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### How to Organize a Large-Scale Ecological Restoration Program? The Framework Developed by the Atlantic Forest Restoration Pact in Brazil

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## **How to Organize a Large-Scale Ecological Restoration Program? The Framework Developed by the Atlantic Forest Restoration Pact in Brazil**

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*Large-scale ecological restoration programs across the world have begun to extensively transform degraded lands into young native ecosystems. However, more projects like these will be necessary in the coming years to fulfill the goal of restoring 150 million ha established by United Nations Convention on Biological Diversity. Here, we present and discuss the steps required for and the lessons learned from the organization of a large-scale ecological restoration program in Brazil, the Atlantic Forest Restoration Pact. These lessons are organized around 9 steps: (a) the presentation of the motivations driving the promotion of large-scale restoration, (b) the organization of the main stakeholders, (c) the definition of goals, (d) the organization of a database, (e) the indication of both available and priority areas for restoration, (f) the proposal of science-based and field-validated methods, (g) the establishment of a*

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*monitoring protocol, (b) the proposal of a communication program to unite members and interact with society, and (i) the strategies for promoting the establishment of public policies conducive to restoration. This framework may provide a template to help other initiatives to mainstream isolated restoration projects into a large and well-organized movement, which may increase the chances of successful restoration in the future.*

*KEYWORDS* restoration ecology, tropical forests, biodiversity hotspots, ecosystem services, green jobs, timber production, non-timber forest products

## INTRODUCTION

The emerging field of ecological restoration is receiving growing attention from society as one of the most prominent solutions for the environmental crisis that affects the world today (Aronson & Alexander, 2013). In recognition of the importance of ecological restoration to both biodiversity conservation and the provisioning of ecosystem services (Rey Benayas, Newton, Diaz, & Bullock, 2009), remarkable investments have been made to support large-scale restoration programs across the world. Although examples coming from South Africa (McQueen, Noemdoe, & Jezile, 2001), the United States (Doyle & Drew, 2008), Costa Rica (Arriagada, Ferraro, Sills, Pattanayak, & Cordero, 2012), and Brazil (Calmon et al., 2011) indicate that advances have been reached in the practical transformation of degraded lands into young native ecosystems, many more large-scale restoration programs are needed to achieve the 150 million ha of restoration proposed in the United Nations Convention on Biological Diversity's Aichi Target 15 on ecological restoration, as well as by the Bonn Challenge on Forests, Climate Change and Biodiversity (Menz, Dixon, & Hobbs, 2013). Although this is an ambitious goal, the opportunities for forest restoration are even greater; a global assessment has revealed the existence of more than 2 billion ha of deforested and degraded lands available for restoration (World Resources Institute, 2012).

Hopefully, several initiatives such as those described above will be established in the coming years and in regions not yet covered by restoration programs. This potential growth in restoration activity highlights the importance of comprehending the step-by-step process of organizing large-scale ecological restoration programs, based on the lessons provided by the evaluation of pioneering initiatives. Although any new program must be created on the basis of its ecological, cultural, juridical, political, and socio-economic particularities, the study of frameworks adopted by well-established initiatives that seek to mainstream disparate restoration projects into large,

well-organized movements may provide a template with which to start. Here, we present and discuss the initial lessons learned from the development of the Atlantic Forest Restoration Pact, a large-scale ecological restoration program in Brazil. We present these lessons in relation to the nine key steps that guided the organization of the program.

## WHY PROMOTE LARGE-SCALE ECOLOGICAL RESTORATION?

Many forest ecosystems around the world have already faced high levels of deforestation and fragmentation and are now represented by a few scattered forest remnants, frequently degraded and restricted to small portions of land in human-modified landscapes (Myers, Mittermeier, Mittermeier, Fonseca, & Kent, 2000; Riitters, Wickham, O'Neill, Jones, & Smith, 2000). The generation and maintenance of ecosystem services (such as water and air purification, or climate regulation) may subsequently be severely limited in these fragmented ecosystems. From a conservation perspective, low levels of connectivity may limit the capacity of such fragmented landscapes to promote long-term conservation of many biological groups (Ribeiro, Metzger, Martensen, Ponzoni, & Hirota, 2009). Our contention is that in severely fragmented and/or degraded landscapes, the design of large-scale restoration projects is an essential step toward the reduction of local and regional species extinctions, the continued provision of ecosystem services, climate change mitigation and adaptation, and the promotion of human well-being.

The Atlantic Forest, in particular, is a highly biodiverse tropical biome which originally covered 150 million hectares in Brazil. Moreover, situated within the Atlantic Forest limits are the biggest Brazilian metropolitan areas and nearly 120 million people (approximately 60% of the Brazilian population; Calmon et al., 2011). Those people and metropolitan areas depend on the ecosystem services promoted by forests, especially the drinkable water provision. However, currently less than 12% of the original Atlantic Forest cover remains and more than 80% of the fragments are less than 50 ha in size (Ribeiro et al., 2009). The clear constraints placed by this scenario on both the long-term conservation of biodiversity and on the future generation of ecosystem services stimulated the creation of the Atlantic Forest Restoration Pact, a collective movement of Brazilian stakeholders involved in ecological restoration (private companies, governments, NGOs, research institutions, and farmers) to promote the large-scale restoration of its most endangered biome. The idea of creating a Pact emerged in 2006, and by 2009 the "Pact for the Restoration of the Atlantic Forest" (hereafter described as the "Pact") had been launched.

Small forest restoration projects exist almost everywhere in the world (Menz et al., 2013). However, many of them are not integrated into a common objective and instead practice a kind of "environmental

gardening”—projects that are small in scale, have low cost-effectiveness, are not integrated at the landscape level, and have negligible participation from landowners and society (Brancalion, Viani, Strassburg, & Rodrigues, 2012). In this sense, up-scaling forest restoration through large-scale projects which integrate many individual restoration projects into a common objective is a justifiable and necessary strategy to achieve more favorable results in terms of landscape modification.

## HOW TO ORGANIZE THE MAIN STAKEHOLDERS TO SUPPORT A LARGE-SCALE RESTORATION PROGRAM?

Forest restoration is a multidisciplinary activity which depends on the involvement of professionals from a wide range of social, technical, and environmental fields (Armesto et al., 2007). The main stakeholders in the context of large-scale restoration programs may be represented by private companies or by professionals who either work directly within the restoration chain (seed producers, nursery owners, plantation companies, etc.) or who practice restoration to achieve their agricultural production within legal requirements or certification standards, especially in the case of agricultural commodities for export (Rodrigues et al., 2011). Public sector stakeholders are municipal, state, or federal institutions responsible for establishing public policies, providing environmental law enforcement, or delivering the funding for forest restoration. Additionally, the participation of universities, other research institutions, and environmental NGOs are key elements in the forest restoration process, due to either their ability to bring different stakeholders together or through the establishment of their own individual projects. The great diversity in background and interests of each stakeholder make many areas of specific expertise available to the cause of forest restoration. Combining and integrating them into a network is thus a fundamental step toward the establishment of a successful large-scale restoration program (Holl, Crone, & Schultz, 2003; Armesto et al., 2007).

As an example of problems observed when the restoration chain is not organized, restoration practitioners in some regions of the Atlantic Forest have problems locating seedlings of desirable native species for restoration plantings, while nursery owners of the same region complain about the lack of clients. Another example is the identification of areas available for restoration. Today, many companies are looking for areas for implementing restoration projects as means of legal environmental compensation for some authorized degradation, while farmers willing to comply with the Forest Code do not have funding for restoration. As in a dating agency, the Pact can facilitate these contacts by offering an online database of available areas for restoration and by providing a contact point with the institutions that work with restoration in each region of the biome. On the website of

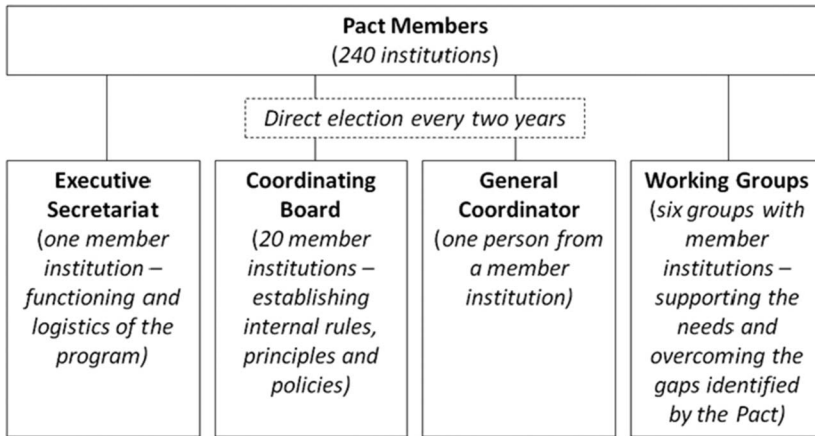
the Pact (<http://www.pactomataatlantica.org.br>), seed and seedling suppliers, reforestation companies, and farmers offering lands for restoration are registered in the system and can be found by anyone accessing the website. As in any emergent activity, the supply and demand of some production inputs may not naturally reach equilibrium easily or fast. Likewise, other links of the restoration chain may need an external force to improve the effectiveness of projects and provide a favorable scenario for entrepreneurs.

However, organizing so many diverse stakeholders toward achieving a collective goal is not an easy task. In fact, a lack of coordination in setting a plan of action could easily cause a large-scale restoration initiative to lose focus and succumb to practical irrelevance after the first few years of implementation. For instance, when the investments in restoration projects are not followed by the capacity-building of practitioners and the development of local-adapted methods, a large amount of money can be spent without achieving the expected results. Rapidly, investors may lose confidence in restoration and compromise the support for its implementation.

Nevertheless, a multi-scale restoration program must undoubtedly follow a different organizational standard than private, governmental, and non-governmental institutions that are based on vertical hierarchies, perhaps resembling a network more than a traditional institution. Thus, an integrated, horizontal relationship of stakeholders replaces the usual top-down distribution of responsibilities.

The Pact is neither an NGO nor a private or governmental institution. It does not even have its own building or employees, and it does not implement restoration projects. The Pact receives funding from some members (especially private companies) to minimally maintain the functioning of the Executive Secretariat hosted by the Atlantic Forest Biosphere Reserve, recognized by UNESCO in 1992. Since the movement aims to create synergies between the projects of the institution members and the needs of the Pact, the employees of these institutions indirectly work for the Pact while their salaries are paid by these institutions. Thus, rather than a regular institution, the Pact is a collective movement of the main stakeholders involved in ecological restoration in the biome. It is governed by a Coordinating Board composed of 20 members representing the four categories of stakeholders (private companies, research institutions, governments, and NGOs) and by a general Coordinator, both of which are renewed every 2 yr by elections (all members of the Pact can vote; Figure 1). Additionally, an Executive Secretariat manages the movement and guides the activities under development by members.

To support the needs and overcome the gaps identified by the Pact and its members, six working groups composed of representatives of the member organizations were created: (a) Technical and Scientific; (b) Information and Knowledge; (c) Communication and Marketing; (d) Public Policy; (e) Socioeconomic; and (f) Fundraising.



**FIGURE 1** Management structure adopted by the Atlantic Forest Restoration Pact in Brazil.

To become a Pact member, an institution must submit an online form to the Executive Secretariat. Various types of institutions working with forest restoration may become Pact members. Members are divided in two main categories: signatories and non-signatories. Signatory members may participate in the Coordinator Board and the working groups and are divided in four subcategories: organizations coordinating restoration projects, research institutes, policy makers, and funding institutions. Non-signatory members are mainly seed and seedling producers, companies which provide supplies and services for forest restoration and personal volunteers.

Launched only 4 yr ago, the Pact presently consists of 240 members—including 122 NGOs, 47 governmental institutions, 56 private companies, and 14 research institutions. The Pact is also interacting with several other major restoration initiatives and consortia—including the Society of Ecological Restoration (SER), the Global Partnership for Forest Landscape Restoration (GPFLR), the World Resources Institute (WRI), the International Union for the Conservation of Nature (IUCN), the Restoring Natural Capital Alliance (RNC Alliance), the Latin America Ecological Restoration Network (REDLAN), and the Brazilian Ecological Restoration Network (REBRE).

Although all members are subjected to a term of commitment, in which the vision and mission of the Pact must be respected, these members are completely free to develop their projects and even to compete among themselves for fund raising. Under the “umbrella” of the six working groups, the challenges facing the Pact are continuously assessed and a team of experts, in collaboration with the Pact members, work to develop solutions to these limitations. To illustrate this strategy, the Technical and Scientific working group of the Pact was convened to create a forest restoration monitoring protocol, further described below. Originally, each restoration institution had its own protocol, and consequently it was virtually impossible to accomplish



a broader analysis of the advances of ecological restoration in the biome, since different ecological indicators, methods for assessing the indicators, sampling designs, and data analysis methods were used for each protocol. To meet this need for a consistent protocol, the Technical and Scientific working group has developed a monitoring protocol based on both literature review and on the field experiences of members. This protocol was discussed, modified, and validated in a 3-day workshop attended by individuals representing more than 70 Pact members, and then subsequently adopted by all Pact members. Today, a group of researchers is working to analyze the data obtained and, based on the results, propose improvements to current restoration protocols used by the members.

Training courses have been carried out to enable members to use the protocol, and new software to analyze monitoring data is under development. In March 2013, another workshop took place to discuss the advances already achieved with the new restoration protocol and to propose modifications of it based on both advances in restoration ecology and empirical field experiences. This case study is a valuable example of an achievement that can only be realized by a collective movement of institutions. Before the Pact, the scientists involved in restoration ecology were accustomed to designing research projects solely to serve the needs of some institution or their own personal research interests. Today, via communication between members, the Pact can generate new research demands that are focused on major challenges faced by the movement, which then allow the creation of a unique, collective research agenda to guide the advance of ecological restoration in the Atlantic Forest.

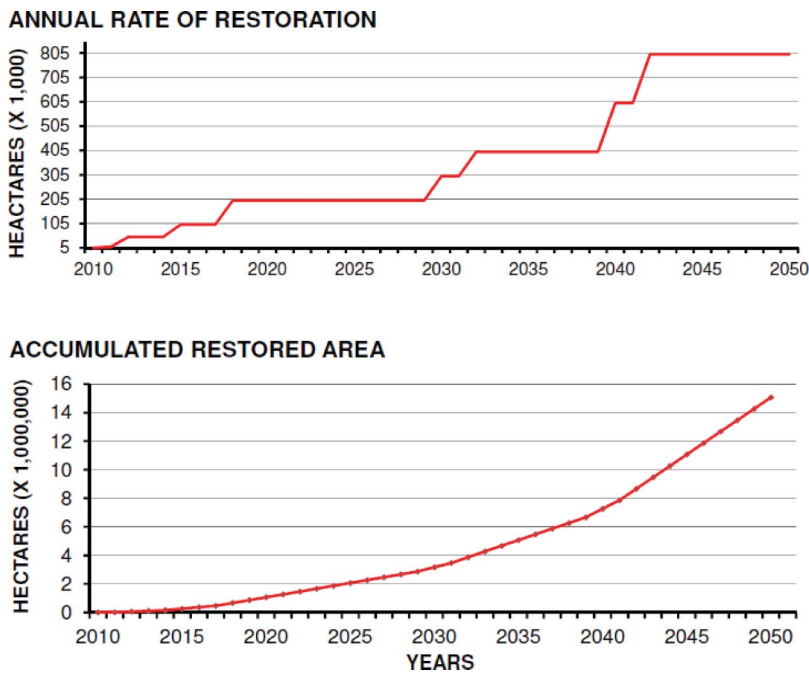
#### HOW TO DEFINE THE GOAL OF A LARGE-SCALE RESTORATION PROGRAM?

The establishment of coherent goals that are achievable within current and realistically anticipated scenarios is one of the main aspects differentiating a viable program from more speculative initiatives. For example, an increase in agricultural production is expected to result in a growing demand for land in the near future. Given that the human population is expected to increase by 50% over the next four decades, food production will need to double or triple by 2050 (Godfray et al., 2010; Smith et al., 2010). It is therefore clear that a key issue underlying the implementation of large-scale restoration in Brazil or elsewhere is to limit agricultural production to already cleared lands, especially those devoted to cattle ranching (Licker et al., 2010; Phalan, Balmford, Green, & Scharlemann, 2011). It will be essential therefore to implement restoration projects in areas considered marginal for agricultural production, where competition for land is not strong enough to discourage the conversion of degraded lands to native forests. Where target areas are

suitable for agricultural production but their fragility justifies conversion to forests, ecological restoration should ideally be mandatory by law, such as in the case of riparian buffers within many tropical countries.

With this in mind, the Pact has focused its main goals on the assessment of deforested lands included in Permanent Protection Areas by the Brazilian Forest Code (where restoration is mandatory), or elsewhere in extensive low-productivity pasturelands on slopes, where annual economic revenue is less than US\$100 ha<sup>-1</sup>. Together, these lands total 17,728,187 ha (Calmon et al., 2011). We acknowledge that complementary efforts for cattle ranching intensification will be necessary to avoid “leakage,” defined as deforestation promoted elsewhere by the displacement of the herd. Based on these calculations, the Pact has committed itself to the goal of restoring 15 million ha, via the annual targets to be met below (Figure 2).

We expect that the rate of restoration will increase in the near future. This assumption is based on the advance of payments for ecosystem services schemes, the increased enforcement of existing legislation, new market demands for the environmental certification of agricultural commodities, and further development of profitable forest restoration models (see details in Brancalion et al., 2012). If so, these forces would allow the Pact to reach



**FIGURE 2** Expected evolution of the conversion of degraded lands into native forests to reach the goal of restoring 15 million ha by 2050 established by the Atlantic Forest Restoration Pact in Brazil (color figure available online).

its goal by 2050. Recently, at the Rio+20 United Nations Conference on Sustainable Development, the Pact committed to restore 1 million ha of forests by 2020, with both the United States Department of Agriculture Forest Service (15 million ha) and the Government of Rwanda (2 million ha) by 2020, which were the first groups to officially establish a commitment to contribute a share of the global goal of restoring 150 million ha (IUCN, 2012). The restoration of 15 million ha would practically double the current remnant area of the Brazilian Atlantic Forest, reaching a level of 30% forest cover, the fragmentation threshold that would theoretically increase biodiversity persistence in the long term (Fahrig, 2003). The Pact is therefore essential to safeguard and allow the continued ecological functioning of a currently shrinking biodiversity hotspot.

If this goal is achieved, the Pact has the potential to result in numerous positive outputs for society, such as the generation of more than 3 million direct and indirect local jobs in the restoration chain, the removal of approximately 200 million tons of CO<sub>2</sub> yr<sup>-1</sup> from the atmosphere and the storage of more than 2 billion tons of CO<sub>2</sub> by 2050 (Calmon et al., 2011). In order to accomplish these goals, the Pact has complementary targets to meet—such as: (a) to increase the total economic value of the Atlantic Forest; (b) to promote and expand the local and regional economy by generating jobs and income, as well as creating new livelihood opportunities; (c) to integrate and provide more leverage for the restoration efforts currently underway; (d) to encourage the development of research and technologies which could improve restoration success; (e) to mobilize financial resources and investment to support restoration and further leverage the current markets for ecosystem services; and (f) to monitor results and contribute to improving the quality of forest restoration practices in the Atlantic Forest biome and in the rest of Brazil.

## HOW TO ORGANIZE A FOREST RESTORATION DATABASE?

Creating a database to register and catalog restoration project information is a step needed in any large-scale restoration program. A database in a large-scale restoration program is used primarily to monitor the restoration program's multiple goals. Monitoring is carried out by the managers of the projects and uploaded into a web-based system of the Pact. Once the monitoring data is included in the Pact's database, it can be processed to provide valuable information to restoration practitioners, such as reference values of restoration success for each method and for different time scales in the region. This information may be also used to disseminate and exchange experiences, develop capacity-building programs, attract investors and supporters to enhance the quality and scale of the restoration efforts, and—last

but not least—promote ongoing research, project development, and growth (Calmon et al., 2011).

Initially, it is essential to register all non-signatory and signatory members in the large-scale restoration program. Due to the great diversity of members and stakeholders, it is important to first divide the registries according to categories; for instance, executors with their fields of expertise (ex., seed producers, nurseries, etc.), research institutions, funding institutions, and policy makers, and then to collect all the useful information pertaining to each of these categories—such as region of work, contacts, interests, and specific information for each category. It may be done online through a pre-determined catalog sheet for each category. Once registered, members may have authorization to access confidential information online. Most of the information, however, should be available online to the general audience. For example, a list of members within each category, available online, is useful for providing information not only to all members of the Pact but also to restoration stakeholders not included in the Pact or entrepreneurs interested in investing in restoration that might want to seek expertise in any activity involving forest restoration.

The major initial step is registering the restoration projects. For these entries, additional information such as main executor, size, location and geographical coordinates of projects, restoration methods and techniques applied, date of implementation, and maps delimiting the restoration area are necessary. This register has to remain updatable in order to allow updates in the accounting of area and other fields. Currently, more than 58,055 ha of restoration projects are registered on the Pact website.

It also important to periodically post reports online with the cumulative results, not only to monitor the goals but also to attract the attention of society and the actors described above. Restoration initiatives are being registered and divulged on the website, where updated reports and information about specific restoration projects may be consulted and downloaded. These reports and the information updated on the website have been used as the main source of information in presentations, television programs, events, outreach activities, and other forms of communication.

## WHERE TO RESTORE?

Ecological restoration may provide multiple benefits such as biodiversity conservation, carbon sequestration, water purification, soil protection, income generation, social development, etc. In spite of this range of opportunities, each stakeholder may be more interested in a single specific benefit when supporting a given restoration initiative. For example, a stakeholder may be an NGO focused on the reestablishment of endangered species, a river basin committee focused on water production and purification, or

an industry focused on carbon sequestration. Therefore, a large-scale forest restoration program should offer a menu of subject areas that best fits the expectations of each stakeholder, thus optimizing the allocation of the financial resources available for restoration projects. Thus, if a company is interested in investing in restoration to provide watershed protection, the Pact may help to find the restoration organization that could best attend to this demand. In this context, the Pact has produced different thematic maps to guide restoration efforts in the Atlantic Forest. So far, four thematic maps have been produced: (a) potential areas for restoration (in which 15 million ha were indicated for restoration in the biome); (b) eligible areas for carbon restoration projects under the Verified Carbon Standard (see details at <http://v-c-s.org/>); (c) key areas for urban water supply (degraded water basins that supply drinking water to large urban conglomerates); and (d) priority areas for improving landscape connectivity. These maps can also be overlaid to identify the hotspots for ecological restoration, in which the benefits resulted from a given restoration project would be amplified. This strategy may guide investment when the need for restoration is huge but the available resources are scarce—the most common scenario for ecological restoration in the world today (Menz et al., 2013), especially in developing countries.

## HOW TO RESTORE?

Large-scale restoration programs work at the regional or biome scale, in which several distinct ecological and socioeconomic scenarios are usually found. Therefore, there is no singular recipe to restore forests in large-scale programs. Different restoration strategies are needed in small and large farms, and socioeconomic aspects of land use and tenure also need to be considered when deciding the best restoration practices and approaches (Holl & Aide, 2011; Rodrigues et al., 2011). Nevertheless, the decision about which forest restoration techniques to best use within a large-scale program must remain science-based and consider the successes or failures of past restoration initiatives. This is of the utmost importance in order to avoid repeating any mistakes that are already known or documented.

A useful tool in this sense may be the collective elaboration of forest restoration concepts within a reference book. This reference would contain case studies of successful and failed experiences and descriptions of several applicable techniques for restoration of specific scenarios, as well as primers for improving communication with people who have limited knowledge of ecological restoration. The Atlantic Forest Restoration Pact, for example, produced in Portuguese and translated into English, is a reference book describing techniques, underlying concepts and motivations for restoring high-diversity tropical forests in the Atlantic Forest of Brazil, building on 30 yr of scientific research (Rodrigues, Lima, Gandolfi, & Nave, 2009). The

expressed goal of the book is to help avoid the mistakes of the past, establish guidelines, and provide a baseline for advancing science-based restoration. As an example of these mistakes, restoration plantings with few fast-growing species were carried out in large areas within highly fragmented landscapes. Due to dispersal limitation, late successional species did not colonize the understory and, after the senescence of the pioneer trees, the area returned to the initial degraded stage (Rodrigues et al., 2009). Another example was the use of exotic tree species. Due to the lack of seedlings of indigenous species in nurseries, many restoration practitioners used exotic species to implement restoration plantings and, as a consequence, restoration has become an importance source of invasive species dissemination (Assis, 2012). As a result, the Technical and Scientific working group has developed models of forest restoration with a special focus on the opportunities of economic return through payments for ecosystem services, agro-successional models of restoration, and exploitation of timber and non-timber forest products (see details in Brancalion et al., 2012). The concept here is to use and refine these models in order to transform forest restoration into a profitable land use, competitive enough to occupy degraded areas currently covered by extensive, low-producing (or marginally productive) pasturelands. This new and challenging research topic is one of the main paths by which the Pact intends to develop large-scale initiatives in the near future. As an example of progress achieved so far, the research working group of the Pact has guided the implementation of approximately 30 ha of experiments along the Brazilian eastern coast, in partnership with private companies and farmers, to test restoration models focused on the exploitation of timber and non-timber forest products. These projects will provide key information—such as the growth curves of valuable native timber species, the potential of using eucalyptus as a fast-growing commercial pioneer tree, and the challenges for harvesting native timber in restoration sites—to be used in the design of a large-scale program initiative in which private companies, mainly pulp companies, will support the restoration of degraded lands in farms that supply agricultural products to the industry.

### ESTABLISHING A MONITORING PROTOCOL

An effective monitoring and evaluation system is an essential part of a restoration project, allowing a comparative measurement of progress and, more importantly, helping to identify corrective actions and modifications that will inevitably be needed in such a long-term process (Vallauri, Aronson, Dudley, & Vallejo, 2005). In addition, the application of a monitoring protocol throughout restoration projects helps to identify technical, economic, and social bottlenecks as well as to stimulate the design of solutions to the problems found. Elaboration of a forest restoration monitoring protocol

for a large-scale program is a difficult task due to trades-offs that must be coherently balanced. A good monitoring protocol must be general enough to be applicable under all conditions and for all techniques (necessary for further analyses of the results) while also balancing efficiency for practical application.

As an example of the above, the Pact has developed a Restoration Monitoring Protocol in a cooperative effort including more than 70 Pact members. This monitoring protocol is based on four principles that successful restoration projects must address: ecological, economic, social, and management needs. The ecological principle seeks to evaluate whether natural ecological processes are being restored. The economic principle seeks to provide a better understanding of financial mechanisms that support restoration. Social aspects were included to lead to strengthened relationships between restoration initiatives, local communities, and restoration workers. Finally, the management principle aims at a good administrative cycle: planning, controls, and documentation. Within each principle there are indicators and checks which are collected in the field and analyzed afterwards. This protocol is available online on the Pact website, and the intention is to apply it to every restoration project within the large-scale restoration program. This protocol does not however present reference values for each indicator evaluated. These values will be established once the protocol is largely applied, so that sound results support the proposal of specific reference values for the different regions within the Atlantic Forest.

### HOW TO COMMUNICATE?

In addition to finding scientific data to justify ecological restoration, it is of utmost importance to effectively communicate these benefits for society in suitable terms and communication channels. Large-scale restoration will only become a reality if people strongly believe that it is necessary and support it both through individual and public investments. Thus, restoration programs will have to invest in this outreach, communicating the associations between environmental degradation and reduction of human welfare, and especially the associations between ecological restoration and improvements in the quality of life of present and future generations.

One of the main concerns of the Pact was to provide a democratic platform to communicate with current and future members, as well as with society at large. This was achieved with a website, in which comprehensive information about the movement is provided. The Pact also has an e-mail group comprised of all registered members, communicating online with up-to-date news on ecological restoration (“Stay-Tuned”), and a bi-monthly newsletter (ComPacto) to disseminate relevant news and achievements. The Pact also has profiles on Facebook and Twitter. In addition to these strategies

of communication, which primarily reach Pact members, we work in partnership with television programs, private companies, and outreach agencies to disseminate the Pact's proposal to a wider audience.

## HELPING THE DEVELOPMENT OF PUBLIC POLICIES

The highly ambitious goals of large-scale restoration projects will not be easily achieved without the behind-the-scenes work of lobbying for and developing public policies which stimulate forest restoration via the creation of financial or legal mechanisms. Thus, policy development is one of the major priorities for large-scale restoration programs. Once hundreds of members and institutions participate in the program and support a common goal, they are able to better influence policy makers than individual restoration stakeholders alone. Such networks of stakeholders not only influence policy makers but also mobilize society, which in turn may generate feedback and increase influence on policies over time.

Influence on public policy may be achieved in different ways within large-scale restoration programs. The Atlantic Forest Restoration Pact, for instance, frequently supports or organizes events, conferences, or workshops to discuss important topics for forest restoration in partnership with policy makers and public institutions. For example, the Pact has recently organized, in partnership with the São Paulo State Environmental Agency and other interested institutions, a workshop about native forest production in order to subsidize a plan for establishment of economically and ecologically viable native forests. After the event, a report was compiled which is being considered for use in the development of São Paulo State projects and in policies related to conservation and restoration.

As an example of the Pact's achievements, the government of Pernambuco State has officially adopted the Pact as the guideline for the restoration of 4,000 ha of Atlantic Forest, compensating the construction impacts of a very large new port, and the Brazilian Bank of Economic and Social Development (BNDES) has created a line of financing for restoring the Atlantic Forest. The Pact has also been collaborating with technical and financial international agencies, such as the German Agency for International Cooperation (GIZ) and the German government-owned development bank (KfW), to mobilize funding and technical support for the Pact.

Finally, an organized restoration movement may provide the necessary framework for the accomplishment of both private and public restoration goals. For instance, the government of the state of Rio de Janeiro has an agreement with the Olympic Games Organization Committee to plant 34 million native tree seedlings by 2016, in order to compensate the emissions of greenhouse gases resulting from the games. Without the support of a restoration movement such as the Pact, it would be much more difficult to organize



the seed and seedling producers, reforestation companies, and the farmers necessary to accomplish this goal.

## FINAL CONSIDERATIONS

Large-scale forest restoration programs are already being implemented around the world, and as the need and importance of these initiatives increases, they are becoming even more common. Such large-scale forest restoration programs are essential if we want to have a more pronounced positive effect (both ecological and socioeconomic) from forest restoration projects at both the landscape and the biome level. Creating new large-scale programs will clearly require arrangements uniquely specific to the biome or region in question. However, understanding the framework developed in other initiatives such as the Atlantic Forest Restoration Pact may provide a starting point for establishing the first steps for supporting large-scale forest restoration wherever it is needed.

However, it is important to mention that having a well-organized restoration movement is no guarantee of success, since many other factors may stimulate or hamper the implementation of restoration projects. As examples of “external” forces affecting the success of the Pact, we mention: (a) the Brazilian government has recently enacted a new Forest Act, which reduces the need of restoration in private landholdings (Calmon et al., 2011); (b) the global economic crisis reduced the investments of some Brazilian companies in restoration projects and evidenced that, under conditions of economic uncertainty, restoration may be the first activity to have its budget reduced; and (c) the current demand for tropical hardwood could be supplied in the future by some exotic tree species or by monocultures of native species, such that planting a mix of native species may be less competitive. In fact, finding the money for tropical forest restoration is one of the most relevant challenges to be met by the Pact and any other large-scale restoration initiative (Brancalion, et al., 2012). We expect that, once appropriate models of restoration are available, private companies and farmers will invest in the prominent market of the production of valuable timber species in marginal agricultural lands, while policies supported primarily by public funds will establish schemes of payments for ecosystem services to stimulate the restoration of degraded lands in private landholdings.

Although not a guarantee of success, a well-organized group of restoration stakeholders has much more potential to overcome the above-described and many other barriers to up-scaling restoration than the same institutions individually, as well as greater capacity to find solutions for collective problems. Large-scale restoration is certainly an endeavor vulnerable to many unpredictable forces, with several challenges to be faced in order to create favorable prospects for investments in this emerging field. We believe that the

spirit of cooperation and mobilization of the Pact described here, combined with pragmatism and technical, science-based methodologies developed in-situ, provides a template that could be transferred to other forest biomes in Brazil and, possibly, to other mega-diversity countries around the world.

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