

Experiences related to the Growth Acceleration Program in the urbanistic treatment of Permanent Preservation Areas in the Curitiba metropolis

Experiências do PAC no tratamento urbanístico de APP na metrópole de Curitiba

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Abstract

This paper analyzes slum upgrading based on case studies focusing on the implementation of the Growth Acceleration Program (known as PAC) in the east side of the Curitiba metropolis, with the aim of discussing urban solutions employed in Permanent Preservation Areas (PPAs). The results showed that the interventions aimed to restore, to the maximum limit, the space of the PPAs that had been previously occupied, and that linear parks were the strategy adopted to equalize environmental and urban functions. Other findings are the existence of an impasse concerning the landscape design proposed by the state ignoring local demands, which results in the delay or interruption of the constructions, and the recurrence of the environmental degradation cycle. Advances were also observed, such as the resignification of PPAs as natural macro-drainage structures, and the use of PPAs by the community for collective leisure activities.

Keywords: Permanent Preservation Areas; slum upgrading; Growth Acceleration Program for slums; linear park.

Resumo

Este artigo aborda a urbanização de assentamentos precários, a partir de estudos de caso do Programa de Aceleração de Crescimento (PAC) na franja leste da metrópole de Curitiba, objetivando discutir o tratamento empregado nas Áreas de Preservação Permanente (APPs). Verifica-se que as intervenções buscaram a restituição máxima do espaço das APPs antes ocupados e que os parques lineares foram a estratégia adotada para equilibrar funções urbanas e ambientais. Constatam-se o impasse em relação ao projeto paisagístico proposto pelo Estado e as demandas locais, resultando no atraso ou paralisação de obras, além da reincidência do ciclo de degradação ambiental. Constatam-se, também, avanços como a resignificação das APPs como uma estrutura natural de macrodrenagem e a apropriação desse espaço pela população para o uso coletivo de lazer.

Palavras-chaves: APP; urbanização de assentamentos precários; PAC Favelas; parque linear.



Introduction

The precarious settlement is a result of the unequal urbanization of Brazilian metropolises, characterized by the imbalance between income classes in access to housing, infrastructure, and urban services. Due to the low housing production of public programs and without financial conditions to acquire a house in the legal part of cities, the poorest class of the population remains occupying areas unsuitable for urbanization, protected by environmental legislation and that do not interest the real estate market. A combination that oftentimes results in occupations with risk and environmental degradation of Permanent Preservation Areas (APPs).

Despite the discourse of “model city” and “ecological city,” developed in the last decades of the twentieth century, Curitiba does not escape the rule of unequal Brazilian urbanization. A problem accentuated in the capital of the state of Paraná by the different historical treatment of the housing theme in public policies. According to Albuquerque (2007), the housing issue did not receive the same attention as the local government, as they received public transport and land use, resulting in the extravasation of precarious settlements to the surrounding municipalities, especially in the east side,¹ in the 1990s, on lands with low value in the formal market due to the restrictions imposed by environmental legislation. A dynamic that confirms, according to the author, the role played by springs and river plains of Iguaçu River and its tributaries in the absorption of the socio-environmental ills of Curitiba.

Maricato (2010) makes a point to this severe problem of Brazilian metropolises. According to the author, in Curitiba, in areas

where the occupation by illegal housing has grown the most, in the 2000s, were those in which occupation was prohibited by law, but was not so in the practice of occupation of the territory. Therefore, if, on the one hand, the relevance of the “environmental functions”² performed by APPs is unquestionable, as much as in hydrological, ecological as geomorphological terms; on the other hand, the presence of precarious housing is undeniable, an effect of the absence of public policies consistent with the demand for popular housing in the metropolis.

For a long time, precarious occupations in areas of environmental protection have led to the so-called “conflict housing x environment” that many times reverberates in fragmented public policies, which blame dwellers for environmental damage, such as deforestation, silting and soil sealing (Polli, 2010); thereafter, also blaming dwellers for the adverse effects of environmental degradation. And, in the east side, the restriction³ of new occupations and the prohibition of infrastructure improvement works in the consolidated occupations in water springs, in the last decades of the twentieth century, only worsened the situation of socio-environmental precariousness in the valley bottoms and APPs.

The springs law of the Metropolitan Region of Curitiba (RMC) modifies the understanding of the occupation in springs, from highly restrictive space to a more flexible view in pursuit of the balance of urban and environmental functions. In the core of this alignment of environmental and urban agendas, the program *Direito de Morar* was created in 2003, initiating the practice of urbanization in water springs and valley bottoms, to the detriment of full removal of occupations. At

the federal level, the understanding of these areas as a social interest, with the possibility of reducing the APP range to 15m, given by Conama Resolution no. 369, according to Travassos (2010), made way for the upgrading and implementation of linear parks.

Articulated with the instruments of the Springs Law, the program *Direito de Morar* has begun to guide the actions contracted by Paraná Housing Company – Companhia de Habitação do Paraná – Companhia de Habitação do Paraná (Cohapar) under the Growth Acceleration Program (PAC), in the modality Priority Investment Projects – *Projetos Prioritários de Investimentos - (PPI)*, Intervention in Slums – *Intervenção em Favelas (IF)*. Thus, the interventions are marked by “Environmental Recovery and Urbanization Plans,” making the environmental dimension the leading figure of the institutional discourse of PAC Favelas (PAC in slums) on the east side of the city. And the practice of slum upgrading is seen as a solution to balance urban and environmental functions in valley bottoms and springs.

With the state government as proponent, PAC Favelas (PAC in slums) in the east side has shared responsibility between the local executors, Cohapar and the water and sanitation state company – Companhia de Saneamento do Paraná (Sanepar), and the housing company was responsible for managing the contractual items related to urban design, housing production and drainage infrastructure works; and, to the water and sanitation company, the works of infrastructure for water and sewage supply. In turn, the municipal governments were responsible for providing land for the construction of housing and for the process of relocating families in areas at risk of flooding.

Thus, after 15 years of PAC Favelas focused on the upgrading of areas of environmental fragility, in valley bottoms, of the metropolitan east side, the question is: what was the design approach in relation to APPs? Was there compatibility of urban and environmental functions in the adopted solutions? Which way do local experiences point out?

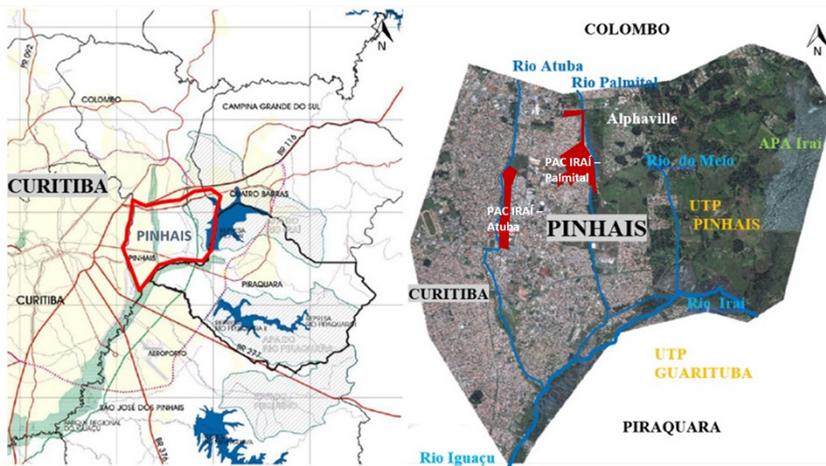
From these questions, when searching support in the literature, similar concerns are perceived, such as those of Denaldi, Ferrara and Silva (2016) who point out that the requalification of precarious settlements, from an environmental viewpoint, is still a great challenge in Brazil, due to the process of full urbanization being under construction and especially in relation to “[...] understanding what is the environmental gain that must be obtained with urbanization processes, what are the acceptable urban and environmental parameters, without consolidating precariousness”.

Considering the growing recognition of the importance of the environmental dimension in the upgrading of precarious settlements, based on case studies of PAC Favelas in the metropolis of Curitiba, this article seeks to contribute to the debate, reporting the local experience and discussing advances and impasses in the urban treatment used in APPs.

Case studies: PAC Iraí and PAC Guarituba

Located in the neighbor municipality of Pinhais, PAC Iraí has two intervention polygons in areas of environmental fragility (Figure 1). The first, at the valley bottom of Palmital River,

Figure 1 – Location of PAC Iraí interventions



Source: Comec (2005); image adapted from Pinhais (2010). Translation: Rio=River.

between the neighborhoods Jardim Cláudia and Alto Tarumã, at the surroundings of Alphaville Graciosa condominium. As a critical point of flood risk, the area had already been the subject of the Environmental Sanitation Program - Programa de Saneamento Ambiental (Prosam) in the 1990s. The second, at the valley bottom of Atuba River, boundary with the municipality of Curitiba, Emiliano Pernetá neighborhood, between highway PR 415 and Tomazina street.

It is important to say that both polygons of PAC Iraí contemplate occupations on land remaining from regular and irregular allotments that were originally destined as free areas for environmental preservation purposes.

The situation before the works was one of socio-environmental precariousness: considering the total of 1,640 families contemplated, 747 of them lived in areas subject to the risk of flooding (Cohapar, 2009). Palmítal River polygonal was characterized by low population density in the APP, with

a predominance of mixed constructions comprising wood and brickwork, while the Atuba River polygonal had a high population density, with a predominance of brickwork constructions with varying degrees of constructive quality. The infrastructure also fluctuated, deficient in the most consolidated non-existent occupation and, with a great lack of basic sanitation in Palmítal polygonal. Figure 2 exhibits an overview of socio-environmental precariousness before the PAC interventions.

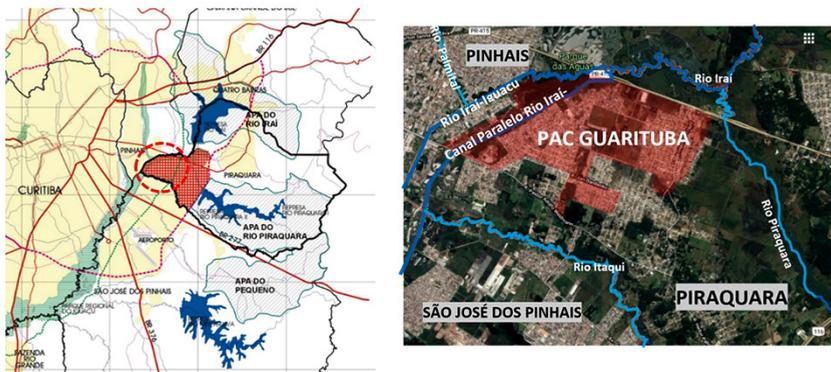
The second case study, PAC Guarituba, is located in the municipality of Piraquara (Figure 3), bordered by Pinhais and São José dos Pinhais, and corresponds to the main work of PAC Favelas in the state of Paraná, due to the volume of resources, the number of families and the strategic location in the Territorial Planning Unit - Unidade Territorial de Planejamento (UTP)⁴ of Guarituba, region of ground zero for the formation of Iguaçu River. PAC Guarituba includes a tangle of occupations in regular, irregular, clandestine and public areas.

Figure 2 – (A-B) Occupations in the APP of Palmital River;
(C-D) Occupations in the APP of Atuba River



Source: Cohapar (2009).

Figure 3 – Location of UTP Guarituba in the metropolitan east side
and PAC Guarituba



Source: Comec (2005); image adapted from Google Earth, in 2018. Translation: Rio = River.

With approximately 44 thousand dwellers, UTP Guarituba has more than 12 thousand buildings, of which 5,000 units are occupied irregularly. The lack of infrastructure in the river plain of the spring of Iguaçu River, characterized as highly susceptible to flooding, makes Guarituba the largest precarious irregular occupation in the water spring area of Curitiba.

Given that it is an intervention in the UTP, a space of territorial management shared by the state and city hall, the urbanization plan was initiated within the scope of the Coordination of the Metropolitan Region (COMEC) in 2004, being passed on to Cohapar in 2006. The upgrading became possible after changes in the zoning of Guarituba UTP (state

decree no. 6314/2006), which allowed greater population densification in the spring, that is, making urbanization and relocation actions possible for housing complexes located in Guarituba itself.

The situation prior to the works was socio-environmentally extremely precarious, implying the relocation of approximately 800 families due to the risk of flooding. As shown in Figure 4, Guarituba set was characterized by wooden constructions, and the infrastructure was deficient in parts of the occupation and non-existent in others, and the dwellers were so responsible for the improvised solutions of the infrastructures, such as street lighting and sanitation.

Figure 4 – Socio-environmental precariousness prior to the PAC works in Guarituba



Source: Prestes (2010).

Either in PAC Iraí or PAC Guarituba, the environmental dimension is revealed in the urban planning of upgrading as the “environmental recovery” axis, with the implementation of linear parks as the main project action. Environmental recovery is interpreted as the restitution of the physical space of the APPs, previously occupied by buildings, added to the recomposition of vegetation in the riparian forests, as will be illustrated below.

The basic upgrading project was developed by the government at the state level and the execution contracted by bidding lots. In addition to the environmental recovery axis (1), the urbanization plan of PAC Iraí and PAC Guarituba is structured in the following axes: (2) removal/relocation; (3) housing production; (4) infrastructure; and (5) land regularization. It is noteworthy that environmental recovery is one of the 22 components able to be contracted in the federal program,⁵ and may accumulate 5% of the transfers of the Union General Budget – Ornamentor Geral da União (OGU) for each contract.

By adopting the flood curves of the Metropolitan Drainage Master Plan as a design parameter for the relocation, instead of the 30m of established by the APP, the scope of these upgrading does not configure the search for minimum removal, but for the maximum restitution of the areas of restriction to be occupied in valley bottoms, with riparian protection ranges varying from 50m to 300m wide, as in the APP of Palmital river.

In Atuba River, which had a lower incidence of flood risk and a higher degree of consolidation of occupations, riparian forest bands with an average width of 50m were restituted. In PAC Guarituba, the situation is peculiar, because, in addition to restituting the APP of Iraí River,

the objective was to implement the APP of the parallel channel, a macro-drainage work, conducted between 1995 and 2002, which branched for 20 km the bed of Iguaçu River.

It is remarkable that Atuba, Palmital and Iraí-Iguaçu Rivers had their courses rectified in the mid-1960s, but still preserve land bed and slopes. A condition that, seen by the environmental dimension, corroborates the decision of the government for the relocation of families in the riparian bands, since, according to Denaldi, Ferrara and Silva (2016), removing dwellers, when the watercourse is entirely buffered or transformed in the rest of its extension, may not be justified, except in situations of risk to life.

In the case of Atuba River, 534 families were relocated to Jerivá Housing Set, while, in Palmital River, 213 families were relocated to sets in the neighborhoods Jardim Dona Joaquina 2 and Jardim Santa Clara (Cohapar, 2009). In the situation prior to upgrading, most households occupied land between dry meanders and the rectified bed of Palmital and Atuba Rivers. The fact that they are occupations in public areas has facilitated the process of relocation in PAC Iraí, compared to the legal-landholding node of relocations in PAC Guarituba, in which most occupations stem from irregular allotments, approved in the 1950s. Therefore, prior to the recommendations regarding the riparian preservation band of the 1965 Forest Code (Federal Law n. 4,771) and Lehmann Law (Federal Law n. 6766 of 1979).

In Guarituba, 694 families were relocated to the residential set Madre Tereza de Calcutá. And the rest of the families were resettled on contiguous land, but with resources from the Program PAC/FNHIS.

Producing housing to enable the relocation process corresponded to the costliest action of PAC Iraí, accounting for 57% of OGU transfers and 65% of the total value of the upgrading. In PAC Guarituba, the relocation accounted for only 14.5% of OGU's resources and 19% of the total amount. Such price variation is justified by the "land location" factor, in which, according to Villaça (2001), the commodity is the socially produced urban space and not the land itself.

Despite the variation in the value of land in the municipalities of Pinhais and Piraquara, in both case studies, housing production occurred concatenated with the process of relocation of the families. There was a convergence of political interests to the detriment of the old practice of opposing urban and environmental agendas. The integration of actors traditionally more aligned with the environmental or urban agenda (Instituto Água e Terra (Water and Land Institute), Conselho Gestor dos Mananciais (Spring Management Board), Secretarias de Obras e Urbanismo (Urbanism and Works Secretariat) in city halls, Comec, Cohapar, Sanepar) occurred, as the state government was the proponent of upgrading, starting to play the role of mediator of interinstitutional conflicts at the various scales of public administration.

Once the process of relocation of families has been completed, the "environmental recovery" axis focuses on the implementation of linear parks. In PAC Iraí, the objective was to transform 562,379.50m² of degraded areas due to urban occupation into requalified areas. An action that financially articulated the three governmental spheres, being BRL 1,398,653.06 (BRL = Brazilian Reais) of the OGU, BRL 222,852.00 of the State and BRL 543,603.33 of the city hall, totaling an investment value (in

Brazilian Reais – BRL) that corresponded to 4% of PAC Iraí (Cohapar, 2009). In PAC Guarituba, the objective was to operate in 357,369.98m² of degraded riverside areas and central urban voids. The investment value reached 5% of the total value of upgrading, corresponding to BRL 4,940,335.78, of which BRL 3,309,305.66 from OGU and the rest from local counterparts.

Between the spatial restitution of APPs and the implementation of linear parks

As previously described, the spatial restitution of the permanent preservation band in Atuba and Palmital rivers or the implementation of the APP in the parallel channel to Iguaçu River, implied the initial relocation of families. In both municipalities, the relocation process took place after peculiar land situations were negotiated in the legal sphere. The context of judicialization has been the main justification of the government for the delays in the execution of the works of the linear parks.

In Atuba polygonal of PAC Iraí, the landscape treatment is divided into southern and northern portions. The area of 86,004.98m² corresponding to the southern portion (between PR 415 and Vila União) was the first to be completed in 2019; while the area of 55,820.88m² (Mandaguaçu bridge to Tomazina street) of the northern portion is partially completed.

Although many demolished buildings were precarious and had their foundations anchored on the slopes of Atuba River, part of the demolished units in the APP presented good constructive

quality. Added to this was the fact that the dwellers live on the border with Curitiba. Thus, convincing families about the need for relocation represented a challenge to the project of the linear park of Atuba River, since the conventional treatment of drainage (channelization with river buffering) persists in the popular imagination as the definitive solution to flood problems.

But the maintenance of occupations in riparian areas is not always a satisfactory solution, and may cause the strangulation of the larger bed, a space necessary for the river to exercise its water dynamics. And, in the case of PAC Iraí and PAC Guarituba, the maintenance of the buildings would also not be justified by the availability of land for relocation.

The images presented in the sequence depict the physical-urbanistic transformations underway in the case studies, between 2010 and 2022. Although the restitution of vegetation is not complete, the intention is to demonstrate that the post-intervention reveals an environmental gain when compared to the pre-intervention situation.

Figure 5 depicts the northern portion of Atuba polygonal of PAC Iraí in the vicinity of Mandaguaçu bridge. The pre-existing street that bordered the riverbed on the left riverbank (belonging to the municipality of Pinhais) was extinguished, and its area was incorporated into the park space. This denotes a treatment more aligned with the sustainable

Figure 5 – Process of requalification in Atuba River – northern portion



Source: adapted from Prestes (2018).

management of rainwater, as opposed to the treatment with the implementation of valley avenues, such as the one observed on the right riverbank, belonging to the municipality of Curitiba.

The second set of images (Figure 6) shows the southern perspective depicted from Mandaguaçu bridge.

Figure 7 shows the transformation underway on the left riverbank of the parallel channel of Iguaçu River. Due to the scale of PAC Guarituba, we chose to use comparative aerial images. In this section of the intervention, the

removals were not only aimed at establishing the band of the APP in the channel, but also at redirecting the degraded areas by occupation to the guidelines of state environmental planning instruments, such as the Territorial Planning Unit (UTP) of Guarituba, which treats the area as an Occupation Restriction Zone (Zona de Restrição à Ocupação – ZRO) and Area of Special Regional Interest of Iguaçu River (Área de Interesse Especial Regional do Iguaçu River – Aieri),⁶ whose perimeter is delimited by the flood curve in a 100-year recurrence of Iguaçu River and the mouth of its tributaries.

Figure 6 – Requalification process in Atuba River – southern portion



Source: adapted from Prestes (2018).

Figure 7 – Institution of the APP in the parallel channel of Iguaçu River – year 2007 and 2015



Source: adapted from Prestes (2018).

After the restitution of the physical space of the preservation bands, the urbanization plan of the PAC interventions, in the “environmental recovery” axis, recommends that these riverside areas acquire a collective use character by the implementation of linear parks, which would articulate urban and environmental functions.

Seeking a multifunctional space is a satisfactory solution in order to break the notion of intangibility of the APP, which, according to Mello (2008), creates a paradox in urban space.

[...] on the one hand, the multiple urbanistic functions, and the effect of attraction that water bodies have on people; on the other hand, the legal provision that prevents the formal occupation of the margins of water bodies in Brazil, aiming at the preservation of their environmental functions. (p. 26)

The 3km-long Atuba linear park covers a quarter of the Atuba River extension in the territory of Pinhais. As previously stated, the project was divided into two phases. The first

covering the southern portion, between the highway PR 415 and Vila União, and the second covering the northern portion, between Mandaguaçu bridge and Tomazina street. The original project comprised a total area of 141,825.86m² distributed in massifs of native vegetation, areas with recovery of vegetation, bicycle paths and public equipment.

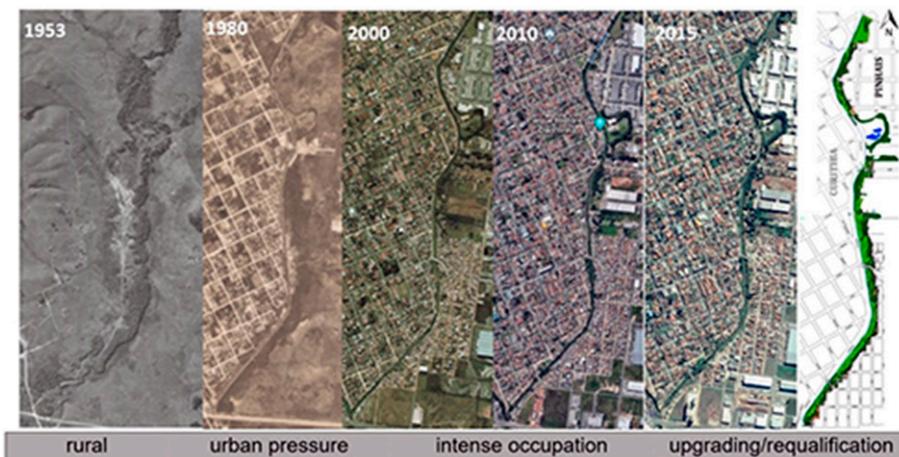
Figure 8 shows the physical-urbanistic transformation of the area of the linear park of Atuba River in the last six decades. As the re-naturalization of the original layout of the river was not an objective of urban treatment, the requalification aimed to achieve a landscape similar to that observed in 1980.

The construction of the linear park of Atuba River was paused in 2018, after the execution of the first stage of spatial restitution of APP, which corresponded to the relocation of

dwellers, demolition of buildings and cleaning of debris (Prestes, 2018). The reason for the embarrassment was the city hall's request to review the landscape project, prepared by the state level, in order to readjust it to local needs, especially with regard to urban control.

One of the urban control devices that could be implemented, according to Prestes (ibid.), was a space demarcating the transition between private areas and the APP. This urban element, which could be the bike path itself or a parkway, would act on two fronts: as a physical barrier inhibiting reoccupations and waste disposal, especially civil construction debris; and improving aspects of public security, since, for most of its length, the original design proposal of the linear park of Atuba River embraced only the funds of private lots. An urbanistic condition that could prevail

Figure 8 – Physical-urbanistic transformation in the linear park of Atuba River, 1953-2015



Source: Prestes (2018).

for many decades until the owners renovated their homes, orienting them to face the linear park. Meanwhile, alleys formed by high walls would limit visual range, increasing the sense of lack of security in public space. A condition that could result in the abandonment of the place by the visitors.

It seems the city hall has conducted a review of the project, and the 2km linear park deployed, between PR 415 and Apucarana street, had the spatial demarcation of public and private spaces. It is noticeable, compared to the original design, that the park received more equipment, such as multi-sport courts, playgrounds and an infrastructure for dog walking space called “Parcão.” And there was

a decrease in the number of areas that were expected to recompose the riparian forest. Thus, the urban function centered on leisure activities stands out in the landscape that has been materializing in the linear park of Atuba River.

In Palmital polygonal, the linear park is partially completed. With 2km of extension, it covers a third of the watercourse in the municipality of Pinhais and follows the same multifunctional principle of the linear park of Atuba River. In parts of critical flood situation, the space destined to the APP reaches 200m wide. The planned equipment is concentrated in a central area, which houses a sports gym, library, multipurpose rooms, janitor's house and playgrounds.

Figure 9 – Atuba River Linear Park



Photos: Prefeitura de Pinhais (2019); GPC (2021).

In this landscape project, a bike path separates public and private space, in addition to connecting collective spaces, including the pre-existing “football” fields in floodplain that were maintained in the implementation of Palmital River linear park. Figure 10 shows the physical-urbanistic transformation of the area since 1953, when Palmital River had not yet been rectified and the river plain was occupied by cattle pastures.

Compared to the landscape project implemented in Atuba River linear park, Palmital River project kept the emphasis on the environmental function in the park. This was probably due to the characteristics of the valley bottom of peaty, flooded soil and the presence

of massive native vegetation. The partial execution of leisure infrastructures, the bike path, and the lack of maintenance of vegetated spaces is still impacting the appropriation of collective use by the population. In recent years, signs of abandonment of the space have been observed, such as the presence of shrubland, littering and use of vegetated spaces for animal pasture.

The construction was resumed in 2022, with a contribution of BRL 1.5 million for the sports and cultural complex of Palmital River linear park (GPC, 2022). While the State will be responsible for the execution of the architectural works, the city hall will assume responsibility for the landscape treatment.

Figure 10 – Physical-urbanistic transformation in the linear park of Palmital River, 1953-2015



Source: Prestes (2018).

In PAC Guarituba, the linear park project has an area of 89,040.89m² distributed in 2km of the parallel channel of Iguaçu River. The execution was divided into stages: the first would comprise 77,644.00m² and the second would

cover 11,396.46m² in a critical flood area in the Occupation Restriction Zone (ZRO) of Territorial Planning Unit (UTP) Guarituba. Figure 11 shows a sequence of photos of the transformations in Guarituba linear park area since the 1950s.

Figure 11 – Physical-urbanistic transformation in the linear park of the parallel channel of Iguaçu River, 1953-2015.



Source: Prestes (2018). Translation: Rural=Rural; Pressão Urbana=Urban Pressure; Intensa Ocupação=Intense Occupation; Requalificação/ Urbanização= Requalification/Upgrading

After the establishment of the physical space of the APP in the parallel channel of Iguaçu River, the work of implementing the linear park infrastructures was paused. The reason alleged by the city hall was the readjustment of the landscape project to local needs. In the project elaborated at the state level, according to Prestes (2018), the design fragmented the collective spaces, not adopting mechanisms to connect them, such as a bicycle path. For the author, the circulation of frequenters attracted by the bicycle path infrastructure would contribute to the security aspect, by bringing more urban vitality to the APP. This would be fundamental to avoid actions of vandalism, degradation, and new processes of occupation of the area.

After 15 years of PAC Guarituba, the landscape along the parallel channel shows evident signs of lack of security and restart of the environmental degradation process, with the occurrence of waste disposal, including civil construction waste, presence of shrubland and lack of infrastructure, such as paving and public lighting. So far, it is not possible to say this area is a linear park.

In terms of the upgrading under study, the implementation of linear parks was intrinsic to the strategy of recovery of riparian forest vegetation. An action that met what was recommended by instruments of environmental planning in the metropolis of Curitiba, such as the Law of Springs. According to Table 1, the three parks would totalize 533,121.83m² of valley bottom areas in the process of environmental requalification, where it was intended to plant about 14 thousand seedlings of native vegetation.

However, if, on the one hand, the memorials advocated the recovery of native vegetation as one of the strategies of the environmental recovery axis; on the other hand, there was no institutional consensus that the project would be carried out in full as planned by the State; there was a lack of clarity on who would be the executor and whether the action would take place under the PAC program. The request to review part of the landscape projects by the municipalities denotes the different views between what is desired by the local government and thought at the state level. Accordingly, the restitution

Table 1 – Quantity of seedlings foreseen for planting in the linear parks of PAC Iraí and PAC Guarituba

Upgrading	Park name	Area (m ²)	Native trees (units)	Trees for landscaping effect (units)	Bush (units)
PAC Iraí	Atuba River Linear Park	141,825.86	3,986	526	6,636
	Palmital River Linear Park	302,255.00	7,740	637	5,080
PAC Guarituba	Guarituba Linear Park	89,040.98	2,810	150	1,636
Total		533,321.83	14,536	1,313	13,352

Fonte: Prestes (2018).

of vegetation has proven to be a point of incongruence between theory (predicted in the memorials) and practice (executed in the territory). As an example, it can be seen that the list of species⁷ specified in the projects of Palmital River linear park and Atuba River linear park was not included in the first ones, with provision only for the planting of grass in grass seedling (Prestes, 2018).

It is highlighted that the terms of PAC Favelas agreement, signed between the State and city halls, also contribute to the gap between planning and execution. City halls being responsible for the operation, maintenance, and conservation of the environmental recovery of degraded areas, while state actors were responsible for the execution of the environmental recovery axis. It should be noted that there was no discrimination of works under the terms of the PAC agreement, being only implied that the environmental recovery would encompass the programmatic content of the parks, which would imply the recovery of native vegetation, part of the landscape project.

In the case of the restitution of riparian vegetation in strategic areas for the environmental planning of the metropolis

of Curitiba, the attributions of the partner institutions should be well-defined under the terms of the PAC agreement. And also accompanied by monitoring and inspection. It is not enough to understand, verbally or implicitly, that in the post-upgrading period the municipalities would assume the planting of vegetation, since this result does not always occur, since the willingness to bind to the process oscillates between the municipalities.

One example is the experience from PAC Iraí, Palmital River polygonal, in 2017 the local initiative began with the planting of native vegetation seedlings, such as araucaria, and the installation of signs curbing the disposal of garbage. In 2022, the Secretariat of Environment of Pinhais also registered points of planting seedlings in the linear park of Atuba River. An integrated action with environmental education and the afforestation plan of the municipality of Pinhais.

However, the numbers reached in local initiatives are still low, compared to the thousands of seedlings targeted in the memorials of upgrading. This shows the different interpretations of needs and priorities among the actors of the institutional spheres in the urban-landscape treatment of APPs.

Figure 12 - Recovery of native vegetation in Palmital and Atuba linear parks



Photos: Prestes (2018) and Pinhais (2022).

Final considerations

This article aimed to analyze the urban landscape treatment of permanent preservation areas under upgrading by THE PAV in the east side of the metropolis of Curitiba, adopting as case studies PACs Iraí and PAC Guarituba.

In general, it was found that the structuring "environmental recovery" axis, present in the memorial of the interventions, resulted in the spatial restitution of the APPs bands, followed by the execution or prediction of the implementation of linear parks, associating the drainage and leisure functions. Thus, collective use becomes one of the key aspects in the requalification of the riparian band.

The strategy adopted in the case studies of the metropolis of Curitiba has already been adopted in other upgrading cases in Brazil, such as Cantinho do Céu, in São Paulo, in which the urban and environmental requalification proposed by urbanization, according to the author of the project, "[...] materializes in "everything at the same time", in which the actions occur simultaneously, orchestrated by the axis of the creation of public spaces" (Boldarini, 2013). In addition to the appropriation for collective use impacting the issues of security and urban control of APPs, linear parks also assist in solving drainage problems. Ferrara, Cardoso and Machado (2022) show the potential of parks for a decentralized approach to drainage in slum upgrading, associating leisure and risk management. Graciosa (2022) lists the prioritization of nature-based solutions and social participation as premises for drainage solutions in precarious settlements.

By collaborating with the damping and dissipation of the floods of the valley bottom of Iguaçu River, being a macro drainage structure characterized by the APP band free of occupation and subject to flooding without the factor of risk, the linear parks of Atuba and Palmital rivers approached the local and metropolitan scales, in addition to the programs PAC Favelas, PAC Saneamento and PAC Risco.

Another aspect to be observed in case studies is riparian vegetation, with regard to both of leisure and environmental drainage urban functions. Mello (2014) says that the conservation of natural riparian forest, or when it is no longer possible to reconstitute vegetation with native species, is best way for the full exercise of the environmental functions of the APPs. Miguez, Veróz and Rezende (2016) reiterate that the interception of precipitation in the canopies of trees, branches, trunks, and roots decreases surface runoff in the basin. Despite the importance of vegetation, case studies reveal that this has been one of the points of deadlocks between the theoretical field of plans and projects and the practical field of the execution of works, management, and maintenance of linear parks. This results in two alternatives: natural regeneration or planting by local initiatives. It should be noted that natural regeneration has an uncertain result in urban areas, because, in addition to the state of degradation of the APP, the process depends on variables, such as the level of soil compaction, presence of a nearby seedling bank, dispersing animals, etc. The experience of implementing the APP in the parallel channel of Iguaçu River, PAC Guarituba, shows that this is not always an adequate solution, as the combination of variables resulted in

the formation of brushwood vegetation, contributing to the aspect of abandonment and insecurity in the linear riparian space, which became the target of waste disposal and construction waste.

Local reforestation initiatives by planting native seedlings, such as in the linear parks of the Atuba and Palmital rivers, have been adequate in the restitution of riparian vegetation, especially when combined with environmental education agendas and municipal urbanization planning. This combination provides greater appropriation of public space by both the population and the local technical team.

Yet the restitution of riparian vegetation is an urbanistic treatment that should be applied sparingly in the linear parks of precarious settlements upgrades, because, safeguarding the physiographic characteristics of the areas, certain sections may even be exclusive to preservation, while others exercise the function of collective use for leisure purposes. The balance in the spatial distribution of urban and environmental functions breaks with the principle of intangibility of the APPs, opening space for urbanity, in addition to avoiding the proliferation of monofunctional linear parks.

Another aspect to be highlighted in case studies is the housing production axis. There was progress in relation to the traditional mismatch between the removal of the residences in APPs and housing production, first conducting the construction of the units and then the relocation of the families. It is

also observed that the relocations occurred in the same neighborhood or bordering areas, even with higher land value in these places. The payment of compensation or resettlement in neighborhoods far from the origin, due to the low value of the land, are not an effective measure, as they deny the right to the city and boost new occupations in other areas of environmental fragility better located. Thus, it is crucial that the housing component precedes the urban treatment action, and that the number of units produced is equivalent to the number of families indicated for removal in the APP.

Even with the impasses listed in this article, it is considered that the strategy of implementing linear parks contributes to the strengthening of a contemporary vision of APPs more aligned with the demands of the city, such as spaces for leisure and drainage. This results in the valorization of this element of nature in the urban landscape, to the detriment of invisibility (channeling of rivers, buffering and occupation of APPs by avenues).

It is concluded that linear parks are adequate tools for the environmental preservation of APPs, landscape enhancement, rainwater management and urban control in the post-upgrading of precarious settlements, provided that they are articulated with environmental planning at the city scale – macro-drainage and ecological corridors –, but without putting aside the demands and priorities of the local scale – community equipment, infrastructure, maintenance, etc.

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Notes

- (1) Territorial portion of the municipalities of Colombo, Pinhais, Piraquara and São José dos Pinhais is defined as the east side, area comprising the urbanized patch of the metropolis of Curitiba.
- (2) According to Mello (2014), the main functions performed by the APPs are: to receive and contain the sediments of the basin; to retain the waters in the micro basin; to ensure the natural fluctuation of water levels; to promote stability of the edges of the watercourse, to prevent silting; to allow side migrations of the watercourses; and to protect biodiversity and gene chains.
- (3) State law n. 8935/1989 brings numerous requirements for occupation in springs, especially in relation to allotments already approved and not implemented.
- (4) Territorial Planning Unit is an instrument of the Water Springs Law of the Metropolitan Region of Curitiba that seeks to discipline the land use in the space formed between areas pressured by urban occupation and the Environmental Protection Areas (APPs).
- (5) Cf. Brazil (2007).
- (6) State Decree n. 3742/2008 establishes the Area of Special Regional Interest of Iguaçu (Aieri), which, among numerous objectives, seeks to avoid irregular urban occupation, to configure biodiversity corridors and to recover the environmental functions of areas contiguous to the bed of Iguaçu River.
- (7) (a) primary succession: corticeira do brejo (*Erythrina crista-galli*), tapiá (*Alchornea sidifolia*), araçá (*Psidium cattleianum*), araucária (*Araucaria angustifolia*), jerivá (*Syagrus romanzoffiana*) and pau de pólvora (*Trema micrantha*) (b) secondary succession: guaçatunga (*Casearia sylvestris*), cedro rosa (*Cedrela fissilis*), ingá (*Inga edulis*), açoita cavalo (*Luehea divaricata*) and (c) late secondary succession: cuvatã (*Cupania vernalis*), cambuí (*Peltophorum dubium*), juvevê (*Zanthoxylum rhoifolium*) and tarumã (*Vitex megapotamica*).

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