

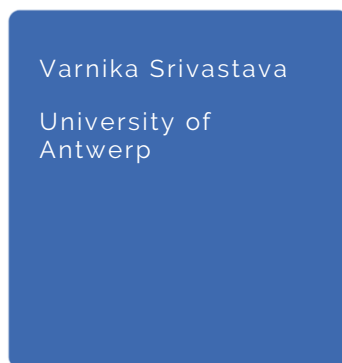
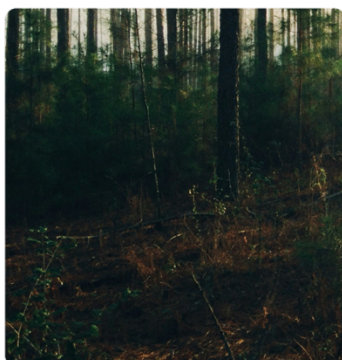


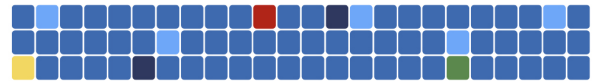
Reserva Particular do Património Natural Municipal (RPPNM)

Transferable development rights to protect urban forests

CLIMATEFIT International best practice factsheet

Case ID: 14





Summary

The Reserva Particular do Patrimônio Natural Municipal (RPPNM) program in Curitiba, Brazil, was instituted in 2006 and leverages the concept of Transferable Development Rights (TDRs) to incentivize landowners to protect urban forests on their properties. By converting their lands into RPPNMs, property owners receive tax benefits and the opportunity to generate income through the sale of TDRs. These rights allow developers to fulfill green space requirements in their projects by purchasing unused development potential from preserved lands. This innovative financial and business model, initially funded with \$1.5 million from public sources, has facilitated the conservation of urban biodiversity without imposing significant financial burdens on the municipal budget. The success of the RPPNM program is attributed to its comprehensive framework, which includes strong public support, transparent procedures, and a synergistic blend of federal and municipal policies. The initiative has significantly reduced the financial strain on Curitiba's municipality by encouraging private investment in environmental conservation. As a result, the program has not only contributed to the preservation of urban forests and biodiversity but also to the improvement of air quality and the reduction of municipal expenses related to land expropriation and urban forest maintenance.

The RPPNM model showcases a successful integration of environmental conservation with urban development, offering valuable insights for similar initiatives globally. Its financial sustainability, coupled with its ability to engage private landowners and developers in conservation efforts, marks it as a best practice in addressing urban sprawl and biodiversity loss through innovative economic instruments.

Keywords: RPPNM, TDR, urban forests, expropriation

Actor(s) interviewed: Retired urban ecologist who worked on the RPPNM program.

Cover image: © SPVS (top photo), Steven Kamenar at Unsplash (middle photo)

Further reading: [Reserva Particular Do Patrimônio Natural Municipal \(RPPNM\) in Curitiba](#)

Suggested citation: Srivastava, V. (2024). *Reserva Particular do Patrimônio Natural Municipal (RPPNM). Transferable development rights to protect urban forests*. University of Antwerp for CLIMATEFIT

Best practice information card

Table 1. RPPNM. information card

Location	Curitiba, Brazil
Population size	3,852,459 (2024)
Project area size	432 km ²
Area type	Urban
Climate challenge	Biodiversity quality loss which is exacerbated by climate change as shifting temperatures and extreme weather events disrupt ecosystems, leading to habitat destruction and species extinction.
Key Community System(s)	Ecosystem and nature based solutions, land use. Water management, health and human wellbeing
Objectives	Protecting urban forests and to prevent unchecked urban sprawl
Climate challenge solution	Curitiba's RPPNM program tackles urban sprawl by incentivizing landowners to conserve natural areas on their property. Landowners who convert their land into RPPNMs receive tax breaks and can earn income by selling tradable development rights (TDRs). These TDRs represent the unused development potential of the land and can be purchased by developers who need to meet green space quotas in their projects. This win-win program fosters conservation, allows for flexible development, and benefits the city with a healthier environment and reduced costs. This program offers various climate resilience benefits through the preservation of natural areas, enhanced biodiversity and improved air and water quality.
Key benefits	Clean air, income for plot owners, reduced costs for municipality of Curitiba
Implementation status	2006, implementation ongoing
Investment volume (€)	1.5 million USD in 2006
Key financing barriers	Limited public budget for expropriation and maintenance
Financial model	The Municipality of Curitiba, Brazil gives incentives to landowners to protect the urban forests on their land through tax deduction or transferrable development rights to build elsewhere in the city.
Financial sources	<i>Public: Government Agencies</i> <i>Private: Households: property owners</i> <i>Private: Private investors (project developers)</i>
Financial instruments	<i>Transferrable Development Rights</i> <i>Non-financial instruments: Incentives (tax breaks)</i>

Overview and timeline

Curitiba is the capital and the largest city in the state of Paraná in Southern Brazil. Currently, Curitiba is the 8th most populated city in Brazil. The city has a total GDP of roughly USD 19.6 billion (2012), which ranks Curitiba as the 6th largest local economy in the country. Its GDP per capita is calculated at USD 9,981.40, ranking the city among the 10 richest in Brazil. In addition, Curitiba is largely comprised of middle-class households, compared with other municipalities in Brazil, which are dominated more by lower-income residents.

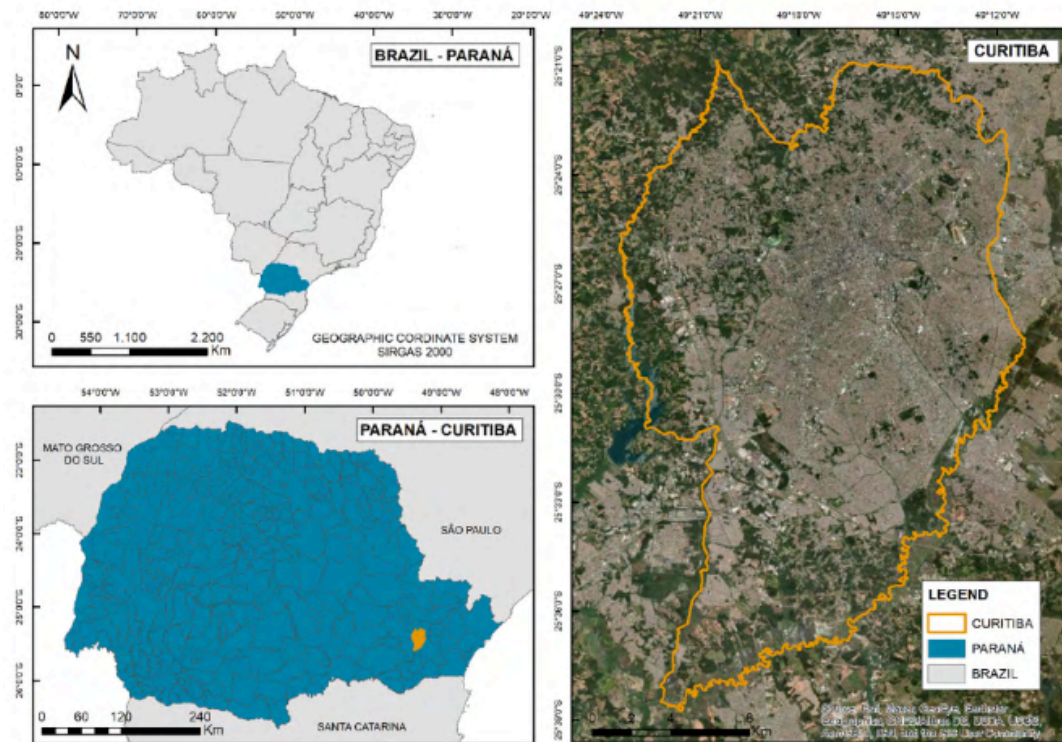


Figure 1: Location of Curitiba in Brazil, with distribution of urbanised areas and green areas depicted in the right in 2020. Source: Freitas et al. (2021)

Curitiba saw rapid expansion of its urban areas in the 1970s, threatening its green spaces. Much of Curitiba's green spaces are located in the north, northeastern, and western parts of the city, but were mostly private plots. Since the early 1970s, the municipality of Curitiba decided to protect green areas and rivers crossing the city's territory. This decision included plans to expropriate roughly 100 meters on both sides of main rivers to create parks and allow the rivers to flood as needed without affecting nearby residents. This marked the beginning of environmental policies implemented continuously by successive mayors. While expropriation as a strategy works, it is also time-intensive and expensive. To combat this problem, Curitiba started exploring alternative solutions to protect its urban forests while alleviating financial pressures on the municipality.

Conservation Units and RPPNs

In Brazil, Conservation Units are spatially defined areas created through laws or decrees to conserve biodiversity and landscapes. The National System of Conservation Units (SNUC), established by Law No. 9,985 on July 18, 2000, and Decree No. 4,340 on August 22, 2002, provides guidelines and procedures for creating, implementing, and managing Conservation Units, which can be federal, state, or municipal depending on the responsible authority.

Private Conservation Units aim to preserve biological diversity and provide space for scientific study, ecotourism, and environmental education. These units are significant tools for environmental conservation in Brazil. They can only be established on private land if public authorities recognize their importance for local biodiversity preservation and the owner voluntarily chooses to include all or part of their property in a Conservation Unit permanently, without compromising property rights. There are no size restrictions for these reserve areas.

Federal law in Brazil originally allowed states to create or expand parks in rural areas to prevent deforestation and agricultural conversion. Subsequently, municipalities were also permitted to adopt this approach to protect large green areas within urban boundaries. The federal law sets two conditions:

- a municipal law defining the characteristics of such large green areas to allow their designation as reserve areas, and
- once designated, this status is permanent and transfers to subsequent owners and heirs.

To preserve biological diversity on urban private properties with healthy native vegetation, Curitiba established the Private Municipal Natural Heritage Reserve (RPPNM) program. **An RPPNM is a type of Conservation Unit overseen by Curitiba's Municipal Department of the Environment.** By enacting legislation in 2006 (revised in 2011), Curitiba demonstrated leadership in supporting urban biodiversity preservation. **The city established its first RPPNM in 2006 to address the challenge of balancing conservation with development, offering landowners of private natural areas the option to convert them into RPPNMs. In exchange for permanently preserving these areas, landowners receive tax breaks and development rights that can be used elsewhere in the city. Landowners may also sell these development rights to developers, an example of Transferable Development Rights (TDR).**

The RPPNM program was considered a win-win for the municipality, plot owners, and developers involved. It allowed the protection of urban forests with minimal or no expenditure from the municipality, while providing opportunities for development outside these areas for landowners and developers alike.

Table 2. RPPNM. Timeline with key moments

Date	Key moment
1970s	Unchecked urban growth in Curitiba
2000	Federal Law No. 9,985 establishes the National System of Nature Conservation Units (SNUC)
2006	First RPPNM is created under Federal Law No. 12080
2007	State Decree No. 1.529 provides for the State Statute of Support for the Conservation of Biodiversity on Private Lands in the State of Paraná and updates procedures for the creation of Private Natural Heritage Reserves (RPPN)
2011	Grants tax incentives to owners of Private Municipal Natural Heritage Reserve areas - RPPNM under the terms of municipal law No. 12,080, of December 19, 2006
2012	Municipal Decree No. 1,599 provides for the granting of Certification intended for constructions that use construction potential arising from RPPNMs as an incentive for the maintenance of green areas in Curitiba

Governance and key stakeholders

The RPPNM was introduced in 2006 by Curitiba. The decision to implement the program was first voted on and approved by the Environment Secretariat, the Urban Planning office, and the Mayor.

Since 2008, the **Municipality of Curitiba** has also partnered with the **Society for Research in Wildlife and Environmental Education (SPVS)**, a non-governmental organization dedicated to conserving nature. SPVS has been involved in urban conservation since 2000 through the **ConBio - Condominium of Biodiversity program**. These institutions combined their efforts to conserve urban biodiversity. Since then, they have visited over 900 properties with native forests in Curitiba, providing owners with information on nature conservation and native forest management. Meetings were also organized to integrate and train owners on the conservation of the Araucaria Forest and RPPNMs. Many owners became interested in converting their properties into RPPNMs as a result of these efforts.

Furthermore, these meetings led owners to mobilize and establish **APAVE – the Association of Protectors of Green Areas of Curitiba and Metropolitan Region**. Given that the majority of forest remnants in Curitiba are located on private land, community support is crucial for conserving these forests within the urban landscape.

Table 3. RPPNM. Key stakeholders and their responsibilities or roles

Stakeholder	Type	Role and responsibilities
Municipality of Curitiba	Municipality	Manages the RPPNM Program through approval of applications and oversees the program
Owners of land	Private households	Manages the RPPNM itself in exchange of tax breaks and transferrable development rights
SPVS	NGO	Works with the Municipality of Curitiba with their ConBio program to preserve urban biodiversity
APAVE	Citizens association	Citizens movement that assist the new applicants of RPPNMs and also strive to protect the urban biodiversity of the area

Business model & financial model

Business model

For a property to be declared as an RPPNM, the owner must first submit an application to the municipality. When a landowner applies to the RPPNM program, they must undergo a rigorous process¹ and meet strict criteria for the plot of land to qualify as an RPPNM. The owner can request the creation of an RPPNM on part of the property, subject to criteria and evaluation by the Municipal Environment Secretariat, while allowing uses in the remaining area in accordance with Zoning and Land Use legislation. These uses must not harm the RPPNM. Activities planned for the remaining area of the property with an RPPNM will only be approved after consultation with the Municipal Secretariat for the Environment (SMMA) and the Municipal Secretariat for Urban Planning (SMU), ensuring they have minimal environmental impact and comply with zoning regulations.

Figure 2 illustrates how RPPNMs are structured. The property is divided into two parts: a smaller part where the landowner resides, and a larger RPPNM where no further development is permitted. The landowner receives development rights from the RPPNM, which they can utilize themselves or sell. This process ensures that urban biodiversity is conserved while allowing responsible development within the municipality of Curitiba.



Figure 2: example of RPPNM, Source: Secretaria Municipal do Meio Ambiente (2023)

With the goal of conserving local biodiversity, any activity deemed dangerous, disruptive, or harmful to the RPPNM is prohibited. If any form of pollution (water, soil, atmospheric, noise, among others) is detected, the activity will be immediately halted until the issue is resolved. The Environment Secretariat conducts all studies and assessments of the green areas. If the Secretariat determines that a property meets all regulations, they can recommend to the Urban Planning department that the area be designated as an RPPNM. The final approval rests with the municipality of Curitiba.

The RPPNM also permits construction in the non-green occupied space of the property to maximize green conservation. A key requirement of the program stipulates that no building should exceed the height of the tallest tree on the plot, and the responsibility for conserving the forest falls on the landowner.

For effective implementation, Curitiba employs a rigorous screening process for landowners, necessitating expertise from biologists, urban planners, and spatial planners. **The program does not involve financial transactions between the municipality and landowners; the only financial transaction occurs if landowners opt to sell development rights to developers.**

The figure below shows the general steps and governance in the entire RPPNM model.

¹ the application process can be found [here](#).

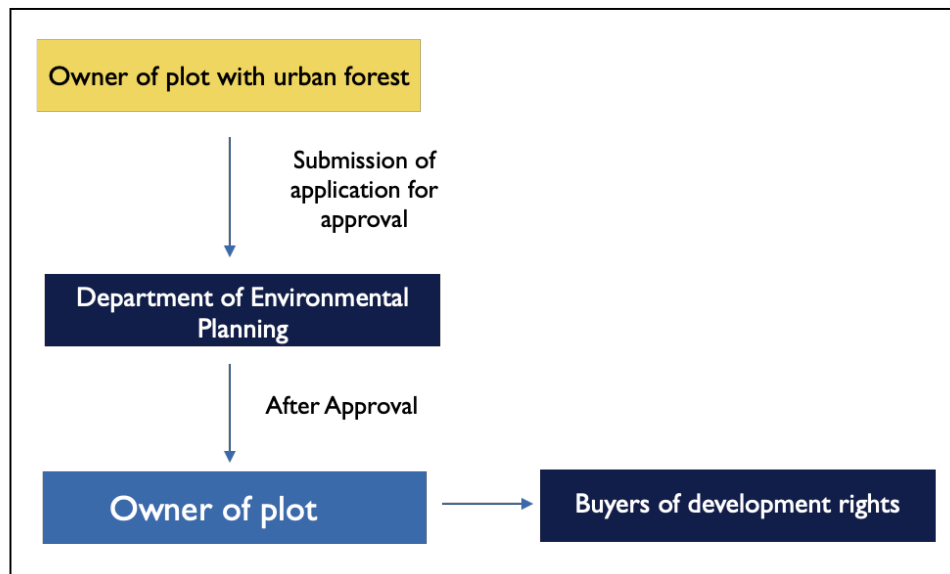


Figure 3: General Governance of an RPPNM. Source: author

The creation of an RPPNM is only permitted on properties that are either unbuilt or have at most one family dwelling. To qualify, the property must be registered with the municipality and have its Public Property Registry updated in the owner's name. Deeds and purchase contracts do not permit the creation of an RPPNM. Once established, the property becomes indivisible, and the creation cannot be revoked. Any applicable street guidelines must be consulted before establishing the reserve.

Creating an RPPNM is a voluntary decision. If a property qualifies, the city of Curitiba offers several incentives to the owner:

- Exemption of the RPPNM area from Urban Property and Territorial Tax calculations.
- Possibility of using the area for scientific research in partnership with universities or other institutions, as well as for ecological, tourist, recreational, or educational purposes with income generation potential.
- Certificate of recognition signed by the Mayor for the owner.
- Transfer of construction potential according to current legislation.

Additionally, the RPPNM program allows developers to purchase building rights to meet mandatory green space quotas in their projects. This program has been instrumental in conserving Curitiba's natural areas, contributing to biodiversity and environmental health.

The initial funding allocated to the Municipality of Curitiba from the Federal Government for the RPPNM program was \$1.5 million. Details on subsequent federal funding are not publicly available, and the interview with the stakeholder from the Municipality were unable to provide updated data. The program's budget covers staff costs for managing the program, urban planning office staff, and technical staff such as biologists who conduct field assessments. The remaining budget is used for logistical purposes like equipment and travel, funded through public taxation. Some budget is also allocated to expropriation to consolidate small plots into larger park or square spaces, as small plots do not qualify for RPPNMs.

The construction potential rights granted to landowners correspond to the size of the plot preserved, with coefficients of 0.3, 0.4, or 0.5 depending on land quality. These construction potentials can be sold to interested construction companies. When assessing property value, depreciative factors for forested or Permanent Preservation Areas (APP) are not considered.

The regulations surrounding the certification of a plot as RPPNM are very strict:

- Properties with buildings under special use conditions cannot qualify for RPPNM.
- If an RPPNM covers part of the property, construction potential granted will be relative to the area where the reserve is established, with remaining property subject to parameters outside the reserve area.

Financial model

Transferrable Development Rights² is a zoning mechanism that conserves land by redirecting development that would otherwise occur on the land. TDR operates in way that owners of the land are compensated for their redirected development rights. TDR is a legal mechanism offered in some local government jurisdictions as a form of development control. In the United States, TDR are also a way to avoid constitutional takings issues caused by rezoning areas that would otherwise eliminate a significant amount of value from the property. The procedure offers landowners financial incentives or bonuses for the conservation and maintenance of the environmental, heritage or agricultural values of their land. TDR is based on the concept that with land ownership comes the right of use of land, or land development. These land-based development rights can in some jurisdictions be used, unused, sold, or otherwise transferred by the owner of a parcel.

Developers can purchase the development rights of certain parcels within a designated "sending district"³ and transfer the rights to another "receiving district" to increase the density of their new development (see Figure 4)

Sending areas are commonly made up of areas with desirable traits that are at risk of being developed such as agricultural lands or wilderness areas, but may also be newly designated historic sites. Alternatively, parcels with buildings that do not use all of their available size have "excess" developable capacity that can be conveyed to other parcels, possibly adjoining the first parcels.

Receiving areas are typically located in urban areas that are ripe for development. Receiving districts are generally areas more suited for higher density developments and sending districts are areas with environmental, heritage or agricultural values that the county, city or town wishes to preserve.



Figure 4: sending and receiving areas in RPPNM model. Source: author

The City of Curitiba receives funding from a federal program in Brazil to cover its staff and technical costs associated with RPPNMs. All other costs related to the functioning and maintenance of RPPNMs are the responsibility of the landowners. Landowners who successfully convert their land into RPPNMs receive tax breaks and the opportunity to develop land in other parts of the city. These development rights can also be sold to other developers.

Upon publication of the decree establishing the RPPNM, property owners may request the city to transfer the property's construction potential, allowing construction to be relocated from environmentally restricted areas to others, in accordance with relevant legislation. This construction potential can be sold to interested developers. Depreciative factors related to forested areas or Permanent Preservation Areas (APPs) are not considered in determining the property's value.

An RPPNM cannot be established if the owner has already utilized the property's construction potential in another manner, preventing its reassignment or further development. If only a portion of the property is designated as an RPPNM, the allowable construction potential will be based on the area covered by the RPPNM, irrespective of the property's total size; criteria for the remaining portion will refer to the non-RPPNM area. RPPNM owners fund maintenance either through private financing or by selling development rights to developers. They can also recoup costs through the tax breaks they receive.

As RPPNMs are undeveloped plots of land, the development rights awarded represent unused development potential. Qualifying landowners must maintain at least 70% mid-successional or mature forest cover on their undeveloped plots. In exchange, they benefit from property tax reductions and/or the ability to transfer development rights to another location or develop non-green areas of their plots.

Enabling conditions

The broader federal policy on Conservation Units, coupled with their funding, enables the municipality to effectively manage the RPPNM program. These federal resources address issues such as land use regulations,

² Transferrable development rights, Source: [Wikipedia](#)

³ Source: [Rutgers](#) and [Wikipedia](#)

tax incentives, and Transferable Development Rights (TDR). They also ensure that the municipal budget is allocated to support program implementation in Curitiba.

Additionally, the municipality has provided extensive resources on its website to encourage plot owners to participate in the RPPNM program. Citizen groups like APAVE are actively involved in assisting new applicants and promoting conservation efforts. The municipality conducts outreach campaigns and offers comprehensive online resources to support participants.

The process of applying for and qualifying as an RPPNM involves rigorous criteria but does not require financial transactions, which incentivizes landowners to participate in the program.

Outcomes

Since 2006, more than 60 RPPNMs have been established in Curitiba, out of a total of 1,184 Conservation Units managed by the Municipal Secretariat of Environment (though more green areas are managed by the government). These RPPNMs cover a combined area of 89.96 hectares (figures from Grimm et al. (2020)).

The interview also highlights that these urban forests serve as crucial sites for biologists and other researchers. The RPPNM program has also alleviated costs for the municipality of Curitiba by shifting the responsibility of maintaining urban forests to landowners. For plot owners, the primary incentives to participate include tax breaks and the potential for additional revenue from selling development rights. However, estimating the actual costs landowners incur to maintain urban forests and the specific tax breaks they receive is challenging and would require further study. Public officials interviewed for this case noted the absence of financial estimates due to the lack of financial transactions between landowners and the municipality.

The RPPNM program has garnered significant interest from the citizens of Curitiba, resulting in a substantial backlog of applications that the city must process. The program has reduced municipal costs compared to previous practices involving expropriation. While the total budget previously allocated to expropriation by Curitiba is unknown, it is clear that costs have decreased because the municipality no longer bears the expense of acquiring and maintaining urban forests.

RPPNMs also contribute to expanding effectively conserved areas within the city, complementing existing municipal Conservation Units (CUs) and potentially establishing ecological corridors between different UCs.

Overall, the RPPNM program in Curitiba has received strong citizen engagement and positive public perception. The municipality faces a growing number of landowners eager to participate in the program, resulting in a backlog of technical assessments for converting plots into RPPNMs.

Lessons learned

Successes and limitations

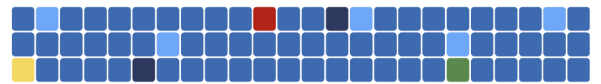
According to the Municipality of Curitiba, the creation of RPPNMs plays a critical role in preserving the remaining Araucaria Forests within the urban environment. This initiative prevents negative impacts such as unauthorized deforestation, illegal waste disposal, hunting, fires, and other actions that could degrade these natural areas.

However, one limitation of the program is that once a plot of land qualifies as an RPPNM, it remains permanently designated as such. As noted by the interviewee, descendants of the original owner can inherit RPPNMs. The municipality anticipates potential issues in the future if a landowner has no descendants or if their descendants are not interested in maintaining the RPPNMs. This situation could lead to uncertainty about the ownership status of the land—whether it will revert to the city or remain neglected due to low interest from heirs. Although this issue has not yet posed a problem, the city foresees it as a potential challenge down the line.

Moreover, for plot owners, the profitability and potential recovery of investment largely depend on the sale of Transferable Development Rights (TDRs). The interview also highlights that finding lucrative opportunities to sell TDRs can be challenging, especially if the available options are in less desirable parts of the city where profits may be lower. Another limitation mentioned is the declining birth rate in Curitiba, which has reduced the demand for new office spaces, high-rise buildings, and other developments that could utilize TDRs. This decline in demand may diminish interest in participating in the RPPNM program in the future.

The mismatch between the supply of building rights and the current demand is evident in the long waiting list for establishing RPPNMs. This backlog underscores another limitation: the municipality's limited resources to process a high volume of applications in a timely manner.

In summary, while the RPPNM program in Curitiba effectively conserves urban forests and receives positive feedback, it faces challenges such as permanent designation constraints, potential inheritance issues,



fluctuating profitability of TDRs, declining demand for building rights, and resource limitations for processing applications. These factors may influence the program's sustainability and participation levels in the years ahead.

Transferability conditions and potential

The interviewee emphasized that public support has been crucial for the success of the RPPNM program in Curitiba. They noted that for other territories considering adopting similar policies, studying the demographics of the area is essential. Currently, the RPPNM program faces a challenge where the demand for new property development has significantly decreased, yet there remains a high number of applicants seeking to establish RPPNMs. This imbalance results in plot owners having development rights to sell but encountering long waiting times before finding buyers.

Furthermore, the interviewee advised that territories looking to implement this model should conduct studies on the geomorphology and ecological assessments of their areas. This would enable them to effectively allocate development rights based on the conservation value of each plot of land. It is also crucial for adopting territories to invest in or collaborate with biologists and urban planners to ensure the success of such programs.

The RPPNM model is not limited to urban forests alone; it can be adapted for other valuable environmental areas as well. The concept of Transferable Development Rights (TDR) can be applied to protect biodiversity, wetlands, and other ecologically significant areas near urban centers. This broader application demonstrates the versatility and potential impact of similar conservation programs beyond urban green spaces.

Related factsheets

The business and financial model of RPPNMs is unique in the set of best practices that we studied. It shares some similarities with SRC credit trading platform (IDO7).

References

- Cerra, J. F. (2017). Emerging strategies for voluntary urban ecological stewardship on private property. *Landscape and Urban Planning*, 157, 586-597.
- Fuders, F., & Donoso, P. J. (2020). *Ecological Economic and Socio Ecological Strategies for Forest Conservation*. Springer International Publishing.
- Polucha, R. S. (2017). Variações na prática dos instrumentos de solo criado: Cota de Potencial Construtivo de Curitiba. *XVII Encontro Nacional da Associação Nacional de Pós-Graduação e Pesquisa em Planejamento Urbano e Regional-Enanpur*.
- (Translation: Polucha, R. S. (2017). Variations in the practice of solo instruments created: Constructive Potential Quota of Curitiba. XVII National Meeting of the National Association of Postgraduate Studies and Research in Urban and Regional Planning-Enanpur.)
- Grimm, I. J., Piva, J. H. T., & Sampaio, C. A. C. (2020). Municipal private natural heritage reserves: Uses and attributions of natural protected areas in the City of Curitiba (PR). *Ecological Economic and Socio Ecological Strategies for Forest Conservation: A Transdisciplinary Approach Focused on Chile and Brazil*, 227-240.
- Secretaria Municipal do Meio Ambiente . (2023, 06). Orientações para Criação de RPPNM e Elaboração do Plano de Manejo e Conservação. Retrieved from PREFEITURA MUNICIPAL DE CURITIBA: [URL](#)
- UNESCO International Centre for Creativity and Sustainable Development. (2021, March 4). Curitiba: Creativity builds ecological city-international center for creativity and sustainable development under the auspices of UNESCO. [URL](#)
- Vieira de Freitas, Eliana & Araki, Hideo. (2021). SIMULATION OF URBAN GROWTH: A CASE STUDY FOR CURITIBA CITY, BRAZIL. *Boletim de Ciências Geodésicas*. 27. 10.1590/s1982-21702021000s00019.