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FORESTS FOR THE FUTURE

RESTORATION SUCCESS AT LANDSCAPE SCALE: WHAT WILL IT TAKE AND WHAT HAVE WE LEARNED?

Edited by Jaboury Ghazoul and Daniella Schweizer

WWF
WWF is one of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global network active in more than 100 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

https://forestsolutions.panda.org/approach/forest-landscape-restoration

Prince Bernhard Chair for International Nature Conservation, Utrecht University
The Prince Bernhard Chair is a special chair embedded within the Ecology & Biodiversity research group of Utrecht University. Founded in 1987 on the occasion of the 75th birthday of His Royal Highness Prince Bernhard, the Chair focuses on building bridges between conservation research and public and policy agendas. It helps to establish the necessary knowledge base for nature conservation and restoration efforts, while creating widespread public and political momentum for the implementation of nature-based solutions for the benefit of nature and society. Currently, WWF-NL is the Chair's primary funder.

Previous chairholders include Norman Meyers (1987-1992), Jeffrey Sayer (1994-2003), Jack Putz (2004-2009), Bill Laurance (2010-2014) and Jaboury Ghazoul (2015-2020).

This report has been edited by Jaboury Ghazoul to mark the end of his term. He is also affiliated to the Department of Environmental Systems Science, ETH Zurich, and the Centre for Sustainable Forests and Landscapes, University of Edinburgh.

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Citation
Ghazoul J. and Schweizer D. (eds) (2021) *Forests for the future: Restoration success at landscape scale - what will it take and what have we learned?* Prince Bernhard Chair Reports (issue 1). Series editors Almond, R.E.A., Grooten, M. and Van Kuijk, M., WWF-Netherlands, Zeist and Utrecht University, Netherlands.

Design and infographics by: peer&dedigitalesupermarkt

Cover photograph: © WWF / Simon Rawles
Mbiwo Constantine Kusebahasa, a WWF Climate Witness, planting a tree seedling at the Forest Landscape Restoration HQ and nursery in Rukoki Sub-County, Kasese in the Rwenzori Mountains, Uganda.

ISBN 9789074595278

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Special thanks

We would like to thank the Prince Bernhard Chair Foundation for its financial support. Special thanks also go to all the people who have been involved in the projects outlined in this report, for giving us their time and for sharing their experience and the lessons they have learned.

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FOREWORD

Marijke van Kuijk [1,3] and Monique Grooten [2,3]

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We are at a critical juncture in time. Our planet is currently experiencing unprecedented habitat loss and species extinction, with dramatic impacts on the functioning of our global life support systems. Ecosystems support all life on Earth and there has never been a more urgent need to restore damaged ecosystems than now. It is with this immense challenge that the UN Decade on Ecosystem Restoration begins, aiming to prevent, halt and reverse the degradation of ecosystems on every continent and in every ocean.

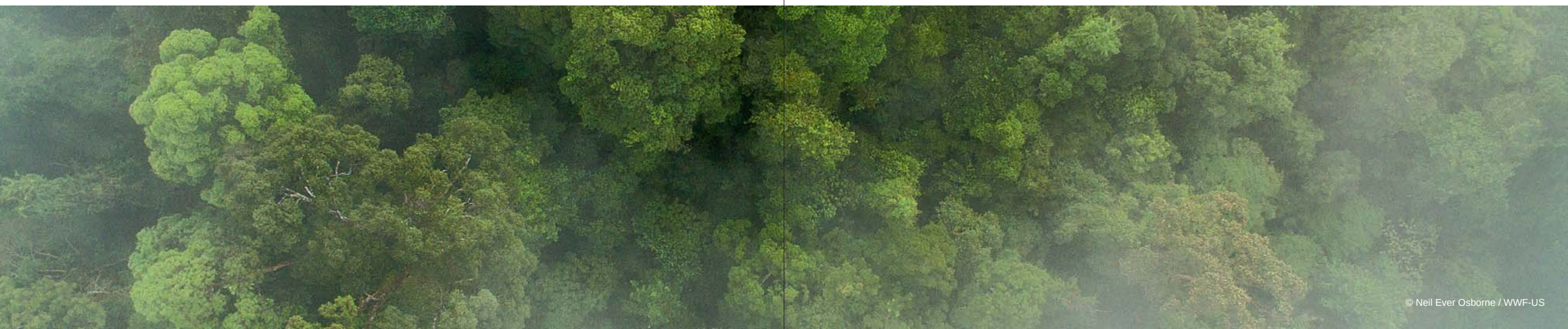
Strengthening connections between conservation science, policy and practice is essential if we are to address these immense challenges, and that is the primary focus of the Prince Bernhard Chair for International Nature Conservation. Established in 1987 to mark the 75th birthday of His Royal Highness Prince Bernhard and embedded within Utrecht University in the Netherlands, the Chair has strong links with WWF-Netherlands, its key supporter. As a partner in the Global Partnership on Forest and Landscape Restoration and a global partner of the UN Decade on Ecosystem Restoration, WWF champions forest and landscape restoration and is working at local, national and international levels to turn commitments into action on the ground worldwide.

Prince Bernhard chairholders are internationally renowned researchers working at the interface of science and conservation, driving efforts to bring them into a broader societal and policy context.

Past Chairs have included Norman Meyers (1987-1992), Jeffrey Sayer (1994-2003), Jack Putz (2004-2009) and Bill Laurance (2010-2014). This report is the culmination of work under the most recent Chair, Jaboury Ghazoul (2015-2020), who focused on degraded forest land and the scaling up of forest and landscape restoration.

We cannot theorize our way to solutions, but we can learn from projects that have already been implemented. To showcase some of this work we have compiled insights from researchers and practitioners at the coalface of forest and ecosystem restoration around the world. They were asked to contribute their perspectives on the greatest opportunities, as well as the most fundamental challenges, that need to be addressed in the coming years. Common themes emerging range from governance and sociocultural norms to capacity-building and financing.

As we enter the UN Decade on Ecosystem Restoration, we hope that these contributions, drawing on extensive and diverse experiences of implementing forest and landscape restoration actions, will inspire you and act as a starting point for conversations about how to turn theory into practice. We know that this effort will only succeed if paper commitments are translated into real, lasting impacts on nature and people's lives. With this report we and the Prince Bernhard Chair Foundation are proud to play our part in the momentous work to come.



An aerial view of Block 1, a newly formed logging concession operated by WWF in the Bukit Tigapuluh, or "Thirty Hills," landscape on the Indonesian island of Sumatra. WWF, together with Frankfurt Zoological Society and The Orangutan Project, is working through a newly formed concession company to protect and restore 100,000 acres bordering the Bukit Tigapuluh National Park that had been originally earmarked for logging concessions.

EXECUTIVE SUMMARY

A year on from the beginning of a devastating pandemic that swept the world, and at the start of the United Nations Decade on Ecosystem Restoration, we know that we need to fundamentally change the way we relate to our natural world and its resources.

We knew this before COVID-19, but the virus has amplified the urgency with which it needs to happen. We know that nearly half of all new emerging infectious diseases from animals are linked to land-use change. Agricultural and industrial expansion into natural areas often disrupts the ecological systems that regulate pathogenic risk, particularly in the biodiverse tropics. This can lead to close contact between wildlife, livestock and people, increasing the chance that a disease will spill over into humans (WWF, 2020).

Led by the United Nations Environment Programme and the Food and Agriculture Organization of the United Nations, this UN Decade is described as *"a rallying call for the protection and revival of ecosystems all around the world, for the benefit of people and nature"* (United Nations, 2020). It aims to build strong, broad-based political momentum for ecosystem restoration by catalysing thousands of initiatives on the ground.

The ambition is grand, shifting ecosystem restoration from small site-based projects to integrated landscape-scale programmes. The ultimate goal is to meet the Bonn Challenge – a global target to bring 350 million hectares of degraded and deforested land into restoration by 2030. Since the Challenge was set in 2011, 74 governments, private associations and companies have pledged more than 210 million hectares (IUCN, 2020).

What do these commitments mean on the ground? The Global Partnership on Forest and Landscape Restoration defines landscape-scale restoration as *"the process of recovering the ecological functionality of deforested and degraded landscapes to secure human well-being and to respond to climate change, biodiversity loss, and continuing food security challenges"* (IUCN, 2011). Healthier ecosystems, with richer biodiversity, can yield greater benefits such as more fertile soils, bigger harvests of timber and fish, and larger stores of greenhouse gases.

It is true that restoring the world's degraded ecosystems is far from a complete solution. It sits alongside transformations in energy generation and consumption, transportation systems, food production, governance, and social and corporate responsibilities. Yet restorative actions such as planting trees can be carried out readily by individuals, communities, companies and governments (Aronson *et al*., 2017). When implemented correctly, these actions can bring substantial and tangible outcomes and benefits to both people and nature within just a few years (Griscom *et al*., 2017; Chazdon and Brancalion, 2019).

As with most environmental initiatives, ensuring that commitments move from aspiration to real implementation is perhaps the most difficult aspect. Trade-offs need to be considered and resolved, decision-making processes must not marginalize the disempowered, governance systems should allow for equitable distribution of benefits, and technologies and monitoring systems need to be developed and implemented to evaluate outcomes in both the long and the short term.

We cannot theorize our way to solutions, but we can learn from projects that have already been implemented. With this in mind, we asked 21 researchers and practitioners, engaged in a wide range of forest and landscape restoration activities across the globe, to provide insights from their experiences and to reflect on the paths needed to implement the large-scale commitments that are on the table. Their contributions touch upon several fundamental themes including governance, sociocultural norms, capacity-building, and financing.

Each contribution is highly contextual; however, key lessons can be summarized as follows:

- Forest and landscape restoration programmes require the long-term engagement of local and landscape actors in participatory decision-making processes. Space needs to be provided for multi-stakeholder involvement in design, implementation, and monitoring. In this way, restorative processes are embedded in a landscape's sociocultural realities, creating a sense of belonging, trust, and social inspiration.
- The multiple dimensions of forest and landscape restoration demand not only natural and social expertise, but the further integration of local knowledge, values and traditions that guarantee the crossing-over of capacities for the recovery of degraded ecosystems.
- The long-term, large-scale nature of forest and landscape restoration demands innovative financial mechanisms that involve private and public funding schemes, coupled with a restorative economic culture that recognizes the breadth of ecosystem values.

The case studies presented tease out what these lessons mean in practice. They are relevant to the ways in which we choose to govern our landscapes, the sociocultural norms we live by, and how we align economic values and finance systems to support better land and natural resource management. Collectively, they emphasize the multidimensional thinking that is required to manage landscapes in a way that replenishes the natural systems on which we depend.

We hope that these essays will inspire and act as a starting point for conversations about how to turn theory into practice, moving from paper commitments to real, lasting impacts on biodiversity and people's lives which will be felt for generations to come.

AT A GLANCE

Good governance drives good outcomes

CHAPTER 1

- Governance will make or break projects
- Identifying winners and losers and ensuring more equitable distribution of benefits is critical
- Discover the 4 Returns model and how it has been developed to create scale
- Be inspired by an ecosystem-based restoration project in Scotland founded on a community governance model for decision-making

Meeting in the middle: bridging social and cultural norms

CHAPTER 2

- Restoration must start by building bridges between the social and the ecological
- Find out why cultural heritage and ecological goals can be mutually supporting
- Learn about the role of citizen education in the Colombian Amazon
- Follow a Scottish project where trusted intermediaries underpin landscape successes

The skills to get the job done: training needs in a complex world

CHAPTER 3

- Capacity needs to be built at scale to deliver on future aspirations
- Read about the expansion of interdisciplinarity within ecosystem restoration training
- Discover key lessons learned from 15 years of restoration initiatives globally
- Find out how capacity-building is improving gender equality and restoration in Burkina Faso

Show me the money: where is the financing to restore landscapes?

CHAPTER 4

- Explore the plethora of ambitious financing models for restoration at scale
- Uncover insights drawn from a private impact investment strategy perspective
- Learn how restoration financing might move away from being public money for public goods to private financing of natural capital
- At a local scale in Brazil find out how three states have created value through mixed restoration actions

A TRANSFORMATIVE YEAR?

Jaboury Ghazoul [1,2,3] and Daniella Schweizer [1,2]

The year 2020 was pivotal, in both expected and unexpected ways. It was a year in which global initiatives on biodiversity, climate change, and the restoration of degraded landscapes were to be launched with international recognition and support.

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Conferences and meetings were awash with the prospects of substantial financing for tree-planting as a strategy for environmental restoration and climate change mitigation. Politicians and CEOs of multinationals were advocating ambitious schemes to plant a billion, a hundred billion, or even a trillion trees – seemingly simple solutions to hitherto intractable environmental problems that have challenged society for decades. The imminent launch of the UN on Decade on Ecosystem Restoration (2021-2030), the growing national pledges to the Bonn Challenge target of 350 million hectares of restored land by 2030, and the optimism about what the UN Climate Change Conference (COP26) was to deliver in Glasgow in November 2020, set the stage for a year in which the world would finally turn the corner on the shared challenges of biodiversity loss, climate change, and environmental degradation.

As it turned out, COVID-19 completely reshaped immediate governmental priorities in 2020, shifting attention to public health and the economy. The COP26 meeting was postponed by a year, and confidence in financing for restoration and climate became much less secure. Nonetheless, optimism about restoration and climate change agendas remains. The environment is now firmly embedded in the rationale of most governments and private sector organizations as being fundamental to the current and future well-being of society, and many governments have included 'green' recovery measures in their COVID-19 crisis recovery packages in order to 'build back better'. While the economic downturn caused by the pandemic might have temporarily stalled progress on these environmental challenges, it remains essential for global well-being and resilience to ensure that local and international environmental agendas and actions are revitalized as quickly as possible.

Such a challenge demands cross-sectoral responses, and the integration of evidence-based approaches into decision-making at local, regional and national scales. This is particularly the case for forest and landscape restoration (also referred to within the case studies as FLR), the process of recovering the ecological functionality of deforested and degraded landscapes to secure human well-being and to respond to climate change, biodiversity loss, and continuing food security challenges.

Restoring the world's degraded ecosystems is far from being a complete solution. It needs to be accompanied by transformations in energy generation and consumption, transportation systems, food production, governance, and social and corporate responsibilities. Yet restoration actions, often through tree-planting, can be readily undertaken by individuals, communities, companies and governments, delivering tangible outcomes with benefits being realized within just a few years of implementation. It is perhaps for this reason that forest restoration has attracted so much interest as a credible and conceptually appealing environmental solution. But the reality is more complex. Successful implementation of forest and landscape restoration initiatives requires trade-offs to be considered and resolved, decision-making processes that do not marginalize the disempowered, governance systems that allow for equitable distribution of benefits, and technologies and monitoring systems that can evaluate outcomes to provide confidence for investors.

It is imperative that, in the midst of headlong enthusiasm for restoration, we take stock of, and learn lessons from, existing restoration projects to better inform the design and implementation of future restoration initiatives. With this in mind, we have collated contributions from a wide range of restoration projects, initiatives and experts, to provide insights on the application of restoration concepts, sharing not only lessons learned but also recommendations on forest and landscape restoration implementation. In presenting these case studies, we hope to inform the development of future restoration activities and research to ensure the delivery of meaningful change through the UN Decade on Ecosystem Restoration.

Learning lessons for improved restoration action

Ecosystem restoration, defined as a process of *"assisting in the recovery of ecosystems that have been degraded or destroyed, as well as conserving the ecosystems that are still intact"* (United Nations, 2020), can be, and has been, implemented through local action, often through communities working at relatively small scales. The growth of small-scale restoration initiatives has engendered an emerging revolution in how land is perceived and managed. Attitudes are changing, with increasing recognition of concepts such as natural capital and resilience among land managers and policymakers. The operationalization of these concepts, in the form of meaningful and tangible projects on the ground, is generating new knowledge on what works and what does not, and on the barriers and opportunities moving forward. Lessons drawn from these initiatives are also informing action elsewhere. Notably, they are providing the foundation of experience from which we can scale-up and scale-out restoration initiatives to landscape, regional, national and global scales. The success of national and global restoration programmes depends, in large part, on their ability to capitalize on the experiences of previous and ongoing projects in which collective action, entrepreneurship, and cross-sectoral engagement are prominent. Broad engagement across different interest groups will more likely preclude undesirable outcomes, such as single-purpose plantation forestry, that might be otherwise hidden under the banner of restoration.

In this report, we draw on the expertise and experiences of 21 restoration experts, each reflecting on examples from different geographies and socioeconomic contexts, ranging from the tropics to temperate regions. Our contributors identify the most exciting opportunities, but also the most critical challenges to be addressed, for implementing forest and landscape restoration projects at the scales that will be necessary to deliver global impact on climate, biodiversity, and human well-being.

Using the lessons that these case studies provide, we aim to focus leadership efforts, at all scales, on emerging key priorities for the implementation of the UN Decade on Ecosystem Restoration (2021-2030) strategy. The year 2020 may yet prove pivotal as the year in which forest and landscape restoration became firmly embedded in the environmental outlooks of governments, corporations and societies. It is critical to ensure that such outlooks are complemented by well-informed implementation strategies that build on lessons gleaned from past experience.

The common themes that emerge from this collection fall into four main categories, each of which is generally applicable across restoration initiatives globally:

GOVERNANCE – in which planning and decision-making processes integrate the range of actors in the landscape, and how such processes are embedded within legislative structures at regional and national scales.

SOCIO-CULTURAL NORMS – which recognizes the need to acknowledge differing social and cultural outlooks that shape future aspirations and underpin decision-making by individuals in the context of the communities within which they are located.

CAPACITY BUILDING – to enhance the ability of individuals, organizations and communities to access, use and apply data, knowledge, technologies, funds, materials, protocols and pathways for effective implementation of restoration.

FINANCE – the opportunities, options and mechanisms for accessing and leveraging private finance streams to enable the scaling-up of restoration activities to a level necessary to meet global targets.

LEARNING BY DOING: LESSONS FROM IMPLEMENTING RESTORATION

Daniella Schweizer [1,2] and Jaboury Ghazoul [1,2,3]

Moving from aspiration to implementation is perhaps the most complex part of any environmental project, particularly when the issue at hand encompasses multiple societal sectors and aspects, and requires a reconfiguration of how landscapes and land uses are perceived and managed.

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COVID-19 placed this complexity in sharp relief, being a crisis not only of health, but also of economy, social behaviour, and governance. This applies equally to forest landscape restoration. Despite enormous impetus from international sustainability agendas, the successful implementation of forest and landscape restoration depends on a set of favourable conditions across a range of sectors and scales.

These conditions include a biophysical environment that is ecologically well suited for restoration and in which restoration interventions do not disrupt existing natural and valued ecosystem properties. A governance system is needed to ensure that decisions on land management interventions for restoration are fair and transparent, enabling just transitions to new forms of land cover and land use that are rooted in people's social, economic and cultural structures. Capacity-building and skills development will be necessary to ensure that restoration is implemented effectively, and to enhance options for local communities to capitalize on new income generation opportunities in restored landscapes. New forms of financing are needed to provide both capital and financial flows to make forest and landscape restoration a self-sustaining reality at scale.

Governance

Given the multitude of stakeholders affected by land-use decisions inherent in forest and landscape restoration implementation, governance emerges as a fundamental aspect for successful implementation and sustained restoration. It is therefore imperative that the forest and landscape restoration transition provides for inclusive, environmentally and socially sustainable economies that help address inequality and poverty, and does not lead to social displacement or marginalization.

The first contribution by Stephanie Mansourian elaborates on some of the main forest and landscape restoration governance challenges, namely poor community engagement, lack of cross-sectoral coordination, and unclear tenure rights over land and resources. To overcome this, William Ferwerda and Victoria Gutierrez share a successful example of community engagement based on the implementation of the 4 Returns model of landscape restoration in a pilot landscape in Spain. Here, an association representing a multi-actor landscape partnership was created around forest and landscape restoration planning and implementation. Surprisingly, there has been little discussion in the literature about the importance of clearly communicating what forest and landscape restoration is, and how to operationalize it. In this regard, the "3 zones – 4 returns" approach is an example of simple, conceptual language that might be understood by different types of actors, and through which collaborative work might be established. However, the authors illustrate how current EU and national policies favour monocultures, which works against integrated land management approaches and systemic restoration.

On contested legislation, Rubens Benini and Fabio Fernandes write about the Brazilian Native Vegetation Protection Law that mandates restoration in private properties and provides mechanisms and regulations that, if enforced, could restore a total area larger than that committed to by Brazil under the Bonn Challenge. However, a lack of political will coupled with numerous petitions to amend the legislation has limited its implementation to date.

To improve national- and local-level coordination, Manuel Peralvo shares a successful example of a coalition of local governments and producer associations which promotes conservation and restoration at regional scales in the tropical Andes of Ecuador. The scale of action, and the range of actors it includes, is more effective than relying on potentially short-lived commitments and incentives provided by a central government. Peralvo emphasizes

the need to identify synergies and trade-offs operating at different scales in forest and landscape restoration implementation, so as to effectively link conservation with sustainable production goals.

Promode Kant and Ananta Bhandari reflect on the role of community-managed forests as fundamental forms of governance for engaging actors on restoration and for solving conflicts in India and Nepal, respectively. In the forest and landscape restoration success case of the Terai Arc Landscape in Nepal, Bhandari indicates that the landscape restoration plan was embedded within a government-led multi-stakeholder process to draft a 10-year development plan, thus guaranteeing government support and harmonization across legislations responsible for different land uses and land tenure rules.

Corruption and lack of transparency are governance issues that hamper the advancement of restoration, as is highlighted by Promode Kant in India and by Stephanie Mansourian more generally. In India, illegal land occupation forces the government to either plan restoration around it or use police forces to evict people, creating further conflict and pitting local people's interests against that of restoration.

Promode Kant emphasizes that restoration actions must be aligned with social norms concerning, for example, water use for irrigation versus water use for consumption. This often requires engagement with local governments and governance systems. Thus, improved policy mechanisms and government programmes that acknowledge formal and informal institutions of forest and land-use management are fundamental for the scaling of restoration actions at landscape scale, as is emphasized by Mansourian. This includes improved tenure rights over the land and resources.

Sarah Robinson and Boyd Alexander explain how the Coigach and Assynt Living Landscape in the remote region of northwest Scotland has emphasized the centrality of community, and of the cultural and historical heritage of the region. The community partnership that underpins the Coigach and Assynt Living Landscape is composed of organizations that span a range of interests, including among others natural heritage and conservation agencies, business development organizations, and cultural heritage groups. While these organizations often have different priorities and values, a universal agreement to work together as a community to manage the landscape for the benefit of all is the unifying motivation. Engaging the community through direct involvement in shaping the strategy and implementing actions, and ensuring good and transparent communication, are the core elements that have enabled success in this initiative.

Sociocultural norms

Forest and landscape restoration can be a lever to restore social and cultural values, and to rehabilitate traditions that are often lost as globalization changes communities. As is explained by Eliane Ceccon, in Mexico's Guerrero state the indigenous community, working alongside researchers and local governments, organized the restoration of the landscape. Embedded in the socioecological and cultural landscape, the project allowed for the revival of indigenous cultural heritage while responding to local economic needs.

Zoraida Calle shares the lessons learned from an interesting project in Colombia aimed at fostering the culture of silvopastoral systems among cattle ranchers. Calle highlights that individual perspectives and peer pressure shape how different landowners respond to forest and landscape restoration. While tangible issues such as the lack of land titles or access to extension agencies are clear barriers, some of the less tangible issues ¬– including a simple fear of snakes, cultural preferences for certain types of trees, or disagreements within families – can limit prospects for implementation. In another region of Colombia, Carlos Rodriguez shares a project based on citizen education of landowners, especially including younger generations, to co-create new ways of thinking and using nature in sustainable ways.

Taking account of local sociocultural values lies at the heart of efforts to restore and manage landscapes in Scotland. Like in many other regions in the world, the Scottish landscape is contested on account of historical events and current ambitions. The Tweed Forum aims to acknowledge the perspectives of local land managers about sustainable landscape management and bridge tensions that arise from the intersection of bottom-up and top-down perspectives of policy priorities. Chris Spray notes that resolving this tension very much depends on trusted intermediaries – people or organizations that have representation in local communities but can also engage with outside agencies from governmental or third-sector organizations ¬– to broker discussions on landscape-scale restoration activities.

Also in Scotland, the Bunloit Estate offers a different model for restoring landscapes, while generating sustainable and ethical livelihood opportunities that draw on the land and its diverse resources. While the Coigach and Assynt Living Landscape is a multi-agency process, Bunloit Estate is largely driven by the vision of a single individual, the landowner, Jeremy Leggett. While Leggett has a clear vision for the environmental and social future

of the landscape, the key to the successful implementation of his vision, as he well recognizes, is to work with local businesses and communities. In this way Leggett can remain open, and sensitive, to the sociocultural norms and perspectives of people in the region.

Capacity-building

Capacity-building has always been a key tool employed by government and non-governmental organizations to improve land management strategies. The same continues to be true in the case of forest and landscape restoration. Manuel Guariguata emphasizes the importance of formal multidisciplinary training among forest and landscape restoration practitioners for implementing restoration interventions across multiple dimensions. He specifically proposes the development of professional development education modules based on the six forest and landscape restoration principles presented by Besseau, Graham *et al*. (2018). Along similar lines, the 'Special Programme for Capacity Development', described by Michael Kleine, might constitute one such approach. A training programme is proposed for national governments where forest and landscape restoration is viewed as a social development process across governance, facilitation, and implementation.

The need for the development of financial, physical and social capital for the long-term sustainability of restored landscapes is echoed in the piece by Robin Chazdon, Sarah Wilson and John Herbohn. These authors provide a synthesis of lessons learned from capacity-building programmes across various tropical landscapes, which reflects the need to tailor and scale programmes to local requirements.

Examples from restoration projects in Zambia, the Colombian Amazon and Burkina Faso, shared by De Beenhouwer, Rodrigues and Vinceti respectively, as well as from various regions in the writing of Chazdon *et al*., emphasize the need to improve the capacity of stakeholders so they can realize the full potential benefits of forest and landscape restoration. Matthias De Beenhouwer highlights that achieving this is challenging at the scale of whole landscapes that involve a multitude of users, each with different needs and desires.

John Stanturf and colleagues explore the capacity needs from the perspective of the US Forest Service, discussing the necessity to account for climate change by building both the knowledge base and infrastructure required for the provision of appropriate seed.

Equally important in the forests of the USA are good silvicultural practices, especially in forests which also have production objectives. Provision of training in silviculture and tree physiology will be essential for managing forests in the context of both climate change and changing priorities for forests.

Barbara Vinceti and Marlène Elias, describing projects in Burkina Faso, mention the technical challenges involved in the adequate provisioning of seedlings of native and rare species. Knowledge on native tree species is usually not readily available, or is not organized in a way that can be used by practitioners or community members. While Burkina Faso has a centralized 'national tree seed centre' (as do many other countries), farmers either do not know of its existence, or cannot afford to buy quality seeds. Training is therefore necessary for farmers to know how to best harvest seeds from wild sources, though existing informal networks and knowledge among farmers might already provide a substantial base on which such training could build. Vinceti and Elias also reflect on how gender inequalities affect restoration potential, when men migrate to cities for work and women are left on the land but lack decision-making power over land uses. In the Philippines, Chazdon and colleagues emphasize the necessity of integrating whole family units in a project, as it is at this household level that decisions are made.

Financing

A fundamental question posed by Paul Chatterton and echoed by Rene Zamora is why, after commitments are pledged, restoration plans drafted, and areas for intervention highlighted, implementation action often lags behind? The lack of secure and continuous public funding for national ecosystem restoration agendas points to the need to secure private financing of restoration over the long term. Chatterton mentions that currently only around 1% of financed restoration comes from the private sector, thus restoration is still mainly viewed as a public good.

Most contributors highlight that current financial incentives and mechanisms to support forest and landscape restoration are not sufficient, nor are they adjusted to the socioeconomic and ecological realities in which projects are immersed. The creation of an enterprise incubator of entrepreneurial restoration ideas, such as the Landscape Finance Lab described by Chatterton, and a pre-investment facility to prepare projects for investment, as is mentioned by Rene Zamora, are interesting innovations being tested and implemented in landscapes across the globe.

Suggestions for overcoming financial barriers include the development of capacity among financial actors on forest and landscape restoration cost structures and return rates, the adaptation of mechanisms to contexts, and improved information-sharing and access to resources. The development of a restoration market, through which goods and services from the restored landscapes are commercialized, is pertinent according to most contributors. Marina Campos adds that it is imperative that these new markets substantially involve and benefit local communities. Other challenges are simply a matter of economic expediency, in that the opportunity costs of land restoration can be high.

Different types of investors can be motivated for investing in different areas or types of projects (Löfqvist and Ghazoul, 2019), though Rene Zamora adds that government support through incentives and enabling policies is fundamental. Public funds can mitigate initial high costs, or supplement in cases where there are no bankable projects with a clear return. The Guatemalan PROBOSQUE payment for ecosystem services incentive is highlighted by Zamora as a successful mechanism for incentivizing forest restoration interventions that range from productive to strictly environmental. Paul Chatterton also argues for the need for more blended financial mechanisms, where public, philanthropic and private funds kick in at different times, and cover the costs of different types of actions subject to their relative risk exposure.

Conclusion

There is an urgent need for a more constructive relationship to, and engagement with, ecosystems and our natural resources. Our societies must adopt more holistic land management practices in which biodiverse ecosystems can coexist with production, and where landscape actors can work collaboratively towards the goal of sustainable restored landscapes. To achieve this at scale, all contributors have highlighted the need for committed governments, strong governance systems, capacity-building, and long-term financing mechanisms across international, national, and local scales. Governments have a key role to play and need to work in close cooperation with private actors, be these landowners, farmers or corporations, and alongside environmental and social organizations, for the implementation of restorative activities that improve both environments and human well-being.

Field workshop in Thua Thien-Hue province, central Viet Nam, to learn from the experience of forestry smallholders. Organizing as cooperatives, smallholders can gain certification, negotiate better terms, access finance that allows them to grow their trees for longer, cultivate better quality seedlings, and follow good environmental practices.

CHAPTER 1

GOOD GOVERNANCE DRIVES GOOD OUTCOMES

Forest and landscape restoration is a process of integrated landscape management, anchored in decision-making processes transcending different land uses across a landscape, and this is why governance matters so much. This chapter explores governance from Brazil to Scotland – a critical theme that has, perhaps, not been given the attention it is due. Who are the winners and losers in different forest and landscape restoration initiatives, and how can centralized or devolved governance systems respond to the inequities that might arise? What is the 4 Returns model being piloted in Spain, the country with the worst degree of land degradation in arid, semi-arid and dry areas of the EU, and how can it deliver cross-societal benefits at scale? One of the biggest challenges in forest landscape restoration projects, as revealed in Brazil, is that of engaging rural producers, without whom restoration cannot happen. Find out how initiatives in Ecuador are navigating the complexities of mountain landscapes with steep environmental gradients and complex land-cover mosaics, and learn why programmes in India emphasize stakeholder identity along with transparency and accountability to prevent corruption. Nepal's Terai Arc Landscape provides an inspirational example of community-based forest management sitting alongside constructive government leadership, while a community-based governance approach in the Highlands of Scotland shows how all relevant landscape actors can be involved in ecosystem decision-making.

Woodland manager leading a volunteer planting day in Little Assynt Estate for the Big Climate.

GOVERNANCE AND FOREST LANDSCAPE RESTORATION

Stephanie Mansourian

Features of forest landscape restoration (FLR) that distinguish it from other forms of forest restoration or rehabilitation include its dual social and ecological objectives, and its large spatial scale. FLR was defined by 30 social and natural scientists in 2000 as "a planned process that aims to regain ecological integrity and enhance human wellbeing in deforested or degraded landscapes" (WWF and IUCN, 2000). Since then there have been various adaptations of this definition. All agree that it is a long-term and complex process that requires flexibility, particularly as it takes place within a social-ecological system (Ostrom, 2009).

Mansourian.org Consultancy and the University of Geneva, Switzerland

Governance is particularly important for FLR because decisions to restore forested landscapes affect multiple stakeholders over a long period of time, with subsequent impacts on livelihoods and landscape sustainability (Wu, 2013). Governance considers how society makes decisions and the rules and mechanisms applied to implement those decisions, and is also a complex process that spans different spatial and temporal scales as well as multiple stakeholders (Armitage, 2008). Different forms of governance (e.g. public, private or hybrid) have been described, and 'good governance' has been the topic of much research, as has the international environmental governance regime (Lemos and Agrawal, 2006; Biermann *et al*., 2012). Ultimately in the context of FLR, governance can be understood as the wider set of institutions and stakeholders at all levels and the ways in which they connect and interrelate over time to influence the implementation of FLR and the process of restoring a forested landscape (Mansourian, 2017).

Governance-related lessons

Several lessons related to FLR implementation have been highlighted through a 'lessons learnt' series of reports led by WWF (e.g. Mansourian *et al*., 2018; Mansourian *et al*., 2019a).

Many of these lessons relate to governance. For example, the importance of transboundary collaboration has been raised in the Danube, the Atlantic Forest and the Terai. Associated with that, the issue of institutional capacity and involvement at different spatial scales (local to international) has been identified as being important in promoting transregional collaboration. The WWF reports repeatedly identified the importance of engaging local communities, while acknowledging their needs and constraints, in many FLR initiatives – including in Mexico, Madagascar, Nepal and Tanzania. Similarly, multi-level partnerships or stakeholder alliances were noted as being important in New Caledonia, Madagascar and the Atlantic Forest.

Opportunities and challenges

Social, ecological, political, economic, cultural and historical contexts all determine how humans relate to their environment and associated decisions. This is also important for FLR which takes place within a 'landscape' which is a social-ecological system (Mansourian, 2017). Understanding these contextual dimensions is essential to identify causes of forest loss and degradation, and to determine suitable restoration options.

FLR and governance intersect in multiple ways and at multiple spatial and temporal scales. Different modes of governance that acknowledge the roles of multiple stakeholders (e.g. hybrid governance, Agrawal and Lemos, 2007) can provide an effective way of taking long-term FLR processes forward. Particular tools and methods associated with governance, such as negotiation platforms and policy incentives (see Mansourian, 2016), can also support the implementation of FLR. A review of three case studies identified five 'governance solutions': supportive national-level policies, clarifying tenure, convening structures, benefit-sharing and compensation, and cultural incentives; and four 'governance challenges': overlapping jurisdictions, inter-institutional relationships, tenure and property rights conflict, and stakeholder power dynamics (Mansourian *et al*., 2019b).

One major challenge for FLR is that the spatial area of targeted forested landscapes rarely matches the administrative scales at which political decisions are taken (Cash *et al*., 2006; Van Oosten, 2013; Mansourian, 2016). Forests often straddle many jurisdictions and may be partly on private and partly on public lands (or contested or community land). As a result, identifying stakeholders, determining responsibilities, and defining suitable governance mechanisms becomes more challenging. Wiegant *et al*. (2020) noted that in Ecuador, funding for FLR was reaching one level of government, while implementation was expected at

another level. Governance modes that favour partnerships and alliances across scales through polycentric governance may help to address this challenge. In New Caledonia's dry forest, for example, an FLR initiative was led by an alliance of 10 public and private actors ranging from the French government (New Caledonia being an overseas territory) to the North and South Provinces and extending down to a local research centre, among others (Mansourian *et al*., 2018). Different stakeholders may play different roles (e.g. implementer, facilitator, enforcer) and hold different responsibilities in the context of polycentric governance (Ostrom, 2010; Bixler *et al*., 2018). There may also be winners and losers in a long-term land-transforming process such as FLR. Acknowledging this is important, as is compensating losers. Systems such as payments for ecosystem services seek to ensure that landowners who set aside part of their land for forest regeneration are compensated accordingly for the services provided.

Tenure has also been highlighted as a particular challenge for FLR and reforestation more generally (Nagendra, 2007). The larger the spatial scale at which a restoration intervention takes place, the more stakeholders are likely to be involved, and thus different claims might arise on land, forest, trees, and various goods and services. Addressing these claims in the short and long term is a challenge for FLR. In Ghana, the issuance of tree tenure certificates helped to encourage tree planting through secure ownership (Baruah, 2017). In the case of the growing carbon market, different actors may lay claim to different elements. For example, multinational companies might pay for the right to the carbon, while the land may be under de facto ownership by local communities but de jure ownership by the state.

Conclusion: thoughts on future prospects

Governance and FLR intersect and inter-relate over time. Limited attention has been given to governance in FLR implementation to date, and particularly to wider governance issues such as cross-sectoral collaboration, empowerment, tenure aspects, issues of legitimacy, and equity. While governance covers many dimensions, it is important to disentangle them and to tackle fundamental aspects that may otherwise have long-term repercussions for the sustainability of any FLR effort. Indeed, no single dimension is sufficient to ensure the widespread and scaled up implementation of a complex process such as FLR. Instead, a multidisciplinary approach is necessary, and interventions required at many scales, from local to international.

A tree nursery in Rwanda depicting different stakeholder types (i.e. implementers and facilitators).

LARGE-SCALE LANDSCAPE RESTORATION IN SPAIN

Willem Ferwerda and Victoria Gutierrez

Trends in environmental degradation and biodiversity loss in the European Union (EU) and across the world are alarming. These have been linked to the current health pandemic, climate change, the loss of livelihoods, food insecurity, migration, and the loss of hope. Complex, interconnected and multidimensional crises such as these require integrated and systemic responses that address the underlying drivers.

Commonland, the Netherlands

The 4 Returns model is an impact-based holistic integrated landscape management (ILM) and restoration framework that has been developed to capture the complexity of ILM in a practical and measurable model, with the ambition to unite all stakeholders with a language and set of tools they all understand. The model has been developed to create scale. It identifies three landscape zones of intervention during a minimum 20-year horizon for four returns – inspiration (hope), social, ecological and financial capital – and is delivered through a five-step process (Ferwerda 2015, Denier *et al.*, 2015). Commonland is an international organization that initiates, catalyses and enables large-scale landscape restoration initiatives by means of the 4 Returns model. By describing some of the ways the 4 Returns integrated landscape management model is serving a multistakeholder network in a severely degraded area in south-eastern Spain, this piece considers policy challenges encountered during the process that have implications at subnational, national and supranational levels, and specifically for the EU Green Deal.

Spain is the country with the worst degree of land degradation in arid, semi-arid and dry areas of the EU, with two-thirds of the country threatened by desertification and soil erosion. In 2014, in the plateau of the provinces of Eastern Andalusia and Murcia, Commonland partnered with local landowners, farmers and entrepreneurs to co-develop and support a 20-year plan for restoring a multifunctional landscape for the return of inspirational, social, natural and financial capital.

The partnership led to the establishment in 2015 of an association called 'AlVelAl' (Altiplano de Granada, Los Vélez, Alto Almanzora) to steer community-based action, provide governance, capacity building and monitoring for continuous adaptive management, in a landscape where nearly 1 million hectares are affected by land degradation. Today this partnership is an interdependent multistakeholder network comprising 350 public, private, social and academic actors, mostly local farmers. AlVelAl has developed business cases for the establishment of a sustainable local economy, creating a farmer-driven company called 'Almendrehesa' dedicated to the processing and marketing of produce from regenerative agroforestry production systems.

While this landscape contains one of the largest rain-fed almond production areas in Europe with 50,000 hectares of certified organic almond groves, it has the potential to transition over 100,000 hectares of almond monocultures into productive agroforestry systems. So far AlVelAl, with Almendrehesa as a business generator, has transitioned over 14,000 of these hectares.

Contrary to many restoration approaches, social inspiration and capital are generated through specifically designed social interventions and are paramount to long-term success. Hence, participatory social processes that build trust must precede and drive ILM and restoration. Furthermore, these are crucial for attaining political support at the subnational and national level – and with it, improved chances of resource investment and interjurisdictional dialogue (DeAngelis *et al.*, 2020). AlVelAl still needs to influence the short-term vision of politicians and create a dialogue with actors in the region who do not share the holistic landscape vision. Also challenging for members is staying in tune with the masterplan visualized in 2014, which requires continuous attention and realignment over time. Without long-term commitment, social change is likely to fail. Yet social interventions that drive transformation are rarely financed. Funders and governments guaranteeing these costs would significantly increase the chances of large-scale landscape restoration success.

For building relationships and trust among stakeholders, and communicating about the initiative, AlVelAl has relied on a non-technical language, the 4 Returns (Figure 1), that can be understood and shared by non-expert actors across policy sectors at the subnational, national and supranational levels. Such a communication tool plays a crucial role in translating the many ways in which ILM and restoration can contribute to EU policy objectives on climate, food security, economy, environment and social progress.

Figure 1:
Illustrative example of how the initiative outlined and connected three zones in Alto Almanzora in Spain.

Yet, at EU policy level, there are conflicts with policies that work against ILM and holistic restoration approaches. The EU's common agricultural policy (CAP) has not served AlVelAl's integrated approach since its subsidies are directed to monoculture farming and exclude more diverse agroforestry systems or High Nature Value Farming, referring to the most biodiversity-rich farming systems in Europe (Keenleyside *et al*., 2014). Consequently, agroforestry in the EU is practised in about 8.8% of the used agricultural land (den Herder *et al*., 2017). Spain, in particular, failed to support multifunctional agroforestry systems or agroecological practices that protect biodiversity and soils (Keenleyside *et al*., 2014).

Instead, by investing in high-input large-scale monocultures on productive land, Spain neglected the more marginal land causing large-scale land degradation, desertification and depopulation. Furthermore, the marginalization of the rural smallholder farmer by subnational (e.g. Andalusia's Rural Development Programme 2014-2020), national and EU policies has increased social, environmental and economic inequalities.

AlVelAl has shown that severely degraded landscapes can demonstrate signs of recovery within as little as a year (De Leijster *et al*., 2019), and foster a bioeconomy within a few years. Financing the diversification of high-quality produce remains a challenge given the lack of government support but may be possible through premiums for regenerative practices that sustain ecosystem services. However, EU-regulated certifications for regenerative organic produce do not exist. Members of AlVelAl call for such a certification system that could incentivize additional farmers to engage in regenerative agriculture.

Overall in the EU, there is a need to elevate and invest in rural landscapes to create productive and biodiverse zones that increase social, economic and environmental resilience. Such an approach will contribute to delivering the much-expected EU Strategies: Biodiversity, the Farm to Fork, Climate, and Circular Economy packages. This will require policy shifts and adjustments of the CAP framework and a sound Forestry Strategy that does not over-rely on a monoculture bioeconomy. It will also require better collaboration and coordination among sectors, particularly the agricultural and forestry sectors, putting aside differences based on conflicting land-use practices. A functioning agricultural industry is paramount to the resilience of communities and the subsistence of local labour (Holl, 2017).

Figure 2: An example of the 4 Returns model
Key interventions designed for multiple purposes and implemented at different stages of the initiative. Firstly, the establishment of a social and purposeful multi-actor network was required to co-design and implement joint business cases focused on creating productive agroforestry systems. With this in place, the restoration of surrounding ecosystem function and services was planned and initiated.

Embedded in a wider landscape, agriculture with agroforestry systems can protect biodiversity and generate more diverse and resilient systems that can provide the services and products people need. The experience of the food and agricultural sectors varies significantly among EU countries and stakeholders, making integrated approaches not only relevant for healthy food and natural ecosystems but also the social inclusion and equity of the communities sustaining these. Therefore, it is vital to demonstrate how ILM and restoration, based on toolkits such as the 4 Returns model, can support policies in the above contexts.

4 RETURNS	KEY INTERVENTIONS	DESCRIPTION	RESULTS PER ZONE
	Shift culture and behaviour to long-term thinking and action by inspiring social purpose and knowledge for participatory and inclusive governance	A multi-actor landscape partnership is founded on the notion that members can thrive when working together, with the goal of creating a joint long-term vision, to govern restorative activities in the landscape, to inspire and mobilise local communities, and to strengthen the social fabric.	**All three zones:** a network formed by 350 members in 2020; 89 face-to-face & online workshops reaching 4000 participants; an aromatic crop production and art project for cultural identity & sense of community.
	Transition to agro-forestry systems and regenerative agricultural practices	The partnership supports the transition from intense monocultures to agroforestry systems by means of promoting regenerative agricultural practices (e.g. green manure, swales, terracing, wind breaks). It provides advice, funding, machinery, capacity building and network opportunities to farmers joining the scheme.	**Combined Zone:** 14,000 ha and 180 farmers have transitioned to ILM; Mean SOM before interventions: 1.38%, with 42% of soils < 1%; mean SOC per ha < 30 tons. After 1-year: mean SOM increased by 15.2%, N by 26%, and K by 16%. N=90.
	Create a local business ecosystem that capitalises on agroforestry systems and other potential activities in the landscape	Local business plans are developed in the landscape capitalising on agroforestry products (e.g. olive oil, aromatic-oils, walnuts, honey, meat from a local sheep variety). A farmer-driven company is created for the processing and trading of certified products in the international market. The local business hub creates jobs and additional financial value.	**Combined Zone:** Increase in regenerative certified organic almond produce from 54 MT in 2016-17 to 86 MT in 2018 and 95 MT is 2020; Estimate 376 t and €4,8 M by 2024 for 60 farms.
	Actively restore and enhance the conservation of natural ecosystem in the landscape	Restoration and management activities (e.g. water conservation and harvesting, removal of invasives, elimination or thinning of monocultures) were planned for a minimum period of 20-years to create biodiversity corridors across surrounding national parks and river basins covering about 25,000 ha of degraded natural areas in public and private land.	**Natural Zone:** So far 140,000 endemic trees and shrubs (e.g. Quercus ilex, Pinus halepensis, Juniperus spps., Rhamnus lycioides) have been planted and over 200,000 seeds sown by drone in mountainous areas.

THE LEGISLATION APPLIED TO FOREST LANDSCAPE RESTORATION IN BRAZIL

Rubens Benini [1] and Fabio Fernandes [2]

The UN Decade on Ecosystem Restoration begins in 2021: this will support countries that have already committed to incorporating nature-based solutions to complement their strategies to tackle climate change. Conservation and restoration are the main actions that contribute to the maintenance and provision of ecosystem services (Griscom *et al*., 2017). It is vital that we map the bottlenecks that need to be resolved to advance the restoration of forest landscapes at the scale and speed that the world needs.

[1] The Nature Conservancy, Brazil

[2] Ministerio Publico de Bahia, Brazil

The obstacles to forest landscape restoration are diverse, ranging from populations' lack of awareness about the importance of forests, to technical and operational difficulties, engagement with landowners, gaps in technical assistance, and lack of financial and material inputs. The latter includes basic infrastructures such as seed collections, nurseries, implementation services, and financial mechanisms to cover restoration costs.

One of the biggest challenges is how to engage rural producers, who are the most critical link in the chain, and are key to delivering restoration at scale. In other words, if landowners are interested, restoration will happen. Restoration is not feasible if landowners remain unwilling to participate in restoration activities, and this is, in part, a function of the value of the land for other uses. Incentives for restoration can encourage landowners to restore some parts of their properties. Such incentives include voluntary valuation of ecosystem services, economic incentives, and command and control mechanisms.

Voluntary valuation of ecosystem services is still rare. Generally, it occurs in places where scarcity of water resources, local temperature increases, or decreases in agricultural production are already apparent and attributable to land degradation or biodiversity loss. In projects where The Nature Conservancy (TNC) operates in southeast Brazil, it is common for rural producers to show interest in restoring forests as they believe that this benefits water security and availability on their farms.

Economic incentives can be diverse. Producers can generate a return on investment by implementing agroforestry or silvicultural systems, or from forest products. There are cases in which restoration projects have doubled the income of rural producers or diversified their economic base, such as the Forest Cocoa Project, developed by TNC in the Brazilian Amazon, and in projects in the Atlantic Forest, where secondary forest fragments were enriched (Maier *et al*., 2019). Other positive illustrations of economic incentives through which rural producers are duly rewarded for forest conservation and recovery actions, such as payments for environmental services (PES), can be found in different parts of Brazil. The municipality of Extrema in Minas Gerais, the Reflorestar Programme in Espírito Santo state, and the case of the city of Balneário Camburiú in Santa Catarina state are all excellent examples of PES projects.

Indirect forest restoration is when rural producers invest their resources and labour in areas better suited for agriculture and leave the less productive or more challenging regions for natural forest recovery. Improved coffee production practices through an increased use of technology have allowed rural producers in Espírito Santo to abandon the steeply sloping areas on their properties, on which forest has begun to return. Currently, there are more than 200,000 hectares under natural regeneration in the state (Sossai, 2018).

Command and control incentives, or regulatory compliance, rely on legislation and enforcement, including the use of environmental fines, to protect native vegetation. Non-complying landowners might also have difficulty obtaining agricultural loans, or even commercializing their products if the market is rigorous regarding environmental issues.

It is common to read or hear that Brazil is one of the countries with the most complete and broadest forest and environmental legislation, namely the Brazilian Forest Code. Most countries treat public and private forests differently, but this is not the case in Brazil (Chiavari and Lopes, 2017). Brazil has had specific legislation to protect its forests since 1934, although the purpose of that law was to ensure the provision of timber (Alston and Mueller, 2007). In 1965 another version of the Forest Code was approved. Subsequent increases in environmental protection and, in particular, the regulation of the federal administrative process for investigating environmental violations in 2008 (Pereira, 2013), led to strong political pressure to amend the legislation.

The approval of the Native Vegetation Protection Law (Law 12651) took place in the context of a conflict between the alleged need to increase agricultural production and environmental conservation (Soares-Filho, 2013), and the discrepancy between what the law required and what was done (Alston and Mueller, 2007). The law maintained the need for rural properties to respect environmentally protected spaces. In addition, the Legal Reserve (RL) has the purpose of ensuring the sustainable economic use of natural resources, and the Permanent Preservation Areas (APPs) have several environmental functions, such as preserving water resources, the landscape, geological stability, and biodiversity. Parts of properties such as riparian forests, hillsides, and hilltops are determined by law as APPs.

Even though the Native Vegetation Protection Law was passed more than eight years ago, there is legal uncertainty about its implementation. Lawsuits contesting its constitutionality were brought in 2013 and only tried by the Federal Supreme Court (STF) in 2018. Necessary instruments were created by Law 12651/12, such as the Rural Environmental Registry (CAR) and the Environmental Compliance Programme (PRA). Still, their deadlines have already been extended several times, most recently in 2019. All properties must be registered in the CAR along with a declaration of their environmental information, which will enable control, monitoring, environmental and economic planning, and fighting deforestation. Registering with the PRA exempts owners from environmental fines if the deforestation happened before 2008.

Despite the engagement of various institutions and social movements in defence of the legislation, the successive CAR and PRA extensions postponed the actual implementation of the Native Vegetation Protection Law, which aims to restore vegetation in APPs and RLs. Therefore, one of the lessons learned is that command and control mechanisms are fragile: rules can be lenient, and deadlines are extended without a comprehensive debate with society. There are still proposals to amend Law 12651/12 under consideration in the Brazilian Congress: special attention is needed so that they are not approved.

For example, the federal government has just challenged, in the Federal Supreme Court, the provision of the law that allows the application of Rule of Law 12651 so that only newly deforested areas – after 22 july 2008 – would be restored in the Atlantic Forest. If this lawsuit succeeds, the Atlantic Forest Law will have a major impact, since it has always been considered more restrictive than the federal scale Native Vegetation Protection Law.

Measures such as these not only harm the environment but also put agribusiness at risk, since it depends on forests and environmental services that are vital for food production. We know that environmental legislation and regulatory mechanisms are essential elements in inducing forest restoration. However, these mechanisms need support from the authorities in their implementation, including in detecting and genuinely fighting against crime.

Even in this context, more than 5 million rural landowners voluntarily registered with the CAR,[2] a mobilization unprecedented on the planet. That shows that the production sector has an interest in contributing to solving environmental liabilities. However, for the issue to truly advance, full compliance with the law is essential.

There is no more time to waste in changing legislation that has already been approved. It is time to demand that property owners comply fully with environmental laws and allow restoration to put Brazil on a path that permits ecosystem services and agricultural production to co-exist. That will undoubtedly help the country achieve the goal it set for itself as part of the Paris Agreement: restoring 12 million hectares while generating jobs and income.

Marginal, steeper areas can be set aside for restoration, while leaving the flatter, more productive land for agriculture. This approach can be cost effective but it needs to be carefully managed so that native species become established.

FOREST LANDSCAPE RESTORATION GOVERNANCE IN TROPICAL MOUNTAIN FORESTS

Manuel Peralvo

The tropical Andes is a global biodiversity hotspot where high levels of endemism and diversity coexist with rapid processes of ecosystem loss and degradation.

Consortium for the Sustainable Development of the Andean Ecoregion (CONDESAN), Ecuador

In an elevational gradient from 600-800 to more than 6,000 masl, and a latitudinal extension between 11°N to 23°S, the tropical Andes covers a surface of more than 1.5 million km^2, where 78% of the surface is still under natural vegetation (Josse *et al*., 2010). In Ecuador, Andean forests and grassland ecosystems provide key ecosystem services to the densely populated mountain area, home to 47% of the total population in the country (INEC, 2010). However, a long history of occupation in the mountain region has negatively impacted the structure, composition and functioning of Andean ecosystems and their animal and plant communities (Young, 2009).

Forest and landscape restoration (FLR) is becoming an important approach to respond to the challenges posed by global environmental changes and land degradation. FLR can contribute to the attainment of goals related to sustainable development, encouraging climate change adaptation and mitigation, and restoring degraded lands by recognizing the importance of land cover heterogeneity and integrated sustainable land management (Stanturf *et al*., 2015).

In Ecuador, initiatives with elements in common with the FLR approach have a long history, but became more focused on restoration from the mid-2000s onwards as local governments and central government agencies started to incorporate ecosystem functions in public policy and intervention instruments (Murcia *et al*., 2017; Schweizer *et al*., 2018).

An important milestone was the development of the National Forest Restoration Plan (NFRP), implemented in its first phase in the period from 2014 to 2017. Challenges with financing, implementation of on-the-ground restoration practices and coordination among levels of governance led to the development of a second phase for the period from 2019 to 2030, where more inclusive intersectoral and multi-actor governance mechanisms have been included (MAE 2019). In this article important challenges and opportunities for FLR governance in mountain landscapes in Ecuador are identified.

Governance: challenges and progress

In a recent contribution, Wiegant *et al*. (2020) identify five spatial and temporal challenges related to FLR governance in Ecuador: 1) there is a disconnect between political cycles and FLR timelines; 2) planning horizons do not align with FLR timelines; 3) national restoration priorities are mismatched with decentralized land use planning; 4) the governance level of FLR efforts is not matched by sufficient funds; and 5) there are tensions between restoration goals related to biodiversity, water and carbon.

The implementation of FLR in mountain landscapes accentuates these challenges. The highlands of Ecuador contain complex land cover mosaics with heterogeneous land degradation patterns. Steep environmental gradients and complex topography imply that agro-ecological conditions change over short distances. In this context, FLR initiatives designed for broader scales, including at the national level, face significant challenges in adapting to these varying conditions in mountain landscapes. FLR initiatives need to systematize and apply specific knowledge regarding ecological conditions, social relations and opportunities to implement restoration activities with good possibilities to be maintained in the long term (Peralvo *et al*., 2020). Restoration in high elevation ecosystems also requires more time to achieve land management goals relative to low elevation ecosystems, due to temperature patterns, humidity and soil conditions (Anthelme *et al*., 2014).

These spatial and temporal characteristics of FLR in mountain landscapes pose further governance challenges. For example, effective maintenance of restored areas requires efforts that go well beyond the four-year cycle of elected officials. Changes in planning and policy goals at national to local scales are normally translated in interventions that are too short to secure the achievement of restoration goals. On the other hand, social and economic crises, challenging agro-ecological conditions, and adverse impacts of climate change and land degradation normally translate into shorter planning time periods at the farm level, narrowing the opportunities to scale up FLR in mountain landscapes.

An important strategy to overcome these challenges is to anchor FLR to governance processes at landscape scales. An encouraging example of a governance mechanism adapted to these challenges is the Andean Choco Association (ACA), a group of six parishes (the smallest political-administrative units in Ecuador) in the northwestern Ecuadorian Andes covering a territory of 124,000 ha, 60% of which is forest, in an altitudinal gradient of 300 to 4,900 masl. These local governments cofounded the association in 2014, with the objective of promoting conservation and restoration of the area's natural and cultural assets. The area harbours highly endemic plants and animals in forest remnants, mixed with agriculture and cattle ranching. Its recent deforestation rate is above the national average, leading to increased forest fragmentation, and compromising connectivity (Torres and Peralvo, 2019).

By linking local governments located in different portions of an altitudinal gradient, the ACA provides an invaluable platform to establish FLR goals that are adapted to the heterogeneous social and environmental specificities of these mountain landscapes. The possibility of assessing land management goals in the broader landscape facilitates dialogue among municipalities, water user groups and individual landowners whose interests and areas of action overlap, generating unique configurations of synergies and trade-offs among land management goals. Another advantage of this meso-scale governance platform is the potential to incorporate a broader set of stakeholders, including local organizations with long-term commitments to restoration processes. Initiatives such as the ACA can be a critical innovation to foster the scaling-up of FLR in mountains and other highly complex landscapes.

Tropical Andes landscape depicting the mosaic of forest fragments and agriculture.

An important innovation in Ecuador's National Forest Restoration Plan is the establishment of territorial restoration roundtables: these will bring together local stakeholders, NGOs, actors from the private sector and academic institutions in defining priority areas for FLR. Groups such as the ACA and other landscape-level governance platforms are natural allies in this new model for the implementation of the National Forest Restoration Plan, but intensive work is required to strengthen the skills needed to plan, implement and monitor FLR processes, especially taking into account the ecological, technical and logistical challenges of restoration activities in mountain landscapes (Peralvo and Arcos, 2018).

The experiences of working in FLR in mountain landscapes point to the need of integrating scale flexibility, understood as identifying the coordination level at which collective action is most effective to plan and implement FLR. In the mountain landscapes of Ecuador, different levels of territorial articulation exist according to the historical trajectories of land use and patterns of access to land. For example, in areas where indigenous communities are prevalent, it is important to incorporate mechanisms at the scales relevant to customary institutions of land-use access.

Moving forward

As more actors and more funding become available for restoration in the tropics, the need to foster effective communication, coordination and collaboration arrangements becomes increasingly urgent. It is necessary to articulate land management goals established by stakeholders operating at different scales and in different sectors. Landscape approaches and landscape-level planning and implementation with the effective participation of local stakeholders is key to ensure that FLR is aligned to their needs and aspirations. Better coordination between the environmental and agricultural sectors is needed as policymaking and intervention in these sectors is fragmented across all levels of governance. This is especially important in mountain landscapes, where endemic poverty is still prevalent and productive conditions are challenging (Hentschel and Waters, 2002).

Also, more attention is needed on the intersection between land control, property rights and governance. Clear property rights are key to securing long-term access to the benefits of FLR. Other institutional arrangements are also important, especially in mountain areas where indigenous communities try to strengthen customary land and resource management strategies.

Integration of policy instruments for land-use governance adapted to mountain landscapes is also needed. These include market-based mechanisms such as payment for environmental services, certification, and denomination of origin, among others (Lambin *et al*., 2014). Certain tools such as participatory farm-level land-use planning have demonstrated a high potential to incentivize forest conservation and restoration goals, along with alternatives for the sustainable intensification of productive systems. The combination of public and private regulatory and incentive mechanisms for sustainable production could serve as a basis to promote wider adoption of in-farm conservation and forest restoration practices.

Finally, FLR needs to stress the governance dimensions of the restoration process, where trade-offs and synergies are identified at different scales and by all stakeholders affected, explicitly linking restoration with conservation and sustainable production goals (Peralvo *et al*., 2020). This requires rethinking the way in which responses to global challenges are being implemented at the local scale. Projects under the umbrella of adaptation and mitigation to climate change, combatting desertification and land degradation, and preservation of biodiversity and its benefits to society all share common conceptual and methodological bases, even if their emphases for intervention are different. This polyphony of goals and approaches needs to be firmly related to local processes for decision-making, priorities and needs.

GOVERNANCE ISSUES IN FOREST LANDSCAPE RESTORATION IN INDIA

Promode Kant

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With just 2.5% of the land area of the Earth, India supports 1.37 billion people, about 17.79% of the global total (UN, 2019). This led to considerable loss of forest lands to agriculture during the 20th century, and it was only after India transformed into a food-surplus country in the 1980s that concrete steps to halt the loss of forests were undertaken. At the Paris climate summit in 2015 India made a mammoth commitment to sequester an additional 2.5 to 3 billion tonnes of CO_2 in forests and trees over its land surface. The most recent assessment of forest cover in India in 2019 suggests that forest cover has now risen to 21.67% of the country's geographical area, up from 21.05% a decade earlier (FSI, 2011; FSI, 2019).

In order to understand the governance issues that affect forest landscape restoration (FLR) work in India, four FLR projects across the country were reviewed by the International Union of Forest Research Organizations (Stanturf *et al*., 2020), as briefly described below:

1. The Cumaraconda forest landscape in Goa, that needed intensive mine remediation work
2. The Gajwel and Mulugu Mandalas in Siddipet district of Telangana, where the demands arising from a high population of poor people had severely degraded the rural landscape
3. The Dabat – Rod Jaman landscape in Bilaspur district of Himachal Pradesh, degraded due to open grazing, rampant illegal removal of wood, and forest fires
4. The Aravalli Hills in the national capital region of India, degraded due to rapid unplanned development in the vicinity of the capital.

Restoration lands under unauthorized use

In all four landscape restoration cases the main governance issues relate to land, its current use, and its immediate and distant users. Lands under unauthorized use by way of encroachments over public lands and mining and quarrying presented the greatest difficulties in the Aravalli Hills. Many encroachments are by poor people who have been able to continue their unauthorized control over the lands using the political power that their large numbers give them. Some encroachment occurs for settlement by relatively rich people who use corrupt practices to prolong their illicit hold. This is easier to address through a determined forest department backed by the government and the judiciary. Lands under active mining and quarrying present the greatest difficulties because of their very high economic utility, given booming infrastructure development and the large number of people employed in these activities.

The difficulties faced in dealing with these unauthorized land uses often overwhelms restoration efforts, and appropriate local solutions to the problem have to be sought. When unauthorized use is by the rich and powerful the best option is generally eviction, but this should be attempted only if the government is willing and able to back action – otherwise it incurs serious risk to forest department field staff. When encroachment is undertaken by a large number of poor households eviction is often neither practical nor ethical. Instead, community-based approaches to promote tree-based economies – through, for example, roadside afforestation and fruit planting combined with agroforestry – can be more successful.

Some lands identified for restoration face another problem, in that they are used for criminal ventures like large-scale distillation of illegal liquor, or narcotic production through cannabis or poppy cultivation. This issue has been evident in all four examples cited, but it did not create major difficulties during restoration as very few people were involved, and the vast majority of villagers in the neighbourhood were opposed to such activities. Seeking the assistance of the police is often a sufficient deterrent, but in remote areas used for growing narcotics forest departments usually leave the task of eviction to professionally trained police forces. Undertaking restoration under these circumstances can clearly only occur after such land-use conflicts, illegal or otherwise, have been resolved. This incurs costs and risks, and requires skills and capacities that are often not considered by FLR project managers during the planning phase.

Identifying primary and distant stakeholders

An important task in FLR is to identify the primary stakeholders who hold the right to wood and non-wood produce, to grazing, and other resources. The most effective means of recognizing primary stakeholders is through a judicious combination of village records and participatory consultations with the people. For lands situated on the village extremities a few knowledgeable people from neighbouring villages should also be included in participatory consultations, as some land rights could also be shared across village boundaries.

Another important but frequently ignored right is that of transhumance grazing for distant people. Traditional nomadic and semi-nomadic people in arid and semi-arid parts of India graze their cattle over large ranges, sometimes more than 1,000 km from their usual place of stay, though they often only exercise this right in years of drought stress. This transhumance right is now under threat in India through joint forest management (JFM) in forests with communities in the immediate neighbourhood where the local JFM participants do not recognize transhumance rights – and do not permit rights-holders to enter their areas. A fair solution to such issues must be found through discussions; often alternative lands for grazing can be agreed upon.

Restoration on private lands

Private lands are also sometimes offered for afforestation by their owners when large-scale restoration activities are undertaken by public agencies like the forest department. Such offers should be approached with caution when restoration of these lands requires large amounts of public money. Restoration is a long-term venture, and landowners might change their priorities over time, or ownership can pass on to the next generation which might also have different priorities, particularly as new opportunities develop. An example of this is the only registered small-scale clean development mechanism (CDM) afforestation project in Sirsa district of Haryana, India (Gujarat Forum on CDM, 2013). Here, farmers offered their uncultivable land which was being encroached by sand dunes to a reforestation project which, after considerable effort and expense, was eventually registered as the second CDM afforestation project in the world in 2008. Afforestation was undertaken with great enthusiasm in 2008-09, but within a year the area was encompassed within a new development plan that included a new road and a canal. The farmers who were earlier eager to include their lands in the CDM project proceeded to uproot the young saplings as they became aware of opportunities afforded by the new infrastructural connections, and the project was a complete failure. Public investments in afforestation over private lands must only be made with a clear understanding of the great risk of pullback by landowners at a future date.

Local rules and regulations

Local land and vegetation rules and regulations that are rarely used and often forgotten can have a serious impact on restoration work. Preparatory work may require land clearing including the removal of dead and decayed trees and of bushes like the invasive lantana for ploughing before planting, but in many places laws – even local municipal rules – may not allow the felling of naturally grown trees. Ploughing is also not permitted in many places. When water is required during planting, or in the initial maintenance years or even occasionally during droughts, local regulations on use of water may become critical for the viability of restoration efforts. These need to be considered at the very beginning of planning because in most water-stressed regions ground water or stream waters are not permitted to be used for forestry activities, although exceptions are usually made for nurseries. Obtaining written permissions from the relevant authorities is an important step in restoration planning. Even captive rainwater harvesting for plantations – by way of developing well-distributed pools across the restoration area for collecting rain waters – should be included in negotiations with local people, otherwise during periods of prolonged water stress these can become a source of conflict with local communities.

Local labour should be used as far as possible, and arranging outside labour should be considered only when it is not available to avoid conflicts that might arise later with the local people. Local laws should be followed in regard to labour wages, housing and other amenities; and where there are no extant legal provisions it would be best to follow fair practices.

Making effective use of local institutions

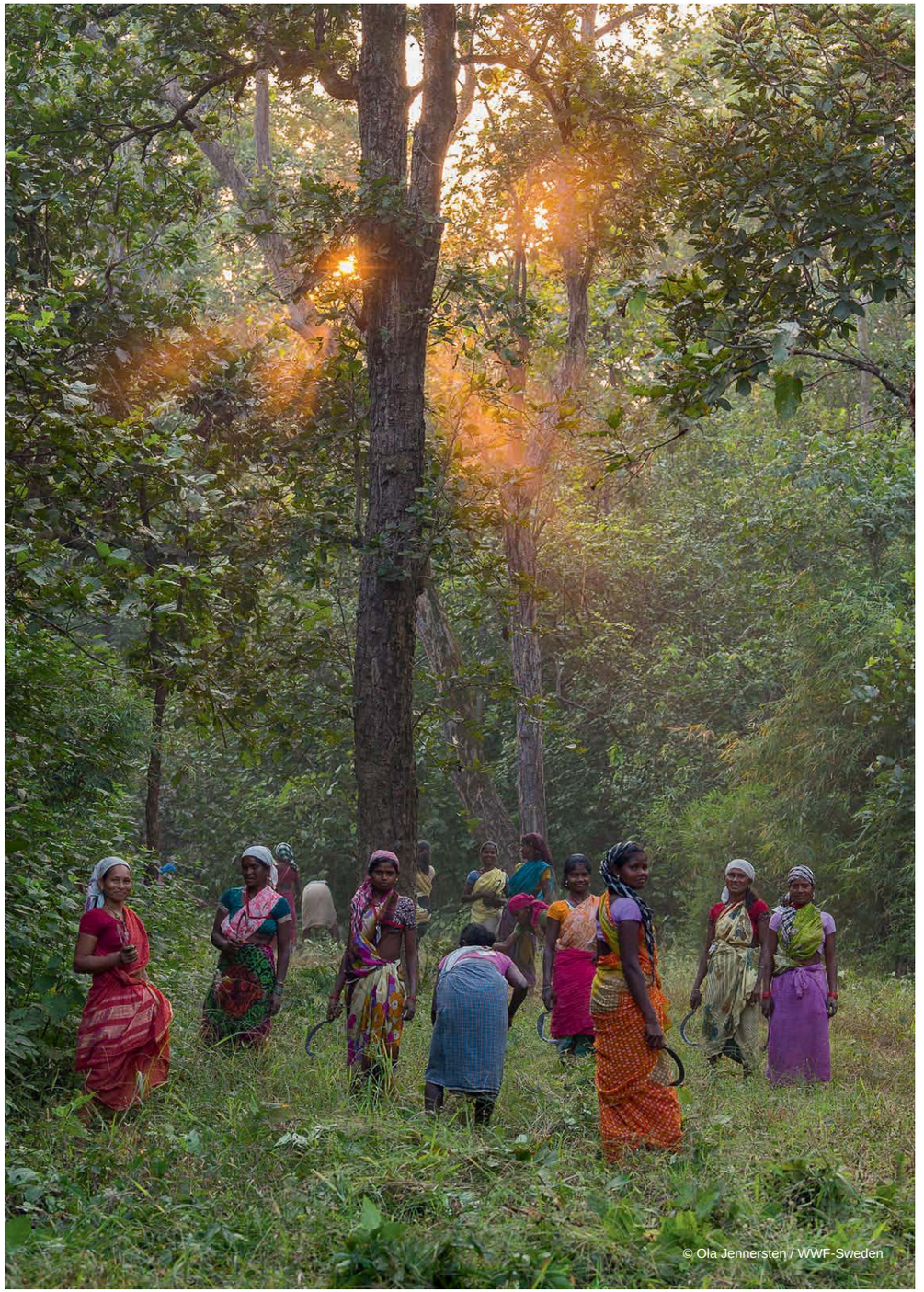
It is not enough to select good and competent officials for initiating FLR. The restoration of forests is a long-term task and good officials may not remain with the same project indefinitely. It is, therefore, important to empower and build the capacity of local institutions, and develop new village-level institutions if needed, to continue the good work beyond the present. Examples of community forest management institutions in Nepal and Bhutan provide guidance for setting up local institutions to help resolve the conflicts that are bound to arise during the maintenance and harvesting phases of these restored lands.

Transparency and accountability

Corrupt practices often creep in due to a lack of oversight in remote forest localities. Bringing transparency would deter corrupt practices to a considerable degree, but in the remote and widely dispersed activities that restoration activities involve this may require both organization and technology. Investment of money and time in developing transparency using technology will, however, more than pay for itself over the long life of restoration activities. Social media can be a powerful tool for good governance in FLR. Widespread dissemination of information on local disputes via social media ensures that the narrative is not determined by only one or two powerful parties. Social media also helps in quickly organizing discussions, and means that local strongmen are unable to control the flow of information.

Conclusions

Long-term forest projects require clarity in the nature and extent of rights over lands in order to minimize conflicts. The most important task in the restoration process in India is to identify stakeholders through consultation, understand local rules and regulations that can impact restoration activities, and develop a plan of action with stakeholder involvement. As far as possible restoration activities should avoid competition with agriculture, or the use of limited resources like water. Preference should be given to locally available labour, and consultative processes with local communities should be activated if outside labour becomes necessary. Local institutions must be used effectively, or new institutions created if necessary. Corruption by a powerful few kills the enthusiasm of participants in community activities. Transparency and accountability are key to preventing corrupt practices, and can be strengthened by the skilful use of social media.



Female forest workers in Kanha National Park, Madhya Pradesh, India.

FOREST LANDSCAPE RESTORATION IN THE TERAI ARC LANDSCAPE, NEPAL

Ananta Ram Bhandari

Forest Programme Lead, WWF-Nepal

The Terai is a stretch of lowlands located in the southernmost part of Nepal, and it is considered as the area that harbours the highest biodiversity in the country. Therefore, the government of Nepal has adopted a landscape approach to conservation after declaring the Terai Arc Landscape programme in 2001.

Forests became heavily exploited in the densely populated Terai region of Nepal, and a contiguous expanse of dense forests has been fragmented over time. Rapid forest and habitat loss and fragmentation forced megafauna species including tigers to live in isolated patches, and resulted in declines in their populations. The Terai Arc Landscape was conceived in order to create contiguous habitat connecting natural ecosystems.

It covers 2.47 million hectares of land, mainly a fertile lowland in the south and fragile hills in the north. The landscape covers two globally important ecoregions: the Terai-Duar savanna and grasslands, and Himalayan subtropical broadleaf forest. Tropical and subtropical broadleaved forests, riverine forests, grasslands and floodplains of the Terai Arc Landscape harbour metapopulations of tigers, elephants and rhinoceros. The Terai Arc Landscape remains a critical habitat for 565 species of birds, 125 fishes, 85 mammals and 47 reptiles. It contains six protected areas and three Ramsar sites, providing habitats for numerous wild animals including keystone species of the region. More than 7.5 million people reside in the Terai Arc Landscape.

A 10-year strategic plan was developed by the government of Nepal in 2004 and revised in 2015 envisioning the Terai Arc Landscape as “a globally unique landscape where biodiversity is conserved, ecological integrity is safeguarded, and sustainable livelihoods of its people are secured”. The landscape covers various land uses such as protected areas, forests, wetlands, agricultural lands and settlements, for which land tenure and jurisdiction vary. The strategic plan was developed recognizing and complementing the legislative systems of various land uses and land and resource tenures. Multiple stakeholders including local communities, community-based organizations, civil society and government agencies were engaged in the strategy development process. WWF is one of the key conservation partners of the government of Nepal in designing the Terai Arc Landscape, to develop its strategic plans, and to implement strategies on the ground.

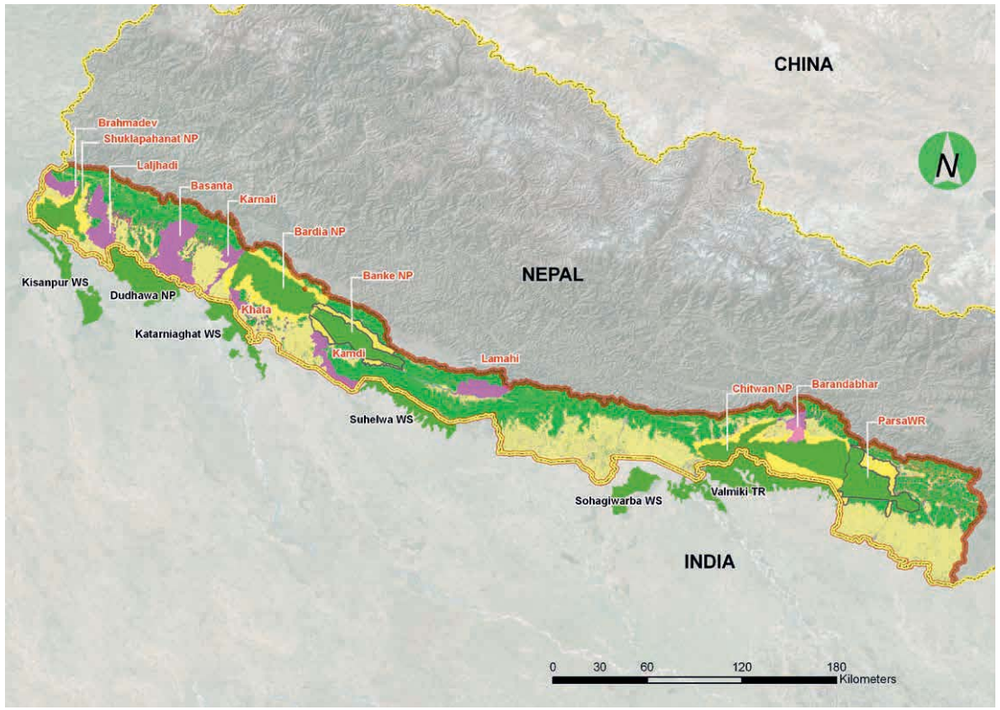


Figure 3:
The different land uses across the Terai Arc Landscape, Nepal. Source: WWF-Nepal.

Forest and landscape restorations and outcomes

WWF-Nepal initiated the Terai Arc Landscape Programme in partnership with the government of Nepal to mobilize local communities and stakeholders for effective management and restoration of critical corridors within the landscape in order to create and maintain ecological connectivity linking protected areas with community forests, plantations and other conservation-friendly land uses. WWF's interventions include forest protection and management, forest landscape restoration (FLR), species conservation, climate change adaptation, wetland management, socio-economic wellbeing and livelihoods, policy and advocacy, and conservation awareness. FLR was one of WWF's priority interventions in the Terai Arc Landscape. Forest restoration was mainly focused on deforested areas, degraded lands and floodplains within the landscape, particularly in the ecological corridors. A two-pronged strategy – plantation and promotion of natural regeneration – was adopted to restore degraded lands.

Major outcomes and benefits achieved in the Terai Arc Landscape during the last two decades include an increase in forest area, an increase in the population of endangered species, and an increase in conservation benefits to local communities. Forest area increased from 1.28 millionha in 2001 to 1.35 millionha in 2016, with a net forest gain of 66,800 ha. This gain was mainly due to forest restoration and forest protection through community-based forest management (Figure 3). A total area of 22,791ha of degraded forest and degraded land has been restored in critical corridors of the landscape. Moreover, 237,050 families have been managing 162,818ha of forests as community forests that increase access to forest resources for local communities. Along with protection, forest restoration and community-based forest management have contributed to an increase in tiger and rhino populations. The tiger population has nearly doubled in the last 10 years, from 121 in 2009 to 235 in 2018; while the rhino population increased from 372 in 2005 to 752 at the most recent census in 2021. Restored corridors also have a hydrological function as water springs have reappeared and the movement of wildlife has increased. Restoration contributed to Reduced Emission of Deforestation and Forest Degradation (REDD+) opportunities and mitigated climate risks. An Emissions Reduction Program Document (ERPD) was approved by the Forest Carbon Partnership Facility (FCPF) in 2018. The ERPD claims a results-based payment of USD 45 million for six years sequestering 9.16 million tonnes of CO_2e from 2019 to 2024 in the Terai Arc Landscape.

A view of the Terai Arc Landscape, showing a mosaic of protected and restored habitats.

Local communities have been benefitting from economic opportunities through forest- and farm-based green enterprises and nature-based tourism. A total of 2,298 households initiated small-scale forest- and farm-based enterprises including production of essential oils, brooms and nectars. Similarly, 132 households run homestays and secure revenues from nature-based tourism. Importantly, local communities have run cooperatives to manage community capital which is created through a revolving fund provided by WWF and their own savings. Approximately USD 4.9 million of community capital has been mobilized through 114 cooperatives for the livelihoods and socio-economic wellbeing of local people.

Lessons learned

The success of the landscape approach in the Terai Arc Landscape was achieved through multi-stakeholder engagement involving government leadership, community stewardship, and civil society support. Local communities are key actors and their participation is crucial for the success of FLR. As most of the local communities depend on forests for their livelihoods, improvement of the socio-economic condition of the local communities needs to be considered in FLR interventions. Thus, FLR needs to address both the immediate and underlying causes of forest loss and degradation to maintain a functional landscape. Since community forestry became a leading forest management regime in Nepal, the technical capacity of forest users and the institutional capacity of forest user groups also needed to be strengthened to protect and restore forests in the landscape.

FLR was also crucial for creating ecological connectivity between habitats for the movement of charismatic species and for the flow of ecosystem services. Forest restoration in the Terai Arc Landscape provides a successful example as it has demonstrably increased populations of flagship species such as tiger and rhino, even in a densely populated landscape. The restoration of critical corridors also contributed to the transboundary movement of wide-roaming megafauna species.

Challenges

After the eradication of malaria in the 1960s, people started migrating from the hills to the Terai region of Nepal, attracted by its fertile plains and accessibility. This resulted in declining forest cover in the Terai, reaching annual deforestation rates of 1.3% per annum between 1979 and 1991.

Migration into the Terai continues to this day, and it has led to a large human population in the landscape. Deforestation and forest degradation thus remain major challenges. Moreover, Nepal has struggled with insurgency and political instability during the last two decades, which have created security challenges for any forest restoration activities. Resolving both these challenges required community engagement and the mobilization of community-based organizations to secure bottom-up participation.

Due to various interests and levels of awareness on forest protection, management and restoration, multistakeholder coordination is always challenging. In the Terai Arc Landscape, the diverse stakeholders include local communities (including indigenous communities), community-based organizations, local governments, civil society organizations, the private sector, and government agencies. Efforts have been made to develop effective coordination mechanisms for the success of FLR.

Nepal has recently moved from a unitary system to a federal system of governance, with three government levels: federal, state and local. The Terai Arc Landscape is now under the jurisdiction of 156 local governments and six state governments. While some issues are the responsibility of local governments, other issues remain under the remit of state governments. Currently, infrastructure development is a top priority at state government levels. It is a huge challenge to protect forests from large infrastructures such as highways, railroads, hydropower and transmission lines. We are having a series of consultations and discussions with concerned stakeholders to minimize the loss of nature and to build sustainable and environmentally friendly infrastructures.

The way forward

FLR needs to be scaled up through the development of ecological corridors and the promotion of habitat connectivity to create functional landscapes. Upscaling can be achieved by integrating FLR across sub-national, national, regional and global initiatives. Whatever the scale, the participation of local communities and multiple stakeholder groups needs to be increased for the success of FLR initiatives. Engaging multiple stakeholders helps to increase ownership and stewardship for FLR and integrated landscape management. Community participation helps ensure social safeguards and natural resource rights for indigenous people and local communities, as well as effective implementation on the ground.

COMMUNITY-BASED LAND MANAGEMENT: THE COIGACH AND ASSYNT LIVING LANDSCAPE, SCOTLAND

Sarah Robinson [1] and Boyd Alexander [2]

The Coigach and Assynt Living Landscape (CALL) is a partnership of community, charity and private landowners working together in a Living Landscape initiative. Encompassing over 635km^2 of land, loch and sea, it is one of the largest landscape restoration projects in Europe.

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CALL Project Partners include: Assynt Field Club, Assynt Foundation, Coigach Community Development Company, Coigach Salmon Fisheries Limited, Culag Community Woodland Trust, Eisg Brachaidh Estate, Historic Assynt, Isle Martin Trust, Tanera Mor, John Muir Trust, Kylesku Estate, North West Highlands Geopark, Scottish Wildlife Trust and the Woodland Trust Scotland

The area has some of the most dramatic and instantly recognizable landscapes in the British Isles, and within these some of the rarest and most endangered habitats. These landscapes represent the interaction of people and place that has occurred over the past two millennia. The importance of the area is recognized by the various natural heritage designations bestowed upon it, along with its inclusion within the North-West Highlands UNESCO Global Geopark. The project was conceived in 2009 by the Scottish Wildlife Trust, and followed the launch (in 2006) of a long-term vision for nature conservation in Scotland entitled 'Natural Connection' (Natural Connection, 2006). Underpinned by the concept of the ecosystem approach (Convention on Biological Diversity, 2004) the vision was about scaling up Scotland's nature conservation efforts from activities focused on species and sites to an ecosystem and landscape scale. It was also about taking nature conservation itself out of its silo, and making it a much stronger element of socio-economic consideration and decision-making. A crucial aspect of this approach involves making the links between a healthy environment, a healthy economy, people's well-being and – ultimately – the prosperity of Scotland.

In 2010, seven landowning project partners launched a programme for CALL. They set out a 40-year vision articulating potential management actions and initiatives to be undertaken in the first five years. The plan brought together the views and aspirations of the partners and a wider range of community-based organizations from the local area. The current phase of the project, the Coigach and Assynt Living Landscape Partnership (CALLP) Scheme, was developed during the preparation of a funding submission to the National Lottery Heritage Fund (NLHF). Through the development phase of the CALLP Scheme, the CALL project partners increased in number to 14, adding local companies (private and community development) and local community organizations (historic and natural history interest groups) as well as a national charity to the original landowning partners. This collective brings together communities of space (who relate to the project on a geographic level), and communities of practice (who relate to the project through shared interests, practices and knowledge). Through this place-based approach, the CALLP Scheme aims to maximize knowledge and values sharing and participative governance, where diverse stakeholders have a say in decision-making.

The CALL Project area has a population of just 1,244 people across its 635km^2. Many local residents are involved in primary industries, and tourism is an important mainstay of the local economy. While the CALLP Scheme aims to allow the partners to fully realize their ambitions for sustainable land management, it also seeks to deliver lasting benefits for the local communities. There are a number of challenges in engaging the communities in the project area: they are dispersed, resources are low, and infrastructural challenges (digital and physical) can hamper collective action and engagement. The partners recognized these challenges. Their process and approach of seeking to involve the wider community has used a variety of engagement methods, and heavily relied on local staff being part of the communities. The participation of local people has been sought at all stages of developing the CALLP Scheme. Communities were invited to take part in the process of identifying the priorities and opportunities the CALL Partnership might enable, and they have been involved throughout the delivery phase of the CALLP Scheme through either partner organizations, project activities or wider consultations.

The CALL Partners are committed to delivering an ambitious suite of 33 individual projects in a five-year period that ends in 2021. These projects cover four complementary themes. In terms of land management, more than 260ha of native woodland have been planted, and 410 hectares have been brought back into active management. Local crofters (small-scale farmers) have benefitted from training in several areas, including bee keeping and the growing and maintenance of heritage fruit trees. Two demonstration crofts are developing more sustainable and cost-effective agriculture. Volunteer work parties contribute by, for example, having removed over a tonne of marine litter from local beaches.

In terms of training, skills and people, our Outdoor and Woodland Learning project has engaged with 90% of the children, at all stages of education from nursery onwards, in the local high school catchment. Workshops on whittling, birch tapping and other woodland crafts have helped to encourage greater awareness of the value of our native woodlands. Our Community Grant Scheme has awarded over £100,000 to individuals and organizations in the area, supporting a range of projects from wildlife recording to guided story walks, and a large tapestry reflecting the area's heritage.

We make the landscape more accessible for amenity and recreation by upgrading footpaths in stunning locations, including the path to the summit of the iconic mountain of Suilven, which ensures both local people and visitors have good access to the area's outstanding natural heritage. The long history of the region is given recognition and prominence through historical and archaeological research, including the excavation of the Iron Age Clachtoll Broch which has uncovered a nationally important trove of finds.

Delivering such a wide variety of projects with a diverse mix of partners inevitably means overcoming disconnect across these groups, in ways of working, language, drivers and values. Communication, transparency and inclusion have all been key to preventing potential conflicts arising, and mitigating any that have occurred. A clear governance structure and the opportunities given to all partners to participate in decision-making has also fostered collaboration and supported the delivery of the CALLP Scheme.

The delivery of the CALLP Scheme and the development of the CALL Partnership have begun the process of bringing people together to create opportunities for better coordination of resources and sharing of good practice. A number of major drivers that will affect the future of the rural economy in Scotland will be acutely felt in the CALL Project area, including climate change and adaptation, post-Brexit changes to financial mechanisms, changing societal attitudes, and the rise in visitor numbers (Davidson Knight, 2020).

The CALL partners and the wider communities in the project area are better placed to respond to these political, cultural and economic opportunities and challenges thanks to their experience of working at multiple scales within a landscape and making the links between a healthy environment, a healthy economy and people's well-being. It is this integrated ecosystem approach that defines a healthy Living Landscape.

Opening of the Glencanisp Nature Trail celebrating the launch of CALLP.

CHAPTER 2

MEETING IN THE MIDDLE: BRIDGING SOCIAL AND CULTURAL NORMS

Social and cultural norms are rules, or expectations of behaviour and thoughts, based on shared beliefs within a specific cultural or social group. In this chapter we learn how important these norms are in designing successful forest and landscape restoration projects. In free-market-driven Mexico we discover why cultural heritage and goals are not necessarily incompatible with ecological goals, and how restoration can both connect landscapes and enhance cultural cohesion. In Colombia, understanding current livestock systems and the sociocultural perspectives of cattle ranchers, as well as land ownership, income, food preferences and safety in rural areas, can help in securing the success of restoration initiatives as much as – or perhaps even more than – biophysical considerations. Restoration projects in the Colombian Amazon focus on citizen education, with young people playing a leading role. Back in Scotland, two projects emphasize the importance of 'trusted intermediaries' in facilitating dialogue among diverse stakeholders, and in engaging local communities to deliver future landscape visions.

Cows grazing amongst endemic trees *Mimosa trianae* and *Tithonia diversifolia* shrubs in Guaviare, Colombia.

THE HUMAN DIMENSION IN LANDSCAPE RESTORATION: THE CASE OF THE XUAJIN ME´PHAA, AN INDIGENOUS NGO IN GUERRERO STATE, MEXICO

Eliane Ceccon

In Mexico, in the last 20 years, radical changes have occurred in the economy and in society (Perrault and Martin, 2005).

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These changes have made the state unable to promote socioecological sustainability, as priority is given to facilitating the free market and opening new commercial spaces (Liverman and Vilas, 2006). This approach has directly influenced public environmental policies in recent decades (Kricheff, 2012). As this process has taken hold, various sectors have discovered that essential parts of Mexican identity have been undermined – such as its great cultural heritage, which is closely associated with its high environmental diversity.

Mexico is a megadiverse country, and yet approximately 50% of the territory has suffered some degree of degradation. Land degradation poses a risk at a national scale, not only to biodiversity, but also to the quality of life of people who live in these territories and depend on the goods and services of natural ecosystems (Ceccon *et al*., 2015). Around 80% of Mexico's forests are in the hands of local communities with collective land concessions. These peasants are the main decision-makers and managers of the forests on which they depend. Given this complex socioecological situation, with tensions apparent between the opportunities of globalization and the needs of local people, counterbalanced by national conservation priorities, it is clear that land restoration projects cannot ignore human dimensions. Any ecological restoration initiative within this context requires bridges to be built between social and ecological sciences (Gobster and Hull, 2000; Gross, 2006).

The La Montaña region of the state of Guerrero in Mexico is culturally diverse (home to the Mixteco, Nahua, Amuzgo and Me´Phaa indigenous groups) and has a longstanding tradition of collective action. It is also one of the poorest regions in Mexico, with a medium to low Human Development Index, reflected by limited access to health services, formal education, paved roads, telecommunications and electricity. The region has also been suffering from a recent increase in militarization and violence due to drug trafficking (Gaussens, 2018).

In the Acatepec municipality, the landscape is highly fragmented, and forests are degraded by intensive fuelwood extraction (Borda-Niño *et al*., 2017; Salgado *et al*., 2018). Agriculture is difficult due to the steep topography of much of the area. The degradation of socioeconomic conditions has been closely related to the evident loss of functionality of natural ecosystems, which has greatly affected the quality of life of the social groups that depend on them.

The Xuajin Me´Phaa non-governmental organization (NGO) was created in 2006 to integrate around 300 producers of organic honey, beans, bananas, pineapple, coffee and hibiscus, this last being the most important source of income (Galicia-Gallardo *et al*., 2019). In 2008, the Regional Centre for Multidisciplinary Research of the National Autonomous University of Mexico (CRIM-UNAM) began working with this cooperative on several local and landscape restoration projects using participatory action-research (Ceccon, 2016). This methodology focuses on respecting and understanding the people with, and for whom, the researchers work. It recognizes that local people are knowledgeable about local ecosystem management, and that they, together with researchers, can work towards analyses of and solutions to environmental issues (McIntyre, 2008). In this region, which is collectively owned, social participation is a fundamental issue because community governments are structured by an institutional set of practices based on providing services to the community. During their lifetime, each member must perform (in an optional and ascending way) the tasks that are indicated by the laws and customs of the community (Gaussens, 2019).

Landscape restoration should not only be a strategy to repair or improve land productivity, but must also promote new relationships with and policies towards nature. It must internalize values for the recovery of the socioecological aspects necessary for the sustainability of societies and ecosystems (Baker *et al*., 2014; Ceccon and Pérez, 2017). The practice of landscape restoration allows for the participation of diverse social sectors, and several environmental perceptions (Higgs, 2005). Thus, ecological restoration can reinforce cultural cohesion through shared practices that restore landscapes linked to cultural identity.

La Montaña

In La Montaña, the research group first tried to ensure that ecological restoration had sociocultural acceptability; this was established based on a direct dialogue among the stakeholders based on participatory methods of consultation and integration (Richardson & Lefroy, 2016). As there was already a formally established organization, the group of academics had only to join the NGO's previously scheduled meetings. Each person responsible for a restoration presented its progress, and a dialogue ensued on the benefits being realized by the community.

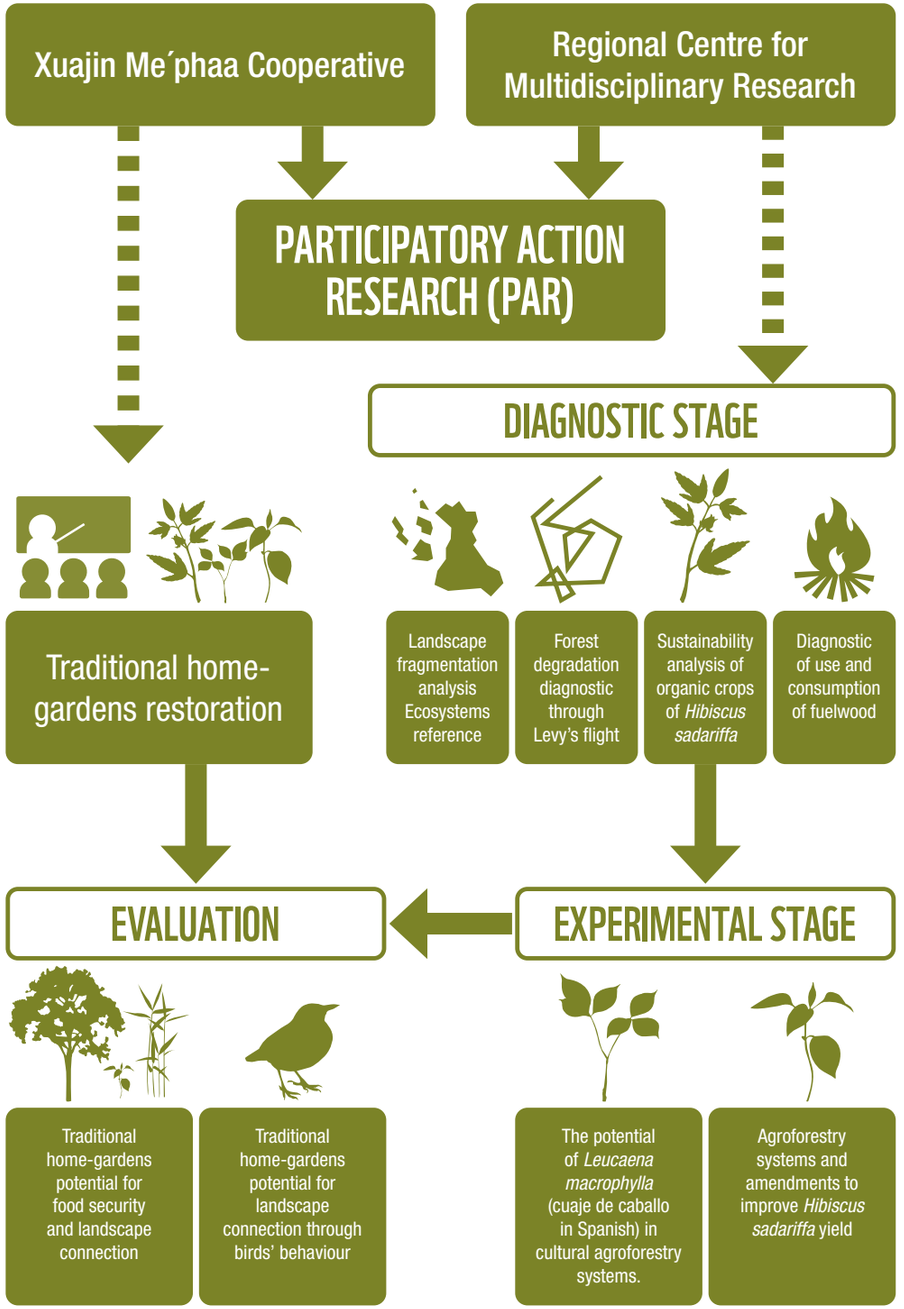
La Montaña landscape, highlighting a hibiscus planting in the foreground and the steep slopes in the background.

The meeting finished with the approval of the local actors to carry out the new restoration actions, and the scope of their involvement was established. Academic participants also had to present and discuss their project results with the students and professors of the local secondary school (Hernandez-Muciño *et al*., 2018). The promotion of these spaces for reflection, dialogue and feedback on objectives and results was essential to resolve conflicts and generate 'collective learning' according to the different interests, positions and visions (Pahl-Wostl and Hare, 2004).

From the academic point of view, after the first meeting with cooperative members, it was concluded that it was first necessary to diagnose the level of degradation of the landscape and describe the reference ecosystems as well as the causes of their degradation. Since the main economic activity was the production of organic hibiscus, it was necessary to know the degree of sustainability of the production system.

The landscape was found to be highly fragmented and degraded; forest patches were considered 'open' due to the intensive use of fuelwood (Borda Niño *et al*., 2017a, Salgado *et al*., 2017). In addition, there was an issue with low yields from hibiscus and maize production (Galicia Gallardo *et al*., 2019). With the results of the diagnostic phase, given the high social capital within the NGO, and according to the farmers' perceptions about the extent and depth of their local landscape degradation and their socioeconomic needs, the group designed different restoration strategies to improve landscape connectivity. Productive restoration experiments were designed to improve hibiscus and maize yield (Silva-Galicia *et al*., 2020).

After six years of the participatory action-research process, common collective learning emerged about ecological restoration and the needs of the community, for both academics and for members of the NGO (Figure 4). It was also possible to perceive a shift in the community's relationship with its natural ecosystems. This change became apparent in 2014, when the NGO began its own financially supported landscape restoration project, focusing on the restoration of 200 traditional home-gardens belonging to its members (Borda Niño *et al*., 2017b). The social participation process generated, in a tangible way, shared meanings between academics and community members, together with the acquisition of new knowledge constructed from the needs, aspirations and motivations of all participants (Garzon *et al*., 2020).



Three years later, the academic group evaluated the motivations of NGO members to participate in traditional home-garden restoration and their potential (in terms of vegetation and bird communities) to connect the landscape. Food security emerged as their main motivation. However, due to the high social capital within the NGO, in addition to the species distributed by the restoration project, there was a high exchange of plants among the peasants, which led to a substantial increase in the diversity in structure and species composition in the traditional home-gardens (Aguirre-Saucedo and Ceccon, 2020). Home-gardens were also found to be very important for the conservation of a great diversity of birds. In addition, home-gardens served as steppingstones between fragments for these birds (Vargas-Cardenas, 2018).

Lessons learned

In rural communities, the presence of social capital – including aspects of social organization such as constructing and strengthening of networks through trust, reciprocity and norms – plays an important role in achieving the objectives of a landscape restoration project, and may be the key to ensure its sustainability over time.

Although academics may have knowledge about the species or ecosystems of a territory, this knowledge must be grounded in a local social reality and must be shared with members of the community through a dialogue of knowledge. In this sense, the beneficiaries must substantially influence the conception, design, implementation, operations and maintenance of a restoration project. Transparency and mutual responsibility are crucial if the main objectives are to obtain sustainability and environmental paradigm shifts over time.

Cultural goals are not necessarily incompatible with ecological goals, but they are distinct and require their own consideration. When communities are effectively included, restoration projects can enhance cultural cohesion through shared practices linked to cultural identities as well as connecting landscapes.

Figure 4:
Diagram of the ecological restoration programme carried out by the Regional Centre for Multidisciplinary Research and Xuajin Me´ Phaa NGO in La Montaña, Guerrero state, Mexico.

TRANSITIONING TO TREE-BASED GRAZING SYSTEMS IN COLOMBIA

Zoraida Calle

Unsustainable livestock systems have caused the destruction and fragmentation of natural ecosystems, particularly in forested landscapes, and have led to soil degradation, biodiversity loss, water pollution, reduced hydrological regulation, and increased greenhouse gas emissions. Conventional grazing systems in Latin America rely heavily on grass monocultures, where external inputs are used to compensate for the loss of ecological processes such as nutrient cycling and biological pest control.

CIPAV (Centre for Research on Sustainable Agriculture) and ELTI (Environmental Leadership & Training Initiative)

Silvopastoral practices are known to increase the productivity and profitability of cattle ranching while enhancing animal welfare and ecosystem services. The integration of grasses, shrubs and trees in structurally complex grazing systems enhances biological processes, reduces the need for external inputs and offers habitat and resources for wildlife (Murgueitio *et al*., 2011). Scaled across rural landscapes, these tree-based cattle grazing systems enrich the agricultural matrix and restore connectivity (Calle *et al*., 2017). Silvopastoral systems therefore allow ranchers to increase yields on their most fertile land, while setting aside marginal or fragile land for restoration, thereby contributing to forest landscape restoration (FLR) and creating benefits for landholders and to society (Calle *et al*., 2013).

A transition towards silvopastoral systems requires the active engagement of cattle ranchers, who need to be convinced of the merits of such systems before adopting tree-based practices. This requires an understanding of the sociocultural perspectives of cattle ranchers, a demonstration of the economic benefits of silvopastures, and the strengthening of capacities to make the transition.

The Colombian Sustainable Cattle Ranching Project

The Colombian Sustainable Cattle Ranching Project (CSCRP) was an initiative implemented in five ecoregions where cattle ranching exists close to protected areas. It aimed to overcome the main barriers to the adoption of sustainable practices, by: (i) improving productivity in participating farms through silvopastoral systems; (ii) enhancing connectivity and reducing land degradation through two payment for environmental services schemes; and (iii) enabling a wider adoption of silvopasture by building the capacities of farmers and extension agents, and by strengthening institutions in the livestock sub-sector.

The CSCRP reached 4,100 families who manage 160,000ha in 87 municipalities and five ecoregions. These families preserved over 18,000ha of mature and secondary forests within their properties, planted 3 million trees, conducted enrichment planting in 3,466ha of second growth areas, allowed 18,603ha to regenerate naturally, and established 38,390ha of silvopastoral systems. These silvopastures included 13,217ha of live fences, 1,930ha of paddocks with planted trees, 18,603ha of paddocks with managed regenerating trees and 4,240ha of intensive silvopastoral systems (Chará *et al*., 2018, 2019). Average animal load increased by 32%, and milk production increased by 29%. A total of 24,416 people learned about silvopastoral systems, 691 extensionists were trained in sustainable livestock production and 1,565,026 tonnes of CO_2e were sequestered.

Key lessons learned

In countries that struggle with inequality and corruption, sociocultural factors such as land ownership, income, food preferences, safety in rural areas and aesthetic values may limit the success of restoration initiatives as much as (or perhaps even more than) biophysical ones. Land tenure and the attachment of landholders to their land are critical and often overlooked factors that influence the success of ecological restoration. For example, landholders without legal title to land may be less motivated to invest in long-term projects involving slow-growing species or the recovery of eroded land. Recent landowners will not have the same attachment to the land as families that have inhabited a place for several generations.

The perceptions, attitudes and motivations of landholders in rural areas are also key determinants of the viability and success of FLR, especially in countries facing governance challenges. For example, the fear of snakes often motivates farmers to burn or cut second

growth vegetation even though they know that their livestock can gain more weight in these areas than in open pastures. Farmers that allow second growth to take over their paddocks will often be criticized by family and neighbours. In some communities, poorer farmers will even spray herbicide in visible parts of their farms to show that they can afford expensive inputs. Ecological restoration in rural properties and landscapes must respect cultural values (such as the aesthetic preference for single-species live fences or trees with straight trunks and predictable branching patterns) and risk perceptions of local communities. This implies setting restoration goals that reflect a compromise between the interests of landholders and restorationists.

Conflicts can also undermine or even reverse restoration investments. Whenever a restoration initiative is perceived as a threat by local communities, for example when workers are brought from distant places to plant trees, people will not be motivated to protect the restored sites. Such apathy often results in the burning or careless grazing of areas where significant resources have been invested in restorative activities. Restoration interventions will only be protected in the long term if they make sense for landholders and rural communities.

Farmers (especially cattle ranchers, who hold 86% of Colombian agricultural land) should play an active role in the design, implementation and monitoring phases of FLR projects. This can be achieved through perception analyses, farmer workshops during the design phase and participatory monitoring of projects. Bringing in farmers' perspectives would result in a more coherent integration of restoration initiatives with agriculture, livestock production and forestry within rural properties, watersheds and landscapes. Similarly, landholders and local communities must have a complete understanding of the ways in which FLR may enhance their production systems and livelihoods.

Specialized capacity-building and the participation of rural families in the monitoring of restoration projects contribute towards an understanding of subtle and complex interrelations. Farmer training should be aimed at enhancing local capacity to design and implement rotational grazing schemes, integrate shade trees within paddocks, provide clean drinking water for animals in grazing areas, use fruits to supplement livestock, enhance nitrogen fixation and the solubilization of soil phosphorus in silvopastures, and restore riparian buffers and steep slopes. Monitoring of restoration initiatives should include variables such as canopy cover, ground cover, tree growth and survival, tree regeneration, dung beetle diversity, and bird species richness (Giraldo *et al*., 2011; Montoya-Molina *et al*., 2016). Therefore, funding agencies should motivate restorationists to invest project resources in high-quality training on sustainable cattle ranching, ecological restoration and agroecology, together with participatory monitoring of silvopastures and restoration areas.

When applied successfully, the enhanced productivity and profitability of cattle ranching systems through the adoption of silvopastoral systems and rotational grazing allow the release of riparian buffers and steep slopes for forest restoration, and the recovery of wetlands (Calle and Holl, 2019). Farmers involved in a single project in the Andean-Amazon foothills of Caquetá (Colombia) were able to release 20% of the land area in their properties after planning land-use and implementing sustainable ranching practices.

Opportunities and benefits of FLR

Before being able to set aside land for ecological restoration, most farmers need to enhance the productivity and profitability of their farming systems. The transition from conventional extensive grass monocultures to silvopastoral systems promotes the sustainable intensification of livestock grazing with multiple economic and

Cows grazing amongst endemic trees Mimosa trianae and *Tithonia diversifolia* shrubs in Guaviare, Colombia.

environmental benefits. Participatory farm planning is an essential step to increase the per-hectare yields and release land. In the process of executing a farm plan that integrates conservation, restoration and sustainable production, rural properties gain tree cover, enhance carbon sequestration and water regulation, and protect biodiversity. A carefully executed farm plan safeguards areas of key conservation value, connects habitat patches, enhances the permeability of the agricultural matrix, and increases yield in the most fertile land. This transformation of rural properties is often accompanied by a change in the attitudes of farmers and their families. As they adopt more sustainable forms of agriculture and livestock production, producers often understand the roles of functional biodiversity in their farming systems and express values related to the stewardship of nature (Calle, 2020). In this sense, FLR not only recovers ecosystem services but also restores farmers' relations to nature.

Main challenges and barriers

Land tenure issues often limit the scope and impact of FLR actions. One frequent situation occurs when a farm is inherited by siblings who do not share a common vision about the land and its resources. Decisions involving land-use changes are consequently delayed by several years until the whole family reaches a consensus about what to do with the farm. Most funding agencies expect implementers to provide evidence of formal land tenure and to demonstrate that landholders are not involved in illegal activities. Because watersheds and landscapes are the sum of rural properties with formal and informal tenure status, such filters create gaps within project areas, where restoration and sustainable farming activities cannot be executed.

Conventional methods based on planting trees and setting aside land for forest restoration often don't make sense for poor landholders. Restoration with rural families whose livelihoods depend on small and highly degraded land often requires an approach that integrates food sovereignty. Projects that involve food production, agroforestry and the integration of wastewater treatment into restoration efforts may be more acceptable for such communities. Agro-successional restoration is the integration of food crops such as plantain, cassava, beans, maize, rice or fodder shrubs in the same plots where trees are planted. Taking care of the crops between trees is often cheaper than controlling grasses and aggressive weeds, with the additional benefit of providing food for the family, feed for animals and income. As the planted trees grow and the canopy closes, annual crops can be replaced by shade-tolerant species or the plot can be allowed to regenerate spontaneously.

Scaling-up sustainable cattle ranching within FLR initiatives demands a unique type of rural extension service that includes the technical aspects of both silvopastoral systems and ecological restoration. Well-trained extensionists play a crucial role in supporting farmers throughout the transition to sustainable land-use practices and ecological restoration. FLR projects that share this vision will need to invest in training cohorts of rural extensionists because such training is not yet offered by Latin American universities.

Future prospects for FLR

FLR needs to move beyond the tree planting paradigm to build an integrated narrative of ecological restoration as the natural complement of biodiversity conservation and sustainable land use. To achieve this, we must foster a deeper understanding of the links between restoration and health, food sovereignty, river navigability, hydroelectric power generation, flood prevention and all dimensions of human well-being. For example, instead of investing enormous amounts of money in inert road stabilization structures, slope failure should be prevented by restoring native plant cover in slopes that drain water over roads. Countries with huge restoration commitments and sustainable development challenges should harness the power of restoration to address risk reduction and prevent human losses in landslides and avalanches. Restoration should also be integrated when planning the post-Covid revival of local and sustainable food supply chains.

FLR provides opportunities to overcome some downsides of classical restoration approaches. For example, the common notion that abandoned lands are the natural stage for restoration is being re-evaluated; in fact, virtually all rural properties offer opportunities for restoring habitats or for enhancing existing ones. It doesn't make sense to wait until lands are abandoned to plan their restoration or rehabilitation.

The displacement of essential economic activities by large-scale ecological restoration initiatives should be avoided, given that it will probably trigger ecosystem damage elsewhere. Instead of competing for available land with other productive activities, we need creative approaches to weave restoration into existing land-uses. This can be achieved by building synergy with forestry, agroforestry, landscaping, sustainable agriculture or infrastructure development.

CHALLENGES FOR FOREST AND LANDSCAPE-SCALE RESTORATION IN THE COLOMBIAN AMAZON

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The Colombian Amazon region has suffered deforestation due to the establishment of agricultural production systems since the early 19th century. Until the 1990s the region was used primarily for small-scale farming by settlers from the Andean region. Since then, however, the region's economy has evolved into a mosaic of family and semi-commercial agricultural production systems where livestock management represents the main economic activity. Low soil fertility and the prevalence of extensive cattle ranching generate land-use conflicts characterized by severe and recurring soil and land degradation, cycles of fallow lands and secondary forest, which result in high deforestation rates to support the production and export of meat and dairy products to other regions of Colombia (Betancourt *et al*., 2015).

During the period between 2016 and 2018, 231,077ha of primary forest and 145,365ha of secondary forest were deforested in the region to establish extensive pastures for livestock (SINCHI, 2020). In addition to this complex scenario, from the 1980s to date, the region has suffered from violence generated by the armed conflict, by forced displacement and land speculation, as well as conflicts derived from the expansion of illicit crops and illegal mining (Peña *et al*., 2016)

In the context described above, the forest and landscape restoration (FLR) project 'Restoration of Areas Disturbed by Agricultural Systems in Areas of High Intervention of the Department of Caquetá' (RADSA-Caquetá) has been conducted by the SINCHI Institute since 2013, with support from the Department of Caquetá, the collaboration of the University of the Amazon, and also the local associations of cattle ranchers (FEDEGANCA) and rubber producers (ASOHECA). The objective of the project is to generate information to formulate protocols for the restoration of degraded forest ecosystems in the hilly and mountain landscapes of the Andean-Amazon transition zone and for the development of an education, communication and institutional coordination strategy to implement landscape-scale interventions in an area of 23,625ha. To date, 1,100 hectares have been restored and six new protocols for restoring forest landscapes have been designed, with the participation of 251 peasant families.

Several lessons can be learned from this project. These have allowed us to propose a number of insights regarding the priorities for the United Nations Decade of Ecosystem Restoration (2021-2030).

Citizen education as the basis for ecological restoration

Landscape dynamics and ecosystem degradation are directly related to the way societies interact with nature. In the Colombian Amazon, the colonization process, multiple types of violent conflicts, different forms of agricultural production, exclusion and social inequality have all shaped cultural patterns which have resulted in the overexploitation of ecosystems. In these contexts of socioecological imbalances, ecological restoration (ER) must go beyond the implementation of scientific-technical strategies to restore forests. It must aim at the building of new ways of thinking, reading and using nature, capable of assuring its conservation, along with sustaining the well-being of the people. This is a process in which young people should have a leading role as future users, but also as guardians of forests.

One of the objectives of the project was citizen education as part of FLR, which allowed for a dialogue between farmers, communities, technicians and researchers, to exchange knowledge and collectively establish the scope of the FLR in the work area. Why should we do FLR? What are the causes of degradation? And where, how and with whom is FLR implemented? This strategy of community empowerment was achieved through environmental education, communication and participatory processes, and by generating scientific and technical knowledge for functional ecosystem restoration . The participatory activities helped to build the social capital necessary to start the process of ecological restoration in the territories. Currently, the project is developing and implementing innovative strategies for education and for building community relations into landscape-scale forest restoration projects, as well as promoting the dissemination of experiences and lessons learned (Garzón *et al*., 2020).

Development of financial mechanisms and instruments for FLR

One important lesson is that despite efforts to design restoration protocols with lower monetary costs and high social and ecological benefits, small and medium rural producers in Caquetá still consider the availability of financial resources and labour for implementing FLR a major bottleneck. At the same time, the incentives and financial instruments applicable to promote the adoption of FLR practices are not adjusted to the sociocultural and ecological conditions of the Amazon region (Jimenez, 2019).

Optimizing the role of financial incentives and instruments in the development of landscape-scale FLR processes is a priority. This might be done by: (a) improving access to information about the incentives and mechanisms offered, and systematizing the experiences developed and their impacts; (b) strengthening the technical and financial capacities of the current promoters of incentives and financial mechanisms in order to adjust the instruments to the cost structures and return rates associated with FLR practices; (c) undertaking studies to improve the identification and evaluation of environmental goods and services obtained from the application of FLR practices; (d) incorporating new lines of financing specific to FLR practices; and (e) strengthening capacity of evaluation and monitoring systems to verify results and evaluate the impacts of FLR.

Worktables for prioritizing ecological restoration (ER) areas at landscape scale in Caquetá, Colombia.

Secondary forests: the great opportunity in the Colombian Amazon

Secondary forests resulting from the abandonment of farmlands are seen by rural communities as land that can be used for livestock production. Hence, it is necessary to incorporate secondary forests into legal regulations of exclusive forest use areas to limit their further deforestation and degradation. The generation and diffusion of information capable of capturing the interest of rural communities and public environmental entities, as well as private investors and international cooperation organizations, should also be prioritized.

Restoration of biodiversity and development of Amazonian ventures

In the Colombian Amazon there are high expectations about the possible ecological, social and economic impact of the sustainable use of timber and non-timber forest products. Significant efforts are applied to generate scientific knowledge about the economic benefits of planting valuable tree species and supporting initiatives of local communities interested in the management, harvesting, transformation and commercialization of timber and non-timber products (Hernández, 2019). Owing to the long history of selective logging in the fragmented landscapes of the Amazon region, populations of valuable species with potential for use in wood and non-wood products have decreased locally to near extinction levels (SINCHI, 2019). Based on the scientific knowledge of the ecology and propagation of the species, and the experiences obtained from the Caquetá project, it is possible to enrich secondary forests with species with potential for use in wood and non-wood products. FLR faces the challenge of promoting the development of restoration actions on a regional scale aimed at the recovery and sustainable management of tree species with high potential for wood and non-wood products in secondary forests and degraded areas, and this could have a positive impact on the creation of rural employment and the diversification of the economic income base of Amazonian peasant families.

Intersectoral articulation of restoration at the different scales

In the formulation of national development plans, the Colombian Amazon region has finally obtained significant recognition of its ecological and social features by establishing metrics that include the number of families adopting agroforestry activities with farm-level conservation agreements, and the number of hectares under conservation schemes and sustainable production systems to control the advance of deforestation in the region (DNP, 2018). The project's FLR activities in the Amazon have contributed towards the inclusion of such environmental goals for the Amazon region as part of national policy. In order to achieve the environmental indicators of the national goals, a main challenge lies in intersectoral policy coordination, especially in relation to environmental, agricultural, educational and mining policies at national and local levels. It is therefore necessary to strengthen the relevance and importance of FLR in different areas and levels of sectoral policies.

There is one important lesson learned from the consolidation of the network of ecological restoration of the Colombian Amazon into the wider Colombian network of ecological restoration. The scenario of social and institutional articulation has allowed the positioning and regional implementation of FLR, opening important spaces for discussion and agreement on relevant issues, cooperation for collective action and the strengthening of human capital to jointly face the enormous challenges of FLR in the Amazon. Consequently, the lessons learned from the Caquetá project emphasize the need to prioritize the strengthening of financial capacity for the actions of information exchange and interdisciplinary technical cooperation of the ecological restoration networks.

Finally, from the lessons learned, we can clearly state that the restoration of forests under a landscape approach is crucial to guaranteeing the conservation of the Amazon biome. To benefit the communities that inhabit this territory, it is necessary to implement a sustainable development model based on the goods and services that forest ecosystems offer. Although substantial challenges remain, projects like RADSA-Caquetá have shown important opportunities that we hope will be seized by rural communities, decision-makers and all stakeholders interested in Amazonia.

A SOCIOCULTURAL PERSPECTIVE OF FOREST AND LANDSCAPE RESTORATION FROM TWEED, SCOTLAND

Chris J Spray

Tweed Forum and University of Dundee, Scotland

The catchment of the River Tweed is a largely rural landscape that straddles the 5,000km^2 of the Scottish (84%) and English (16%) border in the United Kingdom. Rising in the hills at around 840m elevation, the Tweed flows some 100km east to reach the North Sea coast at Berwick-upon-Tweed.

The uplands are dominated by coniferous forestry (mainly introduced Sitka spruce) interspersed with sheep farming, while in the east cereal farming is the main land use. Rural land management underpins the economy. The area retains a strong cultural identity born out of the 'independence' of the Border Reivers who historically occupied the 'lawless' lands between the Scottish and English crowns and respective administrations north and south.

Since 1991, this has been the region in which the non-governmental participative stakeholder organization, Tweed Forum, has operated. From its origin as an informal liaison group, Tweed Forum has grown to become a leader in the field of integrated land and water management, working to "promote the sustainable use of the whole of the Tweed catchment through holistic and integrated management and planning" (Spray and Commins, 2011). In close partnership with its members and the local communities, Tweed Forum works to protect, enhance and restore the natural, built, and cultural heritage of the region at both the strategic and the project level. In recognition of Tweed Forum's innovative bottom-up approach, the Tweed catchment was designated as a UNESCO HELP Basin.

Landscape restoration and management

Tweed Forum began facilitating and promoting landscape restoration through the development of a Catchment Management Plan as far back as 2001 (Tweed Forum, 2003). This was initiated through widespread community consultation across the whole catchment to ensure sociocultural and economic issues were addressed alongside environmental priorities. Launched in 2003, it pre-dates the introduction of river basin management planning under the EU Water Framework Directive and, crucially, takes a much wider view of the socioeconomic challenges faced by communities. The iterative process of identifying key issues, consultation, feedback and redrafting enabled the subsequent development of restoration strategies and actions across the whole catchment (Tweed Forum, 2010). This led to a focus on key issues and locations and, with the award of a £9 million Heritage Lottery Grant, enabled the delivery of restoration activities at a landscape scale, involving local communities as key partners, and delivering multiple benefits across 50 projects between 1999-2006.

Tweed Forum and partners proposed and delivered a pilot for the Scottish government's Land Use Strategy (Spray *et al*., 2014). Through detailed mapping of key ecosystem services provided within the catchment, and through consultation with communities, we were able to highlight the socioeconomic issues behind land use and restoration of habitats, and identify areas where environmental action could best be focused to deliver multiple benefits (Figure 5). This included the creation of opportunity maps to show the most suitable locations for restoring native forestry to reduce flood risk through natural flood management (NFM), while also delivering other community and environmental benefits.

While the Catchment Management Plan and the Land Use Strategy both covered the whole Borders region, Tweed Forum has also researched and implemented river landscape restoration and NFM on the 70km^2 catchment of the Eddleston Water (Tweed Forum). This has included upland and riparian planting of 330,000 native trees, the creation of 29 ponds, embankment removal and re-meandering of 3km of straightened watercourses. This work has only been possible with the voluntary agreement of landowners and farmers. Indeed, while the reduction of flood risk and the improvement of river habitats are key aims, so too has been working with the farming community to sustain their livelihoods, a prerequisite for which is gaining their trust and their active involvement in landscape restoration. This can only be achieved by understanding their cultural and socioeconomic challenges, and their perceptions and behaviours.

Key lessons learned

A key lesson for FLR is the importance of a trusted intermediary situated between the very different sociocultural worlds of individual land managers and the communities in which they operate, and national government and its agencies that determine high-level policy objectives. These two perspectives create an inevitable tension between a bottom-up view that focuses on meeting the immediate socioeconomic needs of local land managers, and a top-down perspective of longer-term policy priorities. As an independent and trusted organization that is respected by both sides, Tweed Forum is able to bridge this gap and facilitate the uptake of landscape-scale restoration activities (Rouillard and Spray, 2017).

Experience has shown that building trust rests on an in-depth knowledge of, and empathy for, farmers and their businesses (Holstead *et al*., 2014). Tweed Forum staff are local, with many from farming backgrounds, and so they readily understand the business pressures faced by the land managers they work with. Landscape restoration cannot be implemented without tackling the economic challenges faced by individual small-scale tenant farmers, reliant on subsidies to support their operations. Modern technology and complex administrative procedures can be an added barrier to engagement, especially among traditional and older farmers. So, providing support for enabling the uptake of measures to restore landscapes – be they tree planting, wetland creation or river restoration – has proved vital to the successful delivery of wider programmes. To this end, Tweed Forum provides administrative support, helps in securing options for blended finance mechanisms, and can even assist with cashflow where an initial capital outlay may be required. Importantly, engagement needs to be undertaken using language that is accessible to all. Academic and policy terms, such as 'good ecological status' for waterbodies (EU Water Framework Directive) or 'ecosystem services' and 'natural capital', need to be replaced by vernacular expressions and local descriptions that reflect local issues.

Finally, it is only through a real understanding of farm business culture that Tweed Forum can prioritize which types of restoration measures to target, where and when. There is little use talking of environmental 'win-wins' or nature conservation 'gains' if the impact on an individual farm business is negative, or at very least uncertain and short-term (Spray *et al*., 2016). Focusing on areas where restoration can add value to a farm business, where it replaces marginal activities, or where alternative sources of finance can be leveraged, may facilitate uptake. It may also allow spatial linking of such areas on individual farms across whole catchments, creating the necessary connectivity to encourage pollination, wildlife corridors or NFM at a landscape scale.

Challenges and barriers

Tweed Forum faces external challenges to which it needs to adapt. Declines in basic subsidy payments for farming combined with increases in the payment rates from the Forest Grant Scheme (for woodland creation) will have inevitable impacts on shaping the mix of sheep and conifer forests in the uplands. For Tweed Forum, this means having to work within the system to promote landscape restoration, and working with landowners to deliver a more balanced basket of ecosystem services.

As noted in the lessons learned, a key challenge is understanding the sociocultural backgrounds and perspectives of the individual landowners, farmers and foresters on whose cooperation such restoration programmes must rely if they are to achieve impact. Without this, restoration proposals will not receive even a hearing, let alone a cautious welcome.

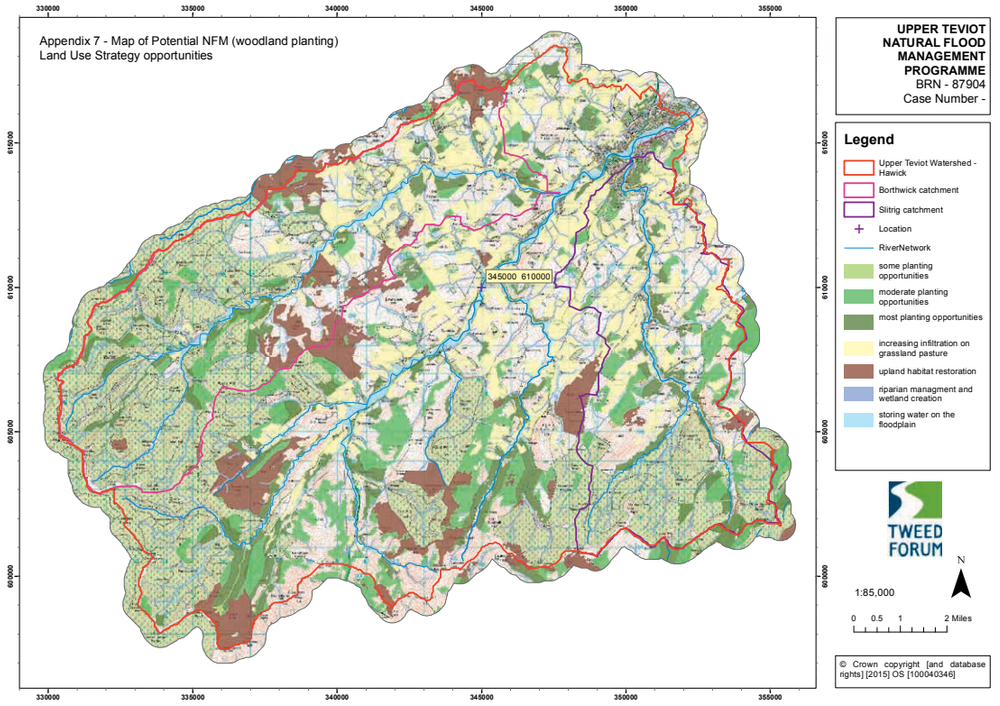

Figure 5:
Upper Teviot natural flood management programme, highlighting land use management opportunities. Source: Tweed Forum.

Our research shows clearly that there are some activities, such as tree planting in the uplands, that are much more likely to be acceptable to farmers than others, such as removing sub-surface tile drains or reducing stocking levels (Spray *et al*., 2016).

For the restoration activities that farmers will consider, a second challenge is providing long-term financial support, not just one-off capital payments on a project basis. Farmers prefer a steady income, so building a sustainable mix of blended funding sources remains a key issue. Even then, what may be acceptable to one farmer may not be to a neighbour. Thus while isolated projects may progress, achieving an impact across the landscape will remain a barrier until mechanisms are available to encourage effective joining-up of individual land managers' actions at a meaningful scale. This is, in itself, as much a social challenge as it is an economic one.

Finally, progress relies on trust, specifically trust by land managers of the good intentions and independence that needs to underpin the facilitation role undertaken by Tweed Forum or other partners.

River landscape restoration in the Eddleston Water catchment of the river Tweed has included the re-meandering of 3km of straightened watercourses.

Priorities for scaling up

An initial priority may be to determine what society wants from the wider countryside; something that is at the heart of the Scottish government's Land Use Strategy. Being clear on what government and society are willing to pay, and where to support different land uses, is a necessary starting point for partnerships to then agree how to incentivize, coordinate and deliver these objectives. Creating the platform for land managers to engage with restoration activities at a meaningful scale will need attention focused on:

- Creating regional partnerships that understand the nature and pressures around farm businesses and the sociocultural perspectives of farmers and land managers
- Identifying who can fill the role of a trusted intermediary at a suitable spatial scale
- Coordination and collaboration between adjacent landowners at the catchment scale
- Building the mix of sustainable funding sources to attract farmers to engage.

In this respect, certain drivers for FLR provide potential ways forward, including, in Scotland, the recognition of a 'Climate Emergency' and 'Biodiversity Crisis'. Actions to adapt to climate change in the form of changes to current land use will need to be progressed at a spatial scale that makes a difference, including those NFM measures to mitigate flood risks.

Future prospects for FLR

From the sociocultural perspective, the key to substantial progress with FLR would appear to lie in the extent to which successful alignment can be achieved between the main drivers (which are often conflicting) of top-down policy objectives (climate change adaptation, woodland expansion, biodiversity recovery, carbon management, sustainable economic growth etc.) and the cultural and economic perspectives of individual landowners and farmers (Rouillard and Spray, 2017). Continued financial support at landscape scales will be part of this, but we also need to identify and value the non-market benefits delivered by land management and landscape restoration beyond the production values of food and forestry. More generally, there is a need to ensure that we are able to target resources to deliver the right measures for restoration in the right places and at the right scale. Combined with the need for diversity and landscape connectivity, we should be creating mosaics of habitats that are environmentally, economically and socially coherent.

THE BUNLOIT WILDLAND PROJECT, SCOTLAND

Jeremy Leggett

Combatting the climate crisis and rebuilding economies after the Covid crisis will require a global green new deal in concert with total system change in environmental stewardship. The Bunloit Wildland project is an effort by one private landowner to do both these things, in a rural context, on a 511ha diverse-habitat estate in Scotland. Its mission is to create an inhabited nature reserve that is a holistic and biodiverse carbon sink, and an exemplar of local solutions leadership that will inspire many others to copy it.

Bunloit Estate, Scotland

Success in this endeavour will be defined by four goals, over the 10 years to 2030. First, there must be a meaningful and measurable increase in the sequestration of carbon across the estate, combining deciduous woodland, mixed woodland, peatland, pasture and built infrastructure. Second, there must be a meaningful and measurable increase in biodiversity. Third, there must be a high level of employment in land management. Fourth, the project must be economic, generating sustainable and ethical profits that capitalize ongoing operations, and that demonstrate better ways to operate than many norms for private estates.

The Bunloit Estate, on the west slopes of Loch Ness in Inverness-shire, is particularly suitable for the chosen mission, being a unique tapestry of habitats in a relatively small area. It was purchased in two lots in February and May 2020 with crowdfunded debt from 28 individuals and institutions, all of whom believe in the importance of the mission, many of them business leaders variously active in combating climate change and biodiversity loss. The two 'Bunloit bonds', totalling £4.3 million, comprise funds both for the purchase of the land and the operation of the business model.

The 'local solutions leadership' element of the mission makes it clear that a critical mass in the local community must be involved in, and approve of, the project. Land-management of the type required to meet the four goals – including repayment of the bonds – will need to be relatively labour-intensive. With this in mind, the project opened its doors in March 2020 intent on a full year of intensive stakeholder consultations before arriving at a final master plan for execution of the mission. This paper has been written five months into that process.

Carbon

Anyone familiar with carbon accounting as of 2020 knows that there is a need for more verification-related research. As such, the Bunloit Wildland aims to be an open laboratory for climate and biodiversity researchers, particularly from Scottish universities and research institutions. Early outreach has resulted in encouraging responses.

Peatlands are areas of particular concern in terms of quantification. They can be either major greenhouse-gas sources or sinks, depending on their physical state. The Bunloit peatlands provide an opportunity to create a well-measured baseline, in particular using flux tower measurements of greenhouse-gas flow in and out of the bogs, in concert with mapping of peat depth. Ongoing monitoring of greenhouse-gas fluxes can then assess improvement following restoration interventions, notably the blocking of drainage channels.

In broadleaf woodland, the expertise and experience of both non-governmental organizations such as The Woodland Trust and Trees for Life, and governmental agencies such as Scottish Forestry, will be brought to bear in formulating a strategy for integrated management and/or wilding. Bunloit is home to some of the northernmost ancient oak woodlands in the UK, and spectacular birch and Scots pine-dominated woodlands.

In existing stands of non-native coniferous woodland, intervention is likely to be much greater. Some of Bunloit's 'commercial' plantations are sorry spectacles: crammed and spindly conifers planted decades ago atop peat, easily blown down in gales today. These are likely to be felled early in the decade of the mission. Other plantations, notably on the Loch Ness slope, contain healthier trees. One contains mature Douglas firs eminently suited to the construction of timber eco-homes. These are likely to be used in the construction of a limited number of eco-homes on the estate.

Following the removal of non-native conifers, the relative ambition and mix of effort invested in peat restoration, woodland replanting and natural regeneration have yet to be decided, as have fencing and other deer-management strategies. All will be directed at enhancing long-term carbon sequestration.

Biodiversity

As with carbon, there are clear opportunities to create biodiversity baselines, and then measure biodiversity change over time. Plantlife UK, the Highland Biological Recording Group and the Natural Capital Laboratory argue that Bunloit Estate is well suited to traditional biodiversity monitoring and assessment techniques alongside pioneering approaches such as environmental DNA (eDNA). Rewilding initiatives by Rewilding Europe, Knepp Wildland and others offer encouragement that optimizing the mix of grazers, including some breeds of cattle, in the pastureland will lead to both greater biodiversity and increasing carbon content in soils.

People

Once the land-management sections of the masterplan take shape, a team will be hired to execute the plan. Roles will include forestry, fence care, deer management and tour-guiding of groups of eco-tourists paying to wander the wildland. Employment of these 'Bunloit rangers' will give preference to local recruits.

Eco-tourism is an important element of the business model underlying the Bunloit Project. The expectation is that the post-Covid 'new normal' will see an increase in the numbers of people seeking to enjoy wilderness. Bunloit may only be 30 minutes from Inverness, but it is already a somewhat wild land, and the intention is to manage it to an even more nature-oriented state. Following the leadership of established wildlands such as Knepp in southern England, eco-tourism strategies are likely to involve the use of yurts deep in the wildland, serviced by rangers backpacking supplies in.

Bogland habitat in the Bunloit Estate in Scotland.

The main engine-room of the business model will be the construction of a limited number of eco-homes in the wildland, envisaged as homes for Bunloit rangers and rentable homes for visiting guests. The estate is dotted with ruined croft houses, and one option is to build new affordable zero-carbon homes on these sites. Also being considered is the construction of a small development on the northern margin of the estate, on one of two clear-felled plots. This would aim to provide a hub for new jobs, new trades, new local businesses unrelated to tourism, and some affordable housing. Expressions of potential interest in involvement to date include a furniture workshop and school, a wood-processing workshop, an architecture consultancy and a microbrewery. Plans are being drawn up to power both Bunloit Estate and the putative new development entirely with onsite renewables, notably solar. Fossil fuels will be prohibited from all land, and battery charging will include electric vehicles, whether individually owned or pool-owned.

The partner in this green infrastructure programme will be Makar, an Inverness-based company that is a Scottish leader in offsite-manufactured timber housing. The Bunloit project operating company has invested in Makar in order to secure the relationship, and Makar plans to build a workshop in the Borlum Wood eco-village.

Economics

The unfolding of the Bunloit Wildland project will take place in parallel with a major set of changes in UK land management as the UK government's new Environmental Land Management (ELM) scheme takes shape. This set of policies seeks to switch rewards for land managers away from subsidies for agriculture and forestry production towards payments for environmental goods through ecosystems guardianship. While the proposed ELM scheme will not encompass Scotland, the Scottish government is nonetheless following its development closely as it seeks to develop its own strategy for future land management. The Scottish government is also seeking to promote new perspectives on land management in which landowners can effectively engage local communities and businesses for better environmental management and innovative employment options.

The Bunloit Wildland project aims to provide a litmus test and flagship for such thinking.

Juniper Ridge in the Bunloit Estate in Scotland.

CHAPTER 3

THE SKILLS TO GET THE JOB DONE: TRAINING NEEDS IN A COMPLEX WORLD

Implementing forest landscape restoration will require capacity-building among communities, land managers and governmental organizations. There is, however, a significant gap between what is needed and what is available. In Latin America and the Caribbean, for example, there is a pervasive bias within university courses and implemented projects which favours the ecological dimensions of restoration. Skills and knowledge gaps need to be addressed to encompass the social, cultural, economic and political dimensions of restoration. Here, we will discover what 15 years of restoration initiatives have taught us. We will hear about the motivations, experiences and capacities of smallholder farmers to implement restoration measures from projects in Ecuador, Brazil, Costa Rica, the Philippines, and Papua New Guinea. We will also discover how forest landscape restoration is gaining momentum throughout Africa – but the approach and the associated capacity development that is needed have to be tailored to local contexts and conditions, as we learn through examples from Burkina Faso and the United States.

Seedlings ready for distribution and planting, produced in the main facility of the National Tree Seed Centre of Burkina Faso.

UPSCALING CAPACITY DEVELOPMENT FOR FOREST LANDSCAPE RESTORATION

Manuel R. Guariguata

Centre for International Forestry Research, Lima, Peru

Forest and landscape restoration (FLR) embraces an integrated approach to balancing environmental and socioeconomic needs. Implementing FLR requires the consideration of essential factors that, more often than not, cut across governance and jurisdictional scales: land tenure and access rights; multiple stakeholder engagement and decision-making; enabling policy frameworks; clear and socially (and gender) inclusive implementation and monitoring plans; adaptive management approaches; financial, human and biological resources; and technical and technological knowhow, including traditional and cultural practices.

To this end, the conceptualization, design, implementation and monitoring of FLR actions and programmes require a good understanding of:

i) the interplay between restorative interventions at the plot scale with the broader socioecological dynamics of human-dominated landscapes;
ii) socioeconomic drivers of habitat conservation, transformation and restoration success; and
iii) collaborative planning, implementation and monitoring, so as to encourage social learning and foster adaptive management.

Enhancing multidisciplinary professional capacity is paramount for the effective implementation and outcome evaluation of integrative landscape management approaches, which include FLR (Sayer *et al*., 2013). Although many tools exist for planning FLR, practical approaches to implementing or operationalizing FLR are notably lacking (Chazdon and Guariguata, 2018). The challenges raised by the current global restoration agenda are substantial and call for enhancing human capacities at scale beyond the planning and diagnostic phases.

From both an operational and a capacity-development standpoint, implementing FLR is not short of challenges. One is how to bring together teams with the necessary disciplinary background (forestry, ecology and economics, as well as social and political science). Another is the need to understand that FLR is both a dynamic and uncertain process: definitions of success are bound to shift as stakeholder views of what constitutes desirable outcomes evolve, as governments and their policy contexts change, and as mismatches between donor cycles and longer-term FLR goals prevail (Wiegant *et al*., 2020). At a minimum, 'connectors' within teams need essential professional attributes such as expertise in negotiation skills, trade-off analysis, communication and multi-scalar thinking – that is, the skills of people trained in managing complex socioecological systems. In addition, capacity is needed for designing and implementing monitoring tools and approaches from the bottom up in order to promote reflection and local buy-in (Evans *et al*., 2018). At present, indicators for measuring global progress of FLR commitments refer to compliance, such as forest and/or tree cover gain (NYDF Assessment Partners, 2019), as opposed to performance-based indicators.

A recent survey of 411 restoration professionals across Latin America and the Caribbean (Meli *et al*., 2019) revealed that the most important constraint hindering capacity development is the limited availability of both curricular and extra-curricular programmes including, most notably, short intensive courses focused on socioeconomic and management dimensions. This need is perhaps a reflection of the pervasive bias of both university-level courses (Sansevero *et al*., 2017) and implemented projects (Murcia *et al*., 2016) towards the ecological/biophysical dimension.
To upscale human capacities in response to the global restoration agenda, one way forward is to enhance the availability of continuing education on a global scale, including degree-credit courses, non-degree career training and personal enrichment courses (all either on-campus or online). Yet inherent to the complexity and multidisciplinary nature of FLR is a trade-off between the breadth and depth of extra-curricular training; there is a risk of producing too many single-discipline, one-time-only course editions, and only when funding is available. Such a perspective is unlikely to have a transformative impact, considering the need to restore the millions of hectares pledged worldwide under national targets. A structured approach to continuing education in FLR is warranted.

At present there are many organizations of national, regional and global scope undertaking capacity development on FLR across the tropics (Bloomfield *et al*., 2019). However, the ideal first step would be to ensure inter-institutional coordination to find synergies and provide a minimum level of thematic coherence to continuing education programmes. The second (while very ambitious) step would be to design a modular programme that guides users through progressive learning stages – from fundamental concepts to specialized issues – in an FLR context, taking into account which competencies are to be gained (i.e. skills and behavioural attributes) in addition to mere knowledge acquisition. The two intergovernmental agencies in charge of implementing the United Nations Decade on Ecosystem Restoration 2021-2030, FAO and UNEP, are well positioned to carry out this task on a global scale. To this end, the six principles upon which FLR is built –

(1) focus on landscapes,

(2) engage stakeholders and support participatory governance,

(3) restore multiple functions for multiple benefits,

(4) maintain and enhance natural ecosystems,

(5) tailor to local context, and

(6) manage adaptively

(Besseau *et al*., 2018) – could be used as the building blocks for a coherent worldwide capacity development programme to prepare FLR practitioners to step up to the global restoration challenge. In fact, the recent Guidelines for Forest Landscape Restoration in the Tropics (ITTO, 2020) are crafted along these principles and include a set of guiding elements and proposed actions. Although this is an important step forward for upscaling FLR, the guidelines were drafted in a top-down fashion. What remains is to validate their practicality in consultation with different stakeholders from diverse interest groups across different socioecological contexts.

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Collaborative land-use planning in Papua.

CAPACITY DEVELOPMENT: LESSONS LEARNED FROM IUFRO'S INITIATIVES

Michael Kleine

IUFRO (the International Union of Forest Research Organizations), Austria

Forest landscape restoration (FLR) has emerged in recent years as a major conceptual framework to address deforestation and land degradation, a phenomenon accompanying human development around the world for centuries. With increasing land degradation in the recent past caused by excessive exploitation and over-use of natural resources, integrated landscape approaches to sustainable development have emerged to reconcile the many expectations and conflicting societal demands towards the natural environment.

To this end, the FLR process aims at regaining, improving and maintaining vital ecological functions and enhancing human well-being, in the long term leading to more resilient and sustainable landscapes (GPFLR, 2020). Given the political momentum for FLR at the global level and the urgent need to obtain progress on the ground, increased capacities are required for integrated approaches to development and landscape planning across society.

The International Union of Forest Research Organizations (IUFRO), the largest global network for forest science collaboration, has been actively involved in FLR initiatives for the past 15 years, including training in FLR through its Special Programme for Development of Capacities (SPDC). In this context, SPDC over the years has been concentrating its work on developing and organizing knowledge-sharing workshops and training on FLR in Africa, Asia and Latin America. A wide array of FLR-relevant subjects are addressed during the training ranging from global policies and governance issues to project planning, facilitation of multi-stakeholder processes, and implementation and monitoring of technical operations on the ground (IUFRO 2020a).

The capacity-building programmes include social skills such as methods of science communication, and science-policy and science-society interactions. The training also draws on experiences gained through a comprehensive analysis of progress made in FLR implementation that was conducted by SPDC in 2019 in 17 landscapes in selected countries across Africa, Asia and Latin America. The aim of the study was to enhance the understanding of the ecological, social and economic dimensions of the FLR process and to share this information for policymaking and learning (IUFRO 2020b).

Understanding forest landscape restoration

The FLR capacity-development approach is based on the following two main considerations:

- A clear distinction is made between the various audiences (stakeholders) involved in FLR at different levels of society; and
- FLR is designed as a social process involving various stakeholders followed by concrete restoration actions in the field.

Distinguishing among the various audiences recognizes that multiple categories of stakeholder groups are involved in FLR ranging from rural communities, private sector companies and NGOs at the local level, to policymakers, governmental legislators and administrators at district and national levels. According to Stanturf *et al*. (2020), FLR implementation is driven by these stakeholders operating in three different spaces – governance, FLR facilitation, and field implementation.

Successful FLR implementation leading to a lasting improvement in ecosystem function and socioeconomic benefits to society largely depends on the knowledge and skills of involved stakeholders. The FLR capacity development programme of IUFRO offers three different information-sharing and training programmes, i.e. awareness-raising among policymakers; training of forest landscape restoration facilitators; and capacity-building of local FLR actors. These programmes are specifically tailored to the needs of stakeholders in the three above-mentioned operating spaces.

Understanding FLR as a social process means stakeholders in the same landscape interact, reconcile conflicting land use objectives, and agree on actions to restore their landscape. As is shown below, there is a systematic development path incorporating feedback mechanisms and iterations that covers the steps from the project idea to measurable results on the ground (Figure 6, Stanturf *et al*., 2017).

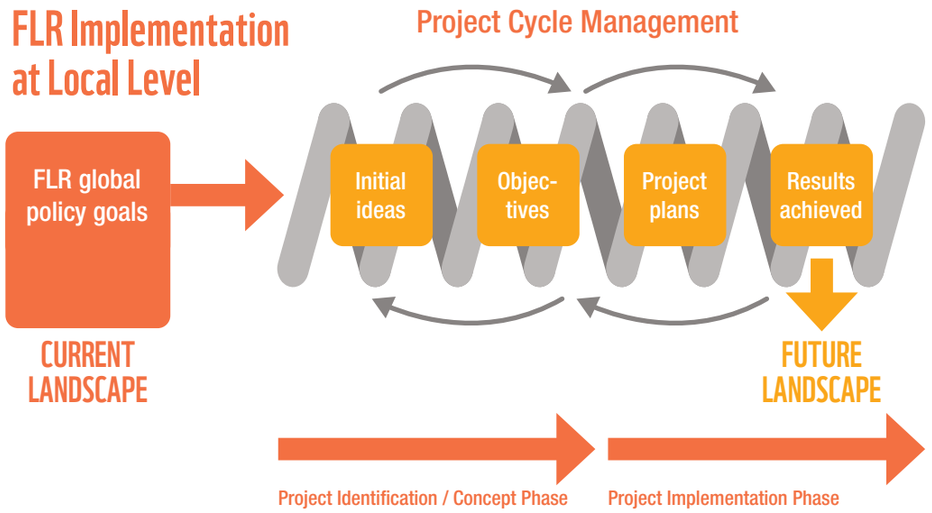

Figure 6:
Systematic development path from the project idea to measurable results, with a feedback and iteration mechanism (Stanturf et al. 2017).

The FLR process and the associated knowledge and skills needed for FLR implementation have been compiled in IUFRO's FLR Guidelines (Stanturf *et al*., 2017). The modular guidebook covers the relevant aspects of FLR implementation ranging from governance issues, project design and planning, to restoration strategies, technical aspects, monitoring and communication.

During the course of implementing various knowledge-sharing conferences, workshops and training sessions on FLR over the past years, we learned a fundamental lesson. Building FLR capacity must relate to the above-described distinction between the three FLR operating spaces with their respective audiences, as well as to the FLR process described in the IUFRO FLR Practitioner's Guide. The audiences in the three FLR operating spaces require different types of information-sharing and different levels of detail in the training content. To this end, the following approach has shown promising results for effective FLR capacity-building.

Lessons learned from FLR capacity-building activities

The approach we have taken entails three different types of information-sharing and training events, each tailored to the operating spaces, such as (a) raising awareness on governance to inform policymakers for creating an FLR enabling environment; (b) FLR facilitation with change agents trained to coordinate and assist local stakeholders; and (c) field implementation with local FLR actors enabled to effectively restore the landscape.

Awareness-raising among policymakers

Decision-makers play an important role in shaping the regulatory and institutional environment that enables FLR implementation and ensures that conservation measures and non-degrading land management practices are employed on a sustainable basis. Policymakers are introduced to the landscape approach, particularly emphasizing the interlinkages among the various economic sectors and their impact on land degradation and management. For example, increasing agricultural subsidies can have negative effects on forests as more forest land could be cleared for agricultural production. Market instruments, government incentives or policies on jobs may have positive or negative impacts on the willingness of landowners to grow and market trees or manage specific land areas for nature conservation. The awareness-raising events aim at sensitizing policymakers for the right mix of regulations and policies that need to be in place for local actors to successfully restore land and for moving towards sustainable land management practices. Such sessions are made attractive through short presentations, video clips, panel discussions and sufficient time allocated for person-to-person interaction for information exchange and debate.

Training of FLR facilitators

Experiences from implementing FLR in various locations around the world show that the multistakeholder process, which provides the backbone of any FLR undertaking, requires planning, moderation and monitoring by skilled FLR facilitators. These change agents may include staff of existing governmental or non-governmental organizations such as agriculture extension services, forest and wildlife departments, farmer associations or rural development NGOs. The facilitators assist stakeholders in organizing the platforms for interaction, reconciling conflicting views and planning FLR activities. In addition, the facilitators' tasks include gathering relevant information; seeking clarification on laws, regulations, tenure systems and market opportunities; linking local stakeholders to policy makers and funding institutions; and monitoring progress made in the FLR process and on the ground. The training content is based on IUFRO's FLR process guidelines (Stanturf *et al*., 2017). Initial experiences with the training of FLR facilitators suggest that a series of training workshops followed by a mentorship programme is the most promising option. While workshops provide the theoretical background the mentorship programme introduces the trainees to the actual work on FLR issues with local stakeholders.

Since FLR to a large extent is a social process that may turn in unexpected directions, it requires adaptation to objectives and plans. Mentorship can provide guidance on this and thus should cover a period of not less than one year.

Capacity-building of local FLR actors

The training of various local stakeholders is considered an integral component of the FLR process (as described in the FLR Practitioner's Guide), which is a joint undertaking by local stakeholders, aiming at co-developing land restoration and improvement measures. The ability to share information, articulate interests, reconcile conflicting views and recognize that landscape-level decisions require compromise are fundamental capacities to be developed among participating local actors. Besides developing social skills, the FLR process also aims at learning and information-sharing on ecosystem functioning, new agriculture/forest cultivation technologies and management methods, products, markets and job opportunities. Local actors participating in the FLR process obtain better insights into many aspects of their local ecosystem and social environment, learn from each other and gradually agree on restoration actions to be implemented.

Outlook

Given that around 25% of the global land surface is considered degraded to varying degrees (Runyan and D'Ododrico, 2016), of which about 15% is suitable for FLR (Minnemeyer *et al*., 2011), the restoration task ahead is monumental. To this end, capacity development of FLR actors in each country as described in this paper represents an essential element in global, regional and national restoration initiatives. Besides informing the policymaking levels of the best options for creating an FLR-enabling environment, training of a sufficient number of FLR facilitators in each country is considered key to significantly upscale FLR implementation on the ground. IUFRO, through its Special Programme for Development of Capacities, will continue contributing to the training of a critical mass of FLR facilitators so that local-level restoration initiatives can take off on a massive scale.

Local stakeholders play important roles beyond FLR activities: traditional cooking methods replaced by energy-saving cook stoves in Malawi .

BUILDING CAPACITY OF FARMERS AND COMMUNITIES FOR FOREST AND LANDSCAPE RESTORATION

Robin L. Chazdon [1], Sarah J. Wilson [2] and John Herbohn [1]

In rural areas of tropical countries, deforestation and forest degradation create urgent socioeconomic and environmental demands for restoring forests and landscape functions. Smallholder farmers and communities are key agents of restoration in these landscapes, through implementing restoration measures on farms or engaging in restoration initiatives led by government or non-governmental organizations. Capacity-building should focus on helping smallholders and communities realize direct and indirect benefits of restoration interventions. As the motivations, experiences and capacities of smallholder farmers to implement restoration measures are often highly heterogeneous, building their capacity to work together as actively engaged forest and landscape restoration (FLR) stakeholders involves harnessing and enhancing their diverse skills and perspectives.

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[2] School of Environmental Studies, University of Victoria, Canada

To illustrate how this has unfolded in the field, we draw on case studies from Ecuador, Brazil, Costa Rica, the Philippines and Papua New Guinea, which encompass different contexts of land tenure, community organization, and engagement with local government agencies.

What is community capacity?

Community capacity can be broadly defined as the resources and skills that a community can draw upon to plan, implement and manage reforestation projects and allied activities. Community-based reforestation is intimately linked to livelihoods and the five types of assets or capitals – natural, physical, social, human and financial – that communities possess (Figure 7) . Collectively, these assets provide the capacity to implement FLR to enhance livelihoods, gauge expectations of reforestation outcomes and ensure an equitable distribution of opportunities and benefits. Capacity-building can also be targeted at increasing capital that will, in turn, transform other capitals. For example, improving social capital allows communities to better access technical and financial assistance from external sources.

Four key lessons learnt regarding capacity-building for restoration

Lesson 1: Tailor capacity-building to the needs of smallholders and communities

Capacity-building should be an early focus of attention and should be an ongoing activity that responds to changing demands and interests of smallholder families and communities. In the Philippines case, capacity-building began long before the first tree was planted. Local stakeholders defined the focus of the capacities to be developed, allowing for flexibility to achieve locally relevant objectives while providing guidance to achieve broader regional or national goals. In Costa Rica and Brazil, framing local restoration as livelihood-enhancing activities fuelled motivation and interest in learning, sharing and applying knowledge. Environmental education should engage families in activities that build both human and social capital, as is shown by the Ecuador and Brazil cases. Witnessing reforestation efforts in a contextually relevant setting is a powerful motivator. In the Ecuador case, early adopters of reforestation practices demonstrated results that inspired and motivated other community members to learn and follow, and activities were framed around livelihood-enhancing ecosystem services. Agroforestry, forestry and nursery training were essential for implementing effective reforestation measures in the Philippines, Brazil and Costa Rica cases.

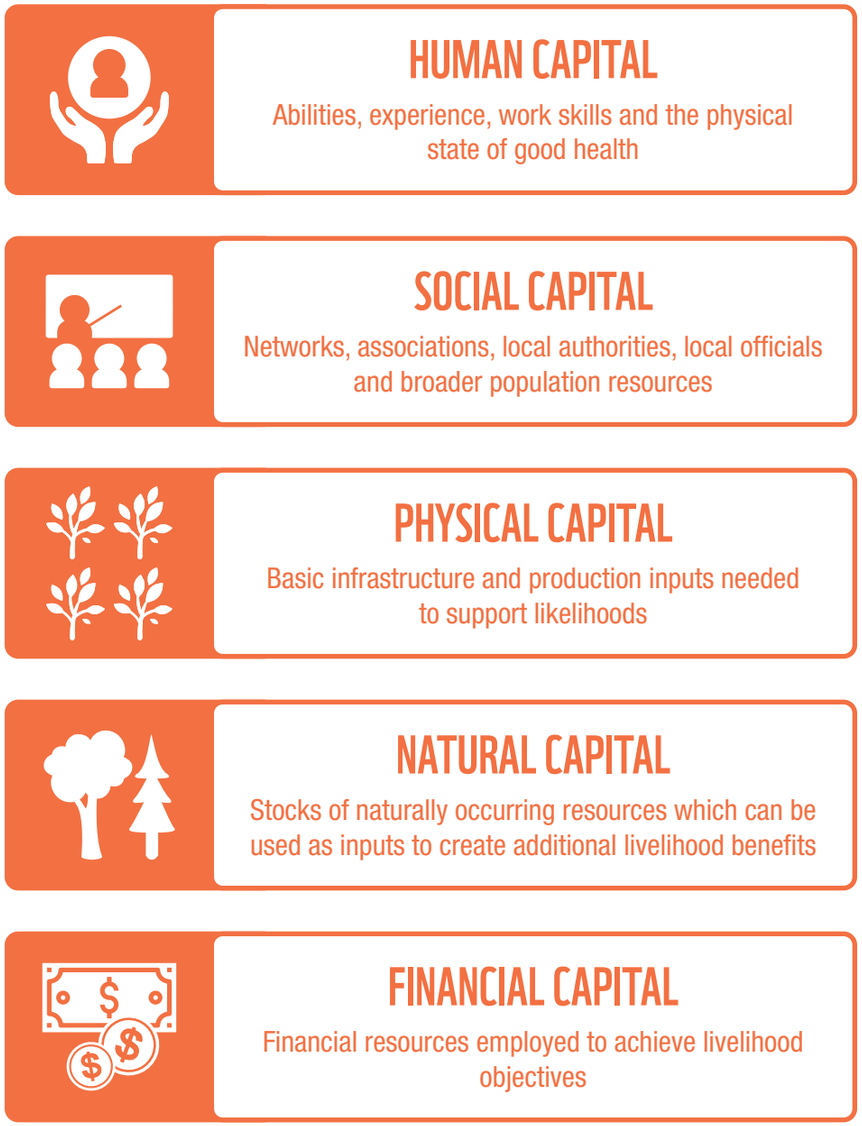

Figure 7:
The sustainable livelihoods framework is based on five capitals that support livelihoods. All of these capitals are important for building community capacity. From: DFID. (1999). Sustainable Livelihoods Guidance Sheets. London: Department for International Development.

Lesson 2: Building human and social capital generates personally fulfilling experiences

It is important to assess and build on the knowledge base of farmers and community members, including traditional or local knowledge. Participation in decision-making and restoration interventions further develops human capital, including skills to enhance self-management and promote independence, empowerment, confidence, cooperation and leadership. Capacity-building builds trust among community members and external agents involved in restoration, and generates realistic expectations of restoration outcomes. Cases in Brazil, Costa Rica, Ecuador and the Philippines show how scientists, government agencies and NGOs led workshops with local communities to provide technical training as well as to help secure land rights and tenure. Inclusive and welcome participation of all families in the area creates a sense of community and unity of purpose, which is essential to sustain long-term forest restoration efforts. Community groups (i.e. youth clubs, women's groups etc.) build social capital and should generate their own ideas for workshops, activities, networks and training programmes.

Lesson 3: Long-term sustainability requires the development of financial, physical and social capital

When local farmers and communities invest time, effort and resources in restoring their landscape, they expect to receive both short-term and long-term benefits. Developing skills to manage small businesses – nurseries and seed supply chains for restoration and market chains for products derived from reforestation – directly benefits livelihoods, improves local infrastructure (physical capital), generates new financial resources, and builds social networks. Payments for environmental services can be critically important during the early stages of restoration implementation, but can lead to unhealthy dependencies if community-based sources of income are not developed. Business ownership, secure land and tree tenure, and development of management skills are important foundations for long-term success. Capacity-building through training alone is often not sufficient; a supportive policy environment is also needed to boost the financial capacity and land and tree tenure security of the community.

Lesson 4: Families are often the basic unit of focus for capacity development

When viewing FLR as a means to improve rural livelihoods, the family unit should be the main focus of capacity-building and training programmes. The Papua New Guinea case emphasizes this important lesson, as families and their associated clans are the basic social unit, and access to community members must be negotiated with the clan leader. Each family/clan group should have access to capacity-building programmes, as information is not shared among different groups. Clans and families have decision-making power, including the power to commit to an extended process of decision-making and capacity-building for reforestation activities. Similarly, in the Philippines, family units are strong and are an important point of contact for capacity development.

Challenges and barriers to capacity-building

The main challenges to building community capacity stem from insufficient investment of project funding in comprehensive capacity-building approaches. Short-term project-level funding does not allow sufficient time to build capacity, or this aspect is simply overlooked. In the Philippines case, communities are paid for raising seedlings and planting trees: the motivation for these activities declined when the funding period ended, long before the trees had finished growing. This problem reflects a conflict between what government agencies or funders want and what community members want. Developing the technical capacity of communities to produce high-quality seedlings should be a fundamental requirement for successful reforestation. But the Department of Environment and Natural Resources, which oversees the National Greening Programme in the Philippines (a FLR initiative), did not enforce its own policy to regulate seedling quality. Communities had no incentive or requirement to produce higher-quality seedlings, which led to the technology not being applied. In another example, a lack of financial and physical capital meant that even though a community received training in nursery techniques, they could not put it into practice because they lacked the financial resources to construct the appropriate low-cost nursery infrastructure.

Community managed nursery in Biliran Province, Leyte, Philippines.

Other challenges stem from the cultural mindset of families, farmers and rural communities. Planting or growing trees is a new land use that farmers are not accustomed to. In the Ecuador case, farmers initially resisted cultivating native trees, as exotic species were viewed more favourably due to their faster growth and greater familiarity. In the case of assisted natural regeneration, early stages of forest regrowth are often viewed by farmers as 'messy' or poor land use practices. In the Brazil case, the landless families that came to settle in the region were largely from urban areas and lacked farming skills or knowledge of agroforestry. In Papua New Guinea, the clan structure created conflicts with economic activities as outcomes of restoration, as the clans do not typically operate as economic entities.

The path ahead

Broadening perspectives and increasing available funding for capacity-building will help to ensure better restoration outcomes. Overcoming cultural biases against restoration requires meaningful, sustained engagement with smallholders and communities. Developing trust within and among community members is essential. This trust is based on a mutual understanding of the needs of the community and the expertise of trainers. Involving capacity-building specialists can overcome obstacles that may stem from distrust of external authorities or limited expertise. Sharing information and demonstration projects within and among neighbouring communities builds social and human capacity, and can create new opportunities for building joint infrastructure or funding opportunities. Radio broadcasts are highly effective for sharing farmers' experiences and successful practices, as demonstrated in several countries in Sub-Saharan Africa. Targeting training workshops and environmental education programmes to the changing needs and capacities of farmers, families and communities generates longlasting outcomes. The key to success is continuity and familiarity, building strong relationships based on experience and mutual respect. Training communities to resolve internal conflicts is also a valuable approach, as is illustrated by the Eco-Negotiations programme implemented in the Brazil case. Educating children can also be an effective way to involve their parents through family-oriented social, cultural and training programmes.

There's no way around the need for investment in capacity-building as an integral part of FLR implementation. The dependency on external funding or payments for environmental services can be reduced by investing in effective capacity-building that leads to local ownership and management of nurseries and other enterprises that support restoration and create local infrastructure. Local ownership of restoration supply chains has been a key to success in the Brazil and Costa Rica case studies, ensuring that FLR leads to thriving livelihoods. The Philippines case shows that the components of community capacity reinforce each other. Building the social capital of communities through various training activities led to the community gaining further support for agriculture-based livelihood projects to support agroforestry and additional funding to expand reforestation in community-managed land.

Mbiwo Constantine Kusebahasa, a WWF Climate Witness looking out over the Forest Landscape Restoration HQ and nursery in Rukoki Sub-County, Kasese, Rwenzori Mountains, Uganda. WWF has given 82 farmers pine woodlots to restore the formally neglected bare hills.

© WWF / Simon Rawles

BUILDING SCALE GLOBALLY BY BUILDING CAPACITY LOCALLY

Matthias De Beenhouwer

Throughout Africa, forest and landscape restoration (FLR) is gaining momentum. Projects across the continent have increasingly shifted from wildlife conservation and rehabilitation to an FLR focus. However, where poaching was (and remains) a huge problem in Africa, land grabbing and human encroachment have increased dramatically in the last few decades and are currently seen as the most important threat to Africa's natural landscapes (Batterbury and Ndi, 2018). This presents risks to ecosystems and to human society at large.

WeForest, Zambia, Malawi and Ethiopia

WeForest, an international organization focusing on FLR projects, focuses on a holistic and long-term approach to FLR, involving a variety of stakeholders, and tailoring our support to local conditions thereby embracing multiple benefits beyond the restoration of the ecological functionalities. Here, we address some of the lessons learnt, successes and challenges faced.

From a project perspective, FLR presents a more holistic approach than traditional conservation efforts. It aims to restore degraded landscapes by identifying and implementing practices that restore a balance between the ecological, social and economic benefits of forests and other land uses in the landscapes. It aims to be tailored to local context and conditions. As such, project implementation should deliver sustainability in the long term as a new equilibrium across the different costs and benefits is realized at landscape scales (Chazdon *et al*., 2015).

One of the opportunities of FLR is how a variety of stakeholders and partners can be involved. Compared to pure conservation projects, an FLR approach can more easily include and engage businesses, put communities at the centre of the approach, and align stakeholders towards common goals. In Mulanje Mountain, Malawi, one of WeForest's project areas, the climate and forest type vary greatly depending on the orientation of the landscape towards the mountain. The southern side of the mountain is wet and tropical, ideal for hydropower, tea and tropical fruits, whereas the northern aspect is drier and semi-deciduous, giving opportunities for irrigation and beekeeping.

Placing communities at the centre of FLR requires building capacity among stakeholders and local businesses. This immediately implies one of the challenges encountered by FLR, namely, the multitude of stakeholders involved, and the limited knowledge of FLR among these stakeholders. The Katanino Forest reserve in the Copperbelt in Zambia provides a good example. This formerly national forest reserve was redesignated as a joint forest, allowing for communities to participate in the management. In practice, implementing local ownership and governance structures has proved to be highly complex. A Joint Forest Management Committee consists of more than 20 board members with several representatives of traditional leaders, village resource management boards, and different government bodies. Many of these stakeholders lacked the capacity to comprehend the multitude aspects of FLR. Limited capacity, and lack of willingness to take responsibility, has not helped to safeguard the forest landscape. As such, this action has remained a paper-exercise, and the forest has continued to be depleted (GFW, 2019). It was also found that most fines and levies paid by parties that use forest resources go to the government at national level rather than flowing back to local levels. Increasing local knowledge of the principle and benefits of FLR, and capacities for governance and management, thus remain key.

As FLR is becoming a widely accepted approach, the actual implementation of it in practice is challenging, and the land tenure and governance remain central (Mansourian, 2016). In Zambia, land ownership is a major consideration for FLR implementation. Most land in Zambia is customary land, without clear land tenure, which increases the risk for project investments. At the same time, large tracts of government land are protected on paper but receive minimal support or attention, and are therefore subject to land degradation as there is no local land ownership. Building capacity among local communities to take this local ownership has proved to be a good strategy to reduce land degradation, but it remains to be seen whether the long-term benefits outweigh the short-term needs for resources locally. Capacity-building of communities should not only focus on training and theory but should be a long-term effort to allow the implementation of activities to bear fruit. Only then is it likely that local ownership will be large enough to be sustainable.

A key aspect of capacity-building that needs to happen, albeit predominantly at federal level, is on governance and legislation. Developing legislation that facilitates land and user rights for (indigenous) communities and resource ownership at private and community level are key to address this. When these user rights remain ill-defined or not enforced, it is likely that overharvesting will follow. In our Desa'a project in Ethiopia, for example, continuing forest degradation was due to resource conflicts at community and household level. WeForest is playing a facilitating role in assisting the development of a community-led design plan and land-use mapping through extensive consultations at local and regional level (WeForest, 2019). This has resulted in a widely supported and approved forest management plan focused on resource ownership through forest restoration.

Local communities engaged in forestry activities in Malawi

Another challenge for FLR projects is the scale at which FLR projects would operate. In Zambia, for example, charcoal production is one of the main drivers of deforestation at the local level, with more than 41,000 charcoal producers permanently engaged (many more across the whole value chain) and representing 2.3% of GDP (Ziba & Grouwels, 2017). Limiting charcoal production to sustainable use in an FLR project will not affect overall consumption nationwide, and is only likely to displace the problem elsewhere. This issue requires a national-scale perspective and approach. Creating enough capacity, both at community and at government levels, to assess and monitor sustainable forest management is key in this regard. In one of our project areas, in Katanino in Zambia, this was illustrated by the communities from outside our target area (FLR catchment area) coming to seek assistance on how to acquire permits for charcoal production and sustainable forest management.

To allow scaling-up of projects, the enabling legislation needs to continue to improve and adapt. In Zambia there is still no clear legislation around ownership of indigenous trees on private land. Owning the land is not enough to own the resources. This constrains the development of business approaches to forestry and sustainable use of resources. As a result, private landowners feel pressured to deforest their land to avoid the government reclaiming it as being underdeveloped (Vinya *et al*., 2011). Private forestry needs to become a valid and viable business before Zambian landowners are likely to engage. Supporting governments to change such counterproductive legislation can help in this respect.

As projects develop, the needs and benefits of value-addition along the livelihood value chain become more important. The involvement of businesses, preferably social enterprises prioritizing market needs for small-scale farmers, is often challenging in rural areas. In the Luanshya Miombo restoration project in Zambia, we linked farmers with a buyer of unprocessed honey. With only one buyer, the farmers remain vulnerable as this single buyer can determine the honey price. Competition would solve this problem, but is generally absent in more rural environments. As FLR projects become more mainstream and market-oriented, the need to support the set-up of social enterprises will increase. This will be crucial to provide long-term financial sustainability for landscape interventions (WeForest, 2020). Involving social enterprises from the start, or building capacity among start-ups in this regard, is thus essential.

Orientation meeting before planting seedlings at a project supported by WeForest in Tigray, Ethiopia.

FOREST LANDSCAPE RESTORATION IN THE USA: PRESENT AND FUTURE CHALLENGES AND OPPORTUNITIES

John A. Stanturf [1], R. Kasten Dumroese [2] and Douglass F. Jacobs [3]

Forest land area in the United States of America (USA) ranks fourth globally, with nearly one-third of the landscape covered by forests and woodlands and more than half (58%) in private ownership (Oswalt *et al*., 2019). Forest and landscape restoration (FLR) in the USA occurs on both public and private land, with financing from public and private sources.

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The Collaborative Forest Landscape Restoration Partnership (CFLRP), focused on land managed at the national level (the National Forest System) by the US Forest Service, is a prominent public approach to FLR; whereas notable private sector programmes have been organized around specific forest types, for example the Longleaf Pine Initiative (ALRI, 2020), or bottomland hardwoods in the Lower Mississippi Alluvial Valley (NWFW, 2019). Major conservation organizations, including The Nature Conservancy, National Wildlife Federation, and American Forest Foundation, are financing restoration programmes on both private and public land with conservation and carbon management objectives. Many other restoration projects are underway at smaller spatial scales, some of them quite local, and often focusing on biodiversity and ecological integrity. These would not be considered FLR as they are not at landscape scale and most do not have a livelihoods component.

In the USA, FLR is primarily undertaken on existing forest stands, where silvicultural techniques are employed toward obtaining desired goals, and through the planting of nearly a billion tree seedlings annually. In order to conserve and protect native forests, increased demand for wood-based carbon materials must be met from forests that are sustainably managed and that originate from afforestation and reforestation, components of functional restoration (Stanturf *et al*., 2014).

Restoring existing forests

The specific Bonn Challenge commitment of 15 million ha was made by the Forest Service, to be achieved through CFLRPs, on National Forest System lands, involving state, local groups, and tribal authorities. The programme began in 2010 and currently comprises 23 collaboratives. The landscapes and community groups are diverse, but face some common challenges (Walpole *et al*., 2017). The objectives of most of the CFLRPs include overcoming a century or more of fire suppression and restoring natural fire regimes. The CFLRPs faced three challenges: developing trust and collaborative capacity, uniting stakeholders around multiple objectives, and integrating ecological science and social values in decision-making. Addressing consensus issues can build relationships and advance long-term goals (Susskind *et al*., 2012), and targeting improved ecosystem resilience as a shared objective has, for example, been effective in overcoming controversial topics such as thinning. Another major challenge is the scale of FLR needed within the National Forest System; of the 78 million ha managed by the Forest Service (about one-third of the nation's forested land), potential FLR needs are between 26 and 32 million ha (Buford *et al*., 2015). The National Forest System provides only a small amount of the nation's forest products (Oswalt *et al*., 2019). Thus, FLR efforts do not typically pay for themselves, but rather require subsidizing. Funding for the CFLRPs has been at least US$915 million from the Forest Service, and totals more than US$1.2 billion over 10 years (www.fs.fed.us/restoration/CFLRP/).

Silvicultural techniques, mindful of changes in climate, are essential to successful restoration activities. Silviculture can be used to modify stand densities and species composition toward increasing resilience and biodiversity, and thereby reduce potential impacts from changes in climate (D'Amato *et al*., 2011; Guldin, 2019). This ongoing conversation – which has, for example, included discussions about site conditions, species vulnerabilities, and basic ecophysiological characteristics of the trees – has led to the Adaptive Silviculture for Climate Change project designed to identify barriers and subsequent science-based, robust, operational concepts, methods and tools that can be used to integrate silviculture across a gradient of conditions with climate change considerations (Nagel *et al*., 2017).

Restoring through afforestation and reforestation

Nationally, the USA has relied heavily on federally funded programmes for large-scale tree planting initiatives. Globally, large-scale tree planting initiatives are now being promoted for restoration and as an efficient climate mitigation technique (Waring *et al*., 2020). The Conservation Reserve Program (CRP) and Wetlands Reserve Program (WRP) are two such national ongoing programmes that include tree planting and are administered through the Department of Agriculture; they target fragile and marginal private farmland. The CRP initially focused on highly erodible soils and has evolved to include wildlife, water and air quality, and other conservation goals. The CRP has enrolled 12.7 million ha; annual payments average US$21.45/ha at a total yearly cost of US$1.7 billion. Similarly, the WRP is aimed at reversing loss of wetlands that have been converted to agriculture. These programmes provide financial and technical assistance to private landowners in return for limited or perpetual conservation easements. Since 1995, landowners have voluntarily enrolled more than 1 million ha into the WRP (NRCS, 2015). Easement payments are based on the income forgone by the landowner, thus varying by region, crop and productivity (Jenkins *et al*., 2010). In one study in the Lower Mississippi Alluvial Valley where the bulk of WRP easements occur, the estimated potential market value of US$1035/ha/yr obtained from emerging ecosystem markets for greenhouse gas and nitrogen mitigation as well as wildlife habitat provision could be more than twice the restoration opportunity costs (Jenkins *et al*., 2010).

Mixed species planting used on Wetland Reserve Program land. Fast growing Eastern cottonwood (Populus deltoides) were planted two years before slower growing Nuttall oak (Quercus texana) that were interplanted between each cottonwood row. This technique mimics natural stand development on sites along the Mississippi River.

Future challenges and opportunities

Reforestation is often included as part of forest restoration efforts, with healthy forests critical for social sustainability (Parrotta *et al*., 2012). Successful restoration of degraded forests through tree planting can meet multiple objectives, including maintaining ecosystem functions (Stanturf *et al*., 2014), increasing biodiversity (Pawson *et al*., 2013), and fostering resilience to disturbance (Spathelf *et al*., 2018). Climate change will increase the area in need of restorative treatments (Seidl *et al*., 2016), and it is also occurring at a rate that is faster than tree species can naturally respond to (Williams and Dumroese, 2013; Zhu *et al*., 2012).

New approaches are needed to meet emerging priorities and objectives resulting from intended and unintended consequences of policy implementation, climate change, funding and wildfires (Jacobs *et al*., 2015). Reforestation efforts have suffered from the increasing frequency and severity of drought events, and the need to restore burned areas has increased (Dumroese *et al*., 2019). Extensive and early use of prescribed fire will be needed to build resilience to wildfires and drought events.

Restoration can be important for climate change mitigation and adaptation, and transformational approaches including assisted migration have been proposed as strategic responses (Williams and Dumroese, 2013; Stanturf *et al*., 2018). The intentional movement of species or their populations to counter effects of climate change is preferred where natural regeneration is unlikely to meet management objectives. Given the incongruence between suitable future habitat locations for tree species and their inability to naturally migrate in a timely manner, more reliance on tree planting may be necessary to move species and their populations across the landscape. The Forest Service is currently seeking to define emerging definitions surrounding assisted migration, when and how it can be implemented, and associated risks with its implementation.

Effective assisted migration requires knowledge about seed origin. Collaborative efforts between federal, state and private concerns are now underway in the eastern USA to establish known seed collection zones (Pike *et al*., 2020), whereas in the western USA seed zones have been a regular part of operational forestry for nearly a century. This knowledge would allow land managers the potential to mix local and non-local seed sources as a hedge-betting response against future climatic conditions. Researchers are developing climate-based seed transfer guidelines that decrease reliance on static seed zone maps (Cooke *et al*., 2019). These evolving efforts have potential to improve efficient use of seed supplies and better match existing and future seed collections to future climatic conditions.

Planting will also be the most efficient way to reintroduce native tree species traditionally bred or bioengineered for resistance to introduced pests that have decimated their populations (Dumroese *et al*., 2015; Showalter *et al*., 2018), as has recently been proposed for American chestnut (*Castanea dentata*), and elm (*Ulmus* spp.) bred for resistance to non-native pests (Jacobs *et al*., 2013; Martín *et al*., 2019).

Successful restoration requires adequate resources for planning and long-term commitment. A supply chain of activities is necessary; focusing only on planting ignores the necessary infrastructure, personnel expertise and resources needed to get to the point of planting seedlings, including seed collection, processing and nursery practices through to caring for seedlings after planting (e.g. monitoring, competition control, and protections from ungulate browsing). Successful tree planting requires planting stock grown with specific traits to meet the challenges of particular sites and the objectives of the landowner (Dumroese *et al*., 2016). Meeting the restoration challenge will require more seedlings, including a greater diversity of species, than are being currently produced, as well as additional professionals well trained in seedling production and deployment (Haase and Davis, 2017).

CAPACITY-BUILDING TO IMPLEMENT RESTORATION COMMITMENTS IN BURKINA FASO

Barbara Vinceti and Marlène Elias

The need to enhance inclusive multi-actor participation and community engagement in forest and landscape restoration (FLR) initiatives is increasingly evident (Mansourian, 2017). Successful restoration must explicitly address social inclusion and the equitable sharing of the costs and benefits of restoration (Djenontin *et al*., 2018). This is particularly so in the context of rural transformations, wherein new markets, demographic shifts, and migration flows are causing profound changes in household structures, livelihood strategies, and landscapes (FAO, 2018).

Alliance of Bioversity International and CIAT (International Centre for Tropical Agriculture)

In many regions of sub-Saharan Africa, the outmigration of able-bodied men from their rural homesteads is leaving women, children and elders shouldering what were previously considered men's responsibilities, and negotiating ways to cope with changing household demographics (Steinbrink and Niedenführ, 2020). Although these patterns are critical for rural development policy and programmes, there is a lack of empirical evidence on the effects of outmigration on gender and social dynamics, including with respect to agricultural and natural resource management knowledge and capacities, decision-making and labour patterns.

Our research experience in Burkina Faso has shown that women often do not have a formal decision-making role to play in restoration initiatives. Low access to productive resources, including secure rights to land, is a main barrier to women's FLR activities.

Incentives for women to engage in FLR are associated with the income they derive from harvesting non-timber forest products, in some cases on lands which they collectively obtain and manage as a self-help group. Joining such a group increases women's livelihood opportunities as they can exchange ideas and take joint initiatives, form strong networks, and gain some access to funding in the form of micro-credits. This enables them to develop or expand their activities, such as trading, sale of grains, and the processing and marketing of non-timber forest products and other products from their home gardens or personal plots (Elias, 2019).

Some restoration techniques require technical knowledge and physical strength, for example for strenuous land preparation activities. Because they are commonly excluded from capacity-building training, widows and women in households with seasonal male outmigration often lack access to the knowledge men gain through extension services, and have difficulties coping with the physical demands of soil restoration practices. With regard to the adoption of innovative FLR techniques, our research showed that younger women, widows, and women in households where men are seasonal migrants, are unable to adopt restoration innovations mainly due to their lack of secure access to land and low social status as well as their inability to join formal networks that disseminate restoration practices. These women are also excluded from practices that require access to large plots of land or that are expensive (e.g. fencing plots to prevent grazing).

There is a need for contextually-rooted research on gender, restoration and migration that can directly influence the design and implementation of ongoing and future projects and programmes led by influential restoration stakeholders. In particular there is a need to increase understanding of the following aspects: a) do/how do patterns of decision-making, labour, knowledge and capacities that underpin the restoration of degraded lands shift across gender, age and socioeconomic groups as a result of human mobility and migration; b) to what extent does household structure influence land restoration practices, constraints to the adoption of different restoration options, and the distribution and control of benefits from restored lands; and c) do/how do the aspirations of migrants and non-migrating household members differ from those of women and men from households without migrants; and how do these aspirations influence the adoption of land restoration practices?

Build capacity to better exploit a diversity of native trees

Successful FLR requires attention to aspects that sustain long-term resilience of the restored forest cover and needs to be supported by adequate funding. Natural regeneration is the most cost-efficient solution for large-scale restoration efforts, yet active restoration might provide environmental benefits more rapidly than waiting for the establishment of natural regeneration. This is particularly so in circumstances where soil compaction, a high level of vegetation fragmentation, or invasive species may have modified ecosystem composition and structure to an extent that active interventions are required to support forest regeneration (FAO, 2015).

In these circumstances, the appropriate selection of planting material is a critical step, and this should be guided by the thorough characterization of the locally available diversity of native tree species (Broadhurst *et al*., 2016; Thomas *et al*., 2014). Much of the local tree diversity may be neglected in the choice of species to plant, and the resource needs of local communities might not be appropriately considered. This can be challenging when restoring forests in highly diverse forest biomes, particularly given the need to consider both the functional traits of species relevant to restoration goals, and suitability to the planting site across many potential species. An associated constraint is the insufficient supply of planting material for species that are endemic or rare, many of which might be poorly documented and for which propagation protocols are not available. These factors may lead to the risk of using a low diversity of native trees in restoration efforts (Shaw, 2019).

Our experience in Burkina Faso shows that the knowledge on tree species, including both their ecological traits and socioeconomic values, is not organized in a way that is operationally viable. Relevant information is dispersed across several reports and publications that have limited circulation and are rarely made available in accessible formats for restoration practitioners. A centralized information system containing documentation on native trees and their use in restoration is therefore needed. This will require compiling and aggregating information from research, and drawing on expert knowledge and local experience. Systematically organizing this kind of information would also help in the identification of research gaps in the characterization of less known candidate tree species, as potential targets for restoration.

Building capacity to establish a viable tree seed supply

The selection of appropriate tree seed sources is another critical step to ensure that the propagation material used is adapted to the current and future environmental conditions of the planting site. Adapted individuals are those that can reach maturity and reproduce. These are not necessarily the fastest growing individuals or species. Future adaptation requires consideration of the health and vigour of tree seed sources, especially if the target species is occurring in highly fragmented and degraded populations (Bozzano *et al*., 2014).

Our research experience on tree seed sources in Burkina Faso revealed that around 80% of the planting material used in landscape restoration projects came either from the market (without any indication of quality), or is self-harvested by smallholder farmers of which very few had been trained on best practices for tree seed collections. The National Tree Seed Centre provides high-quality seeds to different organizations within Burkina Faso that are involved in restoration. Despite its formal role in providing seed to different users, this centralized facility was not sufficiently known to farmers. In most cases, quality seed was too expensive for the farmers anyway (Valette *et al*., 2019).

These findings underline the need to ensure appropriate training for farmers, across all steps from seed harvesting to production of planting material, to avoid critical bottlenecks in the diversity of the reproductive material used. Best protocols on how to carry out seed harvesting are available, although these guidelines are generally not species-specific. They therefore need to be adapted to the biological characteristics of the target species and the local context.

Furthermore, capacity in the identification of the best *in situ* seed sources should be strengthened at national and local levels, and safeguarding measures should be put in place to ensure long-term availability. These efforts should be supported by research based on new provenance trials focused on a broader range of lesser-known species, and research to define the boundaries for seed transfer zones. Capacity-building targeting local research institutions should develop indirect methods for species' genetic characterization, such as ecogeographical analyses.

Institutional support should also be provided to create networks of nurseries, and to support coordination across small-scale nurseries, so that the production of planting material could more efficiently cover a range of native species suited to different ecosystems.

CHAPTER 4

SHOW ME THE MONEY: WHERE IS THE FINANCING TO RESTORE LANDSCAPES?

From local to global, we will need to pay for the ambitious landscape restoration needed in the coming decades. There are many plausible financing strategies for restoration, but how can investments for regenerative landscapes be scaled-up, and, if the benefits of ecosystem restoration are so obvious, why is restoration – far from becoming a commercial industry – continuing to be almost exclusively subsidized as a public good? What insights emerge from private impact investment strategy perspectives, and can the creation of a pre-investment facility prepare restorative projects for private investments? At a local scale, we discover how stakeholders from three Brazilian states have mixed several actions to create value from landscape restoration.

Successful reforestation, an important component of FLR, relies on a chain of activities from seed collection, processing and storage, to nursery production of high-quality seedlings, to proper storage and outplanting, to monitoring results.

FINANCING REGENERATIVE LANDSCAPES

Paul Chatterton

How can we regenerate forest and other natural ecosystems equivalent to the entire landmass of India or 10 times the area of Germany in the next decade? That's the question set by the Bonn Challenge, a global effort established by 40 governments in 2011 to bring 150 million hectares of the world's deforested and degraded land into restoration by 2020, and 350 million hectares by 2030. The challenge is as critical for human economies and society as for nature.

Landscape Finance Lab

The good news is that natural climate solutions together with forest restoration offer more than a third (37%) of the climate mitigation needed by 2030 to stabilize warming to below 2°C and create positive business opportunities (Griscom *et al*., 2017). Restoring ecosystems also secures water supply, local rainfall, cooling functions, disaster protection and natural products on which economies depend. A strong market should be possible for this service.

The Bonn Challenge, through national commitments to land restoration, is creating the potential for an estimated 354,000 jobs and sequestering 1.38 billion tonnes of CO_2 across more than 45 million hectares of land (NYDF Assessment Partners, 2019). On closer investigation, many of these hectares are policy commitments that have yet to convert into operational projects. Africa, for instance, is showing patchy progress towards its continental target of 100 million hectares (AFR100, 2020) while forest loss continues to accelerate. Between 2104 and 2018 the world lost 120 million hectares of tree cover, almost the entire amount that the Bonn Challenge sought to restore by 2020 (WRI, 2020; NYDF Assessment Partners, 2019). A major rethink in practice is required to operationalize governmental commitments to the Bonn Challenge through high quality aligned implementation between policy, operational practice, finance and commercial incentives. Commercial finance provides a critical ingredient in enabling this.

What's blocking the regeneration industry?

If the benefits of ecosystem restoration are so obvious, what has held back progress? While there are well accepted methodologies for forest landscape restoration (FLR), there are few demonstrations of successful practice. This prevents a common understanding of the key elements of restoration. Climate change adds to the complexity by increasing vulnerability to threats, changing ecosystem composition and range, and adding uncertainty. Practitioners must plan for conditions decades into a future that is increasingly hard to predict. New carbon markets have created opportunities, though many investors and companies still perceive this as a complex and difficult market.

In many regions, limited technical experience and capacity need to be overcome. Only 12,000 hectares of commercial plantations have been planted in Africa since 2000, and current planting rates reach only around 5,000 hectares annually (NGP, 2018). Stronger progress is found in countries such as Brazil, China and Chile, where professional timber sectors see mixed forest regeneration as a business opportunity (NYDF Assessment Partners, 2019). Alongside progressive associations such as the New Generation Plantations platform, commercial forest actors can be critical players in building capacity and knowhow.

To date almost all financing for restoration comes from public and philanthropic sources (NYDF Assessment Partners, 2019). Private sector investment in this industry accounts for only 1% of Bonn Challenge cases, suggesting that restoration is far from becoming a commercial industry but continues to be almost exclusively subsidized as a public good.

There are a number of reasons for the failure to engage commercial finance. Public investment is not yet well designed to facilitate private investment. Even if it were, there are still a range of barriers that make commercial financing of forest projects difficult, including lack of clarity on land ownership, risk of fire and other natural disasters, lack of early returns while trees mature, assets being in risky countries, stakeholder issues and the general perception of the industry. Finally, for many investors, forestry and restoration projects are simply too small to bother with; they rarely reach the US$100 million dollar mark that excites the large institutional investor.

Towards a regenerative landscape industry

There is an emerging movement to bring together opportunities that individually show promise for upscaling restoration action, but which collectively will create a much more powerful ecosystem on which to incentivize investment and operations. Finance particularly offers a way to build a more integrated and scaled approach but requires a close cooperation between policy actors, businesses and those supporting the communities where ecosystem restoration efforts are found.

The following observations draw on the experience of the Landscape Finance Lab (2020). Set up in 2016 as an innovation unit of the conservation organization WWF, the Lab has a mission to incubate and finance sustainable landscapes across all geographies, biomes and sectors. It supports landscape partnerships to complete full landscape visions and action plans, to create portfolios of investable businesses, and to connect these with investors.

A standardized methodology. A critical element for success is a common language. The FLR and ROAM methodologies (IUCN and WRI, 2014) are now well accepted as the basis for FLR. Importantly they highlight the significance of natural regeneration and regeneration with multiple species over monocultures of exotics. Terminology and approaches for building landscape programmes have also seen significant alignment. *The Little Sustainable Landscape Book* (Denier *et al*., 2015) launched at the Paris Climate COP in 2015 brought together 15 organizations around a systematic process known as the '5 Landscape Elements', and the Landscape Finance Lab is supporting organizations with training, support and templates for developing landscapes using these five elements as the structure (Chatterton *et al*., 2017). A raft of tools have also been developed for applying global goals (SDGs) to different industries. Integration and cross-industry alignment remains a challenge. Commonland's '4 Returns' concept provides an elegant simplification of the SDG impact measures as they apply to landscapes (Ferwerda and Moolenaar, 2016).

Building landscape investment portfolios. Individual projects may be too small to attract investors. However, governments, corporations and community organizations are now testing ways to integrate, bundle and aggregate projects to achieve investable scales.

The South African plantation company Mondi has supported a shift to community ownership of its plantations, and has linked these to natural ecosystem regeneration to ensure consistent water supply and support smarter fire management. The long-running Mondi Wetland programme (WWF-Mondi, 2016) is a model for a national system of forest restoration and water supply that has received significant public investment.

Across Africa this approach is being applied by companies such as Green Resources, the New Forests Company, African Plantations for Sustainable Development (APSD), Global Woods and Form Ghana. New Generation Plantations (2018) explains that a landscape approach for plantations combines "a mosaic of large-scale commercial plantations; smaller-scale plantations and woodlots owned by local people; restored and protected natural forests, wetlands and grasslands; and crops and grazing." Shames and Scherr (2020) propose a methodology for building "integrated landscape investment portfolios" based on 42 models worldwide.

Supply chains and landscape investment. Commercial actors are recognizing the value of working at landscape scale. The landscape approach allows a range of benefits such as sharing risk, simplifying regulatory approvals or stakeholder engagement, and combining efforts to achieve greater profit and sustainability. Rubber giant Michelin and its local partner Lestari Pacific have developed a US$215 million sustainability bond in the Indonesian province of Jambi to support wildlife-friendly rubber, protection of natural forests, and ecosystem restoration concessions (TLFF, 2020). A range of other examples of companies cooperating at landscape or jurisdictional scale can be found with RSPO oil palm in Sabah, tea production in the Naivasha area of Kenya, and beef in the Brazilian Cerrado.

The theory of landscape or jurisdictional sourcing is developing rapidly with a range of applications and tools now emerging (Ghazoul *et al*., 2009; Fishman *et al*., 2017; Scherr *et al*., 2017; Stickler *et al*., 2018). The Paris Agreement has established a firm basis for national and jurisdictional carbon programmes that support forest and ecosystem restoration at significant scale. The recently released Landscape Sourcing report suggests a way to integrate corporate supply chain sustainability with landscape approaches including FLR (Dudley *et al*., 2020).

A number of payment-for-performance systems have been established by entities such as the FCPF Carbon Fund and the Green Climate Fund, new standards are under development (such as ARC TREES), and new prospects of private sector finance are emerging (such as the ICAO CORSIA compensation scheme for the airline industry). Corporates such as Microsoft and Unilever are joining these systems with major commitments to balance their

carbon emissions and support ecosystem restoration programmes. Governments are building their own initiatives, such as the US$3 billion Irish Green Bond which supports peatland protection, forest restoration and renewable energy.

The Mai Ndombe Province Emissions Reductions programme (World Bank, 2020) in the Democratic Republic of Congo shows how some of these large carbon investments may play out. This US$170 million integrated initiative aims to protect over 9 million hectares of forest. Fifteen organizations undertake activities such as establishing commercial plantations, savannah regeneration, sustainable charcoal production, agricultural forest crops, reduced impact logging and forest protection. More importantly, this establishes a long-term institutional framework for implementing the SDGs at provincial scale.

Blending finance. At the supply end, landscape investment portfolios, landscape sourcing bonds and jurisdictional carbon programmes are creating products that attract the larger institutional investors and show potential for a more systematic industry. At the demand end, however, the financing to create these products can be complex and seldom comes from one source. Initial design, regulatory and stakeholder work requires grant finance. Impact investing can assist with early and riskier commercial activities; and risk guarantees will be required to assure more traditional commercial investors to invest across those larger instruments. There is a need for blending of different types and sources of finance (Baumann *et al*., 2017). This process is still far from an exact science but is becoming increasingly more sophisticated with the support of platforms such as Convergence, the Landscape Finance Lab, the Blended Finance Taskforce and the Finance Innovation Lab among others.

Digital learning and incubation platforms. Finally, there is a move towards building digital learning and incubation platforms that link projects, investors and regulators. The digital platform of the Landscape Finance Lab (2020) aims to assist this process and promote knowledge products that advance understanding on how such a system might work.

The Bonn Challenge may be an impossible dream, but some of the machinery for implementing it at an accelerated scale is now emerging.

Land mapping in a meeting of the Maï Ndombe Emissions Reductions programme in DRC. A programme that covers an entire province, protects forests the scale of Greece and involves over 50,000ha of savanna regeneration and plantation development.

FINANCIAL STRATEGIES FOR FOREST AND LANDSCAPE RESTORATION

Rene Zamora Cristales

WRI (World Resources Institute), Latin America

Currently, 210 million hectares have been committed by 61 countries to the Bonn Challenge through regional initiatives (e.g. Initiative 20x20 in Latin America and the Caribbean, Afr100 in Africa) to restore degraded landscapes around the world (Bonn Challenge, 2021; Initiative 20x20, 2021; AFR 100, 2021). Many governments have developed robust plans and strategies to prioritize areas for restoration under multiple environmental, social and economic objectives. But once these processes are finished, restoration often stalls. Why?

The implementation of restoration requires financial resources from the public and private sectors in a coordinated effort to implement the desired activities and materialize expected results. Expectations of returns on those investments vary across investor types (Figure 8). To ensure additionality and the permanence of restoration, these activities must generate multiple benefits to the landowners and must not come at the expense of degradation.

Landowners could be communities, individuals or companies. In many countries, resources from the public sector are scarce, which makes the implementation of sustainable practices and investments difficult. On the other hand, the private sector faces many barriers related to the long-term nature of investments in restoration, the high levels of perceived risks, and the difficulties in finding bankable projects with landowner aggregation (Ding *et al*., 2017). To overcome some of those barriers, various practical experiences in public and private finance are showing the path to a sustainable future that would make possible restoration at the scale required by the climate change challenge and in response to global initiatives such as the UN Decade on Ecosystem Restoration.

Corporate engagement in nature-based solutions for climate change has grown in recent months through the launch of 1t.org at the World Economic Forum. There are now many companies interested in investing in tree planting as a measure to mitigate climate change. Undoubtedly FLR is more complex than only planting trees, but the growing interest and earmarked finance, if oriented properly, can support the implementation of FLR activities around the world. The objective of this piece is to provide real examples of how finance is starting to flow to landscapes and to identify key strategies to accelerate and scale up (impacting policy instruments to promote private sector involvement), scale out (replicate sustainable business models), and scale deep (change unsustainable practices) land restoration around the world.

Investment types aimed at achieving restoration

Impact investors focus not only on achieving financial targets but also on accomplishing environmental and social objectives. In FLR, there are various examples of these investments which have potential for scale: these include investments in conservation-restoration, secondary and degraded forest restoration, and reforestation with native species.

Conservation-restoration

At the landscape level, conservation plays an important role in FLR activities. One of the objectives of FLR is to prevent degradation, which is directly connected to the conservation of key areas in the landscape while degraded areas are being restored. MIROVA, a private impact investor, is a clear example of this model (Mirova, 2021). Through its Natural Capital Fund, MIROVA invests in conservation projects in areas with a high risk of deforestation. The investment supports habitat protection and the restoration of buffer zones by, for example, implementing agroforestry systems. Financial benefits are generated by carbon trading in the voluntary market, and the commodities associated with the agroforestry system. In Peru, MIROVA is investing in protecting 591,119ha in Madre de Dios, and this includes the allocation of 4,000ha for restoration in the buffer zone using tree-shade cocoa agroforestry systems. Financial returns are produced through carbon trading from the reserve and cocoa production from the buffer zone. To support cocoa production, the investor provides technical assistance to farmers that includes the development of a cooperative to aggregate small producers and improve the processing of the product. Cocoa products are then commercialized in deforestation-free, certified organic, and fair-trade markets.

The project's impacts have been to avoid the deforestation of a natural area, to generate jobs in protection and restoration activities, and to create local, sustainable enterprises that will ensure the long-term sustainability of the project once the investor decides to exit.

Secondary and degraded forest restoration

There are many secondary and degraded forests around the world which are heavily threatened by deforestation. Maintaining and restoring them is key to reduce degradation, increase their carbon mitigation potential, and increase forest connectivity in fragmented landscapes. The Forestry and Climate Change Fund from Luxembourg has earmarked US$15 million to implement silvicultural practices that can improve ecological integrity and the capacity to generate ecosystem services from these forests. Their model is simple: the fund identifies enterprises or landowners with secondary forests and provides financial resources through a local organization to implement activities in the forest. The objective is to restore the forest to produce sustainable timber and non-timber forest products from native species while enhancing biodiversity, creating jobs, and ensuring the long-term sustainability of the business model.

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Local practitioners planning restoration monitoring near BOSAWAS Nural reserve in Nicaragua.

Figure 8:
Expectations of returns vary across investor types. Source: Ding et al., 2017 and adapted from FAO and UNCCD, 2015.

The fund invests over a 15-year time period, after which landowners and enterprises will maintain a sustainable model. The financial return is expected to be obtained from timber and non-timber sales in local and international markets. The fund's impacts are to avoid deforestation and further degradation of secondary forests, job creation and value generation for local landowners and enterprises, and biodiversity conservation. In addition, all investments from the fund are planned to be FSC certified and robust (Forestry and Climate Change Fund 2021).

Reforestation with native species

Reforestation with native species is of central importance in FLR. There are a vast number of native species with the potential to generate different products. Still, there has been limited research and development to achieve the scale demanded by current restoration commitments. Despite these limitations, Symbiosis, a commercial company, is developing reforestation projects to promote the establishment of native species (Faruqi *et al*., 2018). Operations are focused in the Brazilian Atlantic Forest, a national priority for restoration. To date, it has planted 553ha of 'working forests' using 55 different species. Financial returns will be generated by the sales of timber and non-timber forest products, with direct impacts on improving connectivity in this highly fragmented landscape. Another example is Ejido Verde, a company specialized in the reforestation of land with native pines in Mexico. To date, it has planted 4,262ha with an impact on 652 families and the creation of 2,145 jobs (Ejido Verde, 2021).

Enabling environment for increasing financial flows

Many of the benefits of restoration do not have market prices. This makes it difficult for the private sector to invest in restoration. Incentives made available through payment for environmental services by FONAFIFO in Costa Rica or PROBOSQUE in Guatemala can help to reduce the risks associated with investments by providing direct payments to reduce the upfront cost of restoration activities. Both programmes have been successful in promoting restoration and conservation, although they have limitations related to competitive uses of the land, the mechanism for payments additionality, and permanence (Wunder *et al*., 2008)

Development of the carbon markets can help to bring additional benefits to the restoration. Colombia, Chile and Mexico are developing different carbon tax mechanisms that could help channel additional resources to restoration or provide benefits from government carbon trading schemes (Trinidad, 2019).

Incubation of ideas and projects

Entrepreneurship is key for placing rural economies on a sustainable path. However, FLR needs the development of incubators that can bring resources to implement innovative ideas around technologies and businesses. One practical example of this is the development of hackathons, very common in the technology industry, addressing the problem of how restoration can revert degradation and unsustainable use of the land. Hackathons are also useful for bringing outsiders to propose new ideas on addressing land degradation problems. There is also a need to increase the matches between project developers and funders. Many funders usually have limited knowledge of restoration, and it is difficult to have spaces or 'markets' to find restoration opportunities. Tools like Terramatch, an online platform to match project proponents with potential funders, can help to increase the probability of getting funding from corporate actors, donors and investors.

Scaling-up successful business models

The private sector is already investing in restoration, although we need to increase the hectares, people and ecosystems impacted. Replication and escalation are vital aspects to ensure national commitments are feasible to achieve. Many projects with the potential of scale are currently at the pre-investment stage, where resources are needed for their preparation and improvement. One strategy to overcome this problem is the development of a pre-investment facility with resources from international donors that can assist projects in overcoming the remaining hurdles to becoming 'investment-ready'. Under this mechanism, support will typically involve the assessment of the financial viability and scaling-up strategy, analysis of the long-term sustainability of the project after exit, community consultation and social network analysis, and technical viability under baseline conditions. The facility can be designed to create a paradigm shift by catalysing investment in landscape restoration activities in the region. There are excellent examples of one-off investments, but bringing investment to scale requires a dedicated and tailored technical support to investors and a coordinated and strategic approach to incentivize the growth of emerging markets.

The sustainable development of the Panama Watershed is anchored on the active involvement of the rural landholders organized into Watershed Councils to strengthen their voices of next to those of the government agencies.

THE EXPERIENCE OF THE NATURE CONSERVANCY IN RESTORING NATIVE VEGETATION IN BRAZIL

Marina Campos, Adriana Kfouri and Rubens Benini

The importance of securing an excellent local institutional arrangement – in other words, good governance – has emerged as a key lesson learned from our experiences in implementing actions to restore native vegetation in Brazil. Cooperation and constructive interaction between stakeholders, legal agencies and their instruments, land management tools and available resources, are essential in allowing restoration to occur on the ground, and to address many of the financial bottlenecks that are encountered along the way.

The Nature Conservancy, Brazil

Assuming the existence of appropriate institutional and governance structures, financial resources for restoration are available through public calls for proposals, and from the private sector (usually linked to the mitigation of climate change), in legal environmental compensation, and through Watershed Committees. It is estimated that in 2017, the allocation to the forest restoration agenda in Brazil was US$353 million (Dave *et al*., 2019). About 30% of that amount came from civil society organizations and philanthropic actions, and 44% from public resources (Scaramuzza *et al*., 2019). This amount is, however, still far below what is needed to gain scale. Some US$10 billion or more has been suggested as being required to restore the environmental liabilities in rural properties across Brazil (Benini and Adeodato, 2017).

In addition to the relative paucity of resources available for restoration, access to resources constitutes another constraint. Available resources rarely cover the entire cost of a restoration project. An example is the classic model of a public call for proposals, which requires the definition, planning and analysis of the areas to be restored, and a letter of interest from rural property owners. All this pre-restoration work, which is called prospecting, has a price tag that can be as much as 10% of the total cost of the project. Those costs are generally not considered by the call for proposals. Many of the funding bodies also do not consider price adjustments due to inflation during the time it takes for the funds to become available. Frequently, they also do not make allowances for the cost of hiring staff, or covering administrative costs.

Access to forest restoration funds is furthermore characterized by bureaucracy and the need to provide guarantees, and this limits access for most small and medium-sized rural landowners. Despite this, in recent years TNC has helped to unlock access to loans at Banco da Amazônia, so that rural producers can restore degraded areas through agroforestry systems (SAFs), a land use system in which native trees are grown around or among agricultural crops or pasture lands in a temporal sequence. For instance, the Forest Cocoa Project, implemented by TNC and partners in southeastern Pará, shows that producers can double their income by using agroforestry approaches with cocoa as the flagship crop.

The total cost of restoration needs to include more than just the planting and maintenance of trees. It is often necessary to train local labour, to produce or buy inputs such as seedlings, and to support local public policies and engage rural producers in the efforts to enable restoration activities to take place. In short, the entire restoration chain must be well organized. Considering this scenario of big challenges and partial financial solutions, collaboration among stakeholders is what allows the implementation and advancement of restoration at scale. The Mantiqueira Conservation Plan, launched in 2015, is an example of a successful institutional arrangement.

In the Mantiqueira Conservation Plan, NGOs, municipal governments, teaching and research institutions, companies and rural unions work together to restore degraded areas in three Brazilian states: São Paulo, Minas Gerais and Rio de Janeiro. Educational institutions offer capacity development for forest restoration and research to improve the cost-effectiveness of restoration techniques. Municipal governments build programmes that encourage, recognize and support rural landowners' efforts to make their property compliant with environmental law, through technical assistance, inputs (fences, seedlings, labour), and payment for environmental services. Companies finance restoration activities via environmental compensation, and NGOs work on several fronts, ranging from implementing projects and strengthening local stakeholders, to shaping the productive chain for restoring native vegetation in the region.

Creating value through restoration

Although today we know that conservation and restoration are significant to agricultural production and the maintenance of ecosystem services, restoration of native vegetation has always been regarded as an environmental activity. To many, it represents the loss of productive areas, delay in economic development, high investment, and no return for the rural property owner or society. It is essential to work to change this paradigm, to inform and educate people on the importance of environmental services for the maintenance of life on Earth. It is also vital to recognize that forests and their products offer excellent opportunities for social and economic development. This starts with the generation of jobs and income throughout the restoration supply chain, and leads to new forest-based economies based on timber and non-timber forest products.

Brazil has committed to recover 12 million ha of native vegetation by 2030. It is estimated that between 112,000 and 191,000 jobs (seed collection, seedling production, planting and maintenance) will be generated annually (Planaveg, 2017). This is an opportunity to foster the restoration supply chain and promote restoration with biodiverse, functional and long-term forests that promote the reduction of inequality and generate opportunities. One example is the restoration activities that TNC and other stakeholders are implementing in the state of São Paulo, where two forest restoration companies representing 60 jobs were created, along with a cooperative, a group of native-seed collectors, and dozens of landowners who were paid to recover their own land.

In addition to job and income opportunities, there is also the potential to commercialize forest products through community-based projects. It requires the creation of a production chain primarily based on government programmes, with tax incentives, technical and financial assistance, applied research, clear regulations, and the nurturing of markets, so that demand and supply can be linked. One study from the Brazilian Amazon (Strand, 2018) showed that one hectare of forest generates annual gains of up to US$40 for the production of Brazil nut, and US$200 for production of sustainable timber. Considering the size of even small properties in the Amazon is around 400ha, farmers can earn US$16,000 with the production of the nut alone. This example can be replicated to other forest products.

Walking through the Coruputuba Farm in Pindamonhangaba, São Paulo, Brazil.

In the state of São Paulo, the Infrastructure and Environment Agency carried out a study on forest restoration business models and estimated financial returns of up to 14% from the sale of fruits, vegetables and timber from the restoration of native species in the Atlantic Forest (Silva and Ribeiro, 2018). If we consider exotic species in agroforestry systems, the return could be even more significant.

Complementary income from payments for ecosystems services, such as water and carbon, can be added to the earnings. Good examples are the Conservador das Águas project in the municipality of Extrema, and the Reflorestar programme in the state of Espírito Santo. In the first example, the municipality's budget pays for the water service provided by the forest; the latter used resources from oil royalties to invest more than US$22 million in the conservation and restoration of its forests

Future priorities and prospects

Market demand is a critical issue that can make a difference to the conservation and restoration of forests, in the short and medium term. Both companies and consumers have a crucial role in the conservation and restoration of forests, and they need to recognize it and take on their responsibility. Companies need to acknowledge the environmental and social impacts of their businesses and work to reduce them, seeking greater sustainability in all stages of their production and commercialization process. Consumers have equal responsibility, and should demand transparency in the production chains.

There are many challenges to advancing the financial bottlenecks of restoration in Brazil. We need financial resources that are easily accessible and pay all the costs related to not only restoration, but all the activities that foster the restoration supply chain. Beyond that, a broad and systematic view of the restoration of native vegetation in biodiverse ecosystems, especially in regions with high socioeconomic inequality, is needed. There is no sustainability without guaranteeing fundamental rights to the human population. For forests to last and provide all the benefits and services that are essential to life, people must be part of the process, acknowledge the value of the forests, consume products from the forests, and plant its seeds.

Native seeds collected by trained seed collectors.

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Chapter 2: Sociocultural norms

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FINANCIAL STRATEGIES FOR FORESTAND LANDSCAPE RESTORATION

For the latest data and information please see:

Bonn Challenge (2021)
A global goal to bring 350 million hectares of degraded and deforested landscapes into restoration by 2030. Available here: https://www.bonnchallenge.org/

Initiative 20x20 (2021)
A country-led effort that aims to change the dynamics of land degradation in Latin America and the Caribbean and bring 50 million hectares of degraded landscapes into restoration by 2030.Available here: https://initiative20x20.org/

AFR 100 (2021) African Forest Landscape Restoration Initiative
A country-led effort to bring 100 million hectares of land in Africa into restoration by 2030. Available here: https://afr100.org/

Forestry and Climate Change Fund (2021)
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Daniella Schweizer

Daniella is a Venezuelan ecologist with a doctorate in Environmental Studies from the University of California, Santa Cruz. She has over 15 years' experience researching social and ecological aspects of forest restoration. As the Prince Bernard Chair Postdoctoral Scholar with ETH Zurich and Utrecht University, Daniella gathered the perceptions of actors within non-governmental organizations across countries in the Global South regarding forest and landscape implementation to draw a series of lessons learned to inform further scaling up of restoration. Several of the contributors to this publication were involved in this project. She has also worked on forest restoration in Latin America, at the University of Sao Paulo and the Smithsonian Institute, and supported Initiative 20x20 with research looking at the role of forestry and environmental policies in advancing the restoration agenda for the region. Currently Daniella is working with the organization Restor.eco in the creation of a restoration community platform aiming to provide the most relevant information and features to support global restoration.

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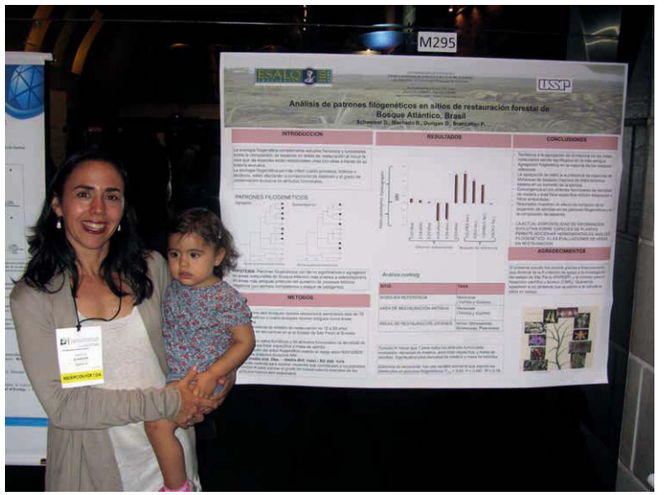

"The tangible outcome of forest restoration is the recovery of woodlands and their associated biodiversity, but success rests on restoring dialogue and social and institutional arrangements among communities, land managers, and policy makers – these are as much a part of forest restoration processes as is the planting of trees."

Jaboury Ghazoul

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