An Assessment of Forest Resilience Bonds for Fire Risk Reduction in Forests across Portugal

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In a nutshell

The U.S. Embassy in Lisbon sponsored an Embassy Science Fellow from the U.S. Department of the Interior to assess the potential for Forest Resilience Bonds (FRB)s in Portugal in the fall of 2024.

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Abstract

The U.S. Embassy in Lisbon sponsored an Embassy Science Fellow from the U.S. Department of the Interior to assess the potential for Forest Resilience Bonds (FRB)s in Portugal in the fall of 2024.

This report presents the findings of this project and provides recommendations that could improve the conditions for FRBs and be a source for private finance of forest management to reduce wildfire risk in Portugal.

Several of the recommendations are consistent with the National Integrated Rural Fire Management Plan 20-30. The project observed instances of private finance investing in forest management, but this was most common with large parcels of land such as *baldios* (communal lands) or owners with large land holdings. The two main challenges for use of FRBs are the high proportion of forest lands that are small parcels owned by tens of thousands of owners, and the regulatory environment that forest management or agricultural businesses face.

Recommendations from the report include policies that would increase land ownership transactions with the goal of reducing land abandonment and neglect as well as providing opportunities for forest management entrepreneurship and promoting land consolidation. In addition, an analysis of regulations and permitting forest management and business that rely on rural land use is needed to remove barriers.

Overall, improving opportunities for innovation and entrepreneurship for rural landowners would improve the conditions for Forest Resilience Bonds.

Introduction

Over the last two decades, Portugal has experienced an increase in wildfire activity with 2003, 2005, and 2017 being notably severe fire seasons (Beighley and Hyde 2018). The total cost of damage from the 2017 wildfires was estimated to be €1.456 billion (San-Miguel-Ayanz, et al. 2020). In response, Portugal has implemented a number of wildfire suppression and prevention programs including the 2020-2030 National Plan for Integrated Wildland Fire Management. The comprehensive plan addresses all phases of wildland fire management including planning, preparedness, prevention, pre-suppression, suppression and relief, and post-fire recovery. The focus of this report is the prevention program which includes the implementation of landscape scale forest management.

Portugal has a Mediterranean climate with a summer dry season and the majority of precipitation occurring from fall to spring. A relatively mild winter produces a long growing season that coupled with the summer drought produces fuel and weather conditions conducive to wildfire. The favorable environment for biomass production is illustrated by the forest transition in Portugal. Over a century of land use change and afforestation efforts increased forest cover from 7% to 40% of the mainland area from 1875 to 2000 (Mather and Pereira 2006); however, recent wildfire trends have impacted the forest transition and have been converting forest stands to shrublands (Oliveira et al. 2017).

Land use changes have also been influenced by a decrease in rural population and maintenance of vegetation. Between 1960 and 2021, Portugal's rural population decreased from 5.7 million to 3.4 million (World Bank). Fernandes et al. 2014 estimated that fuel wood collection, grazing and shrub harvesting reduced by a factor of 10 from 1943 to 2011. The backdrop of a conducive climate and reduced biomass utilization have been identified as important contributors to the wildfire fuels challenge.

Ninety-two percent of Portugal's forests are privately owned with four percent being private industrial forests (ICNF, 2024). There are about 400,000 private forest owners in Portugal with tens of thousands of parcels that are less than one hectare (Feliciano et al. 2015). These characteristics of forest ownership are the primary

challenge for implementing a landscape scale forest management program for fire risk reduction.

Policy Measures

Several policy measures have been implemented to address the challenge of persuading numerous individual private landowners to manage the vegetation on their property to promote fire resilience. The Forest Intervention Zone (ZIF) program was established in 2004 to increase landowner participation in forest owners associations that develop and implement a unified forest management plan. Currently over 1.94 million hectares of forest land are in more than 257 ZIFs. However, implementation of the forest management interventions within the plans have not been significant as investment both private and public has been low.

The Integrated Landscape Management Area (AIGP) program also aims to coordinate landscape management across numerous landowners to reduce fire risk as well as improve economic outcomes. AIGPs consolidate private land parcels into larger aggregates with a mix of different agricultural, forestry, and natural areas. The AIGP manager implements the AIGP plan by converting the land from its current condition to the planned vegetative cover, maintaining the land, and harvesting and selling the resulting products. Participating landowners receive an annual rental payment for the use of their land, and the managed land aggregates would then result in an increase of fire-resistant agricultural areas and fire resilient managed forests. Numerous associations and local governments have developed AIGP plans and are anticipating government funding to convert the lands and implement the management plans. The AIGP program has not entered the implementation phase at the writing of this report, but council resolution 152/2024 established a €331 million fund to implement AIGPs for the next 20 years.

Conservation Finance: Forest Resilience Bond

Conservation finance, used in this report broadly to mean non-government funding for land management, was examined for its potential to fund forest management on private lands at a landscape scale in Portugal. The conditions for a Forest Resilience Bond (FRB) were also specifically assessed. The FRB is a type of conservation finance that has an investor (provides initial capital for management)

and a beneficiary (receives an ecosystem service benefit from management and provides contracted payments to the investor over a defined term) which together provide funding to landowners and land managers for forest management. Some beneficiaries can also be impact investors that are willing to fund a project meeting specific environmental goals without providing a monetary return. Impact investing can also subsidize and be part of an FRB revenue stream.

Embassy Science Fellowship Project

The Embassy Science Fellowship visited the north, central and south regions in Portugal to gather information from numerous organizations in the forestry and government sectors (Table 1). The fellowship also examined projects that are already receiving impact investment for forest management. However, these examples were not at the scale needed to address Portugal's unmet forest management needs. This report's primary focus is to identify forest management business models that generate sufficient revenue to pay back an FRB, and thus be self-sustaining and scalable.

Table 1. Organizations visited during September and October 2024.

Organization Name	*Organization Type*	*Region*
Centro Agro Tech – Fundão Municipality	Municipal Funded Organization	Fundão, Center Region
Associação de Produtores Florestais da Beira Interior	Forest Owners Association	Castelo Branco, Center Region
Silveiratech	Private Landowner	Lousã, Center Region
Baldios do Colmeal	Communal Lands	Colmeal, Center Region
Instituto da Conservação da Natureza e das Florestas (ICNF) - Mata da Margaraça	Government Agency	Arganil, Center Region
Florestgal	State Company	Figueiró dos Vinhos, Center Region
Mação Municipality	Municipal Government	Mação, Center Region
União da Floresta Mediterrânica	Forest Owners Association	Lisbon
Herdade do Freixo do Meio	Private Landowner	Montemor, Alentejo Region
Navigator Company	Private Company	Setúbal, South Region
Monte da Lameira	Private Landowner	Monchique, South Region
Monchique Municipality	Municipal Government	Monchique, South Region
Odemira Municipality – Civil Protection	Government Agency	Odemira, South Region
Silves Municipality – Civil Protection	Government Agency	Silves, South Region
Geota	Nonprofit Organization	Lisbon
Serra do Caldeirão Forest Owners Association	Forest Owners Association	Algarve, South Region
Valongo Municipality	Municipal Government	Valongo, North Region
Life Maronesa	Nonprofit Organization	Vila Pouca de Aguiar, North Region
Valoura Parish of the Vila Pouca de Aguiar Municipality	Municipal Government	Vila Pouca de Aguiar, North Region
Aguiarfloresta - Associação Florestal e Ambiental de Vila Pouca de Aguiar	Forest Owners Association	Vila Pouca de Aguiar, North Region
Antarr	Private Company	Vila Real, North Region
Cávado Intermunicipal Community	Intermunicipal Government	Cávado, North Region
Associação Florestal do Vale do Sousa	Forest Owners Association	Milhundos, North Region
Baldios do Baladi	Communal Lands Association	Vila Real, North Region
Fenafloresta	Forest Owners Association	Lisbon

Findings: Potential for Forest Resilience Bonds

Portugal's land ownership structure that features many small parcels was cited repeatedly as a barrier to improving forest management for fire risk mitigation. For many forest interventions such as tree thinning and shrub control, the only feasible way to implement management at scale is to use mechanized methods and heavy machinery which have a high initial cost for small-scale landowners. Mechanized interventions were more common on large private industrial forest lands and baldios (communal lands).

On small private forest lands, even those within ZIFs, landowners were typically harvesting their lands for revenue with little to no forest management interventions between harvests which leaves these stands vulnerable to wildfire. A ZIF manager in the central region said landowners do not manage their forest between harvest because the risk of loss from fire was often not significant enough for landowners to pay out-of-pocket for interventions between the harvest cycles. The perception was that although interventions could reduce fire risk, the benefit may not offset the cost of the intervention.

Membership in a ZIF or AIGP does improve the scale of management and potentially lowers the cost of forest interventions by consolidating landowners under a management plan. As such, they are potential candidates for an FRB assuming revenue from the management could be shared to repay the FRB. Ideal FRB projects would be those where the terms of the agreement between the landowner and the investor results in a potential improvement in the landowner's income long-term. It is expected that long-term leases would be necessary to realize the benefit of increased income from improved forest management.

Many of the entities in Table 1 cited land abandonment as a major factor in the lack of forest management. In many cases, efforts by local government to contact landowners about implementing a fire prevention plan were unsuccessful. When asked why people hold on to land that they are not using or maintaining, entity representatives cited the cultural importance of land ownership as well as the very low property tax on undeveloped land.

One forest manager interested in acquiring more land in the central region suggested there was little incentive for owners to sell land because the revenue can be low and property tax is often negligible. The tax is so low that in some cases, there is little effort to collect delinquent taxes. These low taxes on vacant land means there is little to no cost for absent landowners to retain their abandon land. In addition, land can only be sold if it has a title that has been recorded in the Land Registry Office which can be costly. The land registry fees can even exceed the sale price of the land for small parcels. To address the challenge of abandoned or neglected land, policy analysis is needed to improve the title transfer process and economic incentives to sell land to new owners that want to manage it. Some consolidation of land to new owners that are interested in managing it would improve scale and potential revenue streams to repay FRB investors.

Another challenge to increasing forest management and utilizing FRBs is the lack of higher value markets for maritime pine. Maritime pine regenerates prolifically after wildfire, and often little or no density management is conducted in these dense, even-aged postfire stands. From a silviculture and fire risk mitigation perspective, this species could be transitioned to uneven-aged stands with an intermediate thinning five to ten years after stand establishment and periodic commercial thinnings (uneven-aged cutting cycle) once the stands reach maturity. This silviculture system would maintain a mature stand of spaced, fire resilient trees that could withstand low severity fire and have reduced risk of high severity fire while producing income. This silvicultural system requires an investment to thin precommercial trees that would reduce potential fire behavior while increasing growth and yield of the remaining lower density stand which would result in a stand of larger, fire resilient trees.

Currently there is no economic incentive to invest in this silvicultural system because there is not a large pine tree price premium from high value pine products such as lumber and construction materials. After the 2017 fires, the Institute for Nature Conservation and Forests (ICNF) had a large volume of maritime pine to salvage on state owned lands and were able to raise significant revenue from auctioning that timber on international markets. This shows that with large enough volume, pine timber can generate revenue from higher value manufactured wood

products. A high value pine market could open up new opportunities for FRBs in maritime pine forests.

Many stakeholders cited challenges with regulatory restrictions from Natura 2000 Network and Reserva Ecologica Nacional which are natural area designations for environmental protection. These restrictions prevent specific activities and limit opportunities to use forest management tools that can improve environmental conditions and reduce wildfire risk. For example, one forest manager with significant land holdings within Natura 2000 wanted to use machinery to replant a eucalyptus stand that was no longer productive. The manager was willing to invest in converting some of the eucalyptus to native cork oak forest in exchange for regenerating a portion of the unproductive eucalyptus stand. However, the plan was rejected because protected area regulations prohibit eucalyptus replanting and the use of heavy equipment for site preparation. Land managers also said these environmental regulations sometimes cause abandonment of eucalyptus after several cutting rotations since eucalyptus productivity in a coppice system declines after each harvest. This abandonment increases the prevalence of fire-prone unmanaged lands that are burning at high severity and causing environmental and social damage.

Recommendations

The Embassy Science Fellowship was not able to meet with water utilities to understand their concerns about wildfires in the watersheds they depend on for water supply. These areas could have high potential for an FRB. Similar to the Yuba FRB in California, water utilities are potential beneficiaries of forest management through protected water quality or increased water yield from forest management. It would be useful to identify reservoirs where water supply is a concern and assess the types of interventions needed for the forest type and what the potential impact on water yield would be. Engagement with academics in hydrological science to discuss what forest management interventions might achieve fire resilience and water yield improvements could be a starting point.

As mentioned above, policy analysis on increasing land ownership transactions with the goal of reducing land abandonment and neglect as well as providing opportunities for forest management entrepreneurship and promoting land consolidation could improve FRB potential.

Policy analysis of protected area regulations is needed to see if a waiver process can be developed for certain prohibited activities when those activities would support the goals of environmental protection and restoration in the long-term.

ZIFs and AIGPs that are seeking financing for implementation need a prospectus to share with potential investors that outlines the forest description, a treatment description with estimated costs, and an estimate of revenue.

To address the lack of a high value pine market, a federation of ZIFs or baldios may be able to attract and negotiate with log buyers on the international markets.

To further seek opportunities for conservation finance in Portugal, a partnership coordinator located in a government agency would be needed to conduct outreach to investors and beneficiaries and to facilitate negotiations between investors, landowners, and beneficiaries. This position should be located within the government so that policy proposals from this report can also be communicated to the relevant government officials.

Conclusion

Conditions for FRBs in Portugal were present in limited cases. The main challenge is finding beneficiaries and revenue streams to repay the bond investors. In general, there is a potential to improve revenue streams and thus FRB opportunities by implementing policies that improve the environment to start and grow forest management businesses.

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Appendix 1

Presentation summarizing the Embassy Science Fellowship on October 8, 2024 in Lisbon, Portugal at Centro Cultural de Belém.

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