoration_June_2017_-_Wertz_pdf/

Martin Cremer, UN Environment Programme, Germany, in his presentation entitled "Seed capital assistance facility for FLR", introduced the participants to a financing approach that aims at the use of limited public funds to leverage a maximum of private investment with an average leverage factor of larger than 10 times. The twofold objective of the approach includes, on one hand, to entice the private sector to engage in early stage project development deemed too risky, and on the other hand, to work through the private sector to achieve local capacity building. In this way, an alignment of interest through a cost-sharing approach is achieved combined with an obligation to reimburse grants in case of success. By addressing early stage investment barriers, the facility leverages substantial private funds whereby donor funding is efficiently used by recycling of grants throughout their lifetime.

https://www.iufro.org/download/file/27726/6474/39_MC_20170607_SCAF_Puerto_Rico_FLR_v2_pdf/

The final presentation in this session on "Catalysing Investments in Landscape Restoration" by **Ulrich Apel**, Global Environment Facility (GEF), highlighted common features of GEF funding for landscape restoration including integrated approaches at scale; striving for multiple benefits; enabling supportive policies and public sector role; flexible financial instruments; and local economic benefits and revenue streams such as sustainable provision of food, timber, NTFPs, PES, and ecotourism services. Preliminary lessons of past and ongoing projects show the importance of not simply adding up hectares but embedding FLR in the broader development agenda of countries; securing land tenure as a prominent feature of good governance; avoiding perverse incentives and/or contradictory policies that hamper restoration or lead to deforestation; capacity building at different levels; and technical assistance to bring bankable projects to the investment phase.

https://www.iufro.org/download/file/27727/6474/40_UA_GEF_-_Financing_Restoration_v02_Puerto_Rico_pdf/

From the presentations and discussions in this session, important **lessons learned** could be derived, particularly those related to the need to further develop financing mechanisms and build an enabling policy and regulatory environment for investors in FLR, which participants viewed as a priority. Also important, is local landscape coordination leading to more attractive economic returns. Today, there are already substantial annual investments into trees that could be partly shifted towards FLR. The seed capital assistance facility provides a risk-sharing mechanism for early-stage FLR development, thus addressing and ultimately overcoming early stage investment barriers. All in all, embedding FLR in a broader development agenda and looking at FLR as a means to achieve a wide range of development objectives would attract more funding.

2.9 Poster sessions

During the two-days of workshop activities a total of three poster sessions were held providing the authors opportunities to present their posters. Moderated by various participants, the authors made very brief statements in a "lightning round" followed by general discussion. Authors explained the type of research or experiment, the results and implication for FLR implementation, shown on the posters. A total of 25 posters were presented and can be downloaded from the SPDC website at: https://www.iufro.org/science/special/spdc/flr/flrconf/.

3 Ministerial-level Policy Dialogue

3.1 Opening session

Convened at the Condado Vanderbilt Hotel in San Juan, Puerto Rico, the one-day ministerial-level policy dialogue was opened by the representatives of the US Forest Service (US-FS), the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) and the International Union of Forest Research Organizations (IUFRO).

Ariel Lugo, on behalf of the Chief, US Forest Service, welcomed the participants to the policy dialogue on forest landscape restoration implementation. The US Government is pleased to host this important conference in Puerto Rico, a place with a long history of landscape transition from deforestation due to intensive agricultural development to reforestation and rehabilitation of forests because of a policy shift away from agriculture to other economic sectors.

BMUB State Secretary **Jochen Flasbarth** in his welcome remarks emphasised that climate targets set out under the Paris Agreement cannot be achieved without substantial global restoration and protection of existing forests. The Bonn Challenge platform established by the German government is still proving effective with an increasing number of countries supporting this policy initiative by their commitments for forest landscape restoration. In this context, German cooperation with many countries has been highly successful, including the smooth-running cooperation at a working level with the United States, despite the new and not particularly climate-aware US administration. In this context, knowledge gained through research and practice on the restoration of forest landscapes, which has been brought together and summarised in this conference in Puerto Rico, is considered an important contribution to any policy dialogue between government decision-makers, international organisations and local stakeholders.

In 2011, the German government was one of the founders of the Bonn Challenge for the restoration of forest landscapes. The aim of the Bonn Challenge is to restore a total of 150 million hectares of forest landscapes around the world by 2020. At the beginning of May 2017, this target was in fact surpassed slightly, thanks to pledges by Pakistan, Bangladesh, Mongolia and Sri Lanka. By 2030, the Bonn Challenge aims to restore a total of 350 million hectares of forest landscapes worldwide. Among its many initiatives, the BMUB, for example, supports reforestation in Central America through its International Climate Initiative (IKI). Since 2011 the Federal Environment Ministry has supported implementation of the Bonn Challenge in the countries of the South with a total of 100 million Euros.

IUFRO President, **Mike Wingfield**, in his opening speech highlighted the role that a global network of forest science cooperation like IUFRO can play in mobilising scientific knowledge and expertise for shaping policy and decision-making at global, regional and national scales. IUFRO's current strategy emphasises the contribution that forests and trees can make to achieve the broader development agenda formulated in the Sustainable Development Goals. Over the past many decades IUFRO scientists all over the world have addressed restoration of degraded lands and rehabilitation of forests in all its aspects. Building diverse and resilient forest ecosystems has been central to a wide spectrum of biophysical, social, economic and policy research specialisations. Thus, this knowledge and experience is vital for successfully developing and implementing FLR on the ground – and to contributing to current policy debates on FLR. In this context, IUFRO has been active at the interface of forest science and policy through various long-term initiatives such as the Global Forest Expert Panels; World Forest Society and Environment Project; the Global Forest Information Service; and the Special Programme for Development of Capacities. IUFRO is grateful to the BMUB and US Forest Service for being a partner in this FLR Conference in Puerto Rico and is ready to further assist in mainstreaming FLR as a meaningful contribution to the 2030 Sustainable Development Agenda.

In his key-note address on "Lessons from the Puerto Rico Experience with Land Restoration", **Ariel Lugo**, US Forest Service, introduced the participants to the 75 years of continuous research in dry, moist, wet, and rain forest

environments that the International Institute of Tropical Forestry has been conducting in Puerto Rico. The research included species trials with over 400 native and non-native tree species; monitoring native and plantation forest stands for over 60 years; studying the effects of disturbances such as hurricanes on forests; continuous island-wide forest inventories since 1982; and landscape-level analysis of land cover changes using air-photo images from the 1930s to the 1970s and high resolution satellite images since then. The impressive amount of scientific information on landscape and vegetation changes was illustrated with paired photographs showing "before" and "after" restoration images. Important lessons learned from this long-term research demonstrates that restoration, either under anthropogenic or under non-anthropogenic control, works; monitoring restored systems and allowing time for these systems to develop are necessary steps to ensure the success of restoration; protecting and restoring the soil is critical for facilitating restoration, particularly soil organic matter; all species, native or non-native, have a role to play in restoration; natural processes, such as seed dispersal, colonization, and self-organization, are restoration assets; humans cannot replace and should avoid suppressing natural processes; and novelty in ecosystems is to be expected in restoration initiatives.

3.2 "Landscape" of the global restoration movement

In the second session of the policy dialogue, moderated by **Horst Freiberg**, BMUB, the role of major participating institutions in the global restoration movement was discussed. A panel consisting of representatives of the main actors in the global forest landscape restoration stage informed participants about key strategies and activities in support of restoration. Each representative gave a short statement as summarised below:

Peter Besseau, Canada explained the role of the Global Partnership on Forest Landscape Restoration as a proactive global network that unites governments, organizations, academic/research institutes, communities and individuals under a common goal: to restore the world's lost and degraded forests and their surrounding landscapes. The platform plays a major role in aligning the work of different organisations through information exchange, collaboration, promotion of FLR at the global, regional and national policy levels as well as joint implementation of projects and initiatives.

Ulrich Apel, Germany, informed about the priorities of the Global Environment Facility including the high importance given to funding restoration of degraded lands. Together with partner agencies and organizations, the GEF is at the forefront of efforts to restore deforested and degraded lands globally. The recently approved programme has established collaboration among IUCN, FAO and UNEP on forest and landscape restoration, linking with the Bonn Challenge and the GPFLR. The landscape approach will be an important vehicle to provide countries with implementation packages tailored to a wide range of landscapes and facilitate scaling up. It will also allow for addressing the interactions, competition and trade-offs between different land uses and thereby avoiding further degradation of land, ecosystems and forests.

Sabin Ray, WRI, USA, provided some insights into the FLR work of the World Resources Institute which mainly involves facilitating regional FLR policy initiatives such as the "20x20 Latin America" FLR policy dialogue. The institute also acts as the secretariat of the Global Restoration Council, a voluntary, non-departmental entity which aims at harnessing the collective wisdom, influence and energy of its members to catalyse and sustain a global movement for restoration. Efforts by the council are directed towards inspiring commitments to restoration; getting the right enabling conditions in place; and mobilising implementation to achieve results.

Douglas McGuire, FAO, reported on the Forest and Landscape Restoration Mechanism developed and implemented by FAO. The Mechanism aims to significantly contribute to scaling-up, monitoring, and reporting on FLR activities to a level needed to meet the Bonn Challenge and Aichi Biodiversity targets. It helps to coordinate and facilitate the development and implementation of projects, programmes and related activities in FAO member countries, in full collaboration with other key actors.

Chetan Kumar, IUCN, explained the role of IUCN in the global restoration movement, particularly focusing on mobilising political support for restoring forest landscapes in the various regions and in countries which have

pledged areas for restoration. In this context, regional policy dialogues on forest landscape restoration are organised in cooperation with national authorities as well as institutions in the Global Partnership on Forest Landscape Restoration. Other activities include the development of planning and monitoring tools for FLR at the national level such as the Restoration Opportunity Assessment Methodology (ROAM) and more recently, the Bonn Challenge Barometer.

Michael Kleine, IUFRO, emphasised the potential of IUFRO's research groups and working parties with member scientists from virtually all regions of the world, to bring on board scientific knowledge and expertise on restoring degraded forests and landscapes. Because FLR implementation takes place in very different biophysical and socio-economic contexts, local research results can provide important elements to guide actual FLR projects on the ground. IUFRO will continue to mobilise and communicate FLR-relevant scientific knowledge for use in shaping policies, training FLR facilitators and field operations.

3.3 Panel Discussion

The core session of the policy dialogue, which was moderated by **Peter Besseau**, Canada, consisted of a presentation of key messages from the knowledge-sharing workshop and a panel discussion by ministerial-level delegates. These included Jochen Flasbarth, State Secretary BMUB, Germany; Ariel Lugo, US Forest Service; Clement Chilima, Director Forestry Department, Malawi; Prime Ngabonziza, Director General, Rwanda Water and Forestry Authority; Mike Wingfield, IUFRO President; José Joaquín Campos Arce, Chair of the Board, CIFOR.

In his presentation of the key-messages, **John Parrotta**, IUFRO Vice President, summarised the results of the deliberations by the scientists and expert into the following six thematic areas:

- Learning from long-term experiences with forest landscape restoration
- Addressing governance challenges
- Participatory planning and monitoring of progress
- Experiences with implementation in diverse local contexts
- Strategies for adaptation to climate uncertainties
- Options for financing and investing in FLR

 These key messages were related to:

Defining and reconciling multiple objectives for FLR under global change

- Well-defined goals and reconciled objectives are indispensable for success: beginning the implementation of an FLR project is a process of turning goals into clear and measurable objectives and actions. This process involves understanding which interventions will be the most feasible and effective in the target landscape. Since FLR results are multifunctional, priority-setting is needed.

- Objectives must be realistic and recognise the uncertainty of outcomes under global change;

- Past restoration approaches based on simple approaches have been successful. However, these same approaches may not be as well-adapted to today's complexity, as well as the increased uncertainties associated with climate change and its effects on ecosystems, communities and their land management practices.

- Structuring and organising FLR processes at the national and local levels requires adequate planning and monitoring tools. There are a broad array of available tools, but in many cases these may need to be adapted to support FLR implementation.

- Further developing *social capital*[1] for improved participatory decision-making can greatly facilitate FLR processes and improve outcomes;

The need to utilise existing knowledge and experience for FLR implementation

- The mobilization and utilization of available scientific as well as local and traditional knowledge and technical expertise is critical for success of FLR efforts.

  A wealth of knowledge and experiences on technical and socio-economic aspects of restoring forests and landscapes has been accumulated over time. Identifying, understanding and applying this knowledge will help to fast-track large-scale FLR implementation.

- Creating productive landscapes in most cases will typically involve a variety of management approaches. These may include agriculture, agroforestry, silvo-pastoral systems, production forests, and protection and enhancement of native forests, including through harnessing the power of natural recovery processes;

- Integrating FLR objectives into the entire value chain for goods and services provided by forest landscapes can contribute greatly to the long-term success of forest landscape restoration and benefits to people;

The importance of improved governance in support of FLR

- Available evidence strongly suggests that FLR policies, programmes and implementation will be most successful when underlying cause of land/forest degradation are recognized and addressed.

  These underlying causes often include: governance failures at various levels, unclear land tenure, as well as lack of policy coordination.

- Understanding, influencing and shaping landscape governance is needed for successful FLR implementation;

- When international commitments are linked to accepted local goals and aspirations, the chances of achieving FLR targets are enhanced;

  FLR can contribute to the attainment of Sustainable Development Goals, in particular those related to food security, poverty alleviation, water, human health, and biodiversity conservation.

The role of diverse finance and investment options to support FLR

- While the costs of investments in FLR may appear to be high – particularly in the near term – these costs are typically very low when compared to the costs of inaction.

- Public finance, overseas development assistance, private investment, NGO support, and innovative approaches such as crowd-funding, all have important and potentially complementary roles in supporting FLR activities.

- Embedding FLR objectives in a broader development agenda – such as attainment of the Sustainable Development Goals – may be very important for building support and the financial resources needed for FLR programmes and activities.

- Investors have different motivations for investing in forest landscape restoration and therefore different expectations of returns. Financing FLR is a matter of matching investor goals with environmental and livelihoods needs. Developing appropriate financing mechanisms and building an enabling environment for investors in FLR are important considerations;

- Finally, there is much to be gained through investments in capacity building at national/sub-national levels.

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[1] Social capital: "networks of relationships among people with shared norms, values and understandings that facilitate co-operation, exchange and innovation within or among groups" (OECD definition)

Summary points:

While the challenges are great, so are the opportunities. The workshop this week demonstrated the depth and breadth of the knowledge, practical expertise, innovation and experience that exist within the scientific and professional community; and within the countless communities living on the front lines of forest landscape degradation, climate change, and other challenges.

It also demonstrated the value of enhanced communication and collaboration across forest science disciplines, and between the scientific community and land managers, communities, government agencies, NGOs, the private sector, and other organizations and movements operating at local, national and global levels. Working together, in dialogue with the public and policy-makers, we may achieve great things.

The **high-level delegates** included representatives of government, international organizations and research bodies with each bringing into the discussions their own perspectives on forest landscape restoration policy and implementation. Over the more than ninety-minute exchange, panellists shared a range of views and experiences with some of the key take-away points including the following five:

- FLR takes many shapes but in all cases, robust, well-functioning partnerships were seen by panellists as an indispensable anchor for any future success. Different panellists stressed different types of partnerships, based upon the specifics of their own FLR experiences and the particular value they bring to the FLR equation: for some, a strong science-policy link was advocated, for others, FLR required strong engagement of the private sector and of non-forest resource sectors; while others made the point that partnerships, over the long-term, should be based upon a long-term effort of "connecting the dots" and supporting education that changes relationships and paradigms.
- The policy architecture needed to support successful FLR includes explicit and deliberate efforts to support lower-level jurisdictions and players in ways that trigger and maintain long-term action. A related point dealt with the implementing environment, whereby novel or innovative partnership arrangements and multi-sectoral actions necessarily require flexibility, time and a generous amount of "learning by doing" to create a new model of interaction that will be durable and productive over the long-term.
- "Maintaining momentum" is critical and can be achieved through strong policy and partner support, by monitoring and reporting on lessons and accrued benefits of successful FLR. Bringing forth evidence must be pro-active and consistent so that lessons (both positive and negative) can feed into future implementation and lead to greater success.
- Our collective "track record" on international policy implementation which has in many cases not met our expectations, suggests that we need to learn from our shortcomings, both to avoid repeating errors as much as to achieve the progress we need more rapidly. In this regard, actions on FLR - i.e. through robust, multi-sector partnerships and at a landscape scale - compel us to do our work differently, in order to achieve impact "on the ground" the way we must.
- The final take-away point is as important as the others: we know how to do this, and in fact, we have been doing FLR for many years – passively and actively - in landscapes across the world. Now, we need to draw on that expertise and amplify our impact in a more concerted way, using partnerships, policy frameworks, building and sharing evidence and learning as we go forward.

4 Annex

International Conference on Forest Landscape Restoration

under Global Change

A CONTRIBUTION TO THE IMPLEMENTATION OF THE BONN CHALLENGE

"Synthesising and sharing globally available forest-related scientific knowledge"

San Juan, Puerto Rico, 6-9 June 2017

Draft Programme

- 5 June: Early Arrival Icebreaker, 7:00-9:00 p.m. at Condado Palm Inn & Suites
- 6 to 7 June: Knowledge-sharing workshop "Translating global FLR policy into local action"
- 8 June: Knowledge-sharing workshop (Field trip)
- 9 June: Ministerial-level dialogue: "Shaping policy for FLR implementation"

Knowledge-sharing Workshop "Translating global FLR policy into local action"

Venue: International Institute of Tropical Forestry
1201 Calle Ceiba, Jardín Botánico Sur, San Juan, PR 00926-1119
https://www.fs.usda.gov/iitf

DAY 1	Time	Subject	Responsible
6 June 2017	**08:00 - 08:30**	Depart Condado Palm Hotel to International Institute of Tropical Forestry (IITF), USDA Forest Service	
	08:30 – 09:00	Registration	Workshop Organisers
	09:00 - 09:30	**OPENING OF THE WORKSHOP** *Moderator: Andreas Bolte, von Thünen Institute*	
		• Welcome and opening remarks by Host Organisations	Leslie Weldon, US Forest Service; Horst Freiberg, BMUB; Ariel Lugo, International Institute of Tropical Forestry; John Parrotta , IUFRO (Vice President)
	09:30 – 10:00	• Keynote Address: Integrated Landscape Approaches for FLR Implementation	Jose Campos, Costa Rica
		LONG-TERM EXPERIENCE OF LANDSCAPE RESTORATION	

6 June 2017	**10:00 – 11:00**	*Key message: As history has shown, FLR needs to be conceptualised as long-term undertaking, in order to yield sustainable outcomes. (15 min. each)* *Moderator: Bastiaan Louman, CATIE*

		• Integration of reforestation policy in Korea	Yeo-Chang Youn, SNU
		• Contribution of plantations to restoration of biodiversity	John Parrotta, USFS
		• Costa Rica	Bryan Finegan, CATIE
		Audience Q&A and Discussions	

	11:00 – 11:30	*Tea/Coffee Break*

GOVERNANCE AND FOREST LANDSCAPE RESTORATION

Key message: Unleashing large-scale FLR implementation requires changes to policy frameworks, tenure systems and institutional arrangements. (15 min. each)

Moderator: Sabine Reinecke, University Freiburg

• Why is governance important for FLR implementation?	Stephanie Mansourian, Switzerland
• Initiative 20x20: a country-led effort to change the dynamics of land degradation in Latin America and the Caribbean	Rene Zamora, World Resources Institute
• Land tenure / access to land (Ghana)	Ernest Foli, Forest Research Institute of Ghana
• Institutional arrangement (Atlantic Forest Pact)	Severino Pinto, Brazil

Audience Q&A and Discussions

	13:00 – 14:00	*Lunch*

FLR PROJECT PLANNING AND MONITORING (14:00 – 15:15)

Key message: Structuring and organising FLR processes at the national and local levels including effective evaluation require adequate planning and monitoring tools. Existing tools need to be adapted to support FLR implementation. (15 min. each)

Moderator: Michael Kleine, IUFRO

• National-level planning tools (ROAM & Bonn Challenge Barometer)	Chetan Kumar, IUCN
• Local-level FLR planning	Promode Kant, Institute of Green Economy
• Towards harmonized and cost-effective monitoring frameworks for FLR	Faustine Zoveda, FAO
• Linking the global with the local: Participatory monitoring and forest restoration	Manuel Guariguata, CIFOR

Audience Q&A and Discussions

GETTING STARTED WITH RESTORATION (15:15– 16:30, 6 June 2017)

Key message: Beginning the implementation of a FLR project is a process of turning goals into clear and measurable objectives and actions, including understanding what feasible interventions in the target landscape are. (15 min. each)

		Moderator: Shira Yoffe, US Forest Service	
		• Enhancing the role of natural regeneration in large-scale forest and landscape restoration	Robin Chazdon, University of Connecticut
		• Framework species approach to restoring tropical forests	Stephen Elliott, Thailand
		• Factors that affect uptake of tree conservation and planting in agricultural farms in Costa Rica	Bastiaan Louman, CATIE
		• Integrating trees in agricultural landscapes with agroforestry	Lars Graudal, ICRAF and University of Copenhagen
		• Forest recovery after agriculture in Puerto Rico	Ariel Lugo, IITF
	16:30-17:00	**Audience Q&A and Discussions**	
	17:00–18:00	**FLR IMPLEMENTATION APPROACHES** *Poster Session with presentations and audience Q&A. Examples of FLR implementation approaches from various regions. Mix of presentations (2-3 minutes each) and moderated discussion.* *Moderator: John Stanturf, US Forest Service*	
		• Underplanting Chilean Nothofagus	Pablo Donoso, Chile
		• Manipulating agricultural watershed hydrology with short tree phases	Richard Harper, Australia
		• Analysis of forest ecosystem restoration on post-mine oil-shale quarries	Diana Laarmann, Estonia
		• Lake Chilwa, Malawi	Steve Makungwa, Malawi
		• Mt. Fuji reforestation project -Corporate social responsibility on ecological forest restoration in conifer plantations in Japan	Takuo Nagaike, Japan
		• Restoring moist tropical forests	Cesar Sabogal, Peru
		• Cluster planting as a lower cost alternative	Somidh Saha, Germany
		• Agroforestry for FLR in central Asia	Niels Thevs, Kyrgyzstan
		• FLR in West Africa through community forestry: Keys to success	Susan Charnley, USA
	18:00-20:00	**Dinner on site & Launching of an IUFRO Publication:** "Implementing Forest Landscape Restoration. A Practitioner's Guide"	John Stanturf and Team
	20:00	Return to Condado Palm Hotel	

DAY 2	Time	Subject	Responsible
	08:00	Depart Condado Palm Hotel to International Institute of Tropical Forestry	
7 June 2017	08:30 - 10:15	**FLR IMPLEMENTATION APPROACHES** *Key message: A wealth of knowledge and experiences on technical and socio-economic aspects of restoring forests and landscapes has been accumulated over time. Understanding and applying this knowledge will help to fast-track large-scale FLR implementation.*	

		Moderator: Jorge Quesada, El Salvador Ministry of Environment	
		• Rehabilitation of degraded land with native tree species in central-Kalimantan	Johannes Schwegler, Fairventures Worldwide FVW GmbH
		• Landscape Governance Capacity Framework - a framework for assessment and strategic guidance of landscape initiatives	Ilse Hennemann, The Netherlands
		• Ethiopia (building productive landscapes)	Agena Anjulo, Ethiopian Forest Research Institute
		• FLR through Conservation and SFM in Sabah, Malaysia	Robert Ong, SFD, Sabah
		• Sustainable management moist tropical forests	Plinio Sist, CIRAD
		• Mapping social landscapes	Sabin Ray, WRI
		• Restoring keystone species through biotechnology	Douglass Jacobs, USA
	10:15-11:15	**FLR IMPLEMENTATION APPROACHES (continued)** *Poster Session with presentations and audience Q&A. Ten examples of FLR implementation approaches from various regions. Mix of presentations (2-3 minutes each) and moderated discussion.* *Moderator: Stephanie Mansourian, Consultant*	
		• FLR in Rwanda	Innocent Bisangwa, Rwanda
		• FLR in Chile	Rodrigo Vargas, Chile
		• FLR implementation approaches in El Salvador	Jorge Ernesto Quezada Diaz, El Salvador
		• FLR in Kazakhstan	Yuliya Borissova, Kazakhstan
		• FLR in Mongolia	Batkhuu Nyam-Osor, Mongolia
		• FLR in Myanmar/SE Asia	Ohn Lwin, Myanmar
		• FLR in Kyrgyzstan	Muslim Rajapbaev, Kyrgyzstan
		• FLR in Uzbekistan	Evgeni Botman, Uzbekistan
		• FLR in India	Promode Kant, India
	11:15-11:45	Tea/Coffee Break	
	11:45-13:00	**FLR and Climate Change Adaptation** *Key message: Adaptive restoration strategies may be incremental, anticipatory, or transformational, depending on their time perspective and tolerance of novelty.* *Moderator: John Parrottae, US Forest Service*	
		• Strategies for adapting FLR to climate change	John Stanturf, US Forest Service
		• Adaptive measures- a view on global regions	Andreas Bolte, Germany
		• Forest stand management regimes under changing environmental conditions	Jürgen Bauhus, Germany
		• Assisted migration: intentionally moving species or populations to mitigate changes in climate	Kas Dumroese, USFS

7 June 2017		• Seeking provenances/species that will be better adapted to future climate	Palle Madsen, University of Copenhagen
	13:00-14:00	*Lunch*	
	14:00-15:00	**FLR Success Stories** *Poster session with presentations and audience Q&A. Ten more examples of FLR implementation approaches from various regions. Mix of presentations (2-3 minutes each) and moderated discussion.* *Moderator: Janice Burns, IUFRO and IFSA*	
		• A global online survey on forest adaptation and forest restoration - concept and first results	Markus Höhl, Germany
		• Livelihoods and integrated plannning	Isabel Gutiérrez, Costa Rica
		• Modeling applied to FLR	Stephan Pietsch, Austria
		• Regional planning for FLR	Jennifer Schulz, Germany
		• Local perceptions and best practices in Fandriana Marolambo / Madagascar Forest landscape restoration	Appolinaire Razafimahatratra, Madagascar
		• Using fast growing commercial tree species to promote native forest restoration	Nino T. Amazonas, Jürgen Bauhus, Pedro H. S. Brancalion
		• The right tree for the right place	Lars Graudal, Roeland Kindt
		• Lessons Learned about applied nucleation as a tropical forest restoration strategy	Janelle Sylvester, Karen D. Holl, J. Leighton Reid, and R. A. Zahawi
	15:00 - 15:30	*Tea/Coffee Break*	
7 June 2017	15:30-17:00	**INVESTING IN FLR IMPLEMENTATION** Key message: Investors *have different motivations for investing in forest landscape restoration and therefore different expectations of returns. Financing FLR is a matter of matching investor goals with environmental and livelihoods needs.* *Moderator: Till Pistorius, Unique Forestry and Landuse Consulting*	
		• Financing strategies	• Faustine Zoveda, FAO
		• Coordinating finance across sectors	• Louis Wertz, EcoAgriculture Partners
		• Seed capital assistance facility for FLR	• Martin Cremer, Frankfurt School of Finance
		• Catalyzing Investments in Landscape Restoration	• Ulrich Apel, GEF
		Audience Q&A and Discussions	
	17:00-17:30	**CLOSING OF KNOWLEDGE SHARING WORKSHOP** *Moderator: Michael Kleine, IUFRO*	
		• Presentation of consolidated findings of the workshop	Andreas Bolte, John Stanturf
		• Closing remarks	Leslie Weldon; Horst Freiberg; Ariel Lugo; John Parrotta
	18:00-20:00	**Dinner on site**	
	20:00	**Return to Condado Palm Hotel**	

Field Trip to FLR Sites near San Juan (Puerto Rico)

DAY 3	Time	Subject	Responsible
8 June 2017	**08:00**	Departure from Condado Palm Hotel	Workshop Organisers
	08:00 – 09:00	Drive from Hotel to El Verde Field Station	
	09:00 - 12:00	Interpretative talks in the field (about 20 mins each) • Mahogany plantation (Jerry Bauer) • El Verde 3 Plot (Tamara Heartsill-Scalley) • Luquillo Forest Dynamic Plot (Jess Zimmerman / Maria Uriarte?) • Canopy Trimming Experiment (Grizelle González) • Radiation Experiment (Ariel E. Lugo)	US-FS; IITF
	12:00 – 12:30	Hike back to El Verde Field Station	
	12:30 – 13:30	Lunch provided at El Verde Field Station	
	13:30 – 14:00	Drive to Rd 191	
	14:00 – 16:00	Visit to Recreational Sites at El Yunque National Forest • Yokahu Tower • Palo Colorado Trail	
	16:00 – 17:00	Drive from El Yunque National Forest to San Patricio Forest	
	17:00 – 18:00	Hike at San Patricio Forest	
	18:00 – 19:00	Return to Condado Palm Hotel	
	19:00 – 20:00	Free time	
	20:00 – 22:00	*Dinner at Condado Palm Hotel*	

Ministerial-level Policy Dialogue: "Shaping Policy for FLR Implementation"

Venue: Condado Vanderbilt Hotel
       1055 Ashford Avenue, San Juan, Puerto Rico
       http://www.condadovanderbilt.com/

	Time	Subject	Responsible
9 June 2017	08:30	Arrival of participants and registration	Organisers
	09:00 - 09:30	**OPENING OF MINISTERIAL-LEVEL POLICY DIALOGUE** Moderator: Michael Kleine, IUFRO	
		• Welcome by US Government	Ariel Lugo, US Forest Service
		• Welcome by BMUB, Germany	Jochen Flasbarth, State Secretary BMUB, Germany
		• Welcome by IUFRO	Mike Wingfield, IUFRO President
	09:30-10:00	• Forest Restoration in Puerto Rico	Ariel Lugo, IITF Director
	10:00 – 10:45	**"LANDSCAPE" OF THE GLOBAL RESTORATION MOVEMENT** Moderator: Horst Freiberg, BMUB	
		Role of major participating institutions in the global restoration movement	Global Partnership on Forest Landscape Restoration; Global Restoration Council; FAO FLR Mechanism; IUCN Regional Bonn Challenge processes; WRI (AFR100, Initiative 20x20); IUFRO (FLR Task Forces and Research Groups)
	10:45 -11:15	*Tea/Coffee Break*	
	11:15 -11:30	**KEY MESSAGES FROM THE KNOWLEDGE-SHARING WORKSHOP** Presentation	John Parrotta, Vice President IUFRO
	11:30 – 12:30	**PANEL DISCUSSION** • Ministers/decision-makers' views on forest landscape restoration Moderator: Peter Besseau, GPFLR	Jochen Flasbarth, State Secretary BMUB, Germany; Ariel Lugo, US Forest Service; Clement Chilima, Director Forestry Department, Malawi; Prime Ngabonziza, Director General, Rwanda Water and Forestry Authority; Mike Wingfield, IUFRO President; José Joaquín Campos Arce, Chair of the Board, CIFOR
	12:30 – 13:00	**CLOSING OF MINISTERIAL-LEVEL POLICY DIALOGUE** • Closing Remarks by US Government, BMUB, IITF; IUFRO	USFS; BMUB; IITF; IUFRO
	13:00 – 15:00	*Lunch*	