

Prepared by Dr. Rana Maya

REA617
Real Estate & Urban Economics

Lecture 7



A vertical collage of five images with rounded corners. From left to right: 1. A person's arm and hand typing on a laptop keyboard. 2. A close-up of hands typing on a laptop keyboard. 3. A hand pointing at a laptop screen displaying a play button icon, with a graduation cap icon overlaid. 4. A hand pointing at a laptop screen displaying a magnifying glass icon, with an open book icon overlaid. 5. A blurred image of a hand pointing at a laptop screen.

Public Finance and Infrastructure in Urban Settings

Lecture 7

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lecture

07

Abstract



Urban infrastructure and real estate markets are deeply interwoven. Cities require extensive infrastructure—transportation, utilities, social facilities, public spaces—to support their populations, and the cost and financing of this infrastructure falls to public finance mechanisms.

Introduction

1. Theoretical and conceptual foundations
2. Public Finance Instruments for Urban Infrastructure
3. Real Estate, Land Markets and Urban Infrastructure: Interlinkages
4. Case Studies
5. Governance, Risk and Quality Management in Public Infrastructure
6. Strategic Considerations for Practice in Urban Real Estate/Infrastructure Projects
7. Lessons for Emerging Markets and MENA Region
8. Future Trends
9. Discussion questions



By the end of the lecture, you will be able to:

- **Explain** the fundamental principles of public finance and its relationship to urban infrastructure .
- **Identify** and evaluate the major instruments used to finance infrastructure—such as taxes, public borrowing, public-private partnerships (PPPs), and value-capture mechanisms.
- **Compare** international case studies that demonstrate alignment between infrastructure investments and real estate growth.
- **Critically examine** the fiscal, governance, and risk management frameworks that shape infrastructure–real estate linkages in urban economies.
- **Apply** analytical methods to estimate the economic impact of infrastructure projects on property values and urban development.
- **Design** policy recommendations for cities aiming to leverage real estate markets to finance and maintain public infrastructure.
- **Reflect** on future trends such as digital infrastructure, green financing, and smart cities, and their implications for real estate–based urban finance models.

Introduction

- How public finance instruments support urban infrastructure?
- How real estate interacts with these mechanisms?
- The implications for urban planning, governance and project/quality management



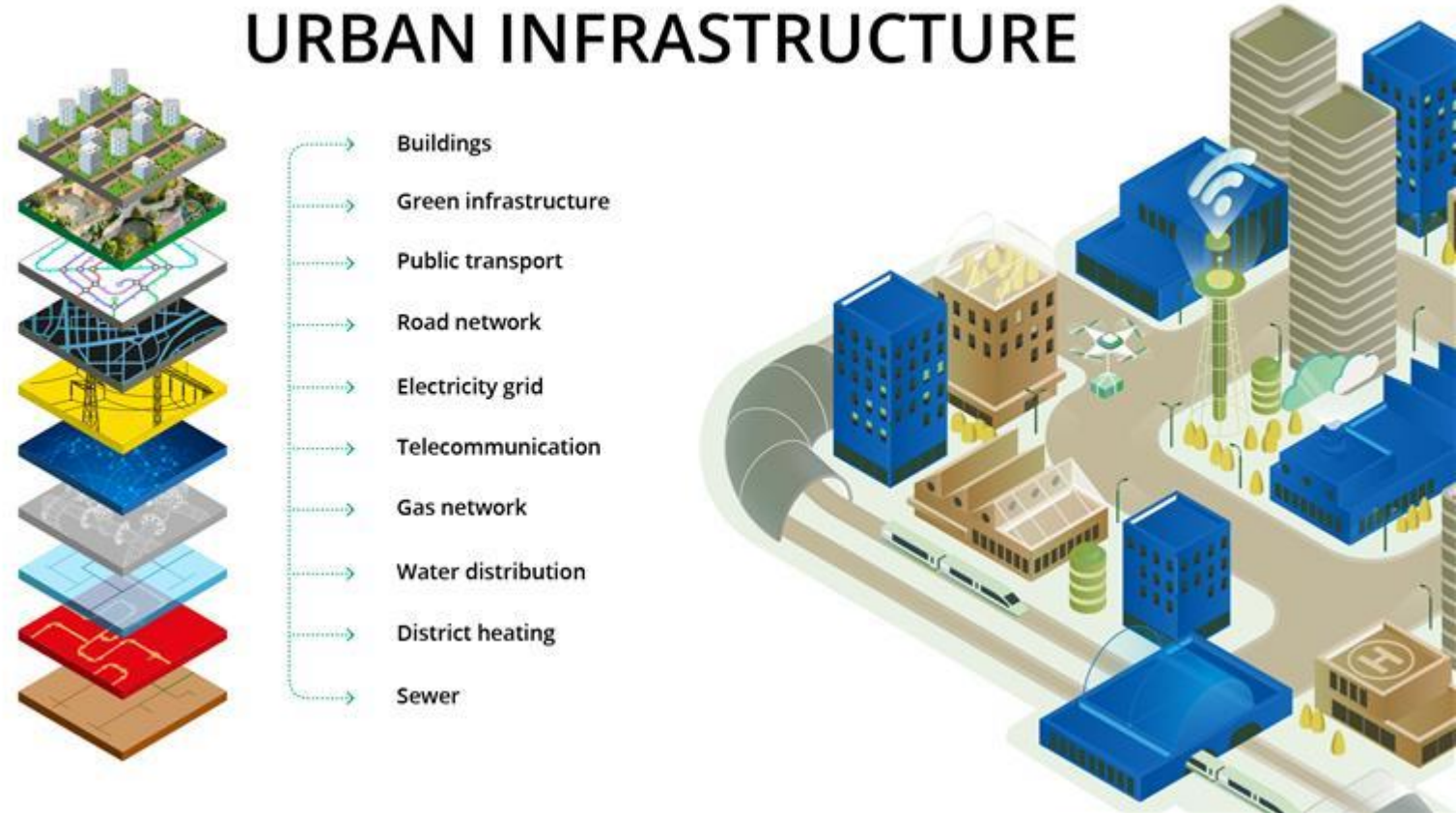
Why?

Real-estate markets respond to, and drive, infrastructure investment: property values rise with proximity to infrastructure, land markets shift, and private development often piggy-backs on public infrastructure.

1. Theoretical and conceptual foundations

1.1 Urban infrastructure and its public finance dimension

Urban infrastructure comprises roads, public transport, water/sewerage, energy, social facilities (schools, hospitals), public open space.



1. Theoretical and conceptual foundations

1.1 Urban infrastructure and its public finance dimension

The financing of such infrastructure is typically a public-sector responsibility (either at national, regional or municipal level).

Over time, the modes of financing have diversified:

- Traditional tax-financed budgets
- User-charges and fees
- Borrowing (municipal bonds)
- Public-private partnerships (PPPs)
- land-based financing (capturing value from surrounding land/real estate).



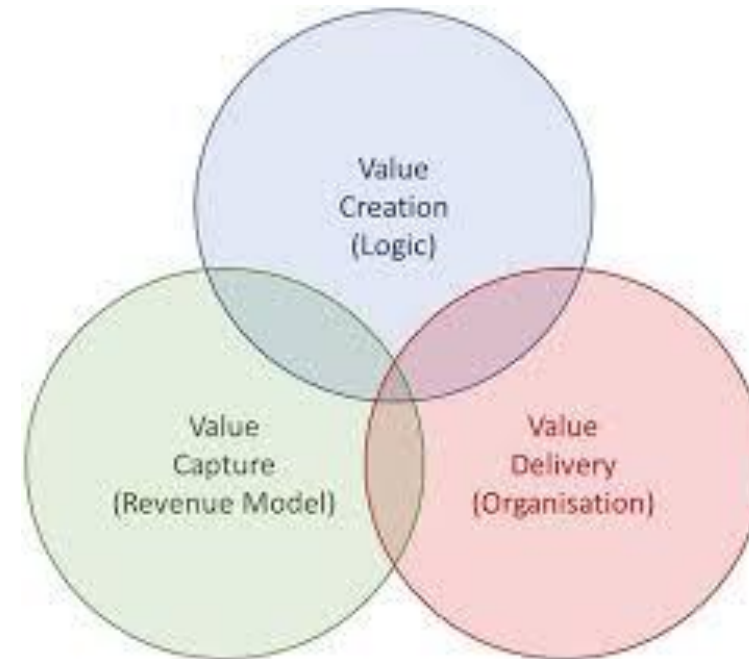
1. Theoretical and conceptual foundations

1.2 Land, real estate and value-capture logic

key insight: infrastructure investment creates value in adjacent land and real-estate markets.

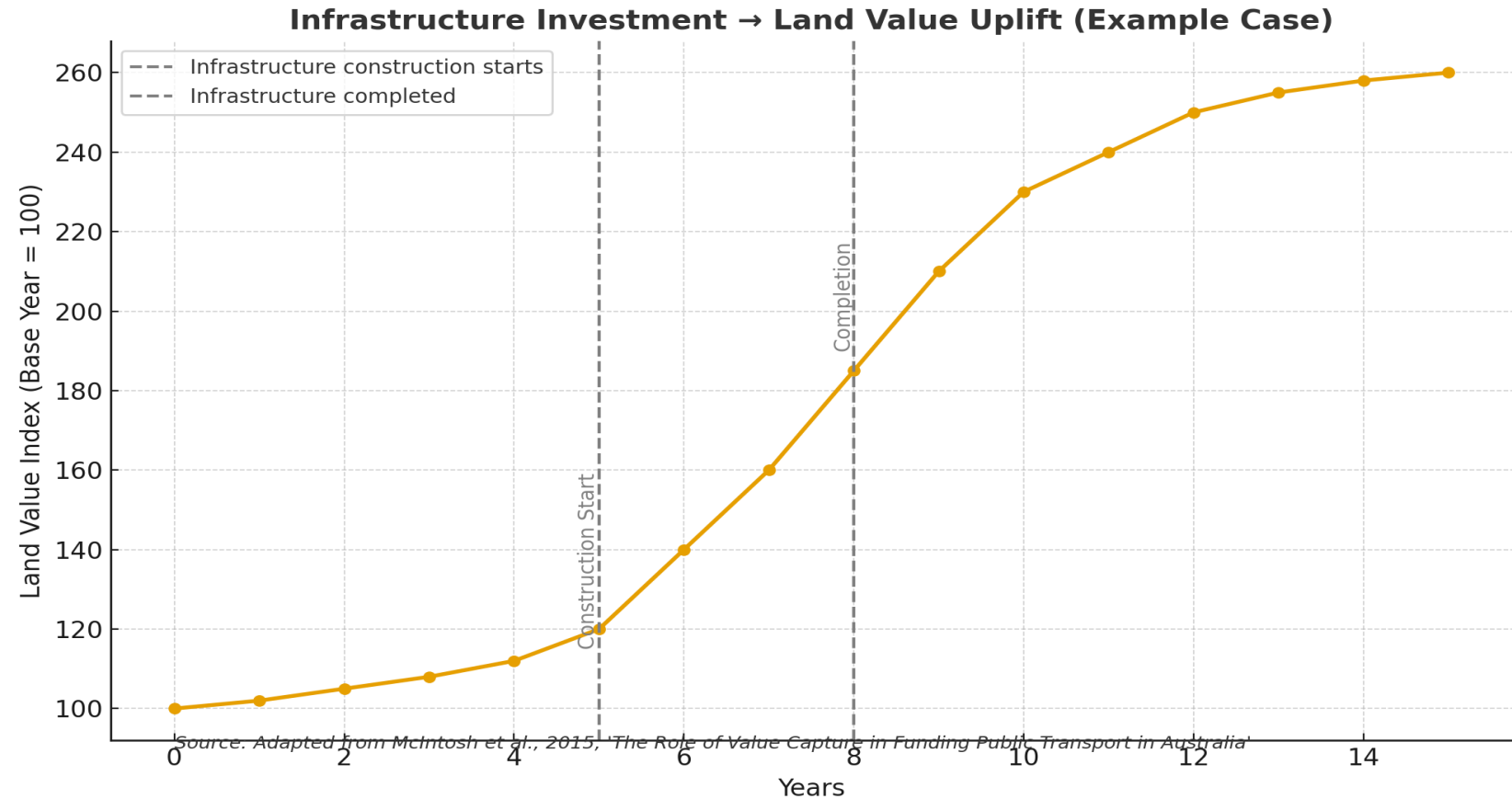
If a city builds a metro line, properties nearby appreciate; if new roads or utilities are delivered, land becomes more serviceable.

Capturing part of this “value uplift” is a way for cities to finance infrastructure.



1. Theoretical and conceptual foundations

land value uplift
following
infrastructure
investment — land
values rise
significantly after
project completion.



1. Theoretical and conceptual foundations

1.3 Real estate financialization and infrastructure

In recent years, the concept of financialization has emerged:

Real estate and infrastructure as financial assets rather than purely service-delivery mechanisms.

This shift has implications for governance, risk, and public finance.

For instance, in the case of Johannesburg commercial real-estate investment (office parks, malls) rather than residential markets dominated the financialisation of space.

And in Birmingham (UK) the “financialization fix” concept shows how urban land tenure, asset management and redevelopment are part of long-term public finance strategies.



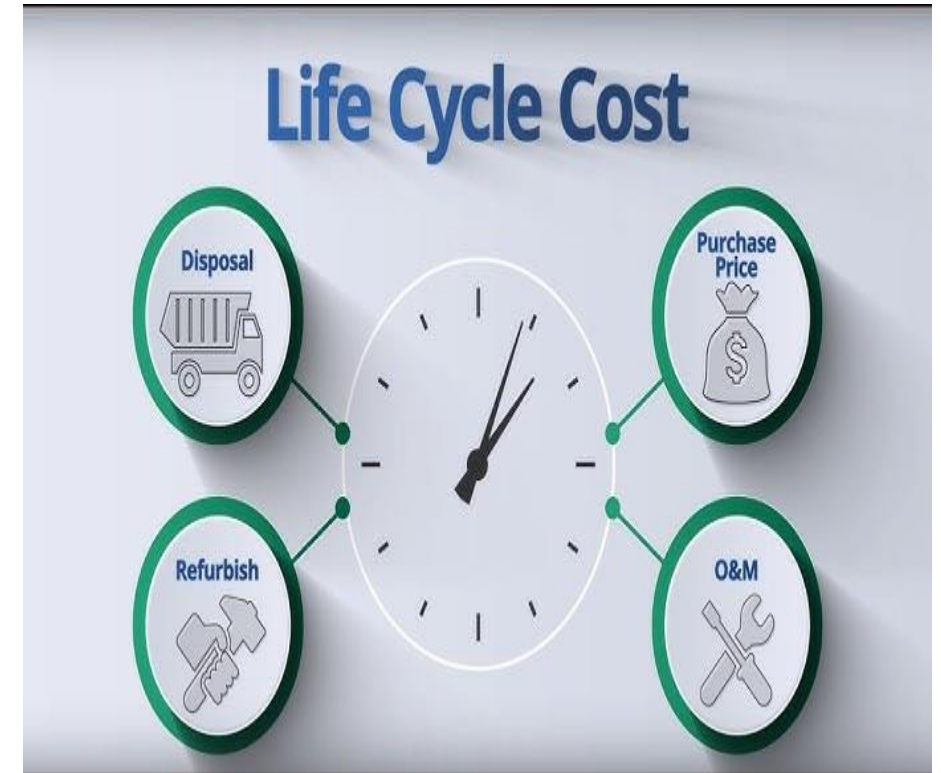
1. Theoretical and conceptual foundations

1.4 Implications for project management and quality management

From a project/quality management lens, infrastructure delivery in urban settings poses complex challenges:

- Multi-stakeholder governance
- Multiple funding streams
- Overlapping land/real-estate dynamics
- long-term maintenance (quality) and risk management (financial risk, governance risk).

The intertwining of real-estate finance means that quality must not only address construction delivery but also long-term asset performance, life-cycle cost, value-capture outcomes and alignment with urban planning objectives.



2. Public Finance Instruments for Urban Infrastructure

2.1 Traditional tax & budget financing

Cities collect property taxes, local business taxes, user-fees (for water, waste), and allocate budgets for infrastructure.

While straightforward, budget financing is constrained by competing demands, debt limits, and often fails to match the upfront capital needs of large infrastructure.



2.2 Municipal borrowing & bonds

Cities may issue municipal bonds or borrow from lenders/international financial institutions. For example, some urban construction investment bonds show how implicit government guarantees affect credit spreads. Borrowing allows cities to accelerate infrastructure delivery but creates debt service obligations that must be managed.

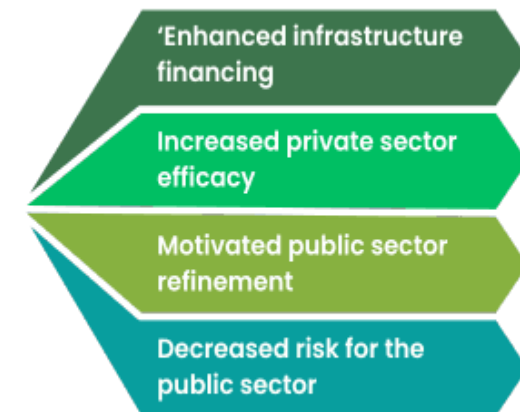
2. Public Finance Instruments for Urban Infrastructure

2.3 Public-Private Partnerships (PPPs) and private finance of public infrastructure

PPPs have grown significantly as a way to deliver infrastructure without relying solely on public funds.

private finance does not free public funds nor enlarge the pool of viable projects automatically; risk allocation is key

PPPs often interface with land development (e.g., a developer builds a transit station plus adjacent commercial property).



2. Public Finance Instruments for Urban Infrastructure

Key Benefits of PPPs in Infrastructure Projects

Access to Private Funding – Mobilizes private capital, reducing public budget pressure.

Improved Efficiency – Delivers projects faster and more cost-effectively through private expertise and innovation.

Risk Sharing – Transfers financial, technical, and operational risks to the private partner.

Lifecycle Value – Ensures long-term performance and maintenance through integrated design-build-operate models.

Better Service Quality – Performance-based contracts drive higher service standards.

Fiscal Flexibility – Spreads costs over time, easing government financial burdens.

Economic Impact – Boosts job creation, investment, and economic growth.

Institutional Learning – Strengthens public-sector capacity in project management and monitoring.

Sustainability – Guarantees proper maintenance and asset longevity.

2. Public Finance Instruments for Urban Infrastructure

Prince Mohammad bin Abdulaziz International Airport (Madinah Airport, Saudi Arabia)

Location: Madinah (Saudi Arabia)

project type: Major airport expansion + operation via PPP (concession) between the public airport authority (General Authority of Civil Aviation (Saudi Arabia), GACA) and a private consortium.

Concession/contract attributes: ~25-year concession, significant private investment (circa US\$1.2 billion initial build cost) financed via private sector with banks/commercial financing.

Structure: The private consortium (including TAV Airports Holding of Turkey, Saudi Oger and Al Rajhi Holding) was responsible for design, construction, financing, and operation of the airport terminal and concessions



2. Public Finance Instruments for Urban Infrastructure

Key Lessons

Clear governance: A strong public procuring authority (GACA) plus a private consortium with finance and technical capabilities is critical.

Risk allocation: Construction, financing, and operational risk are largely shifted to the private partner; public partner retains regulatory & oversight role.

Financing structure: Use of commercial banks, Islamic financing, long-term debt to enable the private partner to invest and recoup returns over concession life.

Real-estate/land value interplay: Although the primary asset is transport infrastructure (airport), the improved connectivity increases land and property value in adjacent zones (hotel development, retail, logistics)

Monitoring & performance: Long-term concession means quality of operation matters (passenger experience, maintenance, on-time service)

Policy alignment: Project supports national strategic vision (Vision 2030) — illustrating importance of infrastructure investment being consistent with broader policy and development objectives.

2. Public Finance Instruments for Urban Infrastructure

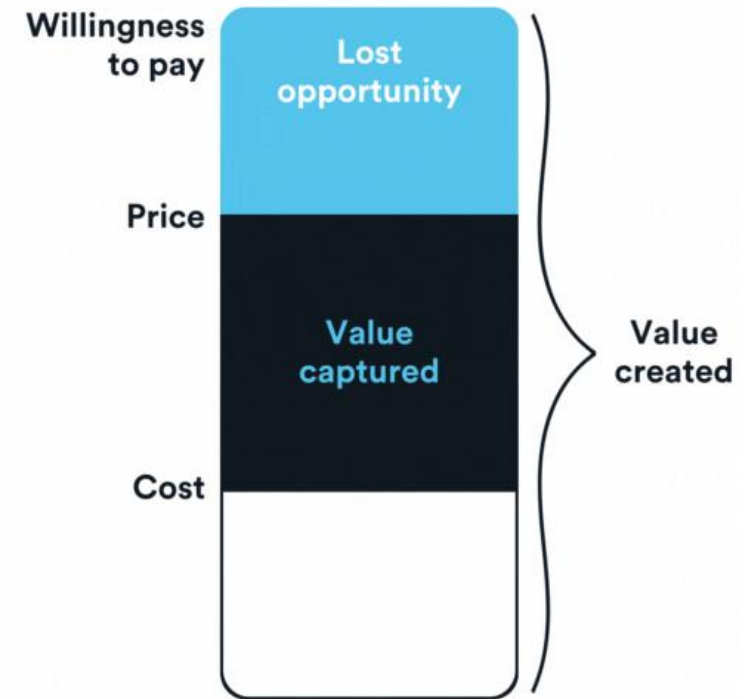
2.4 Value capture / land-based financing

One of the most interesting instruments for real-estate and infrastructure interplay is :

value capture: methods by which the increase in land/real-estate value (due to infrastructure investment) is harnessed to finance the infrastructure.

Tools include :

- development charges, special assessments
- tax increment financing (TIF)
- land leases/leases sales
- and asset sales of public land



2. Public Finance Instruments for Urban Infrastructure



Development Charges (Impact Fees)

Definition:

One-time payments developers make to local authorities to cover the cost of infrastructure (roads, water, schools, etc.) required by their projects.

Examples:

Toronto, Canada – Development charges fund water systems, transport, and parks. Updated regularly to reflect infrastructure costs.

Dubai, UAE – Developers in new areas (like Business Bay) must contribute to surrounding infrastructure (roads, drainage, and utilities).

Bangalore, India – Impact fees on commercial projects help finance citywide road and drainage improvements.

Lesson:

Ensures new development pays its fair share of infrastructure costs rather than burdening taxpayers.

2. Public Finance Instruments for Urban Infrastructure

2. Special Assessments

Definition:

Property owners benefiting from a specific infrastructure improvement pay an additional charge proportional to the benefit they receive.

Examples:

Tokyo, Japan – Applied for street widening projects; owners along improved corridors contribute based on frontage length.

New York City, USA – Business Improvement Districts (BIDs) finance street cleaning, security, and beautification by charging local property owners.

Cairo, Egypt – Some gated communities pay extra fees for upgraded access roads or services beyond municipal standards.

Lesson:

Fair and transparent if property owners see a direct, visible improvement in their area.

2. Public Finance Instruments for Urban Infrastructure

☑ 3. Tax Increment Financing (TIF)

Definition:

Municipality borrows money for infrastructure, expecting that property tax revenue from the rising land/real estate values (after development) will repay the investment.

Examples:

Chicago, USA – Over 130 TIF districts finance road and transit improvements in underdeveloped areas, later repaid by rising tax revenues.

London, UK – Cross rail project partly funded by a TIF-like mechanism capturing business rate increases near new stations.

Riyadh, Saudi Arabia (emerging) – Vision 2030 promotes similar mechanisms for financing infrastructure in new economic zones (e.g., King Salman Park area).

Lesson:

Effective in high-growth zones where tax base expansion can be predicted and captured.

2. Public Finance Instruments for Urban Infrastructure

4. Land Leases and Lease Sales

Definition:

Government or public entities lease or sell public land at higher prices after infrastructure improvements, using the proceeds to finance more infrastructure.

Examples:

Hong Kong – Land lease system (99-year renewable leases). Revenue from lease premiums funds metro expansion and public housing.

Addis Ababa, Ethiopia – Land lease auctions finance major roads and utilities; a primary example of land-based financing in Africa.

Abu Dhabi, UAE – Long-term land leases in Al Maryah Island finance public infrastructure and waterfront redevelopment.

Lesson:

Captures upfront value from land appreciation and reinvests it into urban development.

2. Public Finance Instruments for Urban Infrastructure



5. Asset Sales of Public Land

Definition:

Governments sell surplus or underutilized public land to private developers, using the proceeds to fund new infrastructure or regeneration projects.

Examples:

Milan, Italy – Sale of disused railway lands (Scali project) financed mixed-use urban regeneration and new transport lines.

London, UK – King's Cross redevelopment: former railway lands sold and reinvested in transit, utilities, and housing infrastructure.

Dubai, UAE – Municipality and semi-public entities (e.g., Nakheel) monetize land for financing infrastructure in Palm Jumeirah and Deira projects.

Lesson:

Efficient where government owns valuable urban land; requires transparency to prevent speculation.

2. Public Finance Instruments for Urban Infrastructure

Summary Table – Value Capture Tools and Examples

Tool	Mechanism	Example City	Purpose
Development Charges	One-time fee on new developments	Toronto, Dubai	Roads, water, parks
Special Assessments	Extra charge for benefiting properties	Tokyo, NYC	Street upgrades, BIDs
TIF	Borrow now, repay with future tax gains	Chicago, London	Urban regeneration, transit
Land Leases/Sales	Lease/sell public land for revenue	Hong Kong, Addis Ababa	Metro, roads
Asset Sales	Sell public assets for reinvestment	Milan, London, Dubai	Redevelopment, infrastructure

2. Public Finance Instruments for Urban Infrastructure

2.5 Emerging and hybrid instruments

Other instruments include land leasing (where public land is leased to developers and lease revenue funds infrastructure) :

for instance, in Bahir Dar (Ethiopia) the city finances a significant portion of infrastructure via land lease revenue

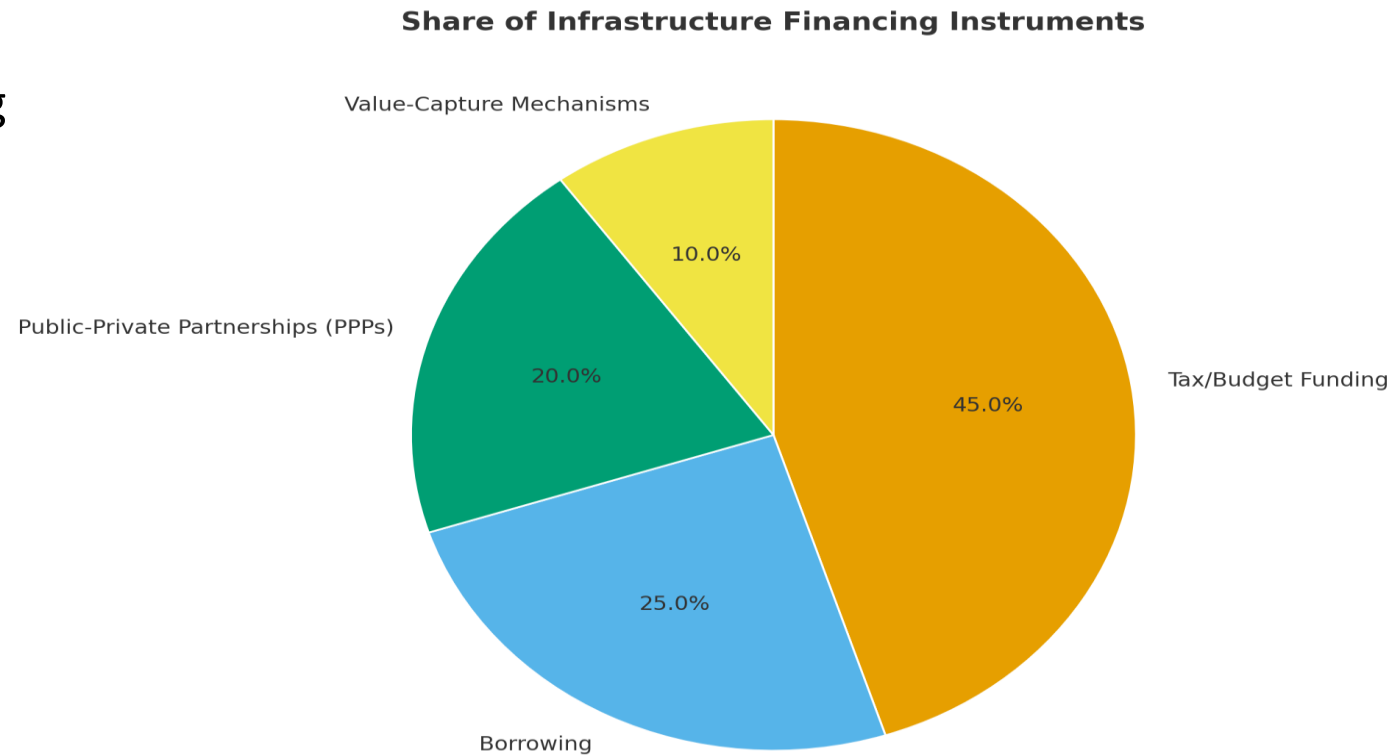
Also, green infrastructure financing (via bonds, carbon finance) is emerging.

Green infrastructure financing is the funding of environmentally beneficial projects, such as stormwater management or renewable energy, through mechanisms like government grants, green bonds, and public-private partnerships.



2. Public Finance Instruments for Urban Infrastructure

Here's the **pie chart** showing the "Share of Infrastructure Financing Instruments," illustrating typical proportions of funding sources: **tax/budget (45%)**, **borrowing (25%)**, **PPPs (20%)**, and **value-capture (10%)**.



Source: Adapted from World Bank (2023), 'Infrastructure Finance Outlook'.

3. Real Estate, Land Markets and Urban Infrastructure: Interlinkages

3.1 The causality: infrastructure → land-value → development

Infrastructure investment (roads, transit, utilities) tends to enhance land accessibility and serviceability which raises land values and encourages real-estate development.

This cycle is particularly strong in growing cities.

For example, infrastructure demand is driven by urbanization in developing countries—with large population growth in urban settlements and therefore rising real-estate/infrastructure interplay.



3. Real Estate, Land Markets and Urban Infrastructure: Interlinkages

3.2 Land markets, speculation and urban sprawl

One risk of the infrastructure-real-estate nexus is speculation and sprawl.

real-estate investors prefer to buy land for investment rather than housing, which delays the provision of basic amenities and creates sprawl.

From a quality/management lens, this raises issues of service delivery, long-term cost, and inefficiency



3. Real Estate, Land Markets and Urban Infrastructure: Interlinkages

3.3 Financialization of real-estate and infrastructure

As mentioned, real estate is increasingly treated as an investable asset; infrastructure likewise. A recent study in China shows how infrastructure financialisation influences uneven regional development.

in Johannesburg the selective nature of real-estate financialisation (focusing on commercial rather than residential) shows the governance implications.



3. Real Estate, Land Markets and Urban Infrastructure: Interlinkages

3.4 Urban regeneration, public land and real-estate assets

Public real-estate assets (under-utilised buildings, decommissioned sites) can trigger regeneration, combining infrastructure investment and real-estate redevelopment.

In Italy, a recent study shows how municipal urban plans are leveraging public real-estate assets for regeneration rather than mere sale for deficit-reduction.

From a project/quality management perspective, these are complex programmes combining infrastructure, real estate redevelopment, governance and value-capture.



4. Case Studies

4.1 Case Study A: Bahir Dar City, Ethiopia – Land Leasing for Infrastructure Financing

In Bahir Dar the city government uses land-lease revenue as a major source of extra-budgetary revenue to finance urban infrastructure expenditure. Researchers found that land lease revenue is a dominant source for infrastructure investment, but inefficiencies in lease collection, transparency and land-provision hamper full potential.

Key highlights:

Land lease revenue financing model.

Challenges: weak information exchange, inadequate land provision, transparency issues.

Real-estate dimension: public land used as asset; lease revenue tied to real-estate development.

Project/quality management implications: careful land inventory; governance of lease processes; linking land-lease revenue forecasting to infrastructure programme planning.

4. Case Studies

4.2 Case Study B: Islamabad, Pakistan – Infrastructure Finance, Land Markets and Sustainability

The study by Rauf & Weber (2021) explores Islamabad's land market and infrastructure finance. They show that individual investors prefer land as investment rather than housing, which leads to slower occupancy growth and delays in infrastructure provision.

Key highlights:

Infrastructure finance is linked with land-market behaviour.

Sprawl and delay in service delivery as investment behaviour dominates occupancy.

Real-estate speculation undermines infrastructure planning and quality of life.

Project/quality management implications: need for aligning real-estate investment behaviour with infrastructure delivery; monitoring occupancy vs investment; ensuring infrastructure readiness for occupancy.

4. Case Studies

.3 Case Study C: Italy – Public Real Estate as Urban Regeneration Driver

In Italy the study by Floris (2024) analyses 45 municipal urban plans and finds public real-estate assets (disused buildings/areas) are being integrated into urban planning not just as asset sales but as regeneration drivers.

Key highlights:

Public real-estate asset census, valorisation programmes, strategies for reuse.

Focus shift from purely economic value toward positive externalities for the community.

Real-estate-infrastructure interplay: regeneration requires infrastructure investment (transport, utilities, public space) plus real-estate redevelopment.

Project/quality management implications: managing multi-asset, multi-stakeholder programmes; lifecycle quality of regenerated assets; governance of value capture and community benefit.

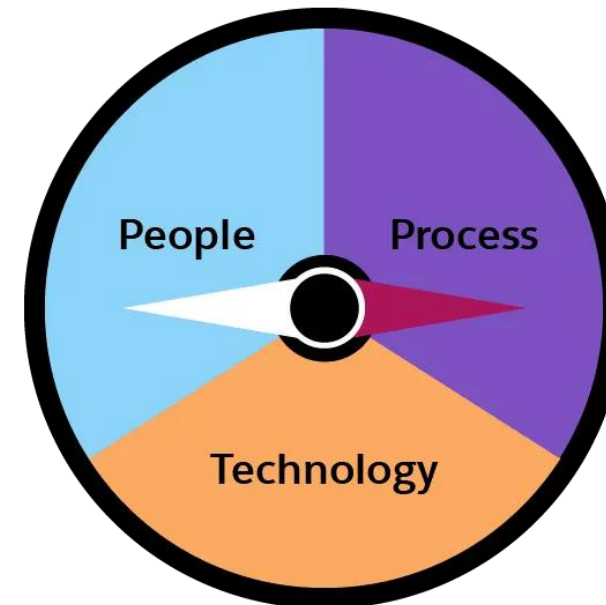
5. Governance, Risk and Quality Management in Public Infrastructure

5.1 Governance frameworks

Effective governance is critical: coordination between municipal planning, land/real-estate regulation, infrastructure finance units, private developers, and community stakeholders.

Weak governance leads to :

- Poor lease revenue collection
- Speculative land markets
- lack of integration of public real estate into planning



5. Governance, Risk and Quality Management in Public Infrastructure

5.2 Risk management

Risks include:

- Cost overruns and delays in infrastructure
- land-market speculation
- Financing risk (debt service, bond spreads)
- Governance risk (transparency, corruption)
- Asset performance risk (maintenance, quality).

For example, the study on construction investment bonds shows implicit government guarantees impact credit spreads—a financial risk dimension



5. Governance, Risk and Quality Management in Public Infrastructure

5.3 Quality management and life-cycle asset management

Quality management in infrastructure delivery must link to long-term asset performance: for real-estate plus infrastructure projects the challenge is broader.

Quality covers construction specs, maintenance, sustainability, user satisfaction, value retention.



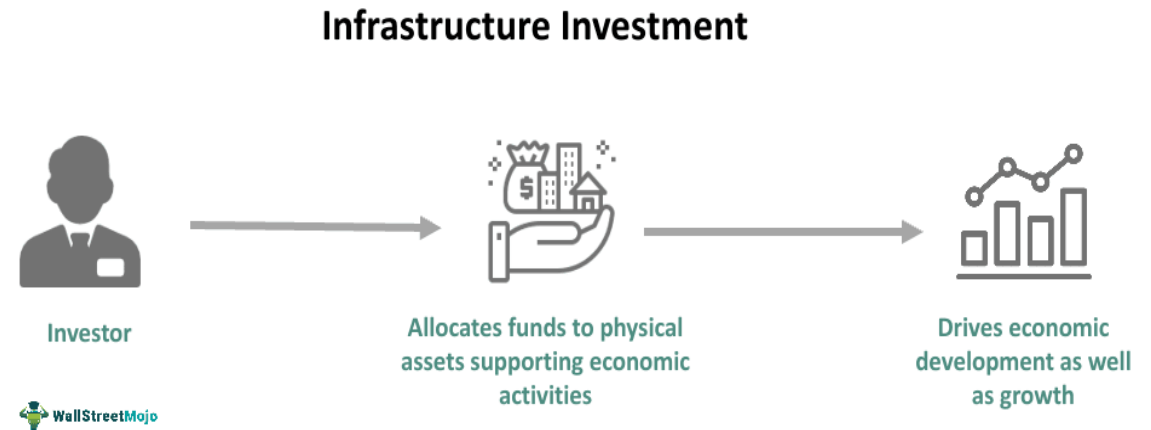
5. Governance, Risk and Quality Management in Public Infrastructure

5.4 Monitoring, evaluation and continuous improvement

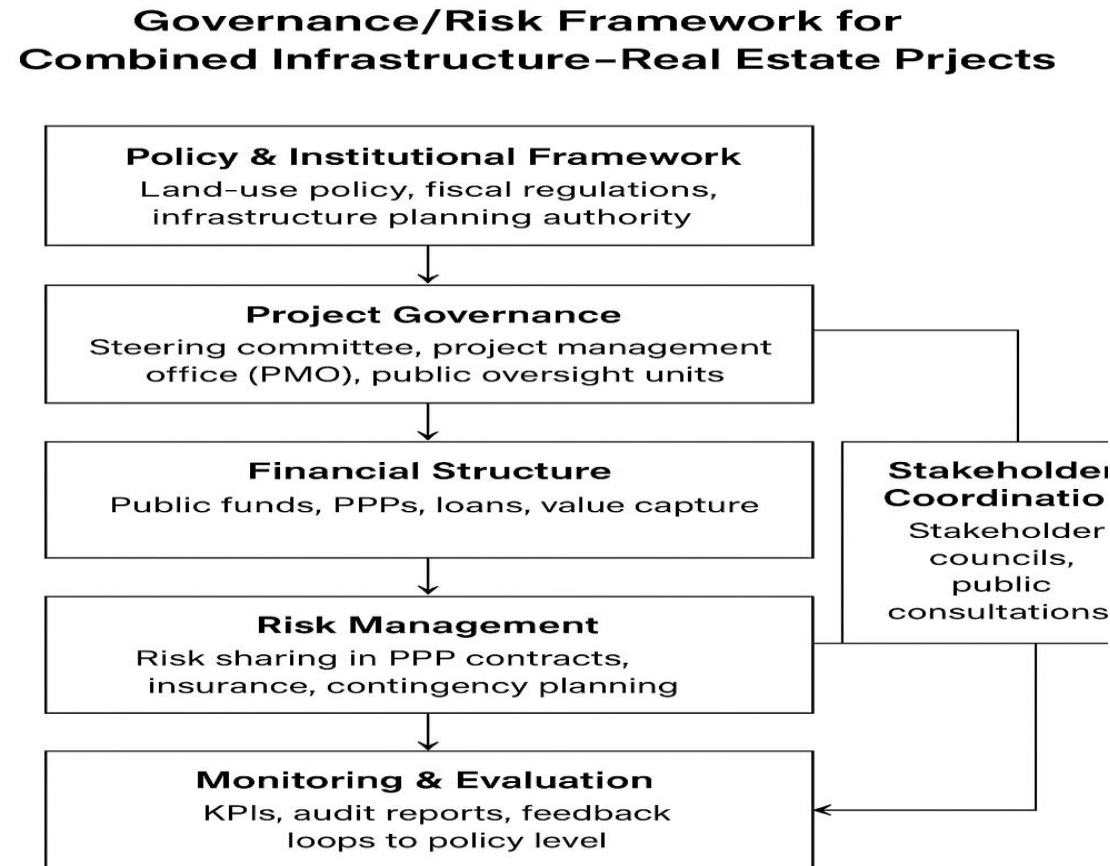
Project and quality managers need monitoring systems:

- tracking infrastructure investment vs real-estate market response
- tracking lease revenue
- evaluating social/community benefits
- benchmarking performance of PPPs.

Tools like early warning for speculative land purchase, metrics for value uplift, and dashboards for asset performance are helpful.



5. Governance, Risk and Quality Management in Public Infrastructure



6. Strategic Considerations for Practice in Urban Real Estate/Infrastructure Projects

6.1 Aligning infrastructure investment with real-estate market dynamics

Before committing to large infrastructure, assess the likely land/real-estate market response:

is the surrounding land ready for development?

Will development follow infrastructure or precede it?

How will value capture be implemented?

Will there be spill-over effects (positive or negative)?

6.2 Designing financing strategies with real-estate linkages

Consider land-based financing early: identify public-land assets, lease potential, property tax bases, value capture mechanisms.

Build realistic projections of lease revenue and ensure governance mechanisms for collection.

Integrate this into infrastructure programme budgeting and schedule.

6. Strategic Considerations for Practice in Urban Real Estate/Infrastructure Projects

6.3 Managing multi-stakeholder programmes (public-private-real estate)

Infrastructure-real estate programmes often involve municipal authorities, private developers, lenders, communities. Project management governance structures must clearly define roles, risk allocation, deliverables, quality standards, timelines, value-capture flows. Use robust contract management especially for PPPs.

6.4 Ensuring quality throughout the asset life-cycle

Quality is not just construction delivery but long-term performance: ensure maintenance budgets, service levels, property value retention, user satisfaction. For regeneration projects, ensure the real-estate component meets market needs (design, sustainability, amenities). Include user-experience feedback loops.

6.5 Monitoring impact and refining strategy

Create monitoring frameworks: e.g., metrics such as land value uplift, real-estate occupancy, infrastructure service levels, cost vs budget, revenue from value capture, social inclusion metrics. Use them to refine future infrastructure/real-estate project planning.

real-world case study illustrating how infrastructure investment was aligned with real estate market dynamics:

Case Study: Crossrail (Elizabeth Line), London, UK Overview

- **Project:** Crossrail (now the Elizabeth Line)\
- **Location:** Greater London Area, United Kingdom
- **Completion:** 2022
- **Investment:** Approx. £18 billion
- **Objective:** Enhance east–west connectivity across London, reduce congestion, and support regional economic growth.

real-world case study illustrating how infrastructure investment was aligned with real estate market dynamics:

1. Strategic Alignment

The UK government recognized that **transport infrastructure** significantly influences **land and property values**. The Crossrail project was designed not only to improve transit but to **stimulate urban regeneration** along its corridor.

The project connected key commercial and residential hubs (Paddington → Canary Wharf → Abbey Wood).

Strategic planning integrated **transport and land-use policies**, encouraging **mixed-use development** around stations.

real-world case study illustrating how infrastructure investment was aligned with real estate market dynamics:

2. Real Estate Market Dynamics

Before Crossrail:

Property prices in outer boroughs like Woolwich, Abbey Wood, and West Drayton were lower due to limited access to central London.

Developers hesitated to invest heavily due to weak transport connectivity.

After Crossrail announcement and during construction:

Land and property values rose by 20–35% within 1 km of new stations.

Commercial rents in areas like Farringdon and Tottenham Court Road increased significantly.

New residential projects and urban regeneration zones emerged around the new transport nodes.

real-world case study illustrating how infrastructure investment was aligned with real estate market dynamics:

3. Value Capture and Financing

Crossrail used a **value-capture financing approach** to align infrastructure investment with real estate growth:

Business Rate Supplement: London businesses contributed 2% extra tax toward financing.

Community Infrastructure Levy (CIL): Developers near Crossrail stations paid a levy linked to increased land value.

Direct Development Returns: Transport for London (TfL) partnered with developers for **Transit-Oriented Developments (TODs)** on public land.

4. Risk and Governance

A **joint governance model** was established: Crossrail Ltd (a subsidiary of TfL) managed the project under close oversight by the UK Department for Transport.

Risk-sharing agreements with private developers ensured coordinated timelines between infrastructure delivery and property development.

real-world case study illustrating how infrastructure investment was aligned with real estate market dynamics:

5. Outcomes

Property prices near stations increased by **average 30%** between 2010–2022.

Over **90,000 new homes** and **360,000 m² of office space** were developed along the route.

The project is estimated to add **£42 billion** to the UK economy over its lifecycle.

Strong **public-private collaboration** aligned infrastructure investment with real estate market cycles, ensuring both fiscal returns and urban regeneration.

6. Lessons Learned

Infrastructure investment can **reshape real estate demand** if synchronized with land-use planning.

Value capture mechanisms effectively recycle private gains from public infrastructure back into funding.

Governance frameworks must align multiple stakeholders—government, developers, financiers—to manage timing, risk, and benefit distribution.

7. Lessons for Emerging Markets and MENA Region

7.1 Contextual challenges: data, governance, informal markets

Many emerging markets face weak land records, informal property markets, limited municipal capacity, variable regulatory enforcement. These create extra risk in value-capture mechanisms and infrastructure-real estate linkages.

7.2 Integrated urban/regeneration programmes

Many MENA cities are undergoing rapid urbanisation and regeneration (new districts, re-use of former industrial land). Combining infrastructure investment with real-estate redevelopment and value capture can accelerate city-making.

7.3 Managing risks of speculation, sprawl and non-serviced development

As the Islamabad case shows, when real-estate is driven by investment rather than occupancy or effective infrastructure, sprawl and service deficits result. In MENA settings, ensuring that real-estate development is accompanied by infrastructure delivery, service provisioning and life-cycle quality is essential.

8. Future Trends

8.1 Digitalization, smart infrastructure and real-estate

Urban infrastructure is increasingly “smart” (internet of things, data analytics, sensor networks). Real-estate markets respond to “smart” amenities. The oversight of financing, delivery and ongoing quality becomes more data-driven.

8.2 Climate resilience, green infrastructure and property markets

Cities face climate challenges; green infrastructure (parks, green roofs, sustainable drainage) is increasingly important. Financing such infrastructure may require innovative value-capture linked to real-estate that benefits from green amenities.



8. Future Trends

8.3 Financialisation, asset markets and inequality

As infrastructure and real-estate increasingly become financial assets, risk of inequality (spatially and socially) increases. Research from China shows infrastructure financialisation can widen regional development gaps. Future research needs to explore how to balance value capture, social equity, and asset quality

8.4 Life-cycle quality and maintenance of combined infrastructure/real-estate assets

Often projects focus on delivery but less on long-term maintenance, quality, asset performance and real-estate market relevance. More research is needed on models that integrate life-cycle cost, asset performance, and value capture, especially in urban settings where infrastructure and real-estate are interconnected.

Exercise :

A government considers building a new arterial road. Initial investment (year 0): \$50,000,000 (construction).

Annual real benefits: \$6,000,000 per year for 20 years (time savings, vehicle operating cost savings, fewer accidents).

Benefits are constant in real terms. Project life: 20 years. Discount rate (real): 6% per year.

Compute: Present value (PV) of benefits, Net Present Value (NPV), Benefit–Cost Ratio (BCR).

Here's the standard formula for an ordinary annuity:

$$P = \text{PMT} \times \frac{1 - (1/r)^n}{1 - 1/r}$$

Where:

P = Present Value

PMT = The amount of each annuity payment

r = Interest rate per period

n = Number of periods

Exercise

$$1-(1+r)^{-n}=1-0.3118047268860843=0.6881952731139157$$

Divide by r : $\frac{0.6881952731139157}{0.06} = 11.469921218565262 \leftarrow$ annuity factor

Multiply by B :

$$PV_{benefits} = 6,000,000 \times 11.469921218565262 = 68,819,527.31$$

Net Present Value (NPV)

$$NPV = PV_{benefits} - C_0 = 68,819,527.31 - 50,000,000 = 18,819,527.31$$

NPV = \$18,819,527.31 (positive).

Benefit–Cost Ratio (BCR)

Using PV benefits / PV costs (cost at $t=0$ so $PV_{cost} = \$50,000,000$):

$$BCR = \frac{PV_{benefits}}{C_0} = \frac{68,819,527.31}{50,000,000} = 1.3763905462$$

BCR ≈ 1.3764

Interpretation /

Conclusion

PV of benefits $\approx$

\$68.82 million.

NPV $\approx$ \$18.82 million

> 0 , so the project is **economically justified** at a 6% real discount rate.

BCR $\approx 1.376 (>1)$, reinforcing that benefits exceed costs in present-value terms.

9. Discussion Questions

- ❖ Compare the roles of taxation, public borrowing, and Public-Private Partnerships (PPPs) in financing urban infrastructure. Which approach works best in rapidly growing cities?
- ❖ How do value-capture mechanisms (e.g., tax increment financing, land lease sales, development charges) create a link between infrastructure investment and real estate value?
- ❖ What risks arise when cities depend heavily on real estate–driven revenues for infrastructure finance
- ❖ examine how **Saudi Arabia’s Vision 2030** encourages private-sector participation and PPPs in infrastructure. What lessons can be drawn for other developing economies?

Conclusion

Urban infrastructure and real-estate markets are deeply intertwined: infrastructure investments raise land values and attract development; real-estate development creates demands for infrastructure; value-capture mechanisms link the two to finance urban delivery.

lecture

07



**Combining financing strategy,
land/real-estate market
understanding, governance,
risk/quality management, and life-
cycle thinking supports Urban
infrastructure**



Thank You