Transaction Costs of Implementing the Transfer of Development Rights Program in Milan

Enzo Falco[a], Emanuele Garda[b] and Sina Shahab[c]

a) Department of Civil, Environmental and Mechanical Engineering, University of Trento, Trento, Italy;
b) Department of Engineering and Applied Sciences, University of Bergamo, Dalmine, Italy;
c) School of Geography and Planning, Cardiff University, Cardiff, UK

Abstract

Transfer of Development Rights (TDR) programs have been used in Italy over the last two decades for various purposes, e.g. to avoid expropriation. While previous research shows that implementing TDR programs at a regional level creates considerable transaction costs, there is no study concerning the costs generated by employing these programs at a city level. This paper addresses this gap through an analysis of the city of Milan's TDR program. Results show that transaction costs in a fully market-based TDR program are mainly related to TDR contracting, monitoring and creation, influencing the efficacy of the program.

Keywords: Transfer of Development Rights (TDR), Transaction Costs, market-based instruments (MBIs), planning policy, Milan.

1. Introduction

Transfer of Development Rights (TDR) programs are a commonly used planning policy instrument internationally, which is employed by planners and decision makers to achieve various planning and sustainability objectives, including environmental and agricultural land protection, heritage conservation (Falco, 2012; Guzle et al., 2020; Shahab et al., 2019), as well as ecosystem services provision (Harman and Choi, 2011; Martinico et al., 2014; Schwaab et al., 2019). TDR programs have spread out in many countries since the 1970s, including for

example Germany (Henger and Bizer, 2010), Switzerland (Menghini et al., 2015), The Netherlands (Janssen-Jansen, 2008), Hong Kong (Hou et al., 2020), and South Korea (Cho, 2002). Within TDR programs, development rights can be transferred from so-called 'sending areas' that are undesirable or less desirable for development from a public-policy perspective to designated areas for development that are called 'receiving areas'. Previous research shows that while TDR programs can be more efficient and equitable, compared to traditional regulatory instruments (such as zoning), implementing these programs generates considerable levels of transaction costs (Bruening, 2008, Messer, 2007, Chomitz, 2004). Shahab et al. (2018b) found out that in four county-wide TDR programs in the US state of Maryland, total transaction costs ranged from 13% to 21% of total TDR costs per transaction. Transaction costs in the context of TDR programs are the costs over and above paying the sale prices for Transferable Development Rights (TDRs) set by the market. These costs that are incurred by different actors involved, include negotiating TDRs sale prices, finalising contracts, meeting administrative requirements, and collecting information on potential TDRs buyers/sellers, and TDRs sale prices. Investigating policy-related transaction costs is important because high levels of transaction costs can negatively affect efficiency, effectiveness, and equity of any policy instruments (McCann, 2013; Qian et al., 2013), leading to 'sub-optimal' policy outcomes (Falconer and Saunders, 2002).

The costs associated with employing TDR programs at the city level have not been studied, despite previous research showing that their implementation results in considerable transaction costs at the regional level. City-wide TDR programs have substantial differences with those implemented at a regional or county level, as cities often face high land prices, land scarcity coupled with higher demand for development in a smaller spatial scale, and more brownfield developments, compared to a region or county. Moreover, the majority of TDR studies have been focused on the TDR programs implemented in the USA, and the

implementation of these programs in other countries has received limited attention. This paper addressed these gaps through uncovering the transaction costs associated with the implementation of the TDR program in the city of Milan, Italy. Specifically, the paper aims to develop a better understanding of a) when transaction costs arise in the process of implementing a city-wide TDR program, and b) by whom such costs are incurred. To do so, the transaction will be considered as the 'basic unit of analysis', in line with the theories of transaction-cost economics (Williamson, 1998), and the effects of transaction costs in different stages of implementing the TDR program will be investigated.

The case of Milan is particularly interesting as it is one of the few well-established city-level TDR programs internationally. Italy, as a whole, has seen a surge in the adoption and application of TDR programs at the city level in the last twenty years. Particularly, the case of Milan represents an urban context of intense experimentation where TDRs transactions are left completely to market dynamics of supply and demand, with minimal involvement from the local government in policy implementation (Serra, 2021, Falco & Chiodelli, 2018). It thus represents a significant example whose analysis has led to the recognition of potential shortcomings, barriers, and strengths leading to important lessons learnt. Indeed, the findings of our analysis reveal distinctive attributes of transaction costs pertinent to the city of Milan. While the established categories of transaction costs in the literature remain relevant, our analysis underscores notable differences. Specifically, transaction costs at the city level in Milan are notably influenced by factors such as land decontamination requirements, speculative market behaviour, high costs of TDR, and regulatory intricacies and updating of TDR Register due to speculative transactions. These aspects represent substantial deviations when compared with TDR programs operating at a county or regional scale.

The outcomes of this paper enable planners in Italy and other countries with similar policies to intervene in TDRs markets aiming to minimise transaction costs of implementing

city-wide TDR programs, which can ultimately lead to improved policy efficiency, effectiveness, and equity. The paper is structured as follows. It first reviews the literature on TDR programs, with an emphasis on the Italian experience, before presenting the concept of transaction costs and its relevance for planning policy in Section three. Section four presents background information and details about Milan's TDR Program to provide a better understanding of the policy context. Next, the methodology utilised in this research will be presented. The paper then goes on to discuss the transaction costs arising from different stages of implementing the case-study TDR program in Milan and how such costs are distributed among actors involved. The paper concludes with the implications of its findings for the design and implementation of TDR programs, whilst recommending ways to reduce TDR-related transaction costs.

2. Transfer of Development Rights (TDR) Programs

TDR programs are market-based policy instruments that generally function through the transfer of "one parcel's (sending area) development rights to the owner of another parcel (receiving area), which allows more development on the second parcel while reducing or preventing development on the originating parcel" (Johnston and Madison 1997, p. 365). Sending areas often include resources that a community wants to preserve (e.g., environment and landscape protection areas, agricultural land, open space, etc.), whilst receiving areas are areas suitable for development where development rights can be transferred and 'used' (for a detailed analysis of the functioning of TDR programs, see for example: Nelson et al., 2012; Walls and McConnell, 2007). TDR programs have been introduced and implemented in different countries for several decades (Falco and Chiodelli, 2018). After its first pioneering applications in the New York zoning ordinance in 1916 (Giordano, 1987), the concept of TDR encountered a comprehensive interpretation between the 1960s and 1970s (Lloyd, 1961;

Kaplowitz *et al*., 2008), and sustained a strong debate due to its applications (Carlo and Wright, 1977; Carmichael, 1974; Costonis, 1973; Gale, 1977; Rose, 1975; Woodbury, 1973).

In Italy, the vast majority of regional planning laws[1] make provisions for TDR programs to be included in master plans (Micelli, 2002; Stanghellini, 2021). In line with the debates and experiences promoted in many international experiences (Walls, McConnell, 2007; Kaplowitz et al., 2008; Henger, Bizer, 2010; Li, Gan, 2013; Shih, Chang, 2016; Serra, 2021), in Italy TDR programs have been implemented to achieve specific outcomes such as ensuring the equitable treatment of landowners, guaranteeing the provision of areas for public services and facilities, and avoiding the use of expropriation procedures (Micelli, 2011; Chiodelli, 2013).

3. Transaction Costs

The concept of transaction costs is first introduced to the study of firm and market organisation by Coase in his seminal paper, 'The Nature of the Firm', published in 1937. Transaction costs are often defined as all expenses associated with exchanges or transactions that are not directly tied to the creation of the goods being traded (Shahab, 2021; Webster and Lai, 2003). The definition of transaction costs has not been agreed upon, despite the fact that numerous authors have written about it, and there are also significant discrepancies between them. The concept has been used with many definitions and purposes, ranging from being used to refer simply to the commission that middlemen charge to a far more general term that can be used to compare the efficacy of various choices for allocating resources (Klaes, 2008; Demsetz, 1969). In transaction-cost economics, the transaction is the 'basic unit of analysis'

[1] In Italy, the Regions can approve their own laws of regional interest concerning different topics defined and granted by the national level. The various topics covered by these laws include urban planning, as well as enabling legislations regarding TDR programs. For Lombardy Region, where the case study of this paper is located, enabling legislations regarding TDR programs were introduced in 2005, when their application at a city level was approved.

(Williamson, 1998). A transaction can be defined as an agreement between two or more parties to exchange goods, services, and payments that can be organised in different ways.

'Transaction costs' has been used to analyse different processes in various policy-related disciplines including planning, where it was first introduced in Alexander's (1992) paper, A Transaction Cost Theory of Planning. Since its introduction to the planning literature, several studies have utilised the concept of transaction costs to explain and analyse various planning issues, for example informal settlements (Darabi and Jalali, 2019, Yuan et al., 2019), transport (Miharia and Woltier, 2010, Sager and Ravlum, 2005), infrastructure (Whittington, 2012), and property development (Wong et al., 2011). See Shahab (2021) for a detailed review of how planning studies have applied transaction-cost theory to explain and analyse various planning issues. The concept of transaction costs has also been employed to analyse different planning policy instruments, such as TDR programs (Hou et al., 2020, Shahab et al., 2018a, 2018b, 2019), ballot-box zoning (Staley, 2001), and land readjustment (Shahab and Viallon, 2019).

In analysing TDR programs in four counties in the US state of Maryland, Shahab et al. (2018b) highlighted that the transaction costs associated with the process of designing and implementing TDR programs, on the one hand, vary across time, and on the other hand, are not distributed evenly among the actors involved in and interacting with the TDR programs. Investigating the transaction costs arising from the TDR program in Hong Kong, Hou et al. (2020) concluded that taking account of such costs in analysing TDR programs can provide practical insights to improving the efficiency and effectiveness of TDR programs. Our review of existing studies on the transaction costs of TDR programs highlights the importance of taking account of transaction costs when designing and implementing TDR programs at national and regional levels. However, to the best of our knowledge, there is no research on the transaction costs arising from TDR programs at a city level, which may entail a set of different

characteristics, such as high land prices, high demand for development, and high levels of opportunistic behaviours.

4. Planning policy context: TDR Program in Milan

Among TDR programs that have been implemented at a city level in Italy, Milan represents an emblematic example for the objectives that have been sought, the concepts and technical elements that have been introduced, the spaces that have been involved, and the roles the 'market' and 'market agents' that have been played (Micelli, 2014; Vitillo, 2014). The case of Milan emerges as the context of major regional and national experimentation and application of TDR programs. It therefore represents a unique example from which potential risks and benefits can be assessed for a TDR program characterised by a strong asymmetry towards the market, with specificities not found elsewhere (Mills *et al.*, 2012).

Milan's TDR program was first introduced within the 2012 master plan (*Piano di Governo del Territorio*) and subsequently refined in its 2019 update, both to achieve 'traditional' objectives, such as equity between landowners and the acquisition of public areas, and to foster other practical intentions (e.g. urban and environmental regeneration). Within the new rules proposed by these plans, the amount of development rights assigned to areas affected by the TDR program is predetermined according to their characteristics (e.g. the size of the area) and the performance to be achieved. The principles, objectives, and procedures introduced since the 2012 master plan are characterised by a strong market-oriented approach, in line with the principles and rules introduced by the regional regulatory framework. In Milan, for example, development rights can be freely bought and sold at any time, without being forced into immediate application, resulting in a 'suspension' condition of potentially indefinite duration.

The master plan, as commonly envisaged, allocated development rights to private areas to be acquired for the implementation of public services such as urban parks, mobility spaces, and social housing. With regard to public utilities, the possibility of allocating development rights also for their construction on private areas has been provided for, without the transfer of ownership to the municipality, but with the signing of an agreement between the service provider and the local municipality. There are also situations in which transfer of development rights is allowed for those areas affected by specific restrictions that prevent TDRs use within these areas due to the presence, for example, of administrative or super-ordinate planning restrictions (e.g., buildings of heritage values). The master plan also envisaged the possibility of recognising rights with an incentive function for stakeholders, partially or totally transferable, to stimulate the execution of various types of interventions for: i) the energy efficiency of buildings; ii) the conservation and restoration of buildings of historical value; and iii) the organisation of architecture competitions.

Building rights can be used within the consolidated urban fabric, within projects of different sizes, promoting the principle of 'generalised transfer of development rights' (Falco and Chiodelli, 2018) that has so characterised Milan's experience. Moreover, in order to favour densification interventions of the urbanised territory in areas characterised by high levels of accessibility to public transport networks, the master plan has imposed the partial acquisition of development rights coming from sending areas by indicating a specific floor area ratio.

Finally, it should be mentioned that to accomplish the obligation imposed by the regional regulatory framework, the city of Milan activated the Development Rights Register. This tool, created and periodically updated at the public offices, which can be freely consulted by all citizens and stakeholders, is intended to record all TDRs transactions.

5. Methodology

A case-study methodology was utilised to analyse the process of implementing a TDR program through the lens of transaction-cost economics. The TDR program in the city of Milan (Italy) was selected as the case study for this research for a number of reasons: a) the program is implemented at a city scale, b) the program is well-established and there were a sufficient number of completed TDRs transactions over the last few years (Comune di Milano, 2023), c) the program had an adequate number of people who were involved in its design and implementation, creating a sufficient number of potential research participants; and d) the program is unique in Italy, and represents an extreme case, as it relies completely on market dynamics where TDRs transactions are not spatially bounded within the city, nor time limited.

This research collected both secondary and primary data. Secondary data sources include documents related to Lombardy regional planning law, Milan planning regulations, planning decisions, and the TDR register to gain a better understanding of the TDR program before conducting interviews. Primary data include data collected through semi-structured interviews and focus groups. Snowball sampling was initially adopted to identify potential interviewees. In addition to the snowball sampling strategy, we utilised different sources to approach additional potential interviewees independently. As a result, half of the interviewees were selected through snowball approach whilst the other half was contacted and approached independently with a response rate of about 30%. In total, ten semi-structured interviews were conducted between September and December 2021 with interviewees who had different roles with regard to the TDR program in Milan in different stages of the policy lifecycle. We aimed to achieve data saturation across all research participants. However, due to difficulty securing interviews with some categories, such as developers, saturation within each individual category may not have been reached. This represents a limitation of the current study. In particular, the interviews were conducted with: four planning officers from the city of Milan, two real estate agents involved in TDRs transactions, two architects involved in preparing

master plans and projects that involved exchanging TDRs, one property solicitor, and the president of a low-income housing association. In addition, two focus groups were conducted in November 2021 with 5-6 planning officers from the city of Milan who were directly involved in preparing the plan and managing the TDR program. The interviews lasted around 45 to 60 minutes while focus groups lasted around 75 minutes.

Informed by the theories of transaction-cost economics, the interview questions and focus groups discussions in this research were designed to address the research objective, concerning the transaction costs of Milan's TDR program. Open-ended questions were used to give research participants a degree of freedom to express their own experiences and opinions (Aberbach and Rockman, 2002). The main themes of the interviews ranged from introductory questions about interviewee's role and expertise, to TDR regulations and their clarity, identification of receiving and sending areas, role of TDR register and mechanisms for matching supply and demand of TDR, and price of TDR and impact on transactions. . The participants were asked to explain in detail the processes associated with the program, as they experienced it. Then, depending on the nature of the participants' experience, a number of subsequent questions were asked to gain a firm understanding of their experiences and the process they had to go through in a chronological sequence. For example, we asked the interviewed planning officers 'from receiving the initial TDR application until final transfer and contract, what has to be done in the implementation or administration of the TDR program?' To identify corresponding transaction costs for each activity or transaction, a number of subsequent questions were also designed and asked.

The interviews and focus group discussions were transcribed verbatim in order to avoid misinterpretation and minimise personal bias in the analysis of the main aspects. For this reason, all transcriptions were coded and analysed by the researchers separately and then results were compared and key themes were extracted. Then, a form of chronological sequences was

utilised. The chronological sequences approach, which is a type of the analytical technique of time-series analysis, seeks to trace phenomena over time (Yin, 2013). In line with the theories of transaction-cost economics, the transactions in the process of implementing the TDR program were identified in a chronological sequence, before explaining the transaction costs arising from each stage of the TDR policy lifecycle.

6. Analysing the implementation of Milan's TDR program from the perspective of transaction-cost economics

Implementing and engaging in a TDR program involves several activities. These activities vary depending on the role of actors, e.g., planners and policy administrators, landowners, and developers. From the perspective of transaction-cost economics, these activities can be considered as a series of transactions, given they involve an exchange of goods, services, or information. According to the collected primary and secondary data, we classified different activities/transactions into different categories, whilst identifying corresponding transaction costs for each category. This is in line with previous research on policy-related transaction costs in planning literature (Tan et al., 2012; Shahab et al. 2018a). Implementing Milan's TDR program begins when TDRs are allocated to land parcels within the master plan and ends when TDRs are retired or landed in development projects after being sold or transferred from landowners to developers. Table 1 outlines the categories of activities involved in Milan's TDR program, and the examples of their associated transaction costs. In the following sections, we take these categories in order and analyse when transaction costs arise in the process of implementing the program and who bears these costs.

[Table 1 here]

6.1 Transaction Costs in Activities Concerning Support and Administration

In this first category of activities concerning implementing Milan's TDR program, the planning department and the planning application office offer potential TDRs buyers/sellers pertinent information and administrative support in various forms that are connected to transactions that result in transaction costs. At this point, before any TDR is actually created as part of registering a TDRs certificate with the municipality or within the planning application process, the planners and administrators spend a considerable amount of time consulting mainly with prospective TDRs buyers and developers who are looking for potential sellers. Here, an important example of transaction costs concerns the support provided to developers and landowners in understanding the eligibility of receiving areas and the residual availability of TDRs on a specific sending area in the form of actual number of TDRs credits (expressed in square metres of Floor Area). As one of the planning officers pointed out, "*this was even more true at the very beginning of the TDR program in 2012 and still is for landowners of small lots who face greater challenges due to the lack of familiarity with the TDR program*". Another notable example of transaction costs, in terms of time spent on the task for planners and policy administrators at this stage, concerns creating, maintaining, and updating the official TDR register where all TDRs transactions are recorded. While the transaction costs generated by implementing the TDR program at this stage were mostly borne by planners and policy administrators, these activities led to reduced levels of transaction costs at later stages of policy implementation, in the form of the time and effort that has to be put into managing the program.

In the first phase of operation of the TDR program in 2013, planners and policy administrators incurred transaction costs including the time spent on preparing and approving various criteria and guidelines for the application of the program. The guidelines were necessary due to the conciseness of the indications provided by the regional regulatory framework, which merely mandated the adoption of the program, leaving the definition of the more specific technical characteristics to the cities. The establishment and upkeep of the

Register have thus become of great relevance to planners from a policy evaluation perspective. The TDR register is in effect employed for an *ex-post* assessment of the spatial effects of the TDR program, as a planning officer pointed out.

6.2 Transaction Costs in Activities Concerning TDR Creation

TDRs creation is the first step in the implementation stage of the TDR program that actively involves landowners and developers. These activities concern landowners and developers involved in development projects as opposed to more general contracting activities (next step) which may involve intermediaries (e.g., brokers), or landowners and developers interested in trading TDRs without an actual development project (see the next section). In TDR creation, the first step for landowners and developers is to determine eligibility and availability of TDRs allowances. Our research shows that this stage is associated with some major barriers and time-consuming activities for developers and the owners of receiving areas, especially at the beginning of the TDR program in 2012. As a planning officer pointed out,

"professionals such as architects and surveyors until about a year ago did not clearly understand how to calculate the actual amount of residual floor area that could land on their property through TDR, whilst respecting the Floor Area Ratio established by the master plan. Now things seem to be going a little better."

As a result, they looked for support from local planning officers, especially the TDR office, for determining the actual amount of TDRs that could land on their receiving areas, while eligibility of sending areas was more straightforward and did not raise any major transaction costs. However, the amount of TDRs that could land on receiving areas indicated by the master plan raised some issues, especially in the receiving areas with higher level accessibility (public transport nodes). In these cases, problems were caused, for example, by the complexity of managing and combining development rights generated by the receiving areas with those transferred from the sending areas.

At the earlier versions of Milan's TDR program, developers and landowners were required to hire a land use attorney/notary as it was unclear whether a TDRs ownership title specifying the amount of TDRs in possession was needed at the start of the planning application process. As a broker stressed,

"*this does not make any sense, as I am not going to buy TDRs, and register them with a notary, before I know whether a planning application is granted or not* [...], *moreover, notaries asked for additional information to owners of TDRs that certified land uses of sending areas before TDRs could be sold."*

As a result, landowners and developers incurred direct monetary transaction costs of around one thousand Euros to prove the possession of TDRs acquired from an eligible sending area through an extra step with a notary. However, as part of more recent changes to the program, this step is no longer needed and planning applications can be submitted without a TDRs certificate, which can be acquired later on before planning permissions are issued and projects approved. This policy change has resulted in a considerable reduction in the transaction costs associated with TDR programs for landowners and developers.

Within the TDR creation category, however, the required land decontamination activity has a major impact on the eligibility of sending areas identified in the master plan (for environmental and ecological purposes), and thus their potential inclusion in the TDR program. This is a requirement set out by the master plan regulations which state that before a sending area of this category, and its ownership, can be transferred to the local authority within the TDR program, the area must be decontaminated and only thereafter transferred to the local authority "*ready to be used*", as a planning officer pointed out. Conducting such land decontamination activities can lead to high levels of transaction costs (both in terms of direct monetary costs and time-related costs) that are borne by landowners and developers. As one developer in the social-housing sector argued, "*the issue of land decontamination is one of the*

most problematic issues of this procedure". Decontamination procedures are expensive and time-consuming, however figures were not provided during the interviews and focus group discussions. In addition to the direct expenses incurred for decontamination by the owners of sending areas, the procedure created additional uncertainties for developers and landowners with regard to the type and intensity of contamination, which in turn resulted in more lengthy procedures. In order to afford decontamination costs, several interviewees highlighted that landowners tend to phase the procedure and break up their land parcel into several lots that are dealt one at a time. In other words, the funds generated from selling the TDRs of decontaminated areas were used to continue the decontamination process of other areas.

Research participants also highlighted the non-idiosyncratic nature of TDRs and its impact on the transaction costs of the TDR program. Regardless of the location TDRs are originated from, they will be treated like any other TDRs in the market. In other words, the price of any TDRs offered on the market at any given time is theoretically the same, and there is no difference between available TDRs. This has led to TDRs to be a nonspecific commodity with a low level of 'asset specificity', i.e., the degree to which an asset or commodity can be redeployed to alternative uses and by alternative users without sacrifice of productive value (Williamson, 1988). According to transaction-cost economics, a low degree of asset specificity leads to reduced transaction costs. In the context of Milan's TDR program, this attribute of TDRs have resulted in reduced transaction costs through decreasing information collection costs (e.g., location and land use of sending areas), whilst making negotiation and finalising a price for TDRs a relatively straightforward effort.

6.3 Transaction Costs in Activities Concerning Contracting

While TDRs were perceived as being easily available for exchanges in the past, research participants argued that in the last couple of years, the search for sellers of development rights

has proven to be a complex and time-consuming activity in Milan. As three interviewees have stressed, it is hard to find available TDRs for purchase. This perceived condition is determined by a series of factors, including the absence of an official entity like a TDRs Bank called upon to facilitate the matching of supply and demand; the complexity of Milan's real estate market in terms of the high number of potential stakeholders, and speculation activities. With regard to speculation, TDRs seem to have become a liquid asset and have attracted considerable investment attention. As a planning officer stressed during the focus group discussions, "*TDRs can be involved in several transactions, sometimes up to five or six, before they are ultimately bought to be used and retired in a development project*". In other words, people might purchase TDRs without an intention to apply them to a development project, instead they hope to sell them for a higher price than what they bought at a later time. Therefore, the presence of opportunistic and rent-seeking behaviours by actors in Milan's TDR market is evident. According to transaction-cost economics, opportunism can increase the transaction costs of actors involved in a market.

As a consequence of speculation and other above mentioned factors, the price of one single square metre of TDRs has increased from around €250 in 2015 to around €600 in 2021. However, the scarcity of TDRs is argued by some research participants to be artificial. For example, one of the interviewed planning officers pointed out that "*there are still 100,000 square metres of TDRs that have yet to land*". This perceived lack of TDRs supply requires developers to hire a broker and pay a brokerage commission of around 3% of the total market value in order to find TDRs before planning applications expire. Moreover, as stressed by a broker we interviewed, "*it has become difficult to find a single seller with sufficient quantities of TDRs, forcing developers to contact and buy from several sellers*". This can be even more true for operators less familiar with these procedures or less involved in informal 'exchange networks', such as small property owners looking to expand their homes. This factor creates

extra transaction costs since developers need to buy from multiple sellers, therefore hiring more than one broker if needed, stipulating multiple contracts and paying multiple notary fees.

6.4 Transaction Costs in Activities Concerning TDR Retirement

This is the last step in the lifecycle of TDRs where traded development rights are finally put into use in receiving areas designated for development. Developers then use TDRs in their development projects to implement the densities allowed for by the master plan zoning regulations. As far as TDR retirement is concerned, this set of activities do not have relevant impacts on developers and landowners. In fact, once the needed TDRs are acquired, and all the activities in the previous steps are performed, the process goes rather smoothly and does not raise any particular issues linked to TDRs use for developers. On the other hand, the situation is rather different for planners and policy administrators who are involved in many activities related to TDRs and specifically to the updating of the TDR Register.

The need to record all TDRs transactions in the public TDR Register, specifically set up by the city in 2013, implies constant efforts and costs on the part of the local administration as a support activity. According to some of the interviewed planning officers, the TDR Register has become a "*complex burden to be periodically updated according to the frequent transactions that totally or partially free up the sending areas"*. For landowners and developers, on the other hand, the TDR Register is perceived as an additional tool and administrative burden in the planning application process compared to traditional planning applications that do not involve TDRs transactions. Therefore, the costs for these actors can be mainly expressed in the time it takes both to understand the mechanisms of the Register functioning and to produce the documentation required to update it.

However, since updating and maintaining the Register is necessary after every TDRs transaction, this assumes particular relevance when TDRs are actually retired and used. Linked

to Register updating, during our focus groups discussions the participants raised a specific question concerning identification of receiving areas where TDRs land. In fact, whilst sending areas are always defined and identified in the Register along with the quantities (square metres) of TDRs generated, receiving areas are not included in the Register. Due to this, the policy administrators perform an *ex-post* and ad-hoc identification of receiving areas through a long and complex process, which involves several offices (e.g., Planning department, planning application office, TDR Office, environment office) and in turn has an impact on the monitoring and evaluation step. As a planning officer stressed,

"*we started years ago with a simple Microsoft Access file which we are currently still using. It is clear that we need a specific software to manage and update our TDR Register and Program, on which we are currently working, to integrate the work of different offices and see where and how (i.e., land uses) TDRs have landed"*.

Finally, after TDRs are transferred and retired, in some specific instances ownership of sending areas is transferred to the municipality. This occurs especially for privately owned sending areas intended to be used for the construction of new public facilities (e.g. public parks). This transfer of ownership requires a contract that is stipulated by a notary. The municipality incurs extra costs in relation to this and to the actual management and maintenance of the acquired sending areas.

6.5 Transaction Costs in Activities Concerning Policy Evaluation and Monitoring

The main considerations to be mentioned with regard to the latter set of activities can be circumscribed to two different topics. Firstly, it was possible to recognise a kind of periodic monitoring of the implementation of the TDR program provided for in the master plan carried out 'informally' by the public offices thanks mainly to the introduction of the Register. This monitoring activity, as far as we could learn from the interviews, consists of the reporting of

the various transactions and their geolocation through a mapping system that is not yet publicly available or known outside public offices. The latter comment emerged in an interview with a planner who even complained about the *"lack of monitoring by the planning authority"*.

Besides the periodic efforts required of public office staff, particularly in terms of time, no significant transaction costs could be identified for this type of activity. Whereas for private actors this first topic does not constitute explicit transaction costs. However, the absence of an official and public mapping available to TDR market actors can be seen as a critical factor in facilitating the exchange of development rights. Secondly, another form of monitoring TDR policies is the one that usually occurs during the modification and updating phase of the master plan. This specific moment is of relevance as it is necessary to verify the effectiveness of the previous framework of objectives, tools and rules, based on implementation, to then define the goals and policies of the new master plan.

In terms of transaction costs, there is a direct and indirect involvement of different categories of actors, for example, in public meetings aimed both at sharing the contents of the new master plan and at supporting the consolidation of the final documents thanks to their suggestions and proposals for integration. These are meetings organised by the municipality for leaders of the various local and regional associations and institutions, often also open to individual professionals or ordinary citizens. After the approval of the master plan, both public officials and private operators need to stay up to date and receive training to understand TDR criteria and regulations. This training process concerned all actors particularly after the approval of the 2012 master plan. As explained above, this specific master plan, which introduced these mechanisms for the first time in the city of Milan, was considered as a point of disconnection with the previous versions, and a highly innovative step for the urban planning procedures of this complex metropolitan context.

6.6. Limitations

The study we have conducted presents some limitations that concern data collection, generalisation of results, and spatial and regulatory context. With regard to scope of data collection, despite efforts to collect data through interviews and focus groups, the study's scope may have been constrained by the number and diversity of participants. The perspectives of certain stakeholders, such as community members or environmental advocates, may not have been adequately represented.

With regard to the second and third limitations, while Milan's TDR program was chosen as the case study due to its unique market dynamics and well-established nature, it still represents a unique case (extreme case as mentioned). Results can thus be hard to transfer to other contexts since TDR rules are unique, especially the complete reliance on the market and the lack of time and spatial limitations for TDR use. This in turn has an impact on the generalisation of findings due to the nature of the TDR programme. This limits the generalizability of the research outcomes. However, despite these limitations, the study has important policy implications and recommendations, which are discussed in the next section.

7. Discussion and Conclusions

Transfer of Development Rights programs use market mechanisms to encourage exchange of development rights and are proposed by planners and economists as an alternative to regulatory policy instruments, such as zoning, with the promise that these programs achieve more efficient and equitable outcomes. In theory, they lead to a win-win situation, as sending areas can be preserved with no or limited public funds, whilst encouraging development in receiving areas where developers can access higher densities, thereby higher profits. In practice, employing these programs can be complex with mixed degrees of success. Previous research, largely on the county-wide TDR programs in the US, shows that TDR programs, if

not designed carefully, might not achieve their goals, or might even fail to create an active market for development rights (Machemer and Kaplowitz, 2002; Fang et al. 2019). Previous studies also show that these programs can be associated with considerable transaction costs, negatively affecting their policy effectiveness, efficiency, and equity (Shahab et al. 2018b; Hou et al., 2020). However, little is known about transaction costs of TDR programs implemented at a city level. This paper aimed at addressing this gap through developing a better understanding of the process of Milan's TDR program from a transaction-cost perspective.

According to our empirical research, the process of implementing the TDR program in the city of Milan involves five categories of activities, as discussed in previous research at the regional level, including support and administration, TDR creation, contracting, TDR retirement, and policy evaluation and monitoring. While public parties primarily bear the transaction costs of activities related to support and administration and policy evaluation and monitoring to follow the spatial effects of the TDR programme within the city's boundaries , private parties bear the majority of the expenses connected with TDR creation, contracting, and retirement. While uncertainties around TDRs prices and finding TDRs sellers create considerable transaction costs in the activities associated with contracting, meeting the requirements of TDR administration, such as legal documentation and land decontamination, are the main sources of transaction costs in TDR-creation activities in the case of Milan. The requirement of conducting land decontamination, if needed, is the single most expensive transaction involved in creating TDRs. At the city level, in general, where available land is scarce and brownfield redevelopments are more frequent and largely foreseen by planning regulations, this requirement needs to be carefully considered in other urban contexts with a less dynamic real estate market as it can significantly impact feasibility of the TDR programme.

Our research has also shown that the activities concerning TDR retirement are relatively straightforward as there is a clear process in place for how purchased TDRs can be applied to development projects, which has led to reduced transaction costs at this stage.

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We found that while there are a lot of similarities between the process of implementing TDR programs at a regional level (e.g., TDR programs in the US) with those implemented at a city level (e.g., TDR programs in Italy, including Milan's program), there are also some key differences. Unlike previous TDR studies that did not find evidence supporting the presence of major opportunism and rent-seeking behaviour among parties involved in county-wide TDR programs, our research showed that such behaviour is an evident characteristic of Milan's TDR program, particularly among the TDRs buyers, and can be a risk for TDR programmes designed and implemented at the city level. The results of this study are consistent with Alexander's (2001) argument on the higher complexity of buyers' behaviour, in comparison to those of sellers. The risk is that TDRs become the currency of development and because of their increasing value over the last few years, many people purchase them, at their own financial risk, with the hope that they will become more valuable in future. Such speculative behaviour results in increased prices for TDRs through creating an artificial scarcity for these development rights, whilst making the process of finding required TDRs more challenging and time-consuming for development. In other words, the rent-seeking and opportunistic behaviours of some of the TDRs buyers have created considerable transaction costs (Williamson, 1993; Coggan et al., 2013). In addition, higher TDRs prices have led in the case of Milan and in general may lead to increased development costs, affecting the financial viability of development projects and housing affordability, as purchasing TDRs is one of the main ways of securing high-density developments in the city.

The findings of our study allow us to draw policy recommendations for reducing transaction costs and renting-seeking behaviours which can be taken up in different cities and jurisdictions. Firstly, as far as planners and policy administrators are concerned, a spatially explicit platform in the form of a public WebGIS could increase transparency and effectiveness, favour matching of TDRs supply and demand, and facilitate management of the TDR Register and monitoring of the spatial effects of the program, also in terms of correspondence with the strategies and specific objectives of the master plan. Along the same line, the TDR Bank could be established to favour matching of TDRs supply and demand and thus reducing transaction costs and perhaps TDRs price. Secondly, TDRs transactions are currently not spatially bounded nor time limited. To avoid speculation and rent-seeking behaviour it might be appropriate and helpful to impose a time limit for TDRs retirement and application in a development project. This might in turn result in higher risks for developers and investors but could contribute to TDRs price containment and to increased availability. Thirdly, the process of implementing Milan's TDR program necessitates extensive administrative support. Policy guidance could be made available and drafted beforehand to provide guidance in advance, in the form of a list of FAQ for example, rather than on a one to one basis. Finally, TDRs price containment could also be achieved by introducing publicly owned TDRs onto the market. This has actually been done by the city administration of Milan for the first time earlier in December 2022 through a public auction for the sale of 32,000 square metres of floor area (Comune di Milano, 2022). In consideration of our results, future research avenues might explore the impact of TDRs on the financial viability of social housing projects and the actual spatial effects produced by the implementation of the TDR Program in terms of development of receiving areas and strategy for public acquisition of sending areas for environmental and ecological purposes.

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Data Availability Statement

The data set of transcripts of all conducted interviews and focus groups is available upon request.

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