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ECO-CITIES AND TRANSFERABLE DEVELOPMENT CREDITS

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Abstract: Some aspects of what is often considered to be good planning include the protection and promotion of green space and heritage assets, the development of infrastructure that benefits the public, and compact city development. However, balancing these aims with economic development can be challenging. Planners may wish to create a public benefit in one area, for example, whilst developer profits may be generated in another. How can planners encourage developers to contribute to public benefits on the other side of the city, or at the far end of the region? This essay explores 'Transferable Development Credits' (TDCs), a tool being used in the US in cases where more traditional approaches may struggle. This market-based planning mechanism is amongst the best established of its kind, and the paper highlights many lessons that have been learned as a result.

Keywords: sustainable development, Transferable Development Credits, market-based planning tool.

Over 320 cities around the world use a market-based regulation called transferable development credits (TDC) to help create or preserve various components of sustainability including compact urban form, dense neighbourhoods, green infrastructure, eco-mobility, environmental quality, local food sources, and a sense of place. TDC provides these community benefits using private sector development profits rather than taxation, exaction or sheer governmental authority. This should make TDC particularly appealing in an era when electorates want healthy, vibrant cities but lower taxes. Yet the percentage of jurisdictions using TDR remains low for reasons that this paper discusses after a brief tutorial on the TDC mechanism.

1. How does TDC work?

A TDC program is created when a government adopts TDC legislation for inclusion in its zoning or land use regulations. The TDC legislation allows additional development potential in places that are appropriate for additional growth, called receiving areas, when developers provide predetermined off-site public benefits in places called sending areas. The TDC legislation specifies the type and/or location of sending sites based on the planning goals that the jurisdiction seeks to accomplish with the program. Most TDC programs aim to preserve environmental areas, farmland and historic landmarks. However, TDC programs can and have been used to protect or create a wide range of public improvements including affordable housing, performing arts theaters, concert halls and traditional infrastructure as well as green infrastructure such as greenways, parks, trails, wildlife habitat, floodplains, greenbelts and scenic views (Daniels & Daniels 2003; Nelson, et al., 2012; Pruetz 2016a; Roddewig & Inghram 1987).

In a classic TDC program, when a property owner voluntarily preserves or creates a community benefit as specified in the legislation, the jurisdiction issues a form of currency which, in this paper, is known as a transferable development credit or TDC. The sending site owner is motivated to do this by the ability to sell the TDC to receiving site developers (and in many programs to intermediaries including a TDC bank operated by the jurisdiction).

On the other end of this transaction, the jurisdiction's land use regulations establish a baseline level of development potential in receiving areas which developers can reach without having to participate in a TDC program. However, to exceed this baseline, receiving site developers must comply with the TDC legislation, which typically requires the developer to retire a TDC for each unit of development above baseline. Depending on the nature of the receiving site, the bonus development might be additional residential density, floor area, land coverage, building height or some other regulatory modification that developers want. Bear in mind that the bonus development potential available via TDC typically has an upper limit specified in the jurisdiction's land use regulations. Receiving area developers are motivated to acquire TDCs by the extra profit generated by the bonus development. Logically, if the additional return on investment made possible by TDC does not exceed the additional cost of the TDCs, receiving area developers are unlikely to choose to exceed baseline.

This paper uses the term 'transferable development credits' rather than 'transferable development rights' to emphasize that the main purpose of TDC is not to shield governments from lawsuits alleging that their land use regulations have illegally infringed private property rights. In fact, jurisdictions within the United States are advised not to rely solely on TDC for legal cover in the event that a land use regulation has gone so far that it effectively 'takes' private property for a public purpose without just compensation. Instead, most TDC programs are adopted to give sending area property owners the option of voluntarily reducing or eliminating development potential when they choose to sell their TDCs. Hopefully, use of the term

transferable development credits will also reduce any tendency to assume that this tool is primarily applicable to US jurisdictions due to the widely held misconception that the US Constitution guarantees a right to develop private property. Although the United States has more than its share of TDC programs, this tool is applicable in countries around the world as a supplement to the traditional means of implementing a wide array of community goals.

2. An Illustration of the TDC Mechanism

Although TDC is used to preserve or create a wide range of community benefits, a majority of programs aim to protect farmland, natural areas and rural land in general from sprawl, a phenomenon that squanders over one million acres of land each year in the United States alone. Consequently, this paper uses a rural land preservation program to illustrate how a traditional TDC mechanism works.

In this hypothetical example, a city's TDC legislation designates an area planned for agricultural preservation as the sending area. In the sending area, on site development is limited to a density of one dwelling unit per 40 acres. Sending area landowners are free to decline the TDC option. But those who agree to participate record a legal instrument with the property deed which will permanently limit the property to land uses and levels of development that achieve the city's goals for the sending area. This legal instrument, typically called a conservation easement in the US, remains in force regardless of future changes in ownership and regulations (Pruetz 2012).



Image: The TDC program in Montgomery County, Maryland has permanently preserved most of the green wedges of its green structure plan. Credit: Rick Pruetz.

When the conservation easement is recorded with the deed for the sending site, the city issues transferable development credits (TDCs) to sending site owners. The TDC legislation includes a formula specifying the number of TDCs to be issued. In this hypothetical example, the sending site owners are issued one TDC for each five acres placed under easement even though on site development is limited to one dwelling unit per 40 acres. An economic study conducted prior to the adoption of the hypothetical legislation estimated that this TDC allocation ratio would likely result in a TDC value that is attractive to sending area property owners as well as receiving area developers. Sending area landowners are motivated to agree to the permanent restriction of development potential by the ability to sell these TDCs, either directly to receiving area developers or to intermediaries such as a TDC bank (see below).

Ultimately, TDCs are purchased by developers in receiving areas designated by the TDC legislation because they are planned for growth and a level of infrastructure needed to accommodate the additional development available via TDC. Within the receiving zones used for this hypothetical example, the TDC legislation establishes a baseline of three dwelling units per acre, meaning developers can build at or below a density of three dwelling units per acre without using the TDC option. However, if developers choose to exceed this baseline, they must retire one TDC for each additional single-family residential detached dwelling unit or two multiple-family dwelling units. The hypothetical TDC legislation allows more multiple family and single family units partly to incentivize compact development and partly because the economic study done prior to adoption indicates that receiving area developers are able and willing to pay more for bonus single family residential dwelling units. Maximum development in the single-family residential portion of the hypothetical receiving zone is limited to seven units per acre. Consequently, a total bonus density of four units per acre is achievable when developers choose the TDC option.

TDC shares some features with other land use regulations, sometimes known as incentive zoning or bonus density, which allow additional development potential when a developer adds community benefits to the same site granted the additional development. For example, many cities allow bonus density to a project that incorporates a specified percentage of on-site affordable housing units. But a distinguishing feature is that TDC creates community benefits at a sending site that is separate from the receiving site where the bonus development occurs. In some cases, the sending and receiving sites are close to one another and in other programs these two sites might be on the other side of the city or at the far end of the region depending on the goals of the TDC legislation.

3. TDC banks

In some TDC programs, reduction of development potential at the sending site and the increase in development potential at the receiving site is approved simultaneously, an approach that simplifies administration but complicates transactions. Consequently, many jurisdictions separate the issuance of TDCs to sending area property owners from the approval of TDC use at a receiving

site. This allows greater flexibility since transfers of TDCs can occur over time and between multiple parties using additional instruments whenever TDC ownership changes.

Separating TDC issuance from TDC extinguishment also allows the formation of TDC banks. TDC banks are governmental entities that use public funding to buy TDCs and hold them for eventual sale to receiving site developers. Although essentially an accounting function, TDC banks can greatly improve program effectiveness. For example, three of the four most successful US TDC programs have a TDC bank. The TDC bank in King County, Washington sells TDCs that were purchased using property tax revenues and uses the proceeds to buy more TDCs, thereby converting what would otherwise be a one-time use of public money into a perpetual revolving fund for preservation. A majority of the 141,400 acres protected to date by the King County TDC program were saved by the TDC Bank. Similarly, Palm Beach County, Florida used funding from voter-approved bonds to buy TDCs from 35,000 acres of environmentally-sensitive land and now sells these TDCs for as much as \$50,000 each, using the income to enlarge and maintain its nature preserve system (Nelson et al. 2012; Pruetz and Standridge 2009).

TDC banks give jurisdictions the ability to target the preservation or creation of high priority benefits rather than letting receiving area developers choose where to buy TDCs (a choice that logically favors low-priced TDCs). Banks also offer receiving area developers an alternative to negotiating directly with sending area property owners and often help establish TDC prices by conducting initial and periodic TDC purchases and sales. TDC banks can also counteract economic cycles, buying TDCs during recessions and selling them when development resumes. In addition, TDC banks often market TDC programs, administer transfers and facilitate individual transactions. However, relatively few TDC programs have banks, primarily because banks traditionally require public capitalization, a task that is politically and fiscally difficult in many jurisdictions.

4. TDC innovations

Pioneering TDC programs offered additional residential density or bonus floor area as the only incentives to buy TDCs. Today, TDC programs are more likely to tailor the incentives to the needs of specific receiving area developers. Consequently, in addition to bonus density and floor area, an increasing number of jurisdictions motivate developers to buy TDCs with incentives like additional building height, lot coverage, traffic generation, wastewater flows and bonus floor area within an individual residential dwelling unit as well as special parking requirements and expedited project approval. Similarly, while the goal of preserving farmland, environmental areas and historic landmarks remains popular, TDC programs have increasingly expanded qualified sending areas to include the creation of parks, trails, affordable housing, performing arts centers, convention centers, scenic views, green infrastructure and other community benefits proposed in municipal plans.

Most programs allow bonus development only when receiving area developers retire actual TDCs. However, at least 25 jurisdictions now give receiving area developers the option of compliance using a density transfer charge (DTC). DTC is a monetary payment that the jurisdiction reserves exclusively for the same purpose as an actual TDC. In other words, a developer in the hypothetical example above might choose to make a cash payment as stipulated in the legislation rather than find, buy and extinguish actual TDCs. DTC relieves developers of having to buy TDCs directly from private property owners, making this option similar to buying actual TDCs from a TDC bank. But, TDC banks must initially be stocked with TDCs, a task traditionally accomplished with public funding. For political and fiscal reasons, many jurisdictions resist using tax dollars to capitalize a TDC bank. DTC circumvents that resistance and can address other issues as well. Since the DTC requirement is posted in advance, developers can begin planning their projects knowing that they will be granted bonus development potential at a known price. In addition to certainty, DTC relieves developers of the time and expense needed to find, negotiate and buy actual TDCs, an effort that developer of smaller projects may particularly want to avoid. In Charlotte County, Florida, small developments tend to use DTC while major developments continue to comply using actual TDCs (Pruetz, 2016a), likely because large development firms have the resources to find TDC bargains while smaller firms would rather make a DTC payment and avoid the extra work. However, this rule of thumb does not always apply: even major developers in Livermore, California, chose to exceed baseline using the DTC option (Nelson et al. 2012).

Sound planning principles have always advocated compact, efficient cities surrounded by healthy, productive countrysides. Regrettably, actual planning often lost sight of those principles in the second half of the last century, particularly in the United States, where planning for automobiles instead of people induced rather than contained sprawl. Fortunately, a return to sanity has been advocated under various banners such as New Urbanism and Smart Growth. These movements promote a return to compact, mixed-use growth with community edges clearly defined by permanently preserved agricultural greenbelts and wildlife corridors (Local Government Commission 1991). To achieve these goals, SmartCode, a free, model zoning code popular in the US, institutionalizes TDC baselines and bonuses in its zoning district template. SmartCode essentially reminds planners to use land use regulations to implement the preservation and community benefit goals of their plans in addition to development objectives.

5. TDC and sustainability

Sustainable cities promote energy-conserving buildings, efficient infrastructure systems and compact, mixed-use development patterns that allow pedestrian, bicycle and transit linkages (Nelson 2013). But for cities to produce these positive outcomes, they must also be attractive and inviting places to live. Many TDC programs aim to improve urban livability by preserving historic character and creating the parks and cultural institutions that enhance quality of life. In 1968, New York City adopted the first US TDC program to preserve historic landmarks. New York City has since then adopted separate TDC programs to save its historic South Street Seaport, revitalize

the Broadway Theater District, add greenspace to a former rail yard and help convert an abandoned elevated railway into the popular aerial greenway known as the High Line (Nelson et al. 2012; Pruetz 2016a). The TDC program in San Francisco has preserved 112 historic landmarks, helping that city protect its unique character (San Francisco, 2013). Seattle, Washington, has used its TDC program to create parks, preserve landmark theaters and help finance its symphony concert hall (Nelson et al. 2012).

More than half of the over 320 TDC programs that I know of are designed to protect environmental resources, farmland and rural landscapes (Nelson et al. 2012; Pruetz 2016a). This green infrastructure benefits cities by protecting water supplies, local sources of fresh food and accessible outdoor recreation. Some TDC programs promote infill redevelopment and urban revitalization by surrounding urban areas with permanent greenbelts, thereby curbing sprawl and encouraging cities to grow up rather than sprawl out into the countryside.

TDC helps reduce the greenhouse gases responsible for climate change by attracting people to live in cities and promoting compact urban growth (Nelson 2013). In addition to greenhouse gas mitigation, TDC also helps cities to adapt to climate change by transferring development potential from areas that are increasingly vulnerable to wildfires, floods, landslides and rising sea levels. The TDC program in Pitkin County, Colorado encourages landowners to voluntarily forego development of rural land where heat, drought and pest infestations are creating conditions for catastrophic wildfires (Pitkin County 2012). In California's Malibu Coastal Zone, a TDC program targets the elimination of vacant building lots in rugged terrain subject to the floods and mudslides that inevitably follow wildfires (Pruetz 1997). In Belmont, California, a TDC program promotes the elimination of development potential in areas prone to landslides, a hazard likely to become more prevalent as climate change generates increasingly severe rainstorms (Matthews 2014). Some coastal TDC programs that were primarily developed to protect habitat and recreational resources but are now also being used to adapt to sea level rise and increasing storm intensity. For example, TDC programs in Largo, Florida, Charlotte County, Florida and other seaside jurisdictions aim to reduce development potential near shorelines that are increasingly vulnerable to storm surge (US Environmental Protection Agency 2013).

6. Why do relatively few cities use TDC?

To return to the question raised at the start of this paper, if TDC can use the proceeds of development to pay for many of the components of sustainability, why do relatively few cities use this tool? In response, 665 US planners replied that they consider TDC to be experimental and that they preferred to rely on traditional zoning to implement their plans. Ironically, most of these survey respondents admitted that they did not expect to achieve all their land use and preservation goals using current regulations and public funding levels (Pruetz 1997; Pruetz 2013).

Despite the reservations expressed in that 1997 survey, there are now over 283 TDC programs in the US (Pruetz 2016a). However, this US figure may exceed the number of TDC programs in all other countries combined. A review of planning publications found only 37 programs in 11 countries outside the US in countries such as Australia, Brazil, Canada, China, France, India, Italy, Japan, Mexico, Spain, and the Netherlands (Pruetz 2016a). TDC may have less appeal outside the US because of the previously-mentioned misunderstanding that TDC is primarily a technique used by US jurisdictions to provide legally-required compensation for regulations that restrict private property (Renard 2007). As discussed above, US jurisdictions are advised not to rely exclusively on TDC for legal protection from a taking challenge which is a property owner's claim that a regulation has effectively taken private property for public use without just compensation in violation of the US Constitution (Pruetz 2003).

Most TDC programs in the US aim to incentivize the voluntary implementation of planning objectives. In some cases, these programs offer TDC as a gesture of fairness to the owners of properties subject to restrictions designed to protect certain community benefits such as prime farmland or sensitive watersheds. The availability of TDC also helps build political acceptance for regulations that might not otherwise be possible. Public support is essential in all democracies, regardless of the extent to which private property rights are enshrined in law. European jurisdictions, which have traditionally relied on regulations alone, may increasingly want to offer compensation to property owners in order to permanently achieve goals that are only temporarily accomplished by regulation (Spaans et al. 2008). Private property owners impose pressure on elected officials even in command and control land use systems. For example, the government of New South Wales, Australia, retreated in the face of property owner objections by withdrawing a 'green zone' proposed for private land that theoretically had no development rights (Williams 2012). In this case, the planning goals proposed by the government were trumped by the political strength of private property owners.

TDC can be used to create community benefits as well as preserve green infrastructure. In the hypothetical example above, owners record conservation easements on their land but continue to own the property itself and use it for non-development purposes, like farming, as allowed by the easement. Many TDC programs also grant TDCs when owners convey title to land for parks, nature preserves and other green infrastructure as well as traditional infrastructure. Jurisdictions typically lack sufficient funding to achieve all or even most of their goals for these benefits using only the traditional tools of public finance or development exactions. TDC is one non-traditional way of creating these community benefits using private sector profits rather than tax dollars.

7. TDC effectiveness

The relatively low use of TDC can also be attributed to a spotty record of success. While the top 20 US TDC programs have preserved over 432,000 acres of land, many other TDC programs have generated few or no transfers (Pruetz 2016a). This paper argues that underperforming programs

do not indicate inherent flaws in the TDC mechanism but rather result from failure to incorporate the factors found in successful TDC programs. The features needed for successful TDC programs have been discussed by dozens of authors (Bredin 1998; Costonis 1974; McConnell, Walls & Kelly 2007; Meck 2002; Merriam 1978; Strong 1998). A 2009 study found that five features appear in almost all of the 20 most successful US TDC programs (Pruetz & Standridge 2009). Conversely, TDC programs underperform or fail entirely in the absence of one or more of these success factors (Nelson et al. 2012).

Developer demand to exceed baseline is an obvious success factor. If the current zoning of a receiving area already allows more growth potential than developers want, a jurisdiction can create a baseline that allows less development potential than the amount allowed by current regulations. Due to property owner objections, this is not a popular option. However, cities have used this option when overly-permissive zoning has failed to fully implement a jurisdiction's plan. For example, the City of San Francisco did this in order to preserve historic landmarks, which the city considered just as important as its goals for dense development. As a less-aggressive solution to overly-permissive zoning, some jurisdictions simply require that TDC receiving areas be created in all areas identified for an upzoning, meaning a regulation change that would result in greater density or intensity. For example, Livermore, California adopted legislation with this approach, making the maximum density of the former zoning the baseline for the TDC receiving zone.

The receiving areas must also be capable of generating enough additional development potential to cover both the extra cost of TDCs as well as the extra cost of building at higher densities. Single-family residential has been a productive real estate product for TDC receiving areas because per unit construction cost of single family residential remains constant and the per-unit costs of off-site improvements needed to serve single-family residential subdivisions often decline due to a per-unit reduction in the necessary length of roads, sewers and other infrastructure. Yet the retail price of a single family home may decrease only marginally with reductions in lot size, all of which can result in enough extra profit to more than offset TDC costs. At the other end of the spectrum, high rise buildings that command equally high per-square-foot lease rates can increase profits despite high construction costs plus the added expense of TDC.

However, challenges occur when receiving areas are in need of redevelopment but the ability to achieve a materially higher level of development is constrained by uncertainty, projections of lacklustre lease rates or regulatory limits on development intensity. For example, in some smaller and/or economically-distressed cities, there may be no profitable way to replace an old one-story building with a new three story building given the cost of land, demolition, remediation and infrastructure upgrades even without the extra expense of TDCs. This is less of a problem in thriving cities where intense development is profitable and allowed. For example, projects on redevelopment sites in Seattle, Washington can afford to transfer TDCs from rural King County despite the extra costs of building on previously developed sites in the heart of the city. Again, economic analysis is critical to estimating how much TDC cost developments in a specific receiving

area can tolerate. In some instances the profit margins can accept the extra cost of TDC although perhaps at a high ratio of bonus development per TDC.

Successful programs offer developers few or no ways to gain additional development potential other than by TDC. This may seem obvious, yet many TDC programs fail because jurisdictions continue to grant zoning code amendments and other regulatory exceptions free of charge. After allowing one or two developers to achieve bonus density without buying TDCs, a jurisdiction finds it difficult to continue imposing the requirement on future projects.

Perhaps the most common cause of program inactivity is failure to create a viable market for TDCs, meaning one that attracts both buyers and sellers. To explain by example, the zoning for a rural sending site might allow a maximum density of one dwelling unit per 40 acres. A program that is likely to fail might issue one TDC per 40 acres of sending site placed under easement while allowing only one bonus dwelling unit at the receiving site per TDC, a formula called a one-to-one ratio. Assuming the sending site owner wants at least \$2,000 per acre for permanently restricting his land, this program expects a developer to pay \$80,000 for each dwelling unit in excess of baseline density, a price that is unaffordable in most jurisdictions. Assuming that an economic study estimates developers in this hypothetical receiving area are able and willing to pay \$10,000 for each bonus dwelling unit, a workable market can be encouraged by granting TDCs at the ratio of one TDC per five acres. At that ratio, sending area property owners receive the \$2,000 per acre they want when they sell their TDCs for \$10,000 each and developers can profitably use those TDCs at this \$10,000 price.

8. Ecocities and TDCs

In 2016, I published *Ecocity Snapshots: Learning from Europe's Greenest Places*, a book that briefly profiles 19 cities recognized for their progress toward sustainability (Pruetz 2016b). I use the phrase "progress toward sustainability" because these cities all fall short of the target of actually being "in balance with nature", the mission of Ecocity Builders, a non-profit organization where I serve on the Board of Directors. Nevertheless, these 19 cities illustrate that progress toward sustainability is possible as well as rewarding in terms of the prosperity, happiness and the health of people and the planet.

Ecocity Snapshots focuses on nine components of sustainability which also serve as some of the indicators used by the European Commission in its annual selection of European Green Capital and European Green Leaf winners. To my knowledge, none of these 19 cities use TDC at this time. But, it is worth considering how TDC could accelerate their progress toward sustainability by exploring one of the nine components examined in *Ecocity Snapshots*: green structure.

Green structure means protecting or creating greenspace throughout the city and connecting green areas in a way that accomplishes multiple ecocity objectives including storm water control,

biodiversity, eco-mobility, density, diversity, accessible recreation and contact with nature. Good green structure creates a solid foundation for ecocity evolution because it makes other components of sustainable development possible. For example, interconnected greenways encourage walking and bicycling in car-free environments, which in turn reduces greenhouse gas emissions and fights climate change.

Over a century ago, Hamburg planners envisioned a Grunesnetz or green network formed by green spokes radiating from downtown to a rural greenbelt of forests and farmland connected by green rings allowing non-motorized access to everyday destinations through the city. Between 1914 and the present, similar green structure concepts appeared in Helsinki, Finland, Oslo, Norway, Copenhagen, Denmark, Essen, Germany, Munster, Germany, Ljubljana, Slovenia, Nantes, France, Freiburg, Germany, Vitoria-Gasteiz, Spain and Stockholm, Sweden. Many of these green networks have materialized to a remarkable extent, particularly considering the last century's history of war and economic upheaval. But these cities could realize even more of their green structure visions using TDC, especially in those places where further progress requires the preservation or acquisition of private property.



Image: Oslo transformed a former shipyard into the walkable, high-density mixed use neighborhood of Aker Brygge. Credit: Rick Pruetz.

In the United States, Montgomery County, Maryland offers a useful example of how TDC can implement a green structure plan. Montgomery County abuts Washington, DC and could easily

have experienced the sprawl that characterizes other counties surrounding the capital and many other US cities. However, in 1964, Montgomery County adopted a plan entitled On Wedges and Corridors (Maryland-National Capital Park and Planning Commission 1964). Using terminology reminiscent of the European green structure concepts mentioned above, the Montgomery County plan aimed to concentrate development within urban spines, the corridors, flanked by a productive rural landscape, the wedges.

Montgomery County's subsequent plan for the preservation of agriculture and open space identified a malady called impermanence syndrome that leads rural landowners to assume that ongoing sprawl will inevitably make it difficult or impossible to continue farming. To cure impermanence syndrome, the 1980 plan and its implementing legislation established a 92,000-acre Agricultural Reserve where maximum on-site density is limited to one dwelling unit per 25 acres. Recognizing that reserving land by zoning is not the same as preserving it by permanent easement, Montgomery County adopted a TDC program in which owners of the land in the green wedges can record easements, perpetually securing the one-unit-per-25-acre density, and then sell one TDC per five acres of land. Developers in receiving areas within the development corridors buy these TDC in order to exceed baselines established in the zoning of several planning areas of the County (Maryland-National Capital Park and Planning Commission 1980).

The Montgomery County TDC mechanism incorporates all of the success factors discussed above. Receiving area baselines are low enough to motivate developers to buy TDCs. Each TDC allows one bonus single family residential unit, creating a five to one transfer ratio that produces TDC prices that developers are able and willing to pay and that is attractive enough to motivate sending area property owners to participate. The sending area property owners are additionally motivated by zoning that limits onsite density to one dwelling unit per 25 acres. Furthermore, Montgomery County has been vigilant about allowing few alternative means of achieving bonus density in the receiving areas other than buying TDCs (Dehart & Etgen 2007; Walls & McConnell 2007).

Today, Montgomery County has permanently preserved roughly 80 percent of its greenbelt as proposed in the On Wedges and Corridors plan. This success has largely overcome impermanence syndrome giving rural landowners the certainty to invest in their properties. By concentrating growth, implementation of the Montgomery County plan has produced urban corridors that can be efficiently served by infrastructure yet locate residents within bicycling distance of the farmland, natural areas and recreational opportunities within the Agricultural Reserve. In addition, this success allows the county to maintain its agricultural industry, enhance local food security and take advantages of the green infrastructure benefits provided by a permanently preserved countryside (Montgomery County 2016).

In some countries, jurisdictions may continue to rely entirely on governmental control to limit development on privately-owned land despite the pressure on elected officials to relax

development restrictions. However, regulations cannot accomplish the acquisition of parkland and other green structure components that must be acquired from private property owners. Public funding can be used for this purpose. But, as the survey mentioned above suggests, the amount of tax dollars available for open space acquisition is rarely adequate to implement all green structure goals. Again, TDC programs can motivate the owners of land planned for parks and preserves to convey title to governments in return for TDCs. Using an incremental approach, owners of qualifying greenspace can convey title to the jurisdiction when they sell TDCs directly to receiving area developers, as in the City of West Palm Beach, Florida. Alternatively, Palm Beach County, Florida used a voter-approved bond to buy 35,000 acres of environmentally sensitive land for its nature preserve system. As mentioned above, Palm Beach County sells these TDC for as much as \$50,000 each and uses the proceeds to expand and maintain its network of nature preserves (Nelson et al. 2012).

9. Conclusion

In addition to implementing green structure plans, TDC can help jurisdictions make progress toward other sustainability components including the creation of compact, mixed-use centers, pedestrian zones, eco-mobility, biodiversity, the transformation of brownfields to eco-districts and the attainment of climate action goals. Yet relatively few jurisdictions use TDC possibly because planners do not see the applicability and/or because TDC programs can be hard to adopt. Additionally, the TDC mechanism has been tarnished by the fact that TDC programs often underperform and sometimes don't work at all. However, a review of 320 programs from around the world suggests that TDC can be an effective tool for creating many ecocity components when proven success factors are observed.

The paper should be referenced as follows:

Pruetz, R. (2016). Ecocities and Transferable Development Credits. *International Eco-Cities Initiative Reflections Series*, Issue 18. University of Westminster. Online: <https://www.westminster.ac.uk/eco-cities/reflections>

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