10 QUESTIONS TO ASK ABOUT PLANNING, FINANCING, AND IMPLEMENTING TRANSIT-ORIENTED DEVELOPMENT STRATEGIES

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EXECUTIVE SUMMARY

Highlights

- Transit-Oriented Development (TOD) strategies can improve connectivity between housing and employment centers, green spaces, and community facilities by supporting both local environmental sustainability objectives, through more efficient use of land, and “complete” streets, by creating safer infrastructure for pedestrians and bicyclists, leading to potential modal shifts.
- Enabling conditions for TOD may include changes in land-use regulation and other statutory provisions to create an integrated regulatory framework. TOD requires robust stakeholder engagement and institutional coordination during planning and implementation.
- Financing mechanisms cities have used to fund TOD include Land Value Capture, a strategy based on expected increases in land values due to infrastructure investments. These mechanisms have been used to generate revenues such as Tax Increment Financing (TIF) and a wide range of taxes and fees.
- Cities should be aware of the potential negative impacts of TOD, such as displacement and gentrification. Effective and inclusive TOD strategies should be accompanied by land management strategies that mitigate these impacts, including having policies in place to ensure the preservation and expansion of affordable housing.

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- There is typically a lag of at least 5 to 10 years before the economic and financial impacts of TOD investments are fully realized, thus requiring the need for patient capital, well-structured deals and financial instruments, and proper governance.

Context

Over the last several decades, cities have increasingly prioritized Single Occupancy Vehicles (SOVs), which has contributed toward greater sprawl. A sample of spatial data from 200 cities across the world showed that between 1990 and 2015, the buildup of urban areas increased at a rate faster than population growth. In the Global South, where urban populations have increased the fastest, urban areas increased by a factor of 3.5 (Angel et al. 2016). This trend shows that growth in many cities has generated sprawl, rather than “smart growth” that encourages transit, walkability, and multimodal connectivity. At the same time, it is estimated that between 2005 and 2050, an additional 2.3 billion vehicles will be added in emerging markets (Suzuki et al. 2013).

City sprawl is directly linked to automobile usage and, by extension, energy consumption and greenhouse gas (GHG) emissions. In many cities in developing countries, the rising rates of motorization and poor existing infrastructure creates traffic congestion that is reducing economic growth (Rajé et al. 2018; Lall et al. 2017). As cities grow, additional infrastructure, such as sewage and water systems, must be expanded to serve new developments. A 2003 study conducted in the United States concluded that the cost per capita of the provision of public services declines with density and increases with sprawl (Carruthers and Ulfarsson 2003), although density should be assessed on a case-by-case basis in relation to infrastructure support capacity. TOD strategies are an opportunity for cities to achieve economies of scale and manage growth by promoting walkability and greater mixed-use development.

Brief summaries of the questions and answers covered in this publication are listed below.

Question 1: What are the benefits and costs of TOD investments?

In general, TOD promotes a mix of land uses, higher-density development within a designated area, and a high-quality walking and biking environment along, around, and/or near transportation corridors. Public benefits of TOD include increasing and diversifying transport and

Box ES-1 | About This Working Paper

This working paper is part of a series of publications by World Resources Institute (WRI), supported by the Citi Foundation. Each paper in the series asks a set of 10 questions relevant to a topic, such as bike-sharing systems (2019) and electric and hybrid-electric buses for public fleets (2019), to help municipal governments meet growing challenges of rapid urbanization in sustainable, low-carbon ways.

This paper aims to provide decision-makers with answers to a series of frequently asked questions about the implementation and financing of TOD. It is neither designed to be a comprehensive guide to TOD implementation nor provide prescriptive recommendations but rather supply information to help city officials navigate some of the major barriers often encountered with TOD.

Existing publications on TOD have focused on a specific topic, such as selection of a station area for development (Salat and Ollivier 2017), Land Value Capture (Suzuki et al. 2013), the evaluation of TOD impacts (ITDP 2017), and the integration of transport and land planning processes (Suzuki et al. 2013). Others are overly US-focused and outdated (Reconnecting America and Center for Transit-Oriented Development 2007). In this publication, we seek to provide a broader perspective, touching on 10 considerations we have frequently heard throughout our engagements and workshops across the WRI Ross Center for Sustainable Cities network. For more detailed guidance, we also recommend the Global Platform for Sustainable Cities' 2018 report *TOD Implementation Resources & Tools*, 2nd Edition (Ollivier et al. 2021), along with WRI and the World Bank's joint 2018 *TOD Corridor Course* (World Resources Institute and World Bank Group 2018).

The research questions have been formulated to include all phases of a typical TOD project development cycle. They have been carefully selected by the authors based on desktop research and on-the-ground experience providing technical assistance to local decision-makers. The 10 questions explore design principles, tools for land assembly, possible funding and financing mechanisms, and legal arrangements, among other relevant issues.

housing options, enhancing open spaces, designing streets that prioritize pedestrians and cyclists, providing community facilities, establishing an enabling environment for economic development, and ensuring environmental sustainability. In terms of the private sector, some of the perceived benefits are increased land values and rents, along with more opportunities for affordable housing. The main capital and operational costs of TOD, which can be shared between public and private sectors and are essential to add fiscal, social, and environmental value, include transit infrastructure, street infrastructure and public spaces, real estate construction and housing, and the operation and maintenance of facilities.

Question 2: What are the planning principles and steps for TOD implementation?

Spatial planning strategies conceptualize how transit lines can connect with station areas to encourage TOD. There are different types of spatial models: urban core refers to high densities and more mixed land uses, urban residential refers to higher population densities than suburban nodes but fewer land uses than urban core, and, finally, suburban residential refers to areas with low population densities but designed to improve accessibility to urban centers. The planning process often includes a stock take or amendment of enabling policies and institutional coordination, market analysis, stakeholder (public and private) engagement, site selection, detailed project design, identification of financing, land assembly, and construction and operation. There are several factors that should be considered when selecting and designing a TOD, such as infrastructure characteristics, ease of implementation, land use constraints, cost of site preparation, political constraints, social equity, and technical and environmental risks.

Question 3: What are common design principles and strategies for TOD?

Common design principles of TOD projects focus on accessibility, livability, safety, and connectivity. TOD projects are designed with an emphasis on residents who walk and bike, and should also be integrated with other modes of transport. In addition, planners consider zoning tools that encourage mixed-use and compact development. For instance, housing is to be built up, rather than out, and the ground floor zoned to attract commercial businesses in order to encourage economic activity and vibrancy within the TOD corridor. Planning for public spaces can increase social capital around TOD corridors by providing universally accessible spaces that offer green spaces and promote social exchange.

Question 4: What are some of the ways to assemble land for TOD?

Some land assembly tools include land pooling, Community Land Trusts, public land grants or write-downs, and eminent domain. These strategies use various legal instruments to amalgamate land parcels for TOD corridors. Utilizing these financial and legal tools to encourage TOD, such as tax incentives, subsidies, or land grants, can promote public services such as green spaces and street furniture.

Question 5: What are possible funding and financing mechanisms for TOD?

As TOD investments are often complex, involving a range of different types of infrastructure and service components, public funding typically cannot cover the entire expense of the project. They have often been funded and financed through a combination of sources, including betterment levies, property taxes, Tax Increment Financing (TIF), air development rights, and special assessment districts. In some cases, financing for a transit investment underlying the TOD district can come from fare box revenues and other user fees; however, this amount generally only covers the cost of operation and maintenance.

Question 6: What are some Land Value Capture tools used to finance TOD?

Land Value Capture (LVC) can potentially support financing TOD projects. The value of land can be affected by its use, building potential, and development in the surrounding area. Government entities can utilize LVC tools through changes in regulation, public investments, or joint developments. Regulatory tools range from changes in zoning to selling rights to increase the building capacity of a land parcel. Using tax measures or charging fees through land banking are common ways government entities can raise funds using LVC.

Question 7: What incentives exist to encourage private sector development?

Throughout the investment life cycle of a TOD, both local and national governments use incentives and subsidies to encourage private investments that meet the public goals set out at the start of the project. Incentives can come in many forms, including grants, zoning changes, fiscal incentives, regulatory measures, programs, and collaborative activities.

Question 8: What are possible legal and institutional structures for TOD?

A range of delivery models and contractual tools have been utilized globally in the implementation of TOD investments. Projects may be wholly or partly owned and operated by the public sector, the private sector, a non-profit organization, or a hybrid combination. Real estate is an inherently political process and requires coordination and communication between developers, funders, stake-

holders, and communities. The city can fulfill this role during design, environmental and public review, financing, land acquisition, and construction.

Question 9: How can cities better manage effects of gentrification?

Gentrification is the result of new development that increases income inequality and displaces people of lower socioeconomic status as property values rise. The main strategies to mitigate the negative effects of gentrification are related to maintaining the existing housing supply along with increasing the stock of affordable units. Some of the ways to do this include inclusionary zoning, which requires a certain percentage of new units to be tied to income levels, as well as a range of flexible financing mechanisms, such as structured funds for affordable housing land acquisition, subsidies to affordable housing, and subsidies to borrowers.

Question 10: How can cities measure expected outcomes and impacts of TOD?

Available metrics focus on how well the TOD has achieved a walkable, high-density, mixed-use, and mixed-income development with high transport connectivity with the rest of the city. The framework and performance metrics related to the overall impact of TOD projects are also linked to indicators connected to financial, social, environmental, and economic impacts. Surveys and assessments, to better understand community opinion, are some of the tools that can be utilized to measure impacts of the TOD. The TOD Standard and TOD Index are two examples of monitoring and evaluation tools cities have used to measure the impact of developments.

INTRODUCTION

Although the concept of Transit-Oriented Development (TOD) has no universally accepted definition, it can be thought of as a process of leveraging mass transit to coordinate public and private investment in reasonable proximity to a transit facility, to provide “moderate and high density housing, along with complementary public uses, jobs, retail and services” (Calthorpe 1993). In this manner, TOD is a planning strategy intended to encourage a more mixed-use, high-density, mixed-income, and pedestrian and bike-friendly urban development organized around transit stations (Sarmiento et al. 2014; Higgins and Kanaroglou 2017). It optimizes land use and transportation linkages to create more economically dynamic neighborhoods that connect people to core services,

employment, and cultural opportunities. TOD’s potential beneficial impacts include improved quality of life and economically thriving, inclusive, and equitable¹ neighborhoods that produce lower carbon emissions (Carlton and Fleissig 2014; Lane 2017; Dittmar et al. 2004).

There is a social dimension to TOD that helps create more livable, inclusive, and mixed-income neighborhoods, in turn creating better cities. Promoting mixed-use development with higher density zoning can create opportunities for developers to build mixed-income housing. An inclusive TOD approach proposes that TOD should provide benefits to the entire community, independent of income level (Sarmiento et al. 2014). Mixed land use enhances economic activity by diversifying the types of goods and services readily accessible within a community. When added to mixed-income development, or a housing development with differing levels of affordability for various income groups, it can help promote diverse labor pools, inclusion, social integration, and innovation (Greenberg and Belzer 2008). TOD can be used by cities as demonstration projects to improve their image, sharpen their identity, and advance urban redevelopment efforts (Amirtahmasebi et al. 2016).

METHODOLOGY

To comprehend current trends in TOD, a literature review was conducted that focused on previously applied TOD frameworks and financing mechanisms, national and local master plan documents, the on-the-ground experience of the authors, and real-world examples. Additionally, 26 case studies from more than 50 cataloged examples around the world were selected and analyzed. The selection was based on geographic distribution and an in-depth review in consultation with experts. The following steps were taken to select and develop the case studies:

- An exploratory mapping exercise of the universe of prominent TOD projects on the ground, not just master plans, was conducted.
- A subset of city examples based on expert consultation and multi-criteria weighting, including geographical representation, financing mechanisms, institutional arrangements, and technical components, was shortlisted.
- An assessment was conducted using a common research framework developed by World Resources Institute (WRI) (“business model framework”). It focused on four dimensions:

- ❑ **Legal arrangements.** What policy frameworks, ownership structures, and contracts were used during implementation?
- ❑ **Technical components.** What types of technology and infrastructure were needed during implementation?
- ❑ **Funding.** What types of public funding, including budgetary allocations, were required to cover capital costs?
- ❑ **Financing.** What types of financing mechanisms were used to mobilize private debt and equity?

Data collection consisted of literature reviews, desktop research, and practitioner consultations in the cities that have been supported by WRI in the development of specific TOD initiatives. In Brazil, WRI Brasil provided technical assistance and capacity building for the Metropolitan Chamber of Rio de Janeiro to identify TOD and frame business models around metropolitan train stations. A two-day training course on TOD business model development was also conducted in more than 20 Brazilian cities. In Colombia, WRI Ross Center for Sustainable Cities collaborated with the Development Bank of Colombia (Financiera De Desarrollo Territorial S.A.; FINDETER) to provide dialogue facilitation to the city of Cali for a large-scale urban transformation project that follows TOD principles (Corredor Verde). Finally, in India, WRI India conducted capacity building for Bangalore Metro Rail Corporation Limited (BMRL) and other public officials to brainstorm possible business models for TOD.

Based on the research and consultation, every TOD project has its advantages and disadvantages; each is unique and has been adapted based on local conditions. No effort has been made to identify exemplary cases or qualify their success or failure. The case studies represented in this publication are simply included to showcase and illustrate the wide array of different types of TOD strategies cities have undertaken, and the positive and negative impacts they have produced.

Q1: WHAT ARE THE BENEFITS AND COSTS OF TOD INVESTMENTS?

Q1.1 Benefits

The benefits of TOD include creating a range of economic opportunities and transport options; preserving pedestrian, green, and open spaces; creating complete streets; providing community facilities; improving quality of life; and encouraging sustainable economic development. Overall, TOD can create a sense of permanence through visual recognition and visitor appeal that spurs development (Salat and Ollivier 2017). More specifically, TOD can lead to several direct and indirect benefits, such as the following:

- Promoting increased density around transit stations, which can reduce automotive traffic and carbon emissions. This also increases ridership and revenues for transit providers, decreasing the need for public subsidies for transit (Sung and Oh 2011; Alberti 1999; Ingvardson and Nielsen 2018; Kamruzzaman et al. 2015).
- Directing new development to infill sites, thereby limiting urban expansion and conserving open public spaces (Cervero and Sullivan 2011).
- Providing the impetus for urban renewal, particularly in areas with unplanned high densities, which enables incremental augmentation of essential infrastructure, community facilities, and open spaces.
- Providing pedestrian-friendly conditions and bicycling infrastructure, resulting in a decrease in traffic fatalities (Ewing et al. 2003).
- Generating overall positive health outcomes through cleaner air, decreased congestion, and increased physical activity (Durand et al. 2011; Brown et al. 2015).
- Providing a financing mechanism through increased property tax and sales tax revenues over time as well as through the establishment of development fees (Bartholomew and Ewing 2011).

The level of investments and public benefits achieved will vary depending on project objectives. However, there are several qualities that are consistent among the TOD projects considered as best practices. TOD aims to create higher-density and mixed-use development, and concentrate infrastructure needs in smaller spaces, leading to economies of scale for the provision and management of

basic infrastructure and services, such as energy, water, and waste, compared to suburban sprawl (Thompson 2013). TOD focuses on creating safe urban spaces built at the human scale,² which can involve the application of a variety of design principles (see Question 3).

Although TOD can increase land values, which benefits municipal governments by creating an additional revenue stream to finance infrastructure projects, there is also a societal cost related to gentrification.

Q1.2 Capital, Operational, and Social Costs

The three main capital costs associated with TOD are transit infrastructure, street infrastructure and public space, and real estate construction and housing (World Resources Institute and World Bank Group 2018). Transit infrastructure can include costs related to a new metro rail, light rail, or bus rapid transit (BRT) line. Typically, this is the largest investment needed and is usually covered by the public sector. Street infrastructure and public space includes changes in the local street networks and associated sidewalks, bicycle lanes, and other public spaces. These capital investments are either covered by the public sector or by developers in cases where the market is strong and the government can place more demands on private companies. In addition, costs related to real estate construction and housing refer to new buildings which form the core of a TOD area (Adams 2003). These costs

are typically borne by the private sector. The government may decide to subsidize these costs through tax incentives, low-interest loans, and grants if developer interest and market conditions are not strong enough to catalyze private investment. Other costs also arise, such as expenditures to cover operation and maintenance of transit facilities and surrounding infrastructure.

Cities can work in partnership with the private sector to create the appropriate framework so that part of the capital cost of the TOD investment can potentially be recouped. Although partnerships with real estate developers and infrastructure concessionaires can provide an alternative source of financing, one of the criticisms of TOD has been that the public investment and related zoning changes have granted private parties excessive returns. A related negative impact has been that TOD investments result in higher land value, which effectively reduces the stock of affordable housing resulting in the displacement of lower to middle-income groups near the transit investment (Wilson 2018). If not mitigated, this may lead to a pattern of unaffordability, gentrification, displacement, and worsened inequalities.

Finally, TOD has not always generated the promised benefits. In this manner, there can be opportunity costs from not having invested in other infrastructure projects that have equal or greater social and environmental impact. Thus, due diligence is critical in the design of TOD facili-

Box 1 | Case Study: Rosslyn-Ballston Corridor, Arlington County, Virginia

The Rosslyn-Ballston Corridor is in Arlington County, Virginia, across the Potomac River from Washington, DC. The area's proximity to the capital of the United States contributed to the high market demand for office space in the corridor. This area experienced considerable growth during the 1960s when regional planning for a Washington Metropolitan Transit System began and Arlington was focused on reviving the existing retail corridor (Arlington County Government n.d.).

County planners and officials saw this growth as an opportunity to reimagine communities, reduce car dependency, and revitalize struggling commercial areas. Arlington's new development occurred with limited public subsidies beyond the construction of Metro, and despite relatively low-density zoning. County officials and residents lobbied for the Metro line to run along an existing, although deteriorating, commercial corridor with stations in Rosslyn, Clarendon, Courthouse, Virginia Square, and Ballston (Alves 2017; EPA 2014). Although in comparison to the originally proposed aboveground Metro line, this new underground Metro line was more expensive to build, the county wanted to protect single-family neighborhoods, where possible, while also

boosting the area's existing retail corridor. The Arlington General Land Use Plan outlined the development around these Metro stations, later complemented by site-specific plans, to guide further development adjacent to each of the five Metro station areas.

Arlington's high-density transit corridor is considered both a model of TOD as well as an illustration of missed opportunities. On the one hand, the corridor has added commercial office space, several federal agencies as well as housing for a growing population of workers who commute via public transit (Greenberg and Belzer 2008). The overall results include increased land values around the transport corridor through the repurposing of previously underused industrial areas. In addition, it resulted in an increased tax base, increased walkability, more green spaces, and improved livability. On the other hand, several apartment complexes along the corridor have gradually been converted into high-end apartments or condominiums, increasing the cost of living and reducing the overall stock of affordable housing. In addition, some historic areas have been converted into modern buildings, reducing the previous character of the area.

ties. Based on experiences in Arlington County, Virginia, Box 1 provides an example of both the positive and negative impacts that can result from TOD efforts.

Q2: WHAT ARE THE PLANNING PRINCIPLES AND STEPS FOR TOD IMPLEMENTATION?

Q2.1 Spatial Models

Spatial planning strategies lay out how transit lines can connect with station areas to encourage TOD. In a 2018 article, Huang et al. identified three main types of TOD nodes—urban core, urban residential, and suburban residential—each of which serve different roles within the overall transit network (Huang et al. 2018):

- **Urban core:** High densities and more mixed land uses. These nodes will tend to have the highest transit and pedestrian traffic.
- **Urban residential:** Higher population densities than suburban nodes, but fewer land uses than urban cores.
- **Suburban residential:** Low population densities but designed to improve accessibility to urban cores, especially during peak periods.

Many cities around the world have tried different combinations of TOD strategies. For example, Portland, Oregon, has used a mix of streetcars, heavy and light rail, and buses to increase densification in the urban core. Similarly, the Mass Transit Railway (MTR) in Hong Kong has developed the “Rail & Property” model that focuses on development around MTR-owned property within a 500-meter catchment area to the main station, which is also known as a “TOD zone.” This strategy encompasses both the urban core and urban residential models. There are five types of mixed-use typologies used by MTR within the urban core (Nguyen 2020):

- High-rise residential with no commercial, typified by Tsing Yi Station
- Large-scale residential with limited office and commercial (Tai Koo Station)
- Large-scale mixed use, roughly divided among various land uses, including hotels (Kowloon Station)
- High-rise commercial with some residential and retail (Central)
- Mixed with a range of other uses

In contrast, Arlington, Virginia, a suburb of Washington, DC, has focused on creating urban residential areas that effectively serve as new urban cores along with developing suburban residential nodes designed to improve access to the large commercial and employment areas in the U.S. capital (Straatemeier 2013; Arlington County Government n.d.). A hybrid model has involved the development of “polycentric” nodes, which essentially seek to provide system-wide connectivity that leads to economies of scale, creates feedback among nodes, and implicitly assumes that lower-density suburban areas can grow to become urban residential areas or a new urban core over time.

Given varying traffic levels, it is more likely that urban core nodes, and possibly urban residential areas with high-volume attraction centers, will generate enough revenue to be self-sustaining over time. In contrast, other node types, such as suburban residential, are more likely to require public subsidies or cross-subsidies to cover capital costs for implementation, as well as costs related to operations and maintenance. These suburban areas also provide the chance to create affordable housing opportunities due to the availability of cheaper land while providing connections to the main mass transit corridors and labor markets within the urban core. Potential drivers of pedestrian traffic and economic activity include the following:

- **Commercial and retail activity.** Making TOD corridors more vibrant and attractive, for example, through the inclusion of cafes, restaurants, and other commercial businesses, can enhance the sense of community in a neighborhood. Closely connected to the idea of active ground floors is the design of transition areas between public and private spaces which can help set the tone for a neighborhood. Retail or other uses that activate the streets or sidewalks are usually prioritized in TOD.
- **Green public spaces.** Green public spaces encourage mixed-used development by providing places for meeting and cultural exchange for all types of residents, regardless of social or economic status. These open spaces are universally accessible and programmed for different income and age groups, and activity types. Such spaces can increase the social capital of a community and increase the quality of life of its residents (Ijla 2012). Safety of public spaces can be improved through active facades and public lighting.

- **Historic and cultural spaces.** This approach focuses on preserving and incorporating places of historic and cultural importance within the TOD area. While it may not always be the most cost-effective or highest density use of a space, in many cases, governments have incentivized historic preservation of buildings within TOD corridors to maintain a neighborhood's character. The preservation of historic buildings can often increase property values and make an area more attractive for residential land use (Renne et al. 2015).

Q2.2 Enabling Factors

To ensure comprehensive implementation of TOD, planning must be coordinated and integrated at all levels. Planning and implementation of TOD will involve various levels of governmental authority: from regional agencies to city agencies and local urban entities. It is observed that despite a fair understanding of the TOD approach, cities find on-the-ground implementation challenging due to a weak enabling environment. Addressing this situation will require integration between tiers of government as well as an exhaustive review of the existing national, state, and city-level regulatory frameworks. It is important for cities to look at regulations for any necessary amendments that may be required to ensure that state legislations, development plans, zonal plans, local area plans, development control regulations, and budgetary allocations enable the implementation of TOD. The existing regulations may require revisions to incorporate the TOD concept and strategies, and might necessitate the formulation of new frameworks or policies to facilitate implementation of TOD. This will also ensure a coalition across all tiers of government entities required to cater to all scales of TOD application; that is, at the city/region level, corridor level, station area level, and at site level.

Q2.3 Planning

Ideally, TOD projects are part of a larger master plan that considers the whole transportation and land use network. However, TODs often start with smaller plans, and cities often debate what is the most appropriate scale to begin a TOD (Hale 2014). One model is to develop multiple transit corridors with TOD nodes concurrently, while another approach is to focus primarily on the development of a key station area of an existing or planned transit line. Although there is no simple rule of thumb, a key part of the planning process is robust due diligence, including stakeholder engagement, particularly with the communi-

ties that will be most affected by the development (see Figure 1). Planning for TOD can occur at different scales: city or regional, corridor, and station area.

- **City-level or regional plans** focus on large areas that are likely to cross into adjoining districts and peri-urban areas. These plans often involve several TOD areas, making it possible to consider social and economic impacts across the metropolitan area. They also facilitate the implementation of urban policies needed to bring TOD to the other scales. At the same time, planning at a larger scale implies institutional coordination, especially if multiple jurisdictions are involved, which adds complexity to budgeting, planning, financing, and implementation.
- **Corridor plans** define land use along a mass transit corridor around transit stations. These types of plans consider connecting and complementing different types of employment drivers and land uses. As with regional plans, there may be institutional coordination and budgeting issues when corridors cut across municipalities. These budgeting issues tend to be present in a phased approach with TOD corridor planning, and, if not planned meticulously, may risk the development opportunity and Land Value Capture (LVC) potential of later stage phases. In general, much of the investment will likely come from the public sector though there may be more consultation and input from the private sector. The corridor scale also allows for area-based fees and taxes over a wider area that can provide significant financing streams.
- **Station-area plans** focus on areas within a 5 to 10-minute walk (or 500 meters to 1,000 meters) from a transit station. At this scale, detailed designs should address station accessibility, mixed use, multimodal integration, public spaces, and increasing density to create a high-quality livable and walkable neighborhood. Investment and implementation plans are easier to determine during upfront negotiations with private developers and existing landowners. Publicly owned land within a limited area can be used as a pilot to ignite redevelopment and entice private investment.

Q2.4 Market Analysis

Because a market analysis can provide a rough estimate of the impact of the TOD on land values and economic growth, the viability of a TOD project, as well as measure the unrealized value of station areas (Salat and Ollivier

Figure 1 | **Planning and Implementation Process for a TOD Project**

Sources: Ramírez and Rosas 2013; Salat and Ollivier 2017; ITDP México 2015.

2017), it should be undertaken relatively early on in the planning process. A market analysis can provide a rough snapshot of current and future land values, information on the type of development (commercial, retail, or residential) that might occur, and growth rates. It should include information on existing land use, recent transactions, demographics, development pipeline, investor feedback, trend analysis, and potential opportunities (Belzer 2011).

Another critical part of a market analysis is understanding the development potential by evaluating zoning constraints and approaches for addressing potential bottlenecks. Eventually, market analysis can be used to help with site selection (Sharma et al. 2017). However, market analyses work best in cities that have more current demographic, land use, and economic data. In some emerging economies, this type of analysis may be more difficult to conduct due to informal settlements and limited cadaster information. In addition, a market analysis also requires from authorities the capacity to appropriately analyze and assess real estate studies in order to correctly assess benefits and costs of potential developments.

Q2.5 Stakeholder Engagement

A well-conceived civic engagement strategy can highlight potential opportunities and concerns, making it easier to gain political buy-in for the project from local communities early in project development. Failing to communicate with key stakeholders and the public can greatly undermine a project's viability by risking a negative reaction to development that may cause excessive delays or project cancellation. Increased taxes and fees as financing mechanisms for TOD projects can also hinder stakeholder buy-in and adoption. Misunderstandings and misconceptions can be quite common at the outset of a project, including concerns about impacting cultural areas, Not in My Back Yard (NIMBY)-type behavior, and gentrification, especially in cities with affordable housing shortages (Devine-Wright 2009; Schrenk et al. 2012).

Q2.6 Site Design and Selection

The next stage in the TOD life cycle is the selection and design of intervention sites. Investment locations are usually selected based on a range of factors, including infrastructure characteristics, ease of implementation, land tenure, land use constraints, site preparation costs, political considerations, and social equity. Intervention sites have different benefits and costs based on the type of land use development in question. The main land uses are:

- **Greenfield development**, the easiest to deliver, converts unused land to urban use by constructing all trunk infrastructure, including roads and utilities. Site design is open-ended, and selection of a greenfield site relies heavily on future development patterns and growth projections. Major considerations are the cost of adding water, sewage, gas, and electricity lines; how these new lines will be financed and operated; and whether the opportunity exists to shift these costs to

the private sector. Greenfield development not only has the greatest demand risk but must also account for the cost of mitigating potential environmental risks to existing natural areas and biodiversity.

- **Brownfield or infill development** involves repurposing existing urban land often from industrial to residential mixed use. While brownfield sites are considered less risky as development patterns may already exist, providing the baseline data for financial projections and land tenure negotiation can be complex. Brownfield sites often have existing infrastructure lines, but there is a cost to moving and upgrading existing water, electricity, and telecommunication lines without disrupting service. Although brownfield sites generally have fewer environmental risks, there might be additional costs related to cleaning up contaminated areas and demolition. Cities are often required to assume these costs as the private sector developers are extremely reluctant to incur them or take on associated risks. Brownfield sites often have great potential to transform the economic and social dynamics of station areas and a larger submarket. Infill development uses land that is either vacant or has a building that can be demolished. There may be limited infrastructure costs associated with infill projects, but parcels are often small and require long permitting processes and more complex construction operations to fit within the city. Infill is more likely when property values are rising, and developers see that they can add value by increasing density.

Q3: WHAT ARE COMMON DESIGN PRINCIPLES AND STRATEGIES FOR TOD?

Approaches to TOD design vary widely. Every case will require a slightly different and unique design configuration. Although the designations have changed over time within the literature, traditional TOD has focused on the “6Ds”—*density, diversity, design, destination accessibility, distance to transit facilities, and demand management* (Hebert 2012; Ewing and Cervero 2010). These principles tend to drive the complementarity that creates greater synergies within a network and urban area. Embedded within these principles is the concept of multimodal integration, which brings together seamless physical connectivity and operational integration among modes of travel. It not only ensures safe and easy access but also reduces travel time and costs while providing multiple

options. Transit stations should be designed to prioritize and support facilities like bicycle parking, intermediate public transport parking spaces, feeder buses, and drop-off spaces, while ensuring barrier-free access (Carrigan et al. 2013). While this approach offers many advantages, it has sometimes undervalued the benefits of improved walkability and connectivity, while often ignoring the potentially negative impacts on existing populations who are priced out of the TOD impact area.

Similarly, the “5Ps” approach, which focuses on *people* (number of residents and workers), *places* (retail and commercial areas), *physical form* (average block size), *performance* (frequency of transit service), and *pedestrian/bicycle areas* (access to sidewalks and low-stress bikeways), has also been introduced in some cases.

Both frameworks include the development of “employment centers” and “attraction centers,” which can include retail districts, social service providers (such as hospitals or education facilities), cultural facilities, recreational centers, or sporting facilities to drive transit and passenger traffic, albeit at diverse and infrequent time periods (Thorne-Lyman et al. 2016). These approaches have the common objectives of supporting the creation or intensification of employment and destination zones, increasing urban and transit concentration, increasing mixed-use development, and promoting transport multimodality while reducing automotive traffic.

These types of design principles, including how to use public spaces and streets, how to manage parking, and how to combine different land uses in a TOD neighborhood, are central to the success of TOD. Fundamentally, an investment in TOD relies largely on the building blocks of a good neighborhood: safe streets, accessible transit, green and open spaces, diversified housing choices to cater to different income groups, and employment opportunities. Below is a summary of the main TOD design principles, drawing from work developed by the Institute of Transportation & Development Policy (ITDP) and WRI (ITDP 2017; Sarmiento et al. 2014):

- **Walkability**, or neighborhoods that accommodate and encourage walking. The pedestrian area is safe, complete,³ accessible, active, and vibrant. High-quality pedestrian access, a key feature of TOD, can be designed through factors such as directness and connectivity, ease of movement, sign legibility, safety, and security.

- **Bikeability**, or neighborhoods that accommodate and encourage cycling. The cycling area and the adjoining network is safe and there is ample space for bicycle storage and parking. In particular, secure bicycle parking facilities at stations give customers the confidence to leave their bicycle at the station during the day (Shah et al. 2015).
- **Connectivity**, or a dense network of streets and paths. Walking and cycling routes are short, direct, varied, and create the right space to compete with automobile usage.
- **Accessibility to transit**. Developments are located near high-quality public transport that is accessible by foot; for example, within 0.5 kilometer (km).
- **Fare and operational integration**, which facilitates switching within and among transit modes so that the first and last-mile connectivity and payment do not become a bottleneck in the use of public transit systems (Hidalgo and Carrigan 2010).
- **Mixed-use development** with a range of demographic and income groups among residents. Mixed-use development within TOD areas can be achieved either by horizontal mixing (separating activities in separate buildings) or vertical mixing (combining uses within the same building) (Coupland 1997).
- **Densification**, or the optimization of residential and employment density which can support high-quality transit as well as public services and spaces.
- **Compactness**, or the creation of regions with short transit commutes with development areas next to or near an existing urban area.
- **Parking and circulation restrictions** to encourage increased nonmotorized mobility by regulating parking and automobile use in core urban areas.

Figure 2 presents an overview of TOD design components and potential benefits.

Q4: WHAT ARE SOME OF THE WAYS TO ASSEMBLE LAND FOR TOD?

Land is the main building block of TOD. It is required for undertaking urban expansion, infill development, or redevelopment of TOD areas. The availability and size of land determines the cost and scale of a project.⁴ Situations vary

Figure 2 | An Overview of TOD Components and Benefits

Source: Evers et al. 2018.

among cities regarding scale of project, size, ownership, type of existing development (i.e., planned or unplanned), and environmental conditions of the parcels, presenting different kinds of challenges. If there are large parcels, a key strategy is consultation with the landowners with large holdings in the corridor, especially next to or near station areas (Guy and Henneberry 2002). If one of these TODs is developed successfully, then it can transform a multi-block area and spark additional economic growth. Intensive cooperation and coordination among the developer, government, local community, and other stakeholders helps to ensure a high-quality project with a design that matches the overall vision for the area. In cases where the public sector is the largest single landowner, it can potentially act as a “master developer” by investing in public infrastructure while managing the timing and phasing of implementation. The key factors that impact land assembly for TOD include the following:

- **Development or redevelopment potential**, which impacts the quantity and size of parcels needed.

- **The number of landowners involved**, especially if the project requires the assembly of several small parcels. Typically, it is much easier to negotiate land assembly with a few landowners, which reduces transaction costs and development time.
- **Public versus private ownership of land.** Private ownership may require invoking eminent domain clauses which tend to be controversial. Even if the land to be acquired is owned by the public sector, there may need to be intergovernmental agreement to ensure the transfer.
- **Valuation method.** In principle, the valuation method should be fair and transparent as well as generally agreed upon by the parties involved. A nontransparent process could create legal and political issues, which could result in significant project development delays.

Experiences with some land assembly approaches are reviewed in this section. These are non-exhaustive, and their applicability is contextual across the world.

Q4.1 Land Pooling or Land Readjustment

Land pooling, also known as land readjustment, assembles land parcels from different owners for unified planning and servicing. It can be considered an LVC mechanism (see Question 6). The idea is to consolidate parcels owned by different owners or groups of owners under a legal entity that transfers ownership to a land pooling agency, which later transfers part of the land back to the original owners (Mathews et al. 2018; Jain 2007). The development authority prepares a master plan for the given area, lays out the infrastructure, and distributes the remaining land back to the landowners while charging them a onetime betterment fee for deployed services. Unlike eminent domain, there is no land acquisition during the land pooling process (Ballaney 2008; Yomralioglu 1993). Land pooling facilitates planned development without complicated compensation negotiations that require large capital investment from the public sector. While it reduces the cost of land assembly, it is constrained by individual landowners' willingness to participate. Additionally, the authority in charge of land pooling has the right to subdivide the land, as needed. Land assembly is widely practiced around the world in the implementation of TOD projects. Prominent land pooling projects include Town Planning Schemes in Ahmedabad, India (see Box 2), land readjustment in Colombia (Vitta 2012), land pooling in Australia (Lozano-Gracia et al. 2013),

the Futako-Tamagawa Station redevelopment project in Tokyo (PPIAF 2017), and the Land Readjustment Project at Toyama Station in Toyama, Japan (Kidokoro 2019).

Q4.2 Community Land Trusts

Community Land Trusts (CLTs) provide collective ownership of land to ensure its ongoing use for community purposes. They are often set up to promote the long-term affordability of rental buildings and ownership housing. CLTs promote housing affordability by retaining ownership of the land beneath homes and multifamily buildings, even after those buildings are sold to income-qualifying households or other nonprofits. By retaining land ownership, CLTs permanently remove the price of land from the total cost of home ownership, partially mitigating the impact of rising land prices (Center for Transit-Oriented Development 2009a). CLTs can require that homes are sold at affordable prices based on agreed-upon resale formulas or rented at affordable levels (Greenstein and Sungu-Eryilmaz 2005). There are several prominent models of CLTs (Democracy Collaborative n.d.), including the Champlain Housing Trust in Vermont (formerly the Burlington Community Land Trust), which is the largest CLT

Box 2 | Case Study: Town Planning Scheme in Ahmedabad, India

In order to manage rapid growth in Ahmedabad, the city has used a Town Planning Scheme (TPS), a type of land pooling and readjustment mechanism, to couple land use planning with service provision in the city's expanding peripheries (Mahadevia et al. 2018). Started in 1915, the scheme was amended in 1999 to make it more effective. The amendment allowed the city to appropriate lands earmarked for roads once a TPS draft was approved. Additionally, the changes enabled the process to finance itself by allowing the city to sell parcels of land. As a result of this success, the TPS process was revamped, resulting in nine times as many TPSes being implemented between 2000 and 2016. Twice as much land was developed with infrastructure in the 10 years since the implementation of the TPS amendment (Annez et al. 2012). As of 2018, there were 480 TPS areas within Ahmedabad's metropolitan area that are part of a long-term development plan for the city. In 2010, Ahmedabad used TPS to appropriate 48 square kilometers (sq. km) of land for roads, utilities, green space, and low-income housing with amenities (UN-Habitat 2012).

TPS has allowed Ahmedabad to obtain land for public purposes, such as low-income housing and utilities, while avoiding much of the un-served expansion that characterizes many other cities in India. Some of the benefits include increased street density, which has allowed for more coordinated development and higher accessibility for residents, and a larger stock of affordable housing (Mahadevia et al. 2018).

in the United States with approximately 565 ownership units and more than 2,200 rental units. City First Homes is another example of a CLT that is serving the needs of low and moderate-income residents of the Washington, DC, metro area with an aim to preserve affordable housing near transit centers and in gentrifying or challenged communities. Other examples of CLTs include the Chicago Community Land Trust, a nonprofit organization that works closely with the city of Chicago, Illinois, to preserve long-term affordability for homes created through city programs; and First Homes Community Land Trust in Rochester, Minnesota, which supports affordable homeownership in the Rochester area.

Q4.3 Public Land Dedication or Write-Downs

Local jurisdictions can make public property available to developers at reduced prices, particularly if the developer provides affordable housing or other public benefits. For the developer to benefit from the reduced price of the land, it must ensure that a portion of or all the land is used for public benefit. Dedicating specific parcels of land, or land write-downs, for private developers can be particularly helpful where rents could otherwise not support new development or where the cost of land is otherwise prohibitively expensive. Public land dedication or write-downs can incentivize development to start around a specific TOD site (Reconnecting America n.d). However, a strong contract that includes the option of penalties is critical to ensure that the developer fulfills its obligations.

Q4.4 Eminent Domain

An example of a public sector land acquisition approach, eminent domain grants regulatory power to governments or public agencies that can compulsorily take over private property for public projects or interests, with compensation to original landowners, but not necessarily with their consent. Eminent domain can help accelerate land assembly, although if not carefully applied, it can also create long-lasting social mistrust toward the public sector. The proposed project can be paused or delayed if it does not meet the requirements for public necessity or interest. Contentious eminent domain processes can potentially result in judicial reviews, which can delay project development and increase costs. Eminent domain authority was applied in Nanchang, China, where it was used in combination with upzoning to fund the public transit infrastructure outlined in the city's master plan and land use plan, highlighting the need for mixed mode integration of five new metro lines and integrated bus services (Suzuki et al. 2015). Although relevant due to its extensive use in

Box 3 | Case Study: Community Land Trust in Anacostia, Washington, DC

As housing prices have consistently increased over time in Washington, DC, low- to middle-income households are being pushed out to peripheral areas from neighborhoods in which they have resided for years. The increasing land values make it difficult for people to become homeowners or even afford rent (Zippel 2016).

One mechanism utilized to ensure affordable housing was to create a CLT, which has been established in conjunction with the 11th Street Bridge Park in Washington, DC—an aerial park across the Anacostia River. The park project is valued at \$45 million and links high poverty and high unemployment areas, Anacostia and Fairlawn, located in Southwest Washington, DC, to the two more affluent neighborhoods of Navy Yard and Capitol Hill (Hui 2017). A nonprofit organization, Douglass Community Land Trust, was formed to facilitate the CLT and avoid gentrification of Anacostia and Fairlawn. The park project planners have engaged the community and built trust by drafting an Equitable Development Plan that incorporates the notion of permanent affordable housing through a CLT. Other mechanisms to encourage sustainable development, which are housed in the Equitable Development Plan, include maintaining affordable housing options that already exist and using the park development to increase economic opportunities for residents (Cohen and Tatian 2018). In order to carry out these initiatives, the nonprofit organization has used a combination of public and private funds to purchase land in Anacostia and Fairlawn and allow residential or commercial development if developers improve the well-being of the community, such as through permanent affordable housing (Hui 2017). The project is ongoing, and its success is undetermined, but the nonprofit organization is working transparently and engaging residents in the process, bolstering the probability of the project's success. For instance, community members comprise the majority of the board positions at the nonprofit organization and are in control of CLT decision-making (Cohen and Tatian 2018).

the past, eminent domain as a method of land acquisition is gradually becoming inactive, with fewer use cases in recent times.

Q5: WHAT ARE POSSIBLE FINANCING MECHANISMS FOR TOD?

Municipalities can use different types of revenue generation mechanisms to invest in TOD or transport infrastructure projects. Investments in TOD are connected to land use management and associated valuations, which can generate revenues from taxes and direct charges. For example, assessing urban betterment fees at the city level creates opportunities to direct generated funds to specific projects (Tian 2014). In general, these kinds of developments are typically capital-intensive, requiring large resources during construction, followed by relatively

minor but recurrent financial resources for operation and maintenance. The financing mechanisms can differ based on the amount of resources leveraged, timing, regularity, and sources. Financing for TOD projects often combines different types of sources to respond to the specific project characteristics during the full life cycle of the investment. No single financing mechanism is likely to cover the full capital and operations and maintenance costs related to TOD, especially with respect to the transit facility that underlies the area. Revenue generated by some of the financing instruments can be used to secure debt.

Cities have access to a range of traditional and nontraditional finance sources to fund TODs (see Table 1). Choosing the best combination of financing sources is highly context specific and ideally should consider multiple aspects, including legal feasibility, social acceptability, revenue generation potential, economic development potential, social value potential, and compatibility with public policy objectives.

LVC has been the most instrumental form of TOD financing. Once used, this group of financing mechanisms opens opportunities to combine land value-based financing and land assembly for TOD. These mechanisms will be explored more deeply in the following section (Question 6).

Q6: WHAT ARE SOME LAND VALUE CAPTURE TOOLS USED TO FINANCE TOD?

LVC mechanisms enable communities to partially or fully recover capital investments by capturing part of the value increase created by the initial public investment. TOD is an appropriate context in which to utilize LVC mechanisms to partially recover the cost of transport and other

trunk infrastructure investments by capturing the value created by subsequent real estate development (Suzuki et al. 2013). Table 2 outlines some LVC tools that can be used to invest in TOD that are organized by how the revenues are captured and created.

- LVC based on changes in regulation:** Instruments that aim to capture land value increases generated by changes in urban regulations and policies, such as additional or special building rights, zoning, and project authorizations.
- LVC based on public investments:** Instruments that aim to capture the appreciation generated by past or future public investments on infrastructure such as transit corridors, sanitation infrastructure, public spaces, or other public goods.
- LVC based on joint developments:** Instruments that allow public and private sectors to coordinate on projects using the land and its value as financial components of the arrangement.

Before implementing LVC mechanisms, cities should analyze and assess the value of land that will be utilized. The square-meter price of land is influenced by three factors: current use, potential use, and its current and future surroundings, especially economic and employment centers and connecting infrastructure (Smolka 2014). These factors can be negatively or positively impacted by zoning regulations, such as use limitations, FAR, and building height restrictions. Changes in regulation and new investments in surrounding infrastructure or in economic activity can generate positive changes in land value. This increase in land value can potentially be captured by the public sector to be reinvested in the city.

Table 1 | **Municipal Financing Mechanisms Utilized for TOD**

TRADITIONAL MUNICIPAL FINANCE	INNOVATIVE MUNICIPAL FINANCING	
<ul style="list-style-type: none"> • Intergovernmental transfers • Municipal budget and borrowing • Capital reserves • Grants • Tax abatements, subsidies, or guarantees 	LAND-BASED	LAND VALUE CAPTURE
	<ul style="list-style-type: none"> • City-owned real estate and other owned assets • Land banking 	<ul style="list-style-type: none"> • Tax Increment Financing (TIF) • Special assessment districts (or Business Improvement Districts; BIDs) • Charges for building rights and Transfer of Development Rights (TDR) • Betterment levies

Source: Nunez and Acero 2014.

Table 2 | Examples and Key Features of Different Types of Land Value Capture Tools

LAND VALUE GENERATED BY CHANGES IN REGULATION	Charges for building rights	Governments sell development rights extended beyond the limits specified in land use regulations (such as Floor Area Ratios [FARS]) or created by regulatory changes to raise funds to finance public infrastructure and services.
	Transfer of Development Rights (TDR)	Fees paid by landowners to the municipality to transfer the density potential of one area of land to another parcel of land that is better suited for greater densities.
	Charges for changes in land use	Governments sell the possibility to change the zoning (e.g., rural to urban) to raise funds to finance public infrastructure and services.
	Density bonuses	Incentive-based tool that permits a developer to increase the maximum allowable development on a site in exchange for either funds or in-kind support for specified public policy goals.
LAND VALUE GENERATED BY PUBLIC INVESTMENT	Land banking and project announcement	Government holds and/or acquires land before announcing an investment in infrastructure. The government then sells developers the land or its development rights (lease) in return for an up-front payment, leasehold charge, or annual land rent payments through the terms of the lease.
	Betterment levies	Surveys imposed by governments on estimated benefits created by public investments requiring property owners who benefit directly from public investments to pay for their costs.
	Property and land taxes	Taxes levied on estimated value of land or land and buildings combined, with revenues usually going into budgets for general purposes.
	Tax Increment Financing (TIF)	A surtax on properties within an area that will be redeveloped by public investment financed by municipal bonds against the expected increase in property taxes. Mainly used in the United States.
LAND VALUE GENERATED BY JOINT DEVELOPMENTS	Real estate consortium/joint development	Coordinated action where private landowners transfer their land to the government to develop buildings and infrastructure in exchange for urbanized land and/or built properties.
	Urban redevelopment schemes	Government, landowners, and developers cooperate to consolidate piecemeal land parcels into a single site that they then develop (such as a high-rise mixed-use building) with new access roads and public open spaces. The local government modifies zoning codes and increases maximum FARs in the targeted redevelopment areas (typically around rail transit stations) and finances the infrastructure.
	Land readjustment	Landowners pool their land and contribute a portion of their land for sale to raise funds and partially defray public infrastructure development costs.

Sources: Smolka 2014; Suzuki et al. 2013; Amirtahmasebi et al. 2016; Mahendra et al. 2020.

LVC mechanisms are an important source of revenue and a strategic planning tool for TOD project success, especially concerning the real estate development incentives around transit corridors. Applying LVC mechanisms requires strategic planning across the city. If there are equally attractive sites where LVC fees or taxes will not apply, then the TOD site becomes less attractive to the real estate market (Evers et al., 2018). These distortions can be mitigated during the first phase of the investment life cycle, particularly with a robust market study that would help determine the sensitivity of investment to increased fees and taxes across the city.

The revenue potential of each LVC mechanism varies from mechanism to mechanism and depends on the local context of economic and real estate market conditions. As mentioned above, LVC mechanisms are one type of a

range of financing instruments and should not be applied alone. It is highly recommended that governments use complementary mechanisms (such as voluntary improvements' contribution, parking fees, congestion charges) as well as associated LVC-management type of mechanisms (those that can assist urban management, minimize risks of gentrification, enable the inclusion agenda, etc.).

Q6.1 Tax Increment Financing

TIF is based on taxing future increases in property values. TIF works best in markets with defined frameworks for assessing and collecting property taxes and developed municipal capital markets, such as in the United States. It has generally struggled in developing countries. TIF revenues can be used to back TIF bonds issued by the public authority or can be used to reimburse a private developer

as incremental taxes are generated (without bond issuance) (Chicago Department of Planning and Development n.d.). In the latter case, the developer can only get repaid (an amount that typically includes interest) after the project delivers and begins to be integrated in the market. This form of TIF requires a developer to absorb some of the risk, in that the developer is required to invest its own capital in infrastructure costs (Amirtahmasebi et al. 2016). TIF funds can be allocated for specific uses, such as the redevelopment of specific areas or to earmark funds for high-priority needs and areas. This tool is most effective when supportive legal and regulatory frameworks are in place (such as designated intervention areas).

Although it can be a valuable mechanism for reinvestment in public infrastructure or to compensate private developers, TIF has been criticized for not always fulfilling the goal of boosting economic development. Critics often claim that TIF tends to use tax money for a special fund that often works in an opaque way—meaning that the money does not always go toward the types of projects that deserve this type of incentive (Merriman 2018). Issues of transparency arise since cities’ financial decisions on TIF are separate from the traditional budgeting process.

Q6.2 Betterment Levies and Taxes

Special assessment taxes, a type of betterment levy, are a targeted form of taxation applied in a specific and defined urban area that will benefit from the infrastructure development that supports the construction of new homes and commercial space. This mechanism is also sometimes called a Business Improvement District (BID) or Local Improvement District (LID), depending on local context (Howard and Bryant 2015). In this case, existing property owners must agree, usually through a public vote, to additional self-assessment as the public authority is generally unable to impose the special assessment unilaterally. The tax is applied on the full value of the property and is added to existing taxes. A special assessment tax can be used to back bonds issued by the public authority.

A successful special assessment tax depends on the following factors: the legal ability of the city to raise property taxes and convene private land developers and owners, the legal and regulatory frameworks that allow changes in property tax rates, a robust fiscal base, and, finally, the technical capacity to assess increases in property values and ensure adequate updates of land registry. This mechanism has been used widely in the United States and a version of it has also been applied in Colombia (see Box 4).

Box 4 | Case Study: Special Assessment Tax in Manizales, Colombia

A certain type of special assessment, or betterment levy, called Valorization Contribution (Contribucion de Valorizacion; CV) has been collected in cities in Colombia since 1921 (Ochoa 2011). Different models have been used in Bogotá and Medellín, which follow different methodologies and priorities in terms of revenue allocation. The Bogotá version is similar to a general tax on financed public works, whereas the Medellín model more closely resembles the concept commonly known as “value capture” finance to fund public infrastructure. The Medellín model, which has also been applied in Manizales, uses a dual appraisal approach, meaning it relies on pre- and post-assessment values to determine the value capture increment (Lozano-Gracia et al. 2013). It will then distribute the tax revenues among the property owners, considering their capacity to afford it. The Manizales Valorization Institute (Instituto de Valorizacion de Manizales; INVAMA) oversees the administration of the taxes with full authority delegated by the city. Manizales has used special assessment taxes to finance a range of urban development projects, such as the renewal of the Alfonso Lopez Plaza and the renovation of Student Walk (Paseo de los Estudiantes). The total investment was financed by a levy assessed on 80 percent of the city’s properties, amounting to a total collection of \$24.6 million by 2011 (Ochoa 2011).

Q6.3 Charges for Building Rights and Transfer of Development Rights (TDR)

There are two groups of LVC mechanisms applied on the basis of development rights or density potential: Transfer of Development Rights (TDR) and charges for building rights. The former acts both as a financing mechanism and a land assembly tool, whereby it transfers density potential from one area to another following the building right charges. The latter, however, focuses only on finance by charging the additional building rights required by the developer.

TDR defines a site’s maximum development potential and permits owners of land zoned for low-density development to sell their development rights to other property owners. The “transferred” development rights allow the purchasing entity to develop its “receiving” parcel at a higher density than would be otherwise legally possible (Machemer and Kaplowitz 2002). TDRs allow the owner to sell the development rights of a particular parcel of land that lies within the designated “sending zones” to another landowner whose land lies in the designated “receiving zone,” as per the development control regulations (National Institute of Urban Affairs 2016). It can be a useful tool to increase density around mass transit

corridors, and increase returns for developers interested in TOD, while preserving areas where development needs to be minimized. Figure 3 provides a summary of how and where TDRs can be implemented

On the other hand, charges for building rights are fees paid by developers to the municipality for additional development rights in the intended real estate development area. In some jurisdictions, the purchase of building rights can be made directly from the municipality by the developer, or it can be made indirectly through a bidding process.

This is the case of the Brazilian Certificates of Additional Construction Potential (Certificados de Potencial Adicional de Construção; CEPACs). They are used as a market-based instrument to finance public investments through air right transactions within a designated urban area.

Through CEPACs, municipalities can raise investment funds by selling additional building rights, such as higher FARs and possible land use changes, which encourages greater densities while attracting private investments (Suzuki et al. 2015). Through CEPACs, local authorities can obtain revenues early in the project development cycle without the use of public fiscal resources. The revenues gained from the sale of air rights can be placed in the dedicated municipal funds to finance public works. The experience of the Faria Lima project in São Paulo, Brazil, with CEPACs is summarized in Box 5.

For more detailed information on TDR, we recommend *Transit-Oriented Development Implementation Resources & Tools* (Ollivier et al. 2021), *Financing Transit-Oriented Development with Land Values* (Suzuki et al. 2015), and *The TDR Handbook* (Nelson 2012).

Figure 3 | Different Visualizations of TDR

Sources: Riggs 2007; NYC Planning n.d.

Box 5 | Case Study: Faria Lima Urban Operation Consortium, São Paulo, Brazil

CEPACs were auctioned off by the city government of São Paulo and can be used only in a designated Urban Operation (UO) area that the municipality has targeted for public investments, similar to an improvement district (Mahendra et al. 2020). In Brazil, a UO is a legally defined area that allows municipal governments to implement projects to improve and enhance urban areas with the assistance of the private sector. UOs target a specific part of the city that has the potential to attract private real estate investments and

provide a way for cities to capture anticipated increases in land values. The funds from the sale of CEPACs are then earmarked or placed in a dedicated fund for investments in the targeted urban area (Biderman et al. 2006). The main concept of the CEPAC and UO areas is to create development rights for upzoning and to then sell these rights to developers to raise funds, which can be used to finance the construction of infrastructure (Ingram and Hong 2010). The figure below depicts the process of a CEPAC.

FIGURE B5.1 | The Process of a CEPAC

Source: Mahendra et al. 2020.

In São Paulo, CEPAC revenue provided the initial capital for infrastructure investment for the Faria Lima Urban Operation Consortium (Operação Urbana Consorciada Faria Lima; OUCFL), an urban redevelopment project in the downtown area of the city that seeks to redevelop a middle-income area of mostly single-family homes. It was proposed and approved in 1995 as a way to secure private funding for public investments necessary to purchase land and build infrastructure to extend Faria Lima Avenue. Technical studies carried out at the time indicated that it would be possible to take advantage

of an additional potential 2,250,000 square meters beyond the city's zoning legislation, and the FARs changed accordingly (Biderman et al. 2006). From 2004 to 2009, the total income collected from selling CEPACs in Faria Lima and Água Espraiada, São Paulo, was R\$1.62 billion (US\$812 million) (Prefeitura da Cidade de São Paulo 2008). These mechanisms have allowed the city to fund the development of parks, improved sidewalks, upgraded informal settlements, and other transformative investments within the targeted area.

Note: It is important to note that the OUCFL was not initially planned as a TOD project. The case was chosen to illustrate the LVC mechanism in an urban project with elements of TOD: an urban project that coordinates urban development in an area, organized around a transit facility, through a public and private investment coordination.

Q7: WHAT INCENTIVES EXIST TO ENCOURAGE PRIVATE SECTOR DEVELOPMENT?

Q7.1 Planning Instruments

Zoning exemptions or requirements are some of the most common incentives provided in exchange for meeting certain public objectives (Burnier 1992). Zoning incentives include greater height or floor-area allowances, such as density bonuses; and parking space reductions. Sometimes these incentives are packaged into overlay zones, where specific areas qualify in hopes of spurring development (Arrington 2005; Atkinson-Palombo 2010). These zones also give cities the opportunity to clearly outline their public benefit requirements.

Density bonus

Density bonuses are ways for local governments to encourage developers to provide public amenities by adopting a density incentive zoning program in the TOD area. When White Flint, Maryland, upgraded its rail transit station in 2010, the planning authority adopted a combination of value capture mechanisms, including upzoning⁵ the TOD area with a density incentive program, where developers could opt to either limit their projects to the standard density maximums—0.5 FAR or 10,000 square feet (sq. ft) (whichever is greater) and 40 feet (ft) in height—or be allowed to build at higher density (Cervero et al. 2004). Depending on the area and the level of benefits provided, density incentives could go up to 3.5 FAR and 300 ft in height (Morris 2002). Projects can receive density incentives for providing public facilities like schools, libraries, recreation centers, parks, public parking, or affordable housing beyond the required minimum (Sloan 2010). In a booming real estate market, where there is little room for affordable developments, linking affordable housing production to market-rate development using density incentive zoning can be an effective tool if the profit from additional density exceeds the extra cost of building the affordable housing.

Reducing parking requirements

The public sector can ease rigid parking requirements, a site-specific obstacle, especially when those requirements are set inappropriately high within a transit-oriented area. In urban areas in the United States, research shows that the cost of constructing one parking space is on average around \$31,000, depending on geographic locations and construction type (Shoup 2014). Although parking can provide additional private sector revenues, lower parking

requirements for housing near transit stations provides more space for commercial development and increases the financial feasibility of affordable housing.

Q7.2 Fiscal Instruments

Other than investment in public facilities and infrastructure and through public-private partnerships (PPPs), municipalities often have limited financial capacity to initiate urban development. However, there are several proven fiscal instruments that can attract private investment.

Tax-based incentives

Local governments can facilitate development by reducing tax liens on projects that provide public benefits. For example, local governments can forgive tax liens for developers that agree on certain site redevelopment requirements. This type of forgone revenue can be considered as a public investment in the future TOD. Credits, deductions, abatements, and exemptions are all different types of tax-based incentives for development (Hess and Lombardi 2004; Cervero et al. 2004; Dittmar et al. 2004).

The Low-Income Housing Tax Credit (LIHTC), a program of the U.S. Department of Housing and Urban Development (HUD), is the dominant funding mechanism for the development and rehabilitation of affordable housing in the United States. The LIHTC is administered by state and local governments, and issues tax credits for the acquisition, rehabilitation, or construction of rental housing that targets lower-income households. It is a dollar-for-dollar tax credit for affordable housing investments and provides incentives for the utilization of private equity in the development of affordable housing for low-income families. LIHTC accounts for much of the affordable rental housing created in the United States.

Non-tax financial incentives

Local governments can utilize non-tax incentives such as loans, tax-exempt financing, and public investment programs to encourage private sector investments in TOD. Financial assistance may also help mitigate some of the risks by having the public sector lead the investment. Table 3 summarizes the potential non-tax financial incentives that can be offered to the private sector.

Table 3 | **Overview of Different Types of Financial Assistance for Economic Development**

TYPE OF ASSISTANCE	PROGRAM	MECHANISM
LOAN PROGRAMS	Capital access	Creates insurance for losses from small business loans
	Loan participation	Government directly lends a portion of a loan or purchases that portion from the lending bank
	Loan guarantee	Government cosigns loan, guaranteeing a portion of the loan amount
	Collateral support	Government funds boost collateral for loans
	Direct loan	Government loans directly to companies
TAX-EXEMPT FINANCING	Private activity bonds	Businesses participate in tax-exempt bond issues
INVESTMENT PROGRAMS	Direct investment	Government provides funds for direct investment in local companies
	Fund of funds	Government provides funds for local private equity and venture capital funds
	Certified Capital Companies	Incentive for insurance companies to invest in local private equity funds
	Investor incentives	Incentives to individuals for local seed capital investing

Source: Francis 2016.

Q8: WHAT ARE POSSIBLE LEGAL AND INSTITUTIONAL STRUCTURES FOR TOD?

While all the benefits detailed in Question 1 are desirable, they are not always feasible. Thus, TOD projects require that the public sector has clearly determined priorities. Inevitably, there will be tough choices in the final site design and negotiation. International experience has shown that prioritizing transit-oriented investments is more robust when it involves all stakeholders (Center for Transit-Oriented Development 2009b; Hale and Charles 2007). Among government stakeholders, there needs to be representation from all the relevant departments in charge of the different aspects of TOD, such as housing, environment, transport, and economic development. In the best-case scenario, representatives of the private sector, civil society, and local resident groups will also be active members during project development. Design changes and continuous negotiations are common in TOD projects. Thus, making a specific public agency accountable for meeting a city's TOD priorities and vision helps to avoid undesirable outcomes (Lane 2017).

Q8.1 Public Sector-Led

Successful implementation of TOD strategies requires necessary physical infrastructure investments, but also an administrative structure that encourages land develop-

ment and investment that is transit-oriented. Planning for real estate can be an inherently political process, requiring coordination and communication among developers, funders, and residents. These are critical responsibilities that a municipal government can fulfill during acquisition, design, financing, and public review (Freemark 2019). Another important role for the public sector is to properly design and enforce regulatory frameworks to encourage investment in TOD.

A **Business Improvement District (BID)** is a type of special assessment district (see Question 5) for delivering district-level improvements such as infrastructure upgrades. BID structures give property and business owners a choice to make a collective contribution to maintain, develop, and promote their commercial district (Listokin 2011) through a majority vote. The core concept of BIDs is that they assess properties within a defined neighborhood to finance a variety of enhanced services in that area. Among the benefits of the BID structure is that it creates a reliable funding source for supplemental services and programs, such as public safety, or marketing of a neighborhood brand (U.S. Department of Transportation 2011). As they are self-managed and funded by the owners themselves, BIDs typically offer the ability to respond

Table 4 | Different Types of Ownership and Delivery Models in TOD Projects

TYPE	DESCRIPTION	BENEFITS	STRATEGIES
Public sector	The public sector can steer the planning and project implementation in conjunction with the private sector and relevant stakeholders; however, it will always require a range of partners to provide a comprehensive suite of development services. Project development would be undertaken through traditional public sector funding processes.	<ul style="list-style-type: none"> Complete value capture by the public sector Public sector control Lower transaction cost in the absence of lengthy procurement process Public interest put at the forefront 	<ul style="list-style-type: none"> Eminent domain Inclusionary zoning Upzoning reform Economic development corporations
Public-private partnerships	Bearing all development-related financial responsibilities and risks, the private sector will initiate and steer the project. Though the public sector has a minority or a limited financial interest in the project, the developer needs to cultivate strong relationships with relevant public agencies.	<ul style="list-style-type: none"> Fewer risks for the public sector Limits public sector role to regulation, monitoring, and enforcement Partial value capture depending on contract structure Ability to take advantage of developer's expertise and resources 	<ul style="list-style-type: none"> Business Improvement District (BID) Private sector concession agreements Rail-plus-Property schemes (R+P) Special Purpose Vehicle (SPV)
Nonprofit organization	Nonprofit, community-based organizations can serve as service providers, developers, or community representatives. This is often used as a hybrid model which includes both private and public sector involvement.	<ul style="list-style-type: none"> Seen as a trustworthy third party Can represent the interests of local communities 	<ul style="list-style-type: none"> Community Development Corporation Trusts Developers and service providers

Sources: Authors, based on case study research and Hale 2008.

more quickly than the public sector to the changing needs of the business community. However, in certain cities BIDs are not always sufficient to cover the cost of some types of large public infrastructure and upgrade projects. In such cases, public sector support is required (Amirtah-masebi et al. 2016).

Rail-plus-Property (R+P) scheme is a public sector-driven delivery model used to leverage revenue from high-value real estate around transit hubs to fund the cost of transit infrastructure. In this model, a rail or transit agency integrates transit investments and urban development around station areas. The owner-operator of the transit system can then recoup the cost of investing in rail transit and make a profit from the property development that may ensue (Xue and Fang 2015; Cervero and Murakami 2009). Its most common application is in Asia, particularly in China and Japan. R+P programs have been combined with land readjustment (see Question 4 on land assembly), as is the case of the Tsukuba Express/Kashiwanoha-campus Station in Tokyo, Japan, which converted an area into developed land parcels for residential, commercial, and industrial services, among others. It is served by roads, utilities, parks, green spaces, and a new railway station (Suzuki et al. 2015).

Inclusionary zoning is another important public sector policy tool for TOD implementation as it allows the city to mandate a minimum percentage of new construction or renovation to be reserved for affordable housing in exchange for development rights or zoning variances (Schwartz et al. 2012). This model helps to ensure that TOD aligns closely with the interests and needs of residents, as well as maintains the socio-economic balance of a neighborhood and provides mixed-income development (Center for Transit-Oriented Development 2009a). As mentioned earlier, upzoning is another zoning tool available to cities to allow higher densities and decreased housing costs. These types of zoning techniques are most effective in cities and neighborhoods that have hot housing markets, low base zoning restrictions, and where the community is generally supportive of greater intensity of development and land use.

Q8.2 Public-Private Partnerships

Given the complexity of TOD projects, which involve transit service improvements, commercial real estate, public space designing, housing equity, and financial viability, PPP models are commonly used to ensure both short and long-term socio-economic benefits (Hale 2008).

PPPs are long-term contracts between a public sector entity and a private sector corporation whereby the private sector often finances, constructs, and operates infrastructure facilities or develops specific urban areas in exchange for payment or the right to collect associated revenues for a certain period (NCSL 2017; Suzuki et al. 2015). The idea is to transfer part of the commercial and operational risks to the private sector, which is better suited to manage the project risks and obtain financing, while providing an attractive offer to investors (e.g., by means of public subsidies) (Siemiatycki and Friedman 2012). In order for this type of agreement to be successful, risks and responsibilities need to be carefully assessed and allocated on the basis of enabling conditions such as policy frameworks and legal arrangements currently in place (World Bank Group 2018). Special Purpose Vehicles (SPVs) are commonly used in conjunction with concession agreements, serving as a subsidiary corporation with an asset/liability structure and legal status, which ensure security of obligations, even if the parent company goes bankrupt. An SPV can be created for the sole purpose of overseeing and managing the investment.

Q8.3 Hybrid or Nonprofit Organizations

Nonprofit, community-based organizations also have an important role to play in the developments that occur in cities. Often, they are seen as trustworthy representatives of lower-income neighborhoods, making their voices that much more important in terms of TOD, which has the potential for displacement and other impacts caused by gentrification (Levine 2016) (see Question 5). These approaches often involve both public and private sector actors.

Community or economic development corporations (CDCs) are organizations that provide an important avenue for community-driven development (Grady and LeRoy 2006). In some cases, CDCs can provide the “missing element” in a PPP, allowing for all stakeholders’ needs and preferences to be represented (Cappellano and Spisto 2014). For example, a local Community Development Corporation, known as the Unity Council, which was involved in the Fruitvale Transit Village development in Oakland, California, was instrumental in first opposing a top-down development by the local transit agency, and then mobilizing and organizing a multistakeholder engagement process between public and private sector actors, as well as local residents (Goggin 2016).

Box 6 | Case Study: Private Sector Concession in Rio de Janeiro, Brazil

In Rio de Janeiro, Brazil, the UO in Porto Maravilha established a private sector concession agreement for the redevelopment of the old port area. The Porto Novo Consortium is made up of three private sector actors who share the contracts for the construction, operation of services, and maintenance of public improvements until 2026. This project also offers an example of how an SPV, in this case the Urban Development Company of the Porto Region of Rio de Janeiro (Companhia de Desenvolvimento Urbano da Região do Porto do Rio de Janeiro; CDURP), manages the concession contract at least until construction is complete. It is a mixed economy company that is not staffed by civil servants but reports to the City of Rio de Janeiro’s PPP Secretariat and the national Securities and Exchange Commission (Comissão de Valores Mobiliários; CVM).

With support from the federal and state governments, the municipal government of Rio de Janeiro initiated the redevelopment of Porto Maravilha through a UO mechanism to stimulate development in the region through physical revitalization of the neighborhood and waterfront. The project is expected to revive the port and cultural heritage of Rio de Janeiro, and integrate areas of housing, cultural, and economic potential with multi-modal transportation (Lane 2017). Investments include new roadways, active mobility infrastructure such as bike lanes, a new privately operated light-rail network, and integration of the port area with the city’s light rail transit (LRT) system and future bus rapid transit (BRT) to link the area to Rio’s Centro neighborhood and the airport (Urban Development Company of Rio de Janeiro Port Zone 2021).

Note: It is important to note that the UO of Porto Maravilha was not initially planned as a TOD project. The case was chosen to illustrate the PPP model in an urban project with elements of a TOD: an urban project that coordinates urban development, organized around a transit facility through a public and private coordination investment.

Nonprofit entities, such as trusts, can also act as **developers or service providers**. For example, this has been illustrated by Del Norte and the Urban Land Conservancy (ULC) of Mile High Vista (Denver, Colorado), and BRIDGE Housing of MacArthur Transit Village (Oakland, California). BRIDGE Housing acts as developer and provider of a mixed-use project aiming to address affordability problems in the area, as well as low transit ridership and economic development, around the MacArthur Bay Area Rapid Transit (BART) station (MacArthur Transit Community Partners, LLC 2008). In the former, the ULC, a nonprofit that acquires, develops, and preserves community real estate assets in Colorado, led the remediation of a contaminated parcel of land which paved the way for the subsequent development by nonprofit housing developer

and provider Del Norte, which built a public library and 80 affordable housing units serving families below 60 percent of the area median income (EPA 2015; Smith 2014).

Q9: HOW CAN CITIES BETTER MANAGE EFFECTS OF GENTRIFICATION?

Despite the potential benefits presented by TOD, an important potential negative impact is gentrification—a process that takes place when property values and incomes rise, which may lead to the displacement of lower-income households by middle- and high-income households (World Resources Institute and World Bank Group 2018). Simply investing in TOD does not automatically mean improved quality of life and livability for all residents; in fact, TOD can potentially increase inequality. While there is no simple solution, cities have employed the following general strategies to address the problem:

- **Maintaining affordability of existing housing supply.** Maintaining the affordability of existing multifamily housing is crucial for keeping housing costs affordable for residents and maintaining the traditional culture of the neighborhood impacted by TOD. As transit improvements are reflected by increases in property values, market-rate rentals that are currently affordable to low-income households may soon become unaffordable if not protected.
- **Increasing affordable housing supply.** When new TOD strategies are implemented, simply preserving the existing affordable housing will not be enough to balance the income mix of the new neighborhood. Thus, boosting the inventory and pipeline for more affordable housing is equally important.

Some concrete ways to implement these strategies, at both the planning and development stages, are outlined in the following subsections.

Q9.1 Inclusionary Zoning

It is common in high-cost markets to require ownership housing to be affordable for low- to moderate-income households and rental housing to be affordable for very low to low-income households (Center for Transit-Oriented Development 2009c). From the planning point of view, local government entities can encourage or require developers to provide more affordable housing by adopting an inclusionary zoning approach that requires

a certain percentage, usually 10 percent to 25 percent, of units in a development to be tied to income levels, with households with a median income above a preestablished maximum being ineligible. A benefit of inclusionary zoning is that it can potentially deliver affordable housing without any direct public spending (Ramakrishnan et al. 2019; Mukhija et al. 2010). However, this strategy may also push housing development further away from the TOD area, thereby creating more sprawl. This risk can be mitigated by designing the inclusionary zoning program over a larger area rather than confining it to a relatively small TOD area.

Q9.2 Flexible Financing Mechanisms

Structured fund for affordable housing land acquisition

To assist the production of affordable housing, flexible land acquisition financing assistance can be particularly useful in helping affordable housing developers to close deals more quickly in transit zones, especially where the timing for development may not yet be optimal (Center for Transit-Oriented Development 2009a).

Subsidies for affordable housing

Generally, in the United States the requirement to receive affordable housing subsidies is that the household makes between 30 percent and 50 percent of the Area Median Income (AMI) (Metropolitan Council 2021). However, in

Box 7 | Case Study: Inclusionary Zoning

Inclusionary zoning is a regulation-based tool that mandates a certain minimum percentage of affordable housing units to be built within TOD areas. In 1976, Montgomery County, Maryland, adopted the first inclusionary zoning ordinance in the United States. The Moderately Priced Dwelling Unit Ordinance requires developers of all mixed-use projects with 20 or more residential units to make 12.5 percent to 15 percent affordable units for lower-income households in exchange for a 22 percent density bonus (Center for Transit-Oriented Development 2009a).

In India, the National TOD policy suggests the provision of a mandatory incentive of additional FAR for Economically Weaker Section (EWS) housing in TOD areas. It also indicates that the cities should fix a minimum percentage of allowed FAR for affordable housing in all development/redevelopment in TOD areas. Besides, the Master Plan of Delhi recognizes the need for affordable housing units within TOD development and mandates the provision of 15 percent FAR over and above the maximum permissible residential FAR for provision of good quality EWS housing.

Box 8 | Case Study: Bay Area Transit-Oriented Affordable Housing Acquisition Fund, California

In order to preserve affordable housing near transit in the increasingly unaffordable San Francisco Bay Area, California, a regional quasi-governmental partnership organization, the Great Communities Collaborative (GCC), decided to form the Bay Area Transit-Oriented Affordable Housing Fund (TOAH Fund), which is a short-term structured loan fund of \$50 million that pools money from various investors with different return expectations to provide financing for acquiring land for affordable housing development near transit (Seifel Consulting and ICF International 2013). A critical step in the creation of the fund was the participation of the Metropolitan Transportation Commission (MTC), which not only committed a \$10 million investment but also served as a top-loss investment, meaning that any defaults would affect MTC's investment first, reducing the risk for other investors. After the \$10 million investment from MTC, the \$15 million funding from community development financing institutes (CDFIs) and foundations occupies the second tier, while the two banks, Morgan Stanley and Citi Community Capital, with a cumulative investment of \$25 million, occupy the most secure, senior risk position (EPA 2013). With MTC and CDFIs' high tolerance of risk and low expectation of return, the TOAH Fund can offer favorable loan terms for affordable housing development projects, such as low interest and high loan-to-value ratio.

some cities, many residents who provide the bulk of essential services (such as retail, food service, tourism, education) do not fall in the low-income category that enables them to be placed on the affordable housing waitlist. As a result, exorbitant housing costs push these essential segments of society to move further and further from their workplace in search of cheaper housing options, leading to negative economic, social, and environmental impacts. In this case, rather than force these workers to commute from affordable but distant areas, cities can incentivize the development of affordable housing for medium-income households, where these workers can live. Although some cities provide direct and indirect subsidies to the developer through density bonuses, upzoning, and impact-fee waivers, these subsidies can potentially be justified over the long term due to increased tax revenues and the continued availability of affordable housing. Moreover, these subsidies can be phased out over time, especially after market acceptance has been established.

Subsidies to borrowers

Other forms of subsidies are subsidized interest rates, longer maturities, or relaxed collateral requirements which could target low-income households. For example, EcoCasa is an on-lending program in Mexico with the goal

of reducing energy usage by 20 percent through bridge loans and guarantees by the Federal Mortgage Society (Sociedad Hipotecaria Federal; SHF), the national housing financing entity responsible for 30 percent of housing construction loans. Similarly, the German development bank, KfW, has financed energy efficiency improvements for five million dwellings from 2005 to 2017, offering loans of up to €100,000 at subsidized interest rates (1.66 percent in real terms) over 10 years, with 20-year maturities and a 2-year grace period (Hennes 2018). Borrowers can also obtain partial debt relief, depending on the amount of improvements achieved. These programs can be combined with TOD investments to help maintain affordability.

Q10: HOW CAN CITIES MEASURE EXPECTED OUTCOMES AND IMPACTS OF TOD?

The investment cycle does not end with construction but continues as buildings lease-up and economic activities take hold in the TOD area. It often takes years for a TOD site to fully lease, which results in additional administrative costs.

There are currently no universally accepted methodologies for measuring the impacts of TOD. Monitoring and evaluation (M&E) systems should be designed to account for the three different scales of TOD planning because the performance indicators will vary by level. There are several performance indicators that can be used as proxies to assess the impact of TODs (see Table 5). These performance indicators will provide a framework on which to base the project's progress. Possible impact indicators are listed in four categories: mobility, social, environmental, and economic. Assessing the impact of these indicators requires the collection of data from a variety of sources. For instance, project success can be measured through the collection of community opinions, user surveys, and assessments. Feedback on neighborhood projects is important at all steps of a project, from planning to implementation.

Q10.1 TOD Standard

The Institute of Transportation and Development Policy's (ITDP) *TOD Standard*, first issued in 2013, is an evaluation tool designed to determine how successful a project has been in integrating sustainable transit options and land use planning (ITDP 2014). TOD projects are evaluated using a point-based system of eight principles and 21 metrics. These principles and metrics are based on the primary components and goals of TOD. The principles

with which projects are evaluated in the TOD Standard are, as outlined in Question 3, “walk,” “cycle,” “connect,” “transit,” “mix,” “densify,” “compact,” and “shift.” As the names suggest, each principle seeks to evaluate projects based on whether they have achieved walkable, high-density, mixed-use, and mixed-income developments with high connectivity to transit. Based on their scores in each individual category, projects can achieve a bronze, silver, or gold TOD standard through this evaluation system. The TOD Standard was designed with TOD projects, zones, and station areas in mind.

Q10.2 TOD Index

An illustration of the economic benefits TOD projects can have for a community’s real estate values can be seen through the TOD Index (Renne-Greschner n.d.). A tool created by Professor John L. Renne, the TOD Index is designed to measure the impact TOD can have on property value. The TOD Index examines the property values of houses located in 3,088 TOD station areas, tracking the property values of TOD housing compared to the average national housing price. As demonstrated by the index, the property value of TOD housing is consistently above average. The TOD Index provides a clear metric by which the economic benefits of TOD can be demonstrated.

Table 5 | **Impacts and Commonly Used Performance Indicators in TOD Projects**

TYPE OF IMPACT	CATEGORY	COMMONLY USED PERFORMANCE INDICATORS
MOBILITY	Travel behavior	<ul style="list-style-type: none"> Vehicle miles or kilometers traveled (VMT/VKT) determine the level of automobile usage within a specific city. Mode share measures the number of trips a household takes using each type of available transit, including pedestrian travel. Auto ownership measures the number of households within an area that own a car. Transit can be measured using the number of residents boarding transit at a specific station or throughout a transit network.
	Accessibility and walkability	<ul style="list-style-type: none"> Number of high-density developments located within a station area Change in length and width of unobstructed sidewalks/footpaths Change in street parking interference Walkability score Number of pedestrian and bicyclist accidents
	Transit service	<ul style="list-style-type: none"> Frequency of transit service Number of public transit options within a community Integration of multimodal options with transit stations Satisfaction levels with public transit options Changes in travel time due to transport improvements
	Road safety	<ul style="list-style-type: none"> Number of redesigned street intersections and crossings Number and/or length of protected bicycle lanes Vehicular speed on roads Public perception of pedestrian and bicycle safety Number of vehicular accidents and fatalities

Table 5 | **Impacts and Commonly Used Performance Indicators in TOD Projects (Cont.)**

TYPE OF IMPACT	CATEGORY	COMMONLY USED PERFORMANCE INDICATORS
SOCIAL	Neighborhood revitalization	<ul style="list-style-type: none"> ▪ Number of community facilities, amenities, and educational services within a project area ▪ Redesigned streetscapes, public spaces, and building facades throughout a project area ▪ Number of mixed-use developments within a project area ▪ Public perception of a project area ▪ Additional economic activity and investment
	Improved social equity	<ul style="list-style-type: none"> ▪ Number of affordable housing units in a project area ▪ Improved access to transit and services for all socioeconomic groups ▪ Diversity within the project area, including racial, ethnic, religious, and socioeconomic diversity of residents and business owners
	Social capital	<ul style="list-style-type: none"> ▪ Number of community outreach programs within a project area ▪ Residents' involvement in community projects and initiatives
ENVIRONMENTAL	High-density and green infrastructure	<ul style="list-style-type: none"> ▪ Reduced greenhouse gas emissions due to change of transport mode and travel behavior ▪ Conservation of green spaces ▪ Number of parks within a project area, as measured by the amount of land covered by green space and trees ▪ Amount of infill and brownfield land reclaimed for the creation of green spaces ▪ Preservation of ecological communities, wetland, and water bodies ▪ Increased tree cover and change in heat island effect
ECONOMIC	Local economic development	<ul style="list-style-type: none"> ▪ Sale numbers for local businesses in a project area ▪ Number of commercial, retail, or industrial businesses and services within a project area ▪ Number of jobs in a project area ▪ Number of vacant buildings or units in a project area ▪ Estimated amount of private investment in a project area
	Increased economic productivity	<ul style="list-style-type: none"> ▪ Number of compact, high-density developments within a project area ▪ Daily commuting distance and times
	Improved real estate market	<ul style="list-style-type: none"> ▪ Property and land values in a project area ▪ Amount of property tax generated for local government from a project area

Source: Adapted from World Resources Institute and World Bank Group 2018.

CONCLUSION

Considering local context, cities around the world should be looking at TOD as an urban strategy to provide a range of benefits to residents, such as increased and more affordable supply of housing, more accessible public transport, green and open spaces, streets that cater to users of all types, and higher-quality community facilities. Despite potential negative impacts, TOD presents a powerful tool to build more compact, mixed-use neighborhoods with high-quality public transport options which improve not only accessibility and quality of life in cities, but also equity for lower-income groups that may be marginalized in traditional models of urban development. This publication brought to light the pertinent questions and considerations that decision-makers should assess before, during, and after a TOD project is put in place, as well as during its operation and maintenance. An awareness of these aspects will contribute to successful developments through informed decisions that relate to planning, design, land assembly, finance, private sector incentives, and administrative structures.

Depending on the design and form of implementation, TOD can potentially be exclusive, leading to many negative outcomes, such as the displacement of lower-income residents as a consequence of the gentrification of neighborhoods. Inclusive TOD strategies imply thinking about these issues upfront, with clear policies and community participation and engagement, to ensure that long-term residents of neighborhoods are served by the decisions made by city leaders, not treated as an afterthought. From both the planning and development perspectives, there are ways for cities to mitigate negative impacts such as displacement. The supply of affordable housing can be increased through the creation of structured funds for land, as well as zoning reforms such as inclusionary zoning.

As TOD is complex in nature, the financial and ownership structures can take many different forms. Bonds, Tax Increment Financing, and special assessment taxes, along with the sale of air development rights are some financial mechanisms available to cities. In terms of ownership, TOD requires close coordination and communication among a range of different stakeholders. Public sector actors, such as planning and transport authorities, should work closely with private developers and service providers, along with nonprofit actors and community organizations. This type of participatory planning is crucial in TOD to reduce the risks brought on by gentrification.

This paper is helpful for cities to identify the building blocks and bottlenecks of TOD. As the landscape continues to evolve, there are a range of questions and considerations that would be interesting to explore with further research, with the overall objective of digging deeper into some of the more pressing and complex challenges that cities that have already initiated efforts to implement TOD may be facing. Some of these challenges include the interaction of potentially contentious strategies such as increased density and open space placed against the need to reduce parking requirements, the socio-economic impacts of land readjustment schemes which may threaten to worsen gentrification and inequalities, and the importance of ensuring cities are utilizing the standard methodologies available to better assess not only the economic benefits, but also the social and environmental benefits of strategies such as TOD.

APPENDIX A: CASE STUDIES

Below is a list of the 26 TOD case studies that were selected from 50 catalogued examples around the world. The selection was based on geographic distribution, availability of data, and consultation with experts.

Table A.1 | **Case Studies of Transit-Oriented Development Projects**

#	TOD	COUNTRY	CITY	SCALE
1	Atlanta BeltLine	United States	Atlanta (GA)	Corridor TOD
2	Dallas TOD TIF District	United States	Dallas (TX)	Corridor TOD
3	Davis Square	United States	Somerville (MA)	Station area TOD
4	Faria Lima	Brazil	São Paulo	District TOD
5	Fruitvale Village	United States	Oakland (CA)	District TOD
6	Futako-Tamagawa Station	Japan	Tokyo	Station area TOD
7	Hudson Yards	United States	New York	District TOD
8	Kashiwanoha-campus Station	Japan	Tokyo	Station area TOD
9	Kings Cross Central	United Kingdom	London	Regional TOD
10	Kowloon Station, Airport Express	China	Hong Kong	Station area TOD
11	Lindbergh Center MARTA Station	United States	Atlanta (GA)	Station area TOD
12	MacArthur Transit Village	United States	Oakland (CA)	District TOD
13	Market Creek	United States	San Diego (CA)	District TOD
14	Nanchang metro rail	China	Nanchang	District TOD
15	NoMa	United States	Washington, DC	District TOD
16	North Hollywood (NoHo)	United States	Los Angeles (CA)	District TOD
17	Pearl District	United States	Portland (OR)	District TOD
18	Porto Maravilha	Brazil	Rio de Janeiro	District TOD
19	Rosslyn-Ballston Corridor	United States	Arlington (VA)	Corridor TOD
20	Shenzhen R+P Development	China	Shenzhen	Corridor TOD
21	Shinagawa Station, JR Yamanote Line	Japan	Tokyo	Station area TOD
22	Tsukuba Express	Japan	Tokyo	Corridor TOD
23	Tung Chung Station	China	Hong Kong	Station area TOD
24	Urban Operation areas	Brazil	Rio de Janeiro and São Paulo	District TOD
25	White Flint Metro (Pike District)	United States	Montgomery County (MD)	District TOD
26	Yokohama MM21 Line	Japan	Yokohama	Corridor TOD

ABBREVIATIONS

BID	Business Improvement District
BRT	bus rapid transit
CDC	Community Development Corporation
CEPAC	Certificados de Potencial Adicional de Construção (Certificate of Additional Construction Potential)
CLT	Community Land Trust
FAR	Floor Area Ratio
LVC	Land Value Capture
SOV	Single Occupancy Vehicle
TDR	Transfer of Development Rights
TIF	Tax Increment Financing
TOD	Transit-Oriented Development
TPS	Town Planning Scheme
UO	Urban Operation

ENDNOTES

- 1 Living Cities defines equitable TOD as that which puts social equity at the forefront of TOD implementation and “aims to ensure that all people along a transit corridor, including those who are low income, have the opportunity to reap the benefits of easy access to employment opportunities offering living wages, health clinics, fresh food markets, human services, schools and childcare centers” (Pollack and Prater 2013).
- 2 For more information about the concept of designing urban spaces at the human scale, we recommend exploring Jan Gehl’s work, in particular the 2010 book *Cities for People*, which includes a toolkit of principles and strategies cities can use to transform urban environments (Gehl 2010).
- 3 Complete streets are designed to provide safe, convenient, and comfortable spaces that are accessible to all users regardless of age, ability, or mode of transport (Smart Growth America n.d).
- 4 TOD projects can be of various scales, namely city-region, corridor, station area, and site. City-region comprises a contiguous extent of urbanized land, largely bound by administrative jurisdictions. Corridor refers to a finite public transit line within a transit network and the immediate area that benefits from it. Station area refers to the area around a public transit station that is within a 10-minute walking distance. The combination of all the station areas along a single transit line forms the corridor. Site refers to a development parcel within a corridor or station area (Ollivier et al. 2021).
- 5 Upzoning is a zoning reform tool that allows the city to change the zoning to allow for higher value (i.e., changing from industrial to residential) and more dense land use (i.e., increasing allowable floor area ratio), with the ultimate goal of decreasing housing costs (Hickey 2014).

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