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Implementing land trust in Bangladesh as a strategy for financing infrastructure and sustainable land management

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ADB Working Paper Series

**IMPLEMENTING LAND TRUST IN
BANGLADESH AS A STRATEGY FOR
FINANCING INFRASTRUCTURE AND
SUSTAINABLE LAND MANAGEMENT**

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Abstract

As Bangladesh is a densely populated and land-scarce country, a land trust method can be applied in order to ensure productive and sustainable land management. We argue that land trust can be applied to managing agricultural land, *khas* land, real estate, and a delta in a sustainable manner in Bangladesh. The benefits of land trust include containing the spiraling of land prices, effective use of land, and ensuring a higher return from land. The main challenges for implementing land trust in Bangladesh include the lack of a legal and regulatory framework, lack of definition and scope of land trust, and weaknesses in land governance. We also argue that Bangladesh could even broaden the scope of traditional land trust to overcome financing bottlenecks of infrastructure investments. In these contexts, this paper discusses various methods of land trusts, challenges and opportunities of its implementation with some empirical evidences.

Keywords: land trust, land trust plus, spillover tax revenue, delta management, Bangladesh

JEL Classification: Q15, R14

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1. INTRODUCTION

Bangladesh, a small but highly densely populated country with 1,255 inhabitants per sq. km., is the country with the lowest land–man ratio in the world, which is estimated to be 0.06 hectares (ha) per person (FAO 2013). The situation deteriorates further with a growing demand for land for non-agricultural purposes. For the construction of new homes, roads, educational institutions, and industries, a substantial area of farmland is being used every year. As a consequence, land transfer and land conversion rates are very high in Bangladesh. Agricultural land, which is currently about 84% of total land, has been depleted at a very high rate, at about 0.56% per annum (Quasem 2011).¹ Land conversion, along with land degradation due to the effects of climate change, has given rise to the need for a sustainable land management policy for planned and efficient use of scarce land. Thus, we argue that land trust (LT) as a sustainable land management (SLM) strategy could be deemed crucial for a land-scarce small country like Bangladesh for ensuring food security, affordable housing, infrastructure development, and the promotion of industrialization.

The traditional land trust is a legal contract between the owner of the land and the trustee (for example, a company) whereby the owner retains all rights to property in anonymity, but the trustee is given the authority to manage the property for a certain period of time (Yoshino et al. 2018; Crabtree et al. 2011).² Within the scope of arrangements, the traditional land trust can be extended to infrastructure construction to attract private investments, solve acquisition and resettlement issues, and maintain a higher return from the land. The idea is that the spillover benefits (for example, tax revenue) that are generated for the project may be shared among the private investors (Yoshino et al. 2018). A similar approach can be applied to delta management to protect coastal areas from floods, salinities, etc., due to rising sea-levels by the construction of dams and dykes. Since the construction of dams or dykes requires huge investments, the costs may be shared by the beneficiaries such as waterbodies, local governments, and inhabitants. We term this approach the “Land Trust Plus” (LTP) approach.

Although land trust is not a new idea, it is new for Bangladesh. The major benefits of a land trust are that it will reduce costs of land purchases, a leasing contract can be enforced, future tax revenue can be repaid and, most importantly, land owners can continue their land ownership. Given the socio-economic transformation happening in the country over time with higher economic growth (over 7% in recent years), increasing demand, as well as escalating prices of land for housing and industry, the need for incentivising private investors to invest in infrastructure and for land owners to collaborate with government in land acquisition is critical. With the increasing rate of fallow agricultural land due to the shift of labor from farm to non-farm sectors and the outward migration of land owners, land trust could be an efficient option that involves several sorts of benefits. For example, land trust may help reduce the cost of land purchase, future tax revenues generated from the spillover effect of infrastructure investments can be shared, and on top of this, the land owners can keep their land. Land trust could be one of the best ways to increase the rate of return, to invite private investors into infrastructure investment, and/or real estate developers to efficiently use

¹ Reviewing various studies, Hossain (2017) argued that land conversion rate (from agricultural to non-agricultural) in Bangladesh is highly controversial.

² A land trust is a trust agreement under which the beneficiary directs the trustee in all matters in regard to the title to the trust property. The beneficiary also holds the trustee free from liability. These types of trusts are now operating well in many countries, including the United States (US), the UK, Australia, and Japan.

non-agricultural land. The objective of this paper is thus to derive a framework for operationalizing LTP in developing countries like Bangladesh towards achieving SLM. We consider Bangladesh as a strong case for implementing LTP because of its growing infrastructure needs with exposure to climate change risks.

The paper is organized as follows. Section 2 discusses the context for introducing LTP as a strategy for SLM. Section 3 discusses various land trust approaches, along with international best practices. Section 4 develops an analytical framework for spillover revenue sharing. Section 5 discusses potential challenges for implementing LTP, and section 6 concludes the paper.

2. THE CONTEXT

2.1 Land Area in Bangladesh

Currently, agricultural land consists of 84% of total land stock, which is estimated at 14.84 million hectares (ha) in 2010. However, the rate of conversion of the cultivable land is estimated at 0.10% annually, mainly due to transfers to housing, road, and industrial infrastructures. On the other hand, from 1973 to 2008, a substantial amount of land was lost (Hasan et al. 2013). A CEGIS (2008) study estimated that the amount of total land eroded was 156,780 ha and 45,520 ha accreted along the Jamuna, Ganges, and Padma rivers from 1973 to 2008. Given this substantial loss of land, it is important to develop policies for land reclamation and sustainable land management.

A good amount of both agricultural and non-agricultural land, directly or indirectly owned by the government and known as *khas* land, is also a concern for sustainable land management in Bangladesh. An estimate shows that there are about 3.3 million acres of *khas* land, of which 0.8 million acres are of agricultural *khas* land, 1.7 million acres are of nonagricultural *khas* land, and 0.8 million acres are of *khas* water-bodies (Barakat et al. 2000). However, as no actual official statistics are available, the actual area of *khas* land would be higher than the estimated amount. Most of the *khas* land are illegally occupied by rich and powerful people in society, although a portion of the *khas* land has been distributed amongst landless poor people.

Table 2: Availability of Agricultural Land from 1976 to 2011

Year	Estimated Land in Bangladesh (million ha)	Cultivable Land (million ha)	% Cultivable Land
1976–77	14.28	9.39	65.75
1980–81	14.29	9.38	65.64
1985–86	14.48	9.44	65.19
1990–91	14.84	9.72	65.50
1995–96	14.84	8.72	58.76
2000–01	14.85	8.40	56.57
2005–06	14.84	8.42	56.74
2010–11	14.84	8.52	57.41

Note: Agricultural land is the summation of cropped land, current fallow, and culturable waste.

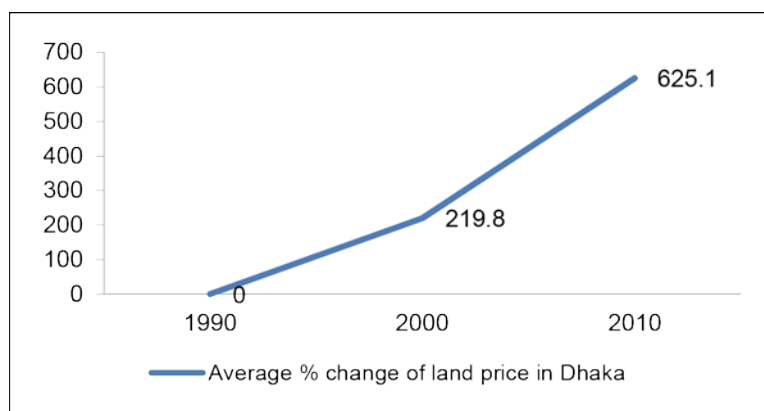
Source: Bangladesh Bureau of Statistics (BBS), 2011.

2.2 The State of Nonagricultural Land

The high rates of urbanization and industrialization have been observed in the country as the amount of nonagricultural land increased from 1.18 mil ha in 1976 to 2.4 mil ha in 2010. This increase is linked to the high growth and diversification of the economy, which consequently led to an astronomical increase in land prices in the country over time (a 600% price hike during 1990–2010, Figure 2). As a result, the land price puts extra cost pressure on private as well as public investments, leading to a lower rate of return.

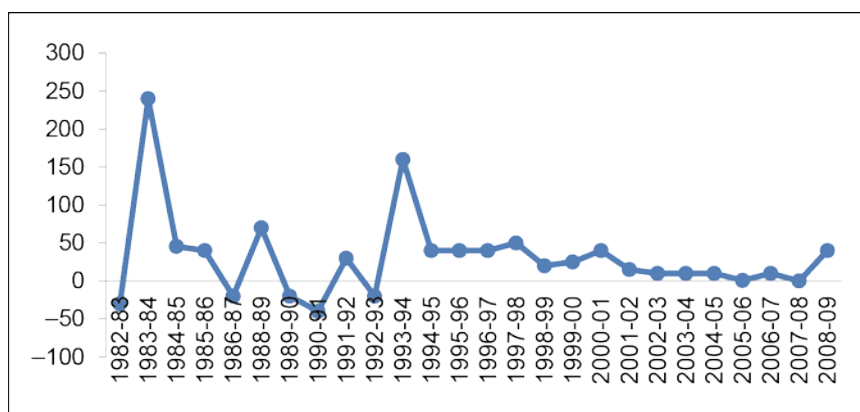
The country also observes episodes of real estate boom over time. The real estate sector in Bangladesh has been flourishing constantly over time with rapid urbanization and an increase in demand for housing in big cities. As a result, the prices of both real-estate land and houses have been increasing continually over time, and the real estate price bubble is underway. As Figure 1 shows, the price of land in Dhaka increased six-fold during 1990–2010. The prices of flats (two- to 3-room homes in a multi-storied building) have increased 20–30% in the last four years. The growth in demand for apartment homes has seen a surge in recent times, with steady growth in the last decade (Figure 2). Along with the increased demand for apartments, the number of real estate developers has also been growing. A study shows that the number increased from 200 in 2005 to more than 1,000 in 2011 (Seraj 2012).

Figure 1: Change (%) in Land Prices in Dhaka, 1990–2010



Source: Real Estate Housing Association of Bangladesh (REHAB) and BBS.

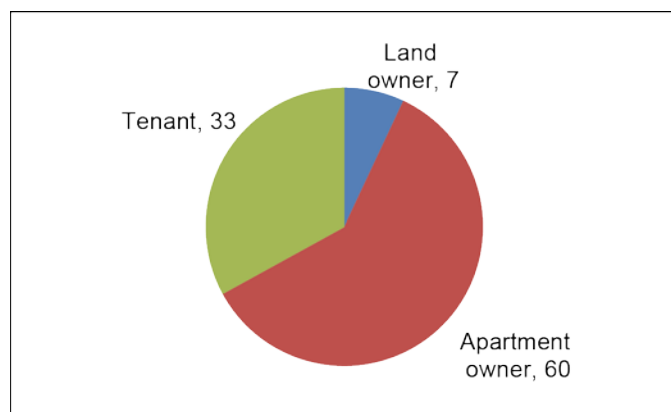
Figure 2: Annual Growth of Apartment Units in Dhaka, 1982–2009



Source: Seraj (2012).

Regarding tenancy patterns, it can be observed that with regard to apartment homes, landowners reside in only 10% of apartments and tenants reside in 33% of apartments, most of which belong to land-owners. About 60% of apartment owners who bought apartments from real estate developers reside in them. It shows that in most cases, real-estate housing development in Dhaka has a 60:40 ratio once homes are built on the land (Figure 3). Land developers sell their shares to outsiders with proportionate share of land. Though this method works well in Bangladesh, without selling land one cannot think of other options using this method. However, as we argue in the later part of the paper, with the provisions of land trust (or community land trust), an owner can enjoy rent for a specified period without losing ownership of the land. Moreover, the current method compels owners to sell the land, which contributes to the surge in the prices of land.

Figure 3: Tenancy Pattern in Apartment Homes in Dhaka



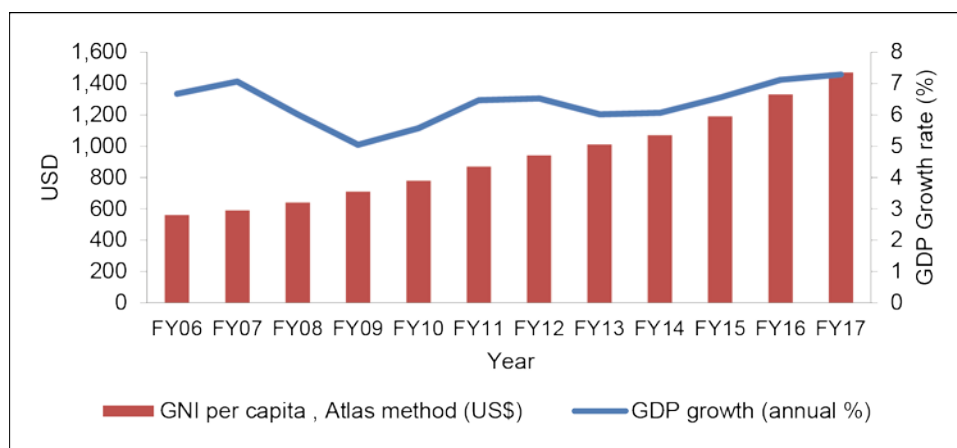
Source: Seraj (2012).

2.3 Land Use for Infrastructure and Financing Investments

There has been a huge demand for infrastructure financing in Bangladesh in tandem with her high growth potential. The economy has been growing at an impressive 6% or more during the last decade and recently, the GDP growth rate has been more than 7%. Since independence, Bangladesh has been experiencing a steady increase in the growth rate of real GDP, accelerating from an average of less than 4% per year during 1974–1990 to 6.4% in the period 2010–2014. The 7th Five Year Plan (2015–2019) forecasts a growth rate annually of 7%–8% GDP.

However, Bangladesh has one of the lowest tax-to-GDP rates in the world, which is around 10%. Total bank credit as a share of GDP grew from 14% to 55% over the period 1980–2012. A high rate of interest and interest spread, high nonperforming loan ratio, and weak corporate governance appear to be key obstacles to mobilizing private finance from the banking sector in Bangladesh. Further, in the absence of a well-developed capital market, the growth of private credit has played a role in supporting the expansion of the private sector in Bangladesh. Therefore, alternative financing approaches for public infrastructure investment need to be explored.

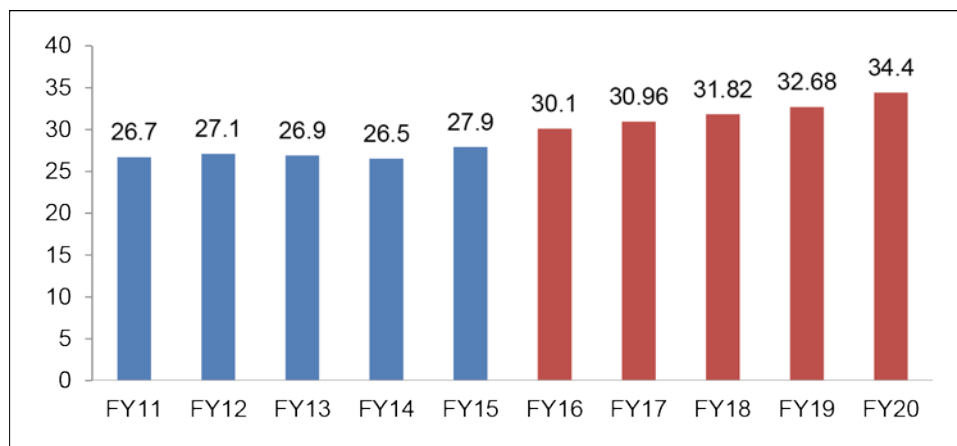
Figure 4: Growth and Per Capita Income (GNI)



Source: Ministry of Finance.

The projection of investment requirements as a percentage of GDP shows that the country needs investments at 34.4% of GDP, of which public investments are projected to be 8–9%. The rest of the investments, equivalent to 26%–27% of GDP, are estimated to be done by the private sector, although private sector investment has been stagnant at around 22–23% for the last five years or so. Thus, it is important to devise policies that might encourage private investments not only in private-sector projects but also in infrastructure projects, given the public–private partnership (PPP) has not been working well in Bangladesh.

Figure 5: Seventh Five Year Plan Investment Requirements (as % of GDP)



Source: GoB: Planning Commission – GED 7th Five Year Plan, 2015.

The proposed land trust can also solve the problems of the private land acquisition process for public infrastructure projects. The inadequacy of the regulatory framework for the land acquisition process, pricing of land, and the concomitant resettlement process are plagued with delays in implementation of infrastructure projects (Hossain 2017; FAO 2013).³ There is thus a challenge when large-footprint projects are to be implemented in green-field areas, industrial estates, special economic zones or export

³ Bangladesh still follows an old “Land Acquisition and Requisition of Immovable Property Ordinance, 1982,” the root of which was the British colonial Land Acquisition Act of 1894.

processing zones. Therefore, it is imperative to create an incentive mechanism so that private land owners will transfer their land happily for building public infrastructure. Land trust could be one of the such options through which private land owners would be interested to transfer their land for infrastructure investments.

2.4 Mega-infrastructure Projects in Bangladesh

At least ten mega projects are now underway in Bangladesh that involves huge and difficult tasks of land acquisition, resettlement costs as well as financing (Table 3). The infrastructure projects, such as bridge, rail link, power industry, deep sea-port, nuclear powerplants etc. are being implemented with a matched government and donor agencies fund. The projects, once completed, are expected to generate huge spillover economic benefits to the people of the project-adjacent areas. The list below shows the intensity of works that has been running over the years.

Table 3: A Brief Account of Ongoing Mega-infrastructure Projects in Bangladesh

Name of the Projects		Resettlement Cost/Land Acquisition	Status
Padma Bridge	Tenure: 2015–2018 (only 43% was completed by 2018) Est. cost: Tk307,933,900,000	Construction of 3.18 km-long bridge involves huge acquisition of land and resettlement work	Ongoing
Padma Rail Link	Tenure: 2016–2022 Est. cost: Tk34,988 crore	Land acquisition is going on along 172 km of railway tracks between Dhaka and Khulna's Mongla	Ongoing
Chittagong-Cox's Bazar Railway Network	Tenure: 2016–2022 Est. cost: Tk18,304 crore	The 100 km dual-gauge single line requires acquisition of a huge amount of land	Ongoing
Metro Rail in Dhaka	Tenure: 2012–2024 Est. cost: Tk21,985 crore	Mainly uses public roadside land	Ongoing
Payra Deep Seaport	Tenure: 2015–2018 Est. cost: Tk1,128 crore.	Land acquisition is required	Ongoing
Rooppur nuclear power plant	Tenure: 2017–2024 Estimated cost: BDT 1,13,092 crore	Civil work to prepare 260 acres of land for the country's first-ever nuclear power plant at Rooppur in Pabna	Ongoing

Source: Various newspaper reports.

2.5 Status of Land Degradation and Land Erosion

Major types of land degradation that occur in Bangladesh are water erosion, soil fertility depletion, salinization, water logging, pan formation, active flood plain, etc. Among them, water erosion and fertility depletion are the main factors. Much of the land degradation is caused by population growth and human-induced technological change in agriculture. About 75% of the hilly areas have very high susceptibility to erosion (BARC 1999). The decline in soil fertility occurs through a combination of lowering of organic soil matter and loss of nutrients.⁴ This situation calls for a proper management of agricultural land that may ensure a balanced use of both agricultural and commercial land as well as their balanced conversion.

⁴ The average organic matter content of top soils (high land and medium high land situations) has gone down from about 2% to 1% over the last 20 years due to intensive cultivation (Hasan et al.2013). Removal of nutrients is also a threat to agricultural productivity.

Rising sea levels will likely eat up a substantial amount of the land in Bangladesh. Sea level rise affects the coastal zones of Bangladesh in a number of ways, including inundation, erosion, and saline water intrusion into the water table.⁵ Results from a recent study showed that the overall trend of sea-level rise in the coastal zone (encompassing 19 districts out of 64 covering 47,201 sq. km. of land area, which is 32% of the total landmass of the country) is 6–20 mm per year, which is about two to five times higher than the global average (Fasullo and Nerem 2018). Chittagong and Cox's Bazar region are likely to be the most affected by rising sea-levels. The sea-level rise is expected to jeopardize the lives and activities of 28% of the total population of the country, although in phases.

As part of delta management, the Bangladesh government has taken various measures, including placing coastal polders, that have enabled bringing 1.2 million hectares of land under agriculture or aquaculture and provided protection of lives and properties of coastal communities against flooding, storm surges, and salinity intrusion. However, there have been unintended consequences, such as river sedimentation and waterlogging, that have become increasingly problematic in the last three decades in certain parts of the coastal zones. Changes in river salinity and the availability of freshwater may affect the fish habitat and productive freshwater fisheries. Thus, the soil erosion issue should be taken care of while discussing sustainable land management.

2.4.1 Infrastructure Investment for Delta Management

In view of the best practices of Dutch delta management experience, Bangladesh has formulated “Bangladesh Delta Plan 2100” (BDP 2100) (Bangladesh Planning Commission 2018). The Plan outlines both institutional and operational aspects of delta management, taking the Dutch experiences into account. As the Netherlands Delta Management approach was supported by the Delta Law passed by the Dutch Parliament in the late 1950s, similar types of laws are suggested in BDP 2100 for Bangladesh. It is to be noted that the Netherlands has constructed 53 dike rings—large regions protected by a single dike. One ring may be protected from a 2000-year flood and another one from a 10,000-year flood. However, replication of such approaches will require huge investments.

Drawing from the above noted replicable lessons of the Dutch Delta management, Bangladesh's past experience, and the present socio-economic-political realities, the proposed approach in BDP 2100 to reforming the water and other related delta governance and institutions include reforming the legal framework for water resources management, the establishment of the Delta Fund, a Delta Commission, and the implementation of the Plan itself. Financing the BDP 2100 is a big concern for Bangladesh. Bangladesh presently spends about 0.8% of GDP on water resources, mostly for new investments with negligible O&M funding. The minimum financing for implementing BDP 2100 is estimated to be about 2.5% of GDP, of which 2.0% would be new investments and 0.5% of GDP would be annual O&M. This proposed amount of annual delta investments would amount to one-third of the total developmental budget of Bangladesh.

The Dutch experience showed that the national budget provided only about a quarter of total delta financing. Regional water bodies and municipalities provided the remaining three-quarters. Bangladesh presently does not have autonomous municipalities and local water bodies. The establishment of autonomous municipalities could be another

⁵ The Intergovernmental Panel on Climate Change (IPCC) made sea-level rise projections for the world which indicate that the global mean of sea level rise was 19 ± 2 cm over the last century and higher rapid sea-level rise is now projected to be 28–98 cm by 2100.

major institutional reform which may take time. Similarly, the establishment of local water bodies and their effective functioning will also take time. Thus, in reality the national budget will be the main source of delta financing in the next few years.

Unlike the Dutch experience, water management is heavily centralized in Bangladesh and most water institutions are managed centrally at the national level. The main local institutions are the Water Supply & Sewerage Authorities (WASAs), municipalities, and the pourashavas (city corporations). These municipal institutions deal with water and sanitation issues, with services mostly concentrated in urban areas. They are managed by the Ministry of Local Government, Rural Development and Cooperatives (LGRD&C) and mostly funded by the national budget, with some limited cost recovery (charges for water and sanitation services). What is missing is the representation of beneficiary stakeholders linked with coastal management, river management, fresh water wetlands (haors and baors) management, large irrigation schemes, and flood control. The establishment of an organization for water management is an essential reform for successful management of the BDP 2100. Thus, designing and adopting technical and socioeconomic solutions to flood and irrigation management projects require the implementation of large water infrastructure projects, including land reclamation from the sea. It can be done through the appropriate selection of spots for reclamation in various places in the coastal belt, and a substantial new amount of land can be reclaimed from the sea and added to the existing land mass. In the coastal zone, especially in the Meghna Estuaries, land has continuously been reclaimed on a limited scale. Bangladesh has experienced the stabilization of newly accreted lands from tidal and storm surges through afforestation and polderization. The north-east and east sides of Bhola island, north and west sides of Hatia, west side of Manpura, and west side of the Sandwip Islands have been experiencing severe erosion. Some areas are also increasingly subject to prolonged waterlogging due to encroachment and land reclamation by closing the tidal channels. Delta management thus makes a strong case for implementing LTP in Bangladesh.

3. LAND TRUST FOR SUSTAINABLE LAND MANAGEMENT

The rapidly increasing demand for nonagricultural land in a land-scarce country like Bangladesh contributes to abnormal land price hikes over time, which impede investment opportunities. High land prices are a big concern for foreign investors because it is causing an imbalance in equity sharing. Moreover, higher land prices make housing unaffordable to middle-class urban people, and it gives real estate companies the chance to make supra-normal profits. Private land is also necessary for infrastructure investment, and the government has to pay huge amounts of money to land owners or, in some cases, private owners to restrain land transfers in a violent way. Land trust could be an effective way of land transfer that could solve many of the land-related problems. As already mentioned, a substantial amount of arable land is now being converted for commercial use. The shift of labor from agriculture to nonagricultural work and outward migration also cause a huge crisis in land management in rural areas. LTP could work as a mode of alternative financing for investment in flood and water management, as well as other physical and social infrastructures.

3.1 International Experiences of Land Trust

Land trust has been applied in many countries. Community Land Trust (CLTs) is widely applied in the US and UK to provide housing through rental, cooperative or mortgage ownership, with additional opportunities for commercial and/or community facilities (Crabtree et al. 2011). The CLT in the US is a few decades old, having started in the 1960s and experienced exponential growth since, mainly due to its affordability and stable home ownership for lower-income households. There are now more than 240 CLTs in the US. The UK's CLT is only a few years old and emerged from interest in the success of the US sector. Australia is also exploring the potential of CLTs for the indigenous housing sector (Table 4).

In Japan, there are four distinctive types of commercial trusts: (1) trusts similar to deposit taking and lending, e.g., loan trusts; (2) trusts for asset management, e.g., money trusts and securities investment trusts; (3) trusts for securitization, e.g., money claim trusts; and (4) trusts for businesses, e.g., land trust (Kanda 2016). In Japan, trust businesses can only be carried out by entities licensed under the Trust Business Act (Act No. 154 of 2004, as amended) and financial institutions licensed under the Act for Financial Institutions' Trust Business (Act No. 43 of 1943, as amended). Currently, more than 200 financial institutions and entities are licensed to carry out trust businesses in Japan (Kanda 2016).

Tables 4: International Evidence of Land Trust

Country	Types of Trust	Applicable
USA	Community Land Trust	Cooperative housing, owned housing
UK	Community Land Trust	Cooperative housing, owned housing
Australia	Community Land Trust	Housing for indigenous people
Japan	Business Trust, Trust for asset management, Loan trust	Financial instruments, assets, business

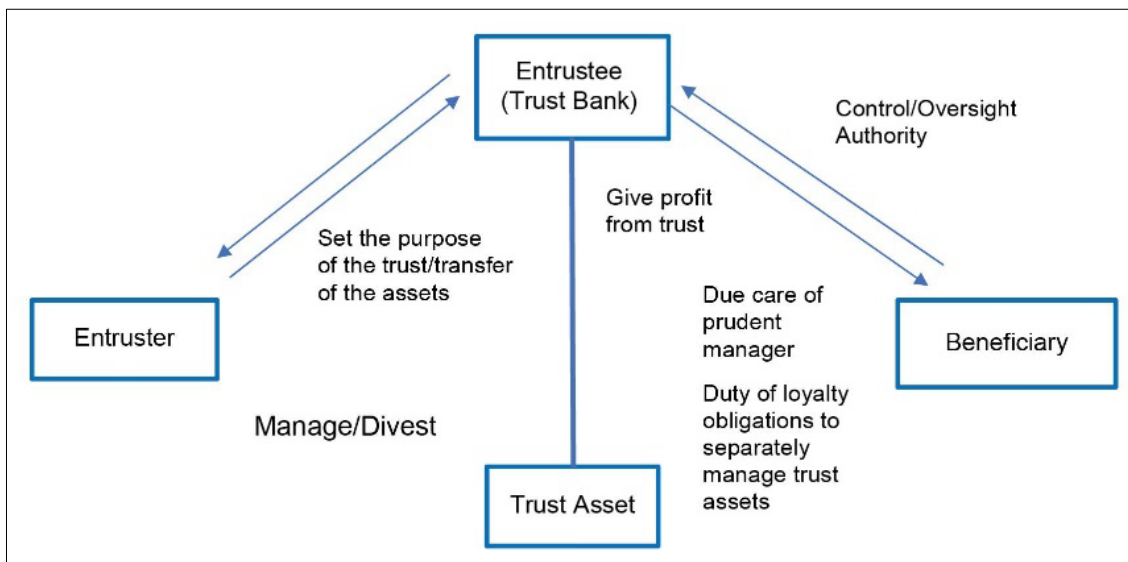
Sources: Kanda (2016); Crabtree et al. (2011)

3.2 Land Trust Structure

In a typical trust structure, three stakeholders are involved: the entruster, trustee, and beneficiary (see Figure 6). An entruster may leave his/her assets for the beneficiary by retaining ownership, but he or she may entrust the trustee with the asset with certain conditions for the beneficiary to receive the profit. The "trustee" could be a trust bank—a separate bank can be formed for this, or existing commercial banks can get licenses under a law which has to be promulgated.

Certain rules apply to the trustee. An trustee must manage the trust asset with prudent care and not for his/her own benefits. As discussed, land trusts have been working well to manage land properties in developed countries. Some developing countries are also implementing land trust in order to effective and sustainable land management. In Bangladesh, there is no legal framework that entrusts banks or other parties to act as trustees. Thus, a land trust law has to be formulated and operationalized so that it may allow commercial banks to act as trust banks and ensure other legal safeguards.

Figure 6: The Three Parties of a Trust



Source: Yoshino, Abidhadjaev, and Nakahigashi (2018).

3.3 Rent Calculation

Following Yoshino et al. (2018), here we propose a method of rent calculation by considering a present value model (PVM) that relates the current price of land to the infinite streams of future earnings from holding the land. Eq. (1) shows the price of land rents in period t as the discounted sum of the expected future net returns to the land (to infinity).

$$P_t = \frac{E(R_{t+1})}{(1+\delta)} + \frac{E(R_{t+1})}{(1+\delta)^2} + \dots + \frac{E(R_{t+1})}{(1+\delta)^n} + \dots \tag{1}$$

where P_t shows the price of land in period t , $E(R_t)$ is the expected land rent in period t , where E denotes the expectation regarding the future returns on land rent, and δ_t is the time-invariant discount rate for period t . If we assume that $E(R_t)$ grows at the rate of g in each period, and $\bar{R}=E(R_t)$, then equation (1) can be written as the capitalization formula, which describes the proportional relationship between the current land price and the expected land rent of the next period.

$$W_t = \frac{\bar{R}}{\delta-g}; g = \frac{\Delta R}{\bar{R}} \tag{2}$$

In the context of land trust organizations, each landholder expects to receive this land rent (W) in period t from such organizations, which consider the role of expectations and discounting factors.

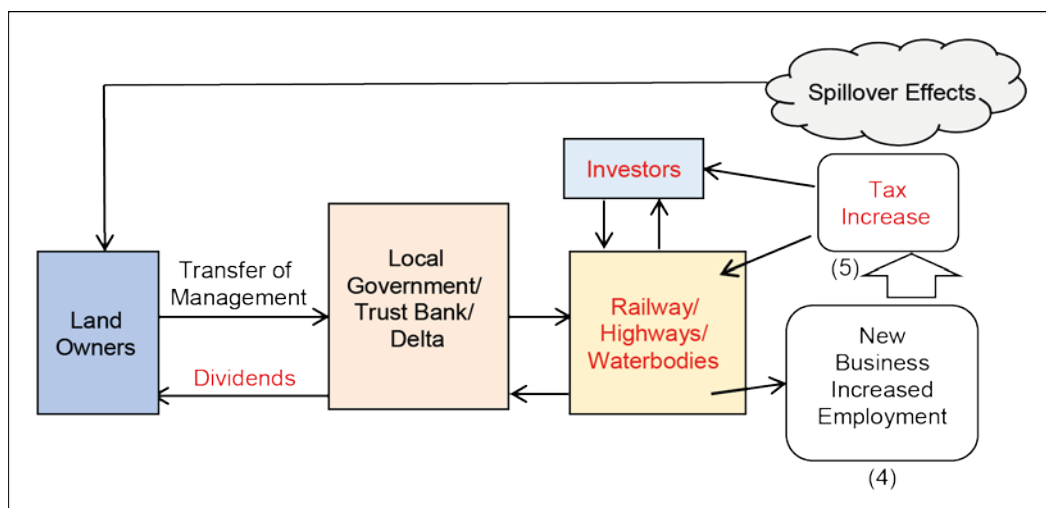
3.4 Schemes of Land Trust

3.4.1 Trust of Land Used for Infrastructure

Land owners trust the land to the trust bank. Many developing countries do not have trust banks. It will be possible to give trust licenses to ordinary banks as long as a solid function of the trust bank can be established. Alternatively, local government can play

the role of a trust bank. A proposed land trust is shown in Figure 7. Land owners entrust their own land to either a trust bank or local government. They watch whether the land is properly used for infrastructure. They check the net revenue of an infrastructure entity. Part of the net revenue is returned to land owners every year. Land owners keep their land as owners, but they lease the land to infrastructure operators for 99 years. Annual rent can be received by land owners.

Figure 7: Benefits of Land Trust in Infrastructure Projects



Based on the nature of land use in Bangladesh, land trust for the following uses can be applied in Bangladesh.

3.4.2 Land Trust for Delta Management

As already discussed, the delta management plan requires huge amounts of money equivalent to 2.5% of GDP, up from the current 0.8% of GDP (BDP 2100). Although in Netherlands two-thirds of delta investments are borne by local water bodies and local government, this may not work in Bangladesh, given the poor institutional and financial structure of these bodies in the country. Instead, like the trust scheme in (a), delta infrastructures can be constructed with private investments and the spillover tax revenue generated from water bodies and local governmental bodies can be shared proportionately among the investors. Thus, the land trust approach can be applied to water bodies, and this is expected to solve financing problems for delta plan implementation.

3.4.3 Trust of Agricultural Land

The “trust of agricultural land” allows landowners to entrust their agricultural land to a trust bank, and the trust bank manages the land. In this case, the trust bank rents the land to farmers who wish to farm on large consolidated land, and the landowners receive a part of the profit as dividends. Here, consolidation of land leads to higher profits for the landowners. In this way, the landowners can maintain the ownership of the land and increase the profit by lending the land to the younger farmers through a trust bank. Hence, land trust is a method to consolidate assets owned by individuals, entrust them to a trust bank, and make better use of the assets.

Land trust will work better than purchasing the land from land owners. This is because agricultural farmers receive huge amounts of one-time money when they sell their land for infrastructure, but land trust can ensure long-term flows of money to land owners, generated by net revenues of agricultural production or investments in infrastructures such as roads, railways, water supply, and electricity.

3.4.4 Trust of Real Estate and Housing

In mega-cities like Dhaka, for building big infrastructures or improving housing conditions in old Dhaka, it is important to consolidate several pieces of land. For consolidation, land owners need help from a trust bank or trust company, which is not possible for an individual real-estate company or others. The trust bank then builds a large building on the land to realize the effective utilization of the land. In this process, landowners can live in apartments within the building or houses and receive part of the profit as dividends from the trust bank as it maintains their ownership. This method will allow individual landowners to gain more profit. The current problem of congestion and land management in old Dhaka city can be resolved easily with land trust.

3.4.5 Trust of *khas* Land

As the ownership of *khas* land lies with the government, any state-owned commercial bank may act as the trustee of the *khas* land that can be used for private benefit, such as housing or industry. This might prevent the misappropriation of *khas* land by a powerful people.

4. ANALYTICAL FRAMEWORK

4.1 Infrastructure Investment and Its Spillover Tax Revenue

Traditionally, infrastructure investors used to receive only user charges from infrastructure investment. However, in this paper, we propose that the spillover tax revenue can be captured into infrastructure investment. Yoshino, Helble, and Abidhadjaev (2018) argue that infrastructure projects can generate spillover benefits through increases in property tax, corporate tax, income tax, etc., a share of which can be used as an incentive for private landholders. A positive spillover effect is possible because a new highway generates more employment through an increase in private businesses and private investment along both sides of the highway.

In macro estimation, Yoshino and Nakahigashi (2004, 2016) used a trans-log production function in Japan to estimate the direct effect of infrastructure investment and spillover effects (i.e., indirect effects). The direct effect of infrastructure investment is created by the construction of infrastructure that will increase the output of the region. Spillover effects (i.e., indirect effects) will have at least two channels, depending on the types of investments. One is that infrastructure construction (roads, bridges, economic zones, etc.) will prompt the construction of other complementary infrastructures, such as new office buildings and new housing, growth centers, marketplaces, restaurants, new residences, etc., which will increase the efficient use of land. The second channel would be income enhancing, which might happen through three channels (Khandker, Bakht, and Koolwal 2009): (1) transportation costs as well as input and output prices; (2) labor supply, as well as farm and nonfarm production; and (3) household outcomes such as earnings, consumption, and schooling. They show that rural households in villages targeted by the road development project have on average an 11% higher consumption per capita per year. They also found that a road

improvement project in rural villages led to an approximately 5% reduction in moderate and extreme poverty in Bangladesh. Analyzing the impact of a big “Jamuna Multipurpose Bridge” in Bangladesh, Mahmud and Sawada (2018) found that with decreasing household unemployment, bridge construction facilitated farm-to nonfarm shifts in employment, which is 4% on average.

Whether or not the infrastructure investment is effective for production activities is verified by estimating the productivity effect of infrastructure. Estimates are made in the following manner using a production function:

$$Y = f(K_P, L, K_G) \quad (3)$$

where K_P is private capital, L stands for labor and K_G is stock of infrastructure investment. The general type of the production function is a trans-log production function.

$$\ln Y = \alpha_0 + \alpha_1 \ln K_P + \alpha_2 \ln L + \alpha_3 \ln K_G + \beta_1 \frac{1}{2} (\ln K_P)^2 + \beta_2 \ln K_P \ln L + \beta_3 \ln K_P \ln K_G + \beta_4 \frac{1}{2} (\ln L)^2 + \beta_5 \ln L \ln K_G + \beta_6 \frac{1}{2} (\ln K_G)^2 \quad (4)$$

Given the production function in equation (4), the productivity effect of infrastructure can be classified into three categories as shown in equation (5). The first term on the right is the direct effect, the second term is the spillover effect in regard to the private capital, and the third term represents the spillover effect related to the labor input. The productivity effect of infrastructure is expressed in marginal productivity.

$$\frac{dY}{dK_G} = \frac{\partial f(K_P, L, K_G)}{\partial K_G} + \frac{\partial f(K_P, L, K_G)}{\partial K_P} \frac{\partial K_P}{\partial K_G} + \frac{\partial f(K_P, L, K_G)}{\partial L} \frac{\partial L}{\partial K_G} \quad (5)$$

Table A1 (appendix) shows an estimate of the direct and spillover effects of infrastructure investment in Japan (Nakahigashi and Yoshino 2016). While the estimated direct effect of infrastructure investment on output was 0.638, the spillover effect due to the use of private capital was 0.493. The biggest spillover effect was estimated to be an increase in employment. It shows that a 1% increase of output will increase tax revenues by, on average, 20% in Japan.

If 50% of the increased tax revenues are distributed to investors in infrastructure, it increases 43.8% of the rate of return as shown in Table A1. In the period 2006–2010, 50% of incremental tax returns increased the rate of return 39.1%. These significant increases in the rate of return would have attracted private investors into infrastructure investment. These estimates serve as a basis for our argument to apply land trust that will allow land owners as well as investors to receive a share of spillover benefits.

Increased tax revenues from spillover effects can be written as follows:

$$dT_{\text{spill}} = t \times dY_{\text{spill}} = t \times \left(\frac{\partial f(K_P, L, K_G)}{\partial K_P} \frac{\partial K_P}{\partial K_G} + \frac{\partial f(K_P, L, K_G)}{\partial L} \frac{\partial L}{\partial K_G} \right) \times dK_G \quad (6)$$

There are two portions in the spillover tax revenues. The first part comes from the contribution of private capital and the second part is created by an increase in employment. Increased tax revenues from the direct effect of building infrastructure is written as:

$$dT_{\text{direct}} = t \times dY_{\text{direct}} = t \times \left(\frac{\partial f(K_P, L, K_G)}{\partial K_G} \right) \times dK_G \quad (7)$$

By adding Eq. (6) and Eq. (7), the total tax increase created by infrastructure is:

$$dT_{\text{total}} = dT_{\text{spill}} + dT_{\text{direct}} \quad (8)$$

The spillover tax revenues are the part of the increase in total tax revenues in the region that is shown in Equation (4). dT_{spill} in Equation (4) is created by private capital and employment which should be returned to infrastructure investors and construction companies. dT_{direct} is the increased tax revenues created by government infrastructure investment.

As already discussed, land acquisition is one of the difficulties in infrastructure investment. When the construction of a road is planned, city officials have to negotiate with many land owners. Huge time costs and huge amounts of money are needed during the period of construction of infrastructure. Japan experienced major problems in constructing commercial buildings and condominiums. Therefore, land trust is extensively used in Japan. Land owners can keep the land as their own and lease the land to commercial developers and condominium developers. Land owners own the land and receive annual rent from commercial developers and condominium developers. Another method is to offer one unit of a condominium to a land owner in exchange for ownership of the land. Thus, this type of land trust can be used for housing too, which may bring down housing prices as well.

4.2 Empirical Exercise: Tax Revenue Effect of Public Investment in Bangladesh

As public infrastructure investments are public goods therefore, both the formal and informal sectors get equal benefits from the productivity gains from public investments. Given the profit function,

$$\pi_i = AK_i^\alpha L_i^{1-\alpha} G - w_i L_i - r_i K_i \quad (9)$$

The total tax to output ratio can be given as

$$\frac{\tau \pi_i}{Y_i} = \frac{\tau}{Y_i} (AK_i^\alpha L_i^{1-\alpha} G - w_i L_i - r_i K_i) \quad (10)$$

Differentiating the above expression with respect to G yields the response of tax-to-output ratio due a marginal increase in G as follows:

$$\frac{d}{dG} \left(\frac{\tau}{Y_i} (AK_i^\alpha L_i^{1-\alpha} G - w_i L_i - r_i K_i) \right) = \frac{\tau}{Y_i} (AK_i^\alpha L_i^{1-\alpha}) > 0 \quad (11)$$

This expression implies that public expenditure should lead to increased competitiveness and, hence, profitability of firms at the margin and therefore the firm's ability to pay taxes.

Following Eq. 11, we run the following regression:

$$\Delta \text{tax_gdp}_t = \alpha_0 + \sum_{i=1}^k \alpha_{1i} \Delta \text{tax_gdp}_{t-1} + \sum_{j=1}^n \alpha_{2ji} \Delta x_{jt-i} + \alpha_3 \text{tax_gdp}_{t-1} + \sum_{j=1}^n \alpha_{2ji} \Delta x_{jt-i} + \sum_{j=1}^n \alpha_{4i} x_{it-1} + \varepsilon_t \quad (12)$$

where

tax_gdp_t = Represents tax-GDP ratio, a measure of tax revenue performance

x_t = Represents a vector of variables that explain changes in other factors

ε_t = Represents a white noise error term

The estimates from the Vector Error Correction Model for the data covering the period 1986–2017 are shown in Table 6. First, we test the stationarity of data series using the Phillips-Perron test. Results suggest that the series tax-GDP ratio, developmental expenditures, and trade-GDP ratio are integrated of order 1 (I(1)) (Table A3 in Appendix). Therefore, the Vector Error Correction (VEC) Model is used. We selected the optimal lags for the model using the Akaike information criterion (AIC) and the Hannan Quinn (HQ) information criterion. According to AIC and HQ, the optimal lag length is 4. Then we did the test for cointegration using the Johansen Cointegration Test with the Rank test and Max-eigenvalue test, and the results suggests that there is 1 cointegration equation at the 5% level of significance. The VECM model results suggest that there is a long-run positive and significant relationship between public developmental expenditures and tax revenue, which can be considered for calculating spillover benefits (the incremental tax revenue) of the government's developmental expenditure because tax revenues are generated due to improvements in infrastructures.

Table 6: Co-integration Test

Tax-GDP Ratio	Log (Development Expenditure)	Log (Trade as % of GDP)
1.000000	-5.98***	-4.027***
Std. Error	(1.02)	(0.34)

Source: Authors' compilation.

5. CHALLENGES OF LAND TRUST

There are legal, financial, and governance challenges in implementing land trust in a country like Bangladesh. A strong commitment from the government is required to initiate the land trust system. Accordingly, a land trust act would be needed to support the trustee, entruster, and beneficiaries. The following are the issues that need to be resolved to initiate land trust. Basic work needs to be done to ascertain the legal parameters under which a land trust model would operate in Bangladesh's jurisdictions. From a legal perspective, it is necessary to define the scope and parameters of land trust. From a financial perspective, it is necessary to determine the activities, business plans, and indicative performances of various land trust models in terms of rent calculation, tax revenue-sharing methods, service charges of banks, etc. Some financial regulations need to be ascertained to allow banks and nonbanks to operate trusts. Different types of governance frameworks would be required to run a land trust. It is to be noted that while private investment in public infrastructure would require one type of governance framework, a separate governing body might work for managing private properties.

In addition, to implement LTP in infrastructure financing with a revenue-sharing mode, the following issues need to be resolved.

1. **Defining catchment area:** A big infrastructure project generates spillover benefits along the project areas and sometimes beyond the project areas. It would create difficulties in revenue sharing if the catchment area of the project is not clearly defined. Moreover, confusing spillover benefits of other non-LT projects might create problems. It is therefore important to delineate clearly the area which receives greater benefits of the projects so that a certain portion of an increase in revenue may be shared among the investors.
2. **Estimating revenue-sharing ratio:** If a road project goes through a district, it might generate spillover benefits across a one-kilometer radius of the project. How much of the incremental revenue of the project can be shared among the investors and for how long? In Japan incremental revenue increases by 20%. Even the tax collection in developing countries like Bangladesh is a complicated issue which warrants a careful analysis of the situation.
3. **Duration of the project:** The duration of revenue sharing should not be for an unlimited period. A proper method for estimating the duration of revenue sharing has to be developed considering the life of the project as well as the rate of return from the project.
4. **Governance:** A governing body consisting of various stakeholders, including public officials such as tax officials and private investors, may be formed for each of the LT infrastructure projects. The body will handle the issues of concern discussed above.

6. CONCLUSIONS

The rapidly increasing demand for non-agricultural land in Bangladesh contributes to abnormal land price hikes over time, which impedes the investment opportunities and affordable housing objective of the people. Climate change vulnerability also threatens to jeopardize many of the country's achievements. In this context, LTP could be an effective way of land transfer that could solve many of the land-related problems in the country and, therefore, could be a vehicle for ensuring SLM, which appears to be crucial for minimizing land degradation, rehabilitating degraded areas, and ensuring the optimal use of land resources for the benefit of present and future generations. The United Nation's Sustainable Development Goals (SDGs) emphasize sustainable land management in its goal number 15: "land for life." As SLM approaches require an appropriate policy and regulatory environment that ensures collaboration and partnership among land users, technical experts and policy-makers to ensure corrective measures against degradation and other concerns, the LTP approach can thus be seen as an important strategy for ensuring SLM.

This paper discusses various options of land trust that can be implemented in Bangladesh in order to achieve sustainable land management. The proposed land trust approaches might go beyond traditional land trust methods, which can be termed as Land Trust Plus (LTP) and could be used as alternative financing for infrastructure construction. An analytical framework for land trust is also shown in this paper, with a discussion of possible challenges. Land Trust Plus could be a way to enhance sustainable land management in terms of its efficient use and productivity while sustaining the rate of return for land owners. Bangladesh has been facing land shortages due to huge industrial needs, infrastructure development, real-estate booms, land

degradation and erosion due to climate change risks, and so on. If properly applied, Land Trust Plus could be one of the options that would attract private investors into infrastructure by increasing the rate of return on infrastructure investment. The spillover effects of infrastructure investment under LTP will increase revenue, sales, and property taxes, which can be shared under an agreeable method among the investors and the government.

In addition to infrastructure financing, this study also proposes traditional land trust for housing, agricultural land use, and *khas* land use. A proper legal and regulatory framework will be needed to implement land trust in Bangladesh. Further, as part of SLM, it is argued that Bangladesh could localize the Dutch experiences of land reclamation and delta management policies with technological innovation to make it cost-effective under LTP. Therefore, Bangladesh could strive to create a clear and implementable action plan for land trust with low-cost solutions such as land reclamation.

REFERENCES

- Bangladesh Bureau of Statistics (BBS). 2011. *Agricultural Census of Bangladesh*. Dhaka: Ministry of Planning.
- Bangladesh Agricultural Research Council (BARC). 1999. Land degradation situation of Bangladesh. Soil Science Division, Bangladesh Agricultural Research Council, Dhaka.
- Bangladesh Planning Commission 2018. Bangladesh Delta Plan 2100 (BDP 2100), Bangladesh Planning Commission, Government of Bangladesh, 2018.
- Barakat, A., uz Zaman, S. and Raihan, S., 2001. *Political economy of khas land in Bangladesh*. Dhaka: Association for Land Reform and Development.
- Center for Environmental and Geographic Information Services (CEGIS). 2008. Prediction of River Bank Erosion Along the Jamuna, the Ganges and the Padma Rivers. UNDP, Dhaka, Bangladesh, Center for Environmental and Geographic Information Services.
- Crabtree, L., V. Milligan, P. Phibbs, C. Sappideen, H. Blunden., and N. Moore. 2011. *Community Land Trusts and Indigenous Housing Options*. Melbourne: Australian Housing and Urban Research Institute.
- Fasullo, J.T. and Nerem, R.S., 2018. Altimeter-era emergence of the patterns of forced sea-level rise in climate models and implications for the future. *Proceedings of the National Academy of Sciences*, 115(51), pp.12944-12949.
- Food and Agriculture Organization (FAO). 2013. "Bangladesh: Arable Land and Land Under Permanent Crops Availability; Accessed June 12, 2019. <http://faostat.fao.org/site/666/default.aspx>.
- Heywood, I., S. Cornelius, and A. S. Carver. 2002. *An Introduction to Geographical Information Systems*. Singapore: Pearson Education.
- Hossain, M. 2017. "Improving Land Administration and Management." In *7th Five Year Plan Background Papers*, edited by S. Alam. Vol. 5, Governance, Gender and Urban Development, June 2017, General Economics Division, Ministry of Planning, Bangladesh.
- Hasan, M. Z., M. S. Hossain, A. M. Bari, and M. R. Islam. 2013. Agricultural Land Availability in Bangladesh, SRDI, Ministry of Agriculture.
- Kanda, H., 2016. A Trust for Commercial Use in Japan: An Unexpected Winner in the Race among Organizational Forms. In *Research Seminar, Law and Finance*.
- Khandker, Shahidur R., Zaid Bakht, and Gayatri B. Koolwal. 2009. "The Poverty Impact of Rural Roads: Evidence from Bangladesh." *Economic Development and Cultural Change* 57, no. 4 (July 2009): 685–722.
- Mahmud, M. and Sawada, Y., 2018. Infrastructure and well-being: employment effects of Jamuna bridge in Bangladesh. *Journal of Development Effectiveness*, 10(3), pp.327–340. No. 3.
- Nakahigashi, M. and Yoshino, N., 2016. Changes in economic effect of infrastructure and financing methods. *Public Policy Review*, 12(1), pp.47–68.
- Quasem, M. A. 2011. Conversion of Agricultural Land to Non-agricultural Uses in Bangladesh: Extent and Determinants, *Bangladesh Development Studies*, Vol. XXXIV, March 2011, No. 1, pp 59–85.

- Seraj, T. M., 2011. Real estate development in Dhaka. In: Roxena, H. and Rabbani, A.K.M.G., ed. 2011. 400 years of Capital Dhaka and beyond: Urbanization and Urban development, Vol. III. Dhaka: The Asiatic Society of Bangladesh.
- Yoshino, Naoyuki, and Masaki Nakahigashi. 2004. "The Role of Infrastructure in Economic Development." *ICFAI Journal of Managerial Economics* 2: 7–24.
- Yoshino, Naoyuki, and Umid Abidhadjaev. 2017. "An Impact Evaluation of Investment in Infrastructure: The Case of a Rail Way Connection in Uzbekistan." *Journal of Asian Economics* 49: 1–11.
- Yoshino, N. and Abidhadjaev, U., 2017. Impact of infrastructure on tax revenue: Case study of high-speed train in Japan. *Journal of Infrastructure, Policy and Development*, 1(2), pp.129–148.
- Yoshino, N., Abidhadjaev, U. and Nakahigashi, M., 2018. Closing the Asia Infrastructure Gap-BRI, Public Investment, Private Financing, and Spillover Effects. *Horizons-Journal of International Relations and Sustainable Development*, (10). Available at: <https://www.cirsd.org/en/horizons/horizons-winter-2018-issue-no-10/closing-the-asia-infrastructure-gap>.
- Yoshino, Naoyuki, Matthias Helble, and Umid Abidhadjaev. 2018. *Financing Infrastructure in Asia and the Pacific: Capturing Impacts and New Sources*. Tokyo: Asian Development Bank Institute.
- Yoshino, N., S. Paul, V. Sarma, and S. Lakhia. 2018. Land acquisition and infrastructure development through land trust laws: a policy framework for Asia. ADBI Working Paper, Asian Development Bank Institute, Tokyo.

APPENDIX

Table A1: Economic Effect of Infrastructure Investment in the Case of Japan

	1956–1960	1961–1965	2001–2005	2006–2010
Direct Effect (Kg)	0.696	0.737	0.114	0.108
Indirect effect (Kp)	0.452	0.557	0.091	0.085
Indirect effect (L)	1.071	0.973	0.132	0.125
20% returned	0.305	0.306	0.045	0.042
Increment	43.8%	41.5%	39.0%	39.1%

Source: Nakahigashi and Yoshino (2016).

Table A2: Phillips-Perron Test Results

Variables	Level			First Difference		
	Intercept	Intercept and Trend	None	Intercept	Intercept and Trend	None
Ln (TRADE-_GDP	-1.61	-1.32	1.25	-5.15***	-5.62***	-4.89***
Ln (DEV-EXP)	-2.27	-2.21	0.17	-6.49***	-6.76***	-6.58***
TAX-GDP	-1.03	-2.56	2.58	-6.33***	-6.18***	-5.20***

*** Indicates the level of significance at the 1% level.