Metro Rail Transit System Impacts On Land-use And Land Values In Bangalore, India

- Background and Need of the Study
- Concept Formation
- Literature Review
- Study Area Characteristics
- Analysis Framework
- Analysis
- Conclusions
### Study Background & Need of the Study

**Study Background**

- The public transportation system does much more than merely carrying its citizens from one place to another - it plays a vital role in encouraging and controlling urban growth.
- Transport infrastructure projects embrace **direct as well as indirect benefits**.
- The direct user benefits such as **reduced travel time**, but also indirect benefits such as **land value increase, land use densification** etc.
- The benefits of transportation investments get **capitalized in real estate market** in the **short-term** while **land-use adjustments occur over longer term**.
- This potential to produce **economic benefits** has become important in decision-making process of the transport investment.

**Need of the Study**

- Accessibility benefits **by improvement in public transport impetus to development** and hence should be taken as **an opportunity** to develop the city.
- This study tries to build a relation among **accessibility benefits, impact on proximate land use and land value gains**.
- The value appreciation **varies from place to place** influenced by various parameters. The study identifies **parameters that influence the scale of increment** in land values.
Research Question:
What is the relationship between accessibility benefits, land use, built form densification and land value increments?

Hypothesis:
Accessibility improvement leads to gain in the proximate land values.

Aim:
The aim of the study is to assess the impacts of accessibility improvement on proximate land use and land values. The study also investigates the potential to capture value appreciation by Value Capture Mechanism.

Objectives:
1. To assess land use changes and land value increment along the metro corridor at different points of time (i.e. Initial speculation period, Project formulation, During construction, Post completion).
2. To investigate Potential of value capture.

Scope & Limitation:
1. The study is be limited to the delineated study area. The land value has been assessed through market guidance value gazettes and also by direct interaction with developers, real estate agents.
2. Value appreciation has been captured through change in accessibility, change in ownership patterns, land consolidations, number of transactions, distance from CBD’s etc.
Land Value

The market price is the price at which the actual transaction takes place.
Registration value is the price at which the sale is registered.
The guidance value is the published value below which the transaction cannot take place.

Land use Changes

Land use changes can be defined as increase in land use mix at various scales, including mixing within a building, along a street and within a neighborhood/area.

Built Form Densification

Changes in Building heights, ability to use higher FSI

Database

• Market Guidance Value Gazettes for the time period 1998-2013
• Survey of real estate brokers, property agents to identify real market values
• 1998 Land use based on CDP and other literature
• Existing Land use Plan (2004); RMP-2015
• Land use details based on Property Tax Database 2007 and 2011 (BBMP)
• For 2014 Land use Primary Survey
• New Proposed development since 2004 (BBMP)
• 2007 Heights based on Property Tax Database 2007 (BBMP)
• For 2014 Building Heights Primary Survey
Literature Review
The land value is guided by the economic principle of the **highest & best use which produces the highest net return over a period of time**.

The property value of a plot includes, value of its land, structural specifications and other contextual attributes (land use, location etc.).

As **construction cost** of different components is uniform depending upon the quality, hence property value is a direct function of Land Value.

### Theories

<table>
<thead>
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<th>Theories</th>
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<tr>
<td>1. Land &amp; its prices</td>
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<td>2. Land rent theory</td>
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<td>3. Land rent &amp; land Use</td>
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<td>4. Micro economic theories:</td>
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<tr>
<td>a. Alonso’s model</td>
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<td>b. Wingo’s model</td>
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### Determinants of Land Value

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<th>Determinants of Land Value</th>
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<tr>
<td>1. Physical attributes of property</td>
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<td>2. Neighborhood attributes</td>
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<tr>
<td>3. Availability of infrastructure</td>
</tr>
<tr>
<td>4. Nature of development</td>
</tr>
<tr>
<td>5. Proportion of road width in context to land use and building heights</td>
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<td>6. Locational attributes and Transport Linkages</td>
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<tr>
<td>7. Economic factors</td>
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<td>8. Supply and demand factors</td>
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<td>9. Legal/ Government forces</td>
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<tr>
<td>10. Potential of future development</td>
</tr>
<tr>
<td>11. Social factors</td>
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</tbody>
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### Techniques to calculate land value change

<table>
<thead>
<tr>
<th>Techniques to calculate land value change</th>
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<td>1. Accessibility and Proximity levels</td>
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<td>2. Market activity &amp; Business competitiveness Surveys</td>
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<td>3. Qualitative analysis</td>
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<td>4. Descriptive statistics</td>
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<td>5. Regression analysis</td>
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<td>6. Hedonic pricing</td>
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<td>7. Transactional analysis</td>
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<td>8. Projected rate able values</td>
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<td>9. Geographically weighted regression</td>
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<td>10. GIS mapping techniques</td>
</tr>
<tr>
<td>a) Inverse distance weighting (IDW)</td>
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<td>b) Kriging</td>
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</table>
### Techniques to calculate Land Value Change

<table>
<thead>
<tr>
<th>Technique</th>
<th>Description</th>
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<tbody>
<tr>
<td>1. Accessibility and Proximity levels</td>
<td>Travel time thresholds with the use of a distance decay function is used to calculate for the improvement in the accessibility levels in terms of reduction in the travel time.</td>
</tr>
<tr>
<td>2. Market Activity &amp; Business Competitiveness Surveys</td>
<td>Assesses the market trends through business interviews, discussions with developers/builders/regulatory agency, FGD’s.</td>
</tr>
<tr>
<td>3. Qualitative analysis</td>
<td>Analysis such as environmental quality audits and other analyses provide complementary information.</td>
</tr>
<tr>
<td>4. Descriptive Statistics</td>
<td>Various factors are cross tabulated with measures of change in travel and modal split (e.g. a correlation analysis).</td>
</tr>
<tr>
<td>5. Regression analysis</td>
<td>Quantifies or establish a relationship among different sets of data.</td>
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<tr>
<td>6. Hedonic pricing</td>
<td>Assumes that the overall transaction prices are combination of different attributes, thus can be decomposed into components.</td>
</tr>
<tr>
<td>7. Transactional analysis</td>
<td>Monitors changes in land values from actual transactions &amp; requires time-series analysis of land values.</td>
</tr>
<tr>
<td>8. Projected rate able values</td>
<td>Determines the way the market is likely to move in terms of yields, occupancy rates and the demand for different type of spaces.</td>
</tr>
<tr>
<td>9. GIS mapping techniques</td>
<td>Create maps representing the level of accessibility both before and after the introduction of the public transport facility and calculates the relative change in accessibility and its impact on land values.</td>
</tr>
<tr>
<td>a. Inverse Distance Weighting</td>
<td>The principle underlying all surface interpolation methodologies is that entities that are found to be close together in geographical space are likely to be similar.</td>
</tr>
<tr>
<td>b. Kriging</td>
<td>The imputation function uses sample points to influence those in nearby locations rather than having a fixed mathematical function to determine values.</td>
</tr>
<tr>
<td>Source</td>
<td>Location</td>
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<td>-------------------------------</td>
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<tr>
<td>Cervero &amp; Duncan (2002)</td>
<td>Santa Clara</td>
</tr>
<tr>
<td>Chesterton (2002)</td>
<td>London JLE</td>
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<td>Pharoah (2002)</td>
<td>London JLE</td>
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<tr>
<td>Hennebury (2002)</td>
<td>Sheffield Supertram</td>
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<tr>
<td>Cervero &amp; Kang (2011)</td>
<td>Seoul</td>
</tr>
<tr>
<td>PWC (2013)</td>
<td>Delhi</td>
</tr>
<tr>
<td>This Research</td>
<td>Bangalore</td>
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</tbody>
</table>
Accessibility is the degree to which desired destinations are served. It is measured in terms of the availability of and proximity of primary destinations to transportation services (Towns, 1996).

Accessibility is referred to the ease in accessing transport infrastructure facilities or the impact on travel times from origin to other destinations (Thakur, 2009).

It is the extent to which land-use and transport systems enable individuals to reach activities or destinations by means of a (combination of) transport mode(s) (Geurs and Wee, 2004).

**Relationship**

- Landuse and transportation interactions are a dynamic process that includes spatial and temporal changes.

- Development of transportation improves accessibility, thus it stimulates changes in land use pattern (Aravantinos, 2000 and Zhao et al., 2003) and escalate land values.

- The firms adjust their locations to take advantage of the improved accessibility. While households also adjust location to maximize opportunities of employment, to reduce commuting cost etc.

## Categorization of Transport Impacts & Its Threshold

<table>
<thead>
<tr>
<th>Impact</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mobility and Access Impacts</td>
<td>Transit use in terms of level of use—such transit ridership, modal split; Travel time savings, Service availability, Service reliability, Service quality and Congestion reduction.</td>
</tr>
<tr>
<td>2. Economic &amp; Financial Impacts</td>
<td>Relative higher productivity and saving across the system, user cost savings.</td>
</tr>
<tr>
<td></td>
<td>Induce Direct as well as Indirect Benefits. Indirect benefits include increment in land prices.</td>
</tr>
<tr>
<td>3. Environmental and Energy Impacts</td>
<td>Induce benefits such as reduced consumption of energy, reduced emissions and reduced exposure to noises.</td>
</tr>
<tr>
<td>4. Safety and Security Impacts</td>
<td>Benefits are related to rider and non-rider safety, security and health as exposure to physical harm from transit operations reduces and security in public places increases.</td>
</tr>
<tr>
<td>5. Social Equity Impacts</td>
<td>The benefits including wider and focused operations of transit services, system configuration with respect to target population concentration etc.</td>
</tr>
<tr>
<td>6. Intangible Impacts and Factors</td>
<td>Individual and community are benefited by improvement in quality of life standard, sustainable development and personal well-being.</td>
</tr>
</tbody>
</table>

### Threshold

- **Within close proximity** to stations, **impact is higher on commercial property values** than on residential values, but the effect is reversed as distance from the station increases.
- **The land prices are higher if land parcel is located within walking distance but not directly next to the station.**
- **Empirical studies conclude that the majority of the benefits extend** till a buffer of **1000m**.
Value Capture and Its importance

What is Value Capture?
Value capture refers to a type of innovative public financing in which, increases in private land values generated by a new public investment are all or in part “captured” through a land related tax or any other innovative mechanism, to pay for that investment or other public projects. (The Lincoln Institute of Land Policy, USA, www.lincolninst.edu)

Why Value Capture is important?
- Public transport increases the quality of a city’s transport system and adds significant value to proximate land.
- The increase in the land values is reflected in the area served, especially around the stations.
- Uplift is more in case of rail-based systems due to long term surety of development investment.
- The value capture mechanisms can be used to monetize the additional land value that, in turn, can be used to defray the cost of providing transport infrastructure.
Study Area Characteristics
Bangalore city has experienced a tremendous sprawl in the city area. The city size has grown from 160 sq.km. (1991) to 741 sq.km (2011).

With more than 8.4 million inhabitants and 11,876 people per sq. km, Bangalore comprises one of the world densest urbanized areas in the world.

City is key contributor in the state economy. The annual growth are about: 3% for the population; 6% for employment; and 9% for the incomes.

Bangalore has a strong and balanced economy, with stimulated by light and heavy engineering (automobiles, earthmoving, and aeronautics), textiles, and high technology (IT, ITeS, Biotech, R&D).

Vehicle ownership has grown from 58 to 503 per 1000 population from 1981 to 2013.

The WPR has changed from 45% (25.5 Lakhs) in 2001 to 43.7% (36.3 Lakhs) in 2011.
Bangalore Metro: PHASE 1

Reach – 3
North Extension (Reach 3a)

Reach – 2

Under Ground

Reach – 3

Reach – 1

Reach – 4
South Extension (Reach 4a)

Image Source: BMRCL
Metro Operational: Operational Corridor

Bangalore Metro Rail Alignment - Phase I

EXISTING METRO CORRIDOR

MG Road
Trinity
Halasuru
Indira Nagar
Swami Vivekananda Road
Baiyappanahalli

Length of operational metro:
6.7 Km.

Image Source: BMRCL
### Bangalore Metro: Introduction

<table>
<thead>
<tr>
<th>Phase</th>
<th>Line</th>
<th>Elevated Length (km)</th>
<th>Underground Length (km)</th>
<th>Total Length (km)</th>
<th>Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>Purple Line</td>
<td>13.22</td>
<td>4.88</td>
<td>18.10</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Green Line</td>
<td>20.20</td>
<td>4</td>
<td>24.20</td>
<td>24</td>
</tr>
<tr>
<td>Phase 2</td>
<td>N-S Extension</td>
<td>6.29</td>
<td>0</td>
<td>6.29</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>E-W Extension</td>
<td>25.74</td>
<td>0</td>
<td>25.74</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>7.46</td>
<td>13.79</td>
<td>21.25</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Yellow</td>
<td>18.82</td>
<td>0</td>
<td>18.82</td>
<td>16</td>
</tr>
</tbody>
</table>

Image Source: BMRCL
Bangalore Metro: How it has been initiated?

Narrow Roads with heavy traffic and no scope of expansion

City faced problems like low travel speed, congestion, high accidental rate and increased pollution level

Need has been felt for an efficient rail-based system

4. Project construction stage (2007-2011)
5. Post-completion stage 1 (2011-2013)

1983
Study of Rail Rapid Transit & suburban services by Metropolitan Transport Project, Madras.

1994
GoK appointed IL&FS to do Feasibility Study Establishment of BMRTL

1995
GoK decides to implement ELRTS on BOOT

1997

2002
DMRC commissioned prepare DPR

2005

2006
GoK approves the project Notification

2007
Civil construction on Reach I of the line, between M.G. Road and Baiyappanahalli commenced on 15 April 2007

2011
In Oct 2011, Reach 1 of Phase 1 was opened to public

2014

BMRTL – Bangalore Mass Rapid Transit Limited
ELRTS - Elevated Light Rail Transit System
UBGC - UB Group Consortium
JBIC - Japan Bank for International Cooperation
Investment in major transport projects such as Metro Rail system leads to change in land use, change in land value and in built form densification.

<table>
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<tr>
<th>Analysis Framework</th>
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<td><strong>Land ownership/ Land use profile:</strong> Private land, Public/Semi Public, Restricted (Defence)</td>
</tr>
<tr>
<td>Influences as a function of Distance from Metro Station divided in a buffer of 150m, 250m, 500m and 1000m.</td>
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<tr>
<td>Project Cycle:</td>
</tr>
<tr>
<td>4. Project construction stage (2007- 2011)</td>
</tr>
<tr>
<td>5. Post-completion stage 1 (2011- 2013)</td>
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</table>

How are these impacts influenced by land ownership?

What is the spatial reach and consistency of these impacts?

When do these changes occur in a project cycle? During which period are these impacts prominent?
Analysis

Analysis has been carried out at 2 Levels:

1) For all Six Stations
2) Detail Study for MG Road Station
Analysis

For all Six Stations
1. Land use profile: Development precincts
2. Impact on Land use
   a) Land use changes over a Period of Time
3. Impact on Land Value
   a) Land Value Increment as a function of time
   b) Land values as a function of distance from metro station
   c) Land value increment and population density

Detail Study for 3 Stations
1. Land use profile: Development precincts
2. Impact on Land use
   a) Land use changes over a Period of Time
   b) Land use Conversion
   c) Plot amalgamation/ Land Consolidation
3. Land use changes: Vertical Densification
4. Impact on Land Value
   a) Land Value Increment as a function of time (Including Deviation factor)
   b) Land values as a function of distance from metro station
Analysis: For all Six Stations
Bangalore metro Reach 1 corridor has been aligned to serve high population density areas of the city.

A large extent of the area is dedicated to the Public/Semi public uses and Defence uses, which restricts development opportunities.

As only private land is available for development, only this has been used for further analysis purpose.
What are Land use changes?

- Land use changes can be defined as increase in land use mix, which refers to allocating different land uses close together.
- Transformation from residential and mixed use as well can be anticipated due to increased demand.

Image Source: BBMP Property Tax Database and Primary Survey
Land use changes over a period of time have started after a period of time. Considerable increase in demand of retail and office spaces around the existing metro stations.

**Land Use Changes**
- Conversion of residential to apartments, mixed use and residential or mixed to commercial and new development on open/vacant land.

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### Image Source:
RMP-2015, BBMP Property Tax Database and Primary Survey
Market Guidance Values: As A Reliable Source

- For analysis, Market Guidance value has been used, which is further ratified with real market prices.
A significant growth in land values have been observed over the period of time 1998-2013.
Land value price escalations are very area specific.
1. **Project Inception Stage (1998-2002)**
   - CAGR in land prices is only 1%-2%.

2. **Project formulation/development stage i (2002-2005)**
   - CAGR of 24%-26% has been observed.

   - CAGR of 20%-21% has been observed.
     - (HIGHEST)

4. **Project construction stage (2007-2011)**
   - CAGR of 7.5%-8% has been observed.
MG Road- Baiyappanahalli, has a significance in city since the past, it has always been a most important commercial area.


- ELRTS project didn’t take off due to various reasons and speculation about the METRO have risen.
- In 2002, DMRC was commissioned to prepare DPR.
- There has not been an evident growth in land prices.
- CAGR in land prices is only 1%- 2%.
2. Project formulation/development stage i (2002-2005)

- Metro project was approved by Govt. of Karnataka in 2005.
- CAGR of 24%-26% has been observed.
- Residential properties have obtained a higher growth in land prices when matched to commercial properties.
- Increment is higher near Halasuru, Indiranagar station.

- Civil construction of Metro started in 2007.
- During this period the land value has determined with the highest growth.
- CAGR of 20%-21% has been observed.
- Growth has been seen in both commercial and residential properties.
- MG Road & Trinity has also determined significant growth in prices.

- In Oct 2011, Metro has been opened to public.
- Areas abutting to MG Road and Trinity, have the highest rise due to increased demand of commercial spaces.
- Rise is significant even if plots are located at a distance from metro.
- CAGR of 7.5%-8% has been observed.
- The area, closely located to metro station has witnessed an escalation of around 11%-13%.
5. Post completion stage i (2011-2013)

- Areas abutting to MG Road and Trinity, have the highest rise due to increased demand of commercial spaces.

- CAGR of 14%-16% has been observed.

- Highest increment has been perceived in areas around Trinity Metro station.

- The areas within a buffer of 1000m had a higher growth in Land Prices due to locational advantage.
Land Value Increment as a Function of Time; Full Time Period (1998-2013)

- Land values have escalated with a steep increase during the whole period.
- CAGR of 9%-11% has been observed.
- Highest increment has been perceived in areas around Halasuru Metro station.
- Areas closer to MG Road and Trinity station, have grown at relatively lower rate due to pre-existed higher prices.
- Absolute increment is highest near MG Road Station.
- Land values are inversely related to the distance of land parcels from the metro station.

- Small increment in proximate areas of MG Road and Trinity due to already saturated Land prices in these areas.

- Ordinarily, land values decreases as we drift away from metro.

- Higher on Southern side

- Metro has exerted influence up to a buffer of 1 km radius with maximum influence in within 500m.
Land Values as a Function of Distance from Metro

- **Market land prices** during 2002 were approx. equal to guidance value or there were **nominal difference (max 1.2 times)**

- **Today, Market land prices** are **approx. 1.6 to 1.7 time of Gazette value**, which can be attributed to Metro.

- A **Nominal increment in prices** concludes that land values are inspired by **other characteristics of properties** as well.

This include

- **High Density**
- **Physical attributes** of plot
- **Narrow roads**
- **Provided Infrastructure facilities**
- **Established old market areas** due to which congestion also exists.
- **Proposed land use** profile and Building **Regulations**
- **Social attributes** (Low, Low-middle income groups).
- **Limited scope** for land consolidation
Population density around the stations has remained **same** even when the population density of Bangalore city has been **increasing rapidly**.

- The **minimal change in population density** has been due to **tremendous sprawl** in the city area.
- Outward movement of population from **core to periphery** due to higher growth in **land values in central part** of the city.
- A smaller increment in population density of the nearby residential areas, can be attributed to **metro**.
- **Increased commercial space** along the metro due to higher demand which have increased **employment** and decreased densities in some areas.
## Analysis: Detail Study; MG Road

<table>
<thead>
<tr>
<th>Overall</th>
<th>150 m Buffer</th>
<th>150- 250m Buffer</th>
<th>250- 500m Buffer</th>
<th>500- 750 m Buffer</th>
<th>750- 1000m Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial purpose (Retail areas, Offices, Restaurants), Mixed land use</td>
<td>Retail Commercial Areas, Shopping Complex, Unclassified area (Military Parade Ground)</td>
<td>Retail Commercial Areas, Hotels, Multi-storied Offices, Residential bungalows</td>
<td>Retail Commercial Areas, Offices, Hotels, Unclassified: Military land, Residential</td>
<td>CBD, Retail Commercial Areas, Mixed Use, Public/Semi Pubic Areas, Unclassified: Military Land, Residential</td>
<td>CBD, Retail Commercial Areas, Mixed Use, Public/Semi Pubic Areas, Unclassified: Military Land, Residential area</td>
</tr>
<tr>
<td>Date</td>
<td>Events</td>
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<tr>
<td>1812</td>
<td>The low density colonial city had a strong European character, with public life and thus public space centered on and around South Parade (MG Road).</td>
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<tr>
<td>Early 19th Century</td>
<td>During British Era, it was purely a military road due to the presence of the Parade Ground and the army barracks.</td>
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<tr>
<td>Post Independence</td>
<td>Development around M.G. Road created market pressures for commercial and entertainment uses. It responded and evolved into a fashionable main street or a colonial street mall.</td>
<td></td>
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<tr>
<td>1990's</td>
<td>Over the years it became the heart of the Central Business District.</td>
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<tr>
<td>Presently</td>
<td>Bangalore projected as a global city and large amount of capital was channeled into and M.G. Road became the obvious choice as the business and entertainment hub for the affluent.</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presently</td>
<td><strong>Primary road</strong> of Bangalore connecting Old Madras road on one side and the State Legislature complex and the older city on the other.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presently</td>
<td>MG road and its surroundings are still the shopping and entertainment hub of Bangalore. The area consists of the most prestigious offices.</td>
<td></td>
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</tbody>
</table>
Land use changes over a Period of Time

- In 1998, the prominent land uses along the M.G. Road have been commercial and Defence.
- Various residences also existed in spite of converting to commercial
- Surrounding areas on the South had commercial use nearby, while in North a mix of commercial and residential existed.
- Tendency towards land use densification have proliferated since the initial speculation of Metro.

Data Sources: BBMP Property Tax Database, CDP, RMP 2015 and Primary Survey
In nearby areas, there is a considerable increase in demand of retail and office spaces. Metro has induced transformation in land use in abutting areas. In nearby areas, there is increment in the commercial use and mixed use, while there is decrease in the area under residential use has been observed. Commercial spaces has been increased from 22.3% to 28.8%.

Data Sources: BBMP Property Tax Database, CDP, RMP 2015 and Primary Survey
Properties have seen one and two time conversions

**Determined changes:**
1. Conversion from **residential properties** to condominium units, to mixed-parcels (including retail, services, and offices) and to dedicate commercial activities;
2. **Mixed use properties** to commercial usage
3. **New development** in the abutting vacant land or open spaces.

- **Approx. 55% (.65 ml. sq. mt.)** of total private land has been converted since 1998.
• Amalgamation is a process, where two or more small land parcels are transformed into a large parcel to provide opportunity for a bigger development.

• The consolidation prospect is directly influenced by the owner's willingness to sell and number/size of the plots.

• Approx. 200 land parcels have amalgamated since the 2011.

• Benefits include opportunities for higher developments in terms of FSI and building heights.
Built Form: Vertical Densification

2007

- Land is scarce. (No scope for horizontal expansion)

2014

- Increased demand for office and retail spaces
- Locational advantage of the area (Nearby CBD and part of Off-CBD.)
- Encouraged by RMP 2015. (FSI of 4 in 150 m buffer of metro)
- Additional FAR of .25 or .50 (Located within Core ring road)
- Most of buildings were 2 & 3 storied, which have been converted to 4 & 5 storied.
Land Value Increment as a Function of Time

Land Value 1998

Land Value 2013

Legend
- Major Road
- Intermediate Road
- Minor Road
- Core Ring Road
- Public/Semi Public
- Restricted (Defence)
- Green/Open Spaces
- Water Bodies

Land Value 2013

Prices
- <1000
- 1000-2500
- 2500-5000
- 5000-7500
- 7500-10000
- 10000-12500
- 12500-15000
- >15000

Cricket Stadium
Core Ring Road
M.G. Road

Kilometers
0 0.125 0.25 0.5 0.75 1

Kilometers
0 0.125 0.25 0.5 0.75 1
• During the Full period CAGR is 15%- 17%.
• A constant raise in the land prices in the proximate areas during all the project stages.
• Small increment during the early stage of project is due to already saturated prices in these areas.
- Land value are more in close vicinity to station, while increment is more as we drift away from metro station, however, this holds true only till a threshold distance of 750 m.

- Prices are higher on Southern side of the metro. Highest consistency has been observed in the plots within the buffer of 250m to 500m.

- On Northern side, land values are higher after 750 m, which is due to the CBD factor.
Station Specific; Land Values as a Function of Distance from Metro

MG Road

Trinity

Halasuru

Indiranagar

Swamy Vivekanand Road

Baiyyappanahalli
Conclusions
Impact on Development Pattern

**Land use Changes**
- Limited influence on land use changes due to the Land ownership profile.
- Land use impact have occurred after 2005. Metro’s impact in terms of conversion of residential to apartments, to mixed use and residential or mixed to commercial and new development on open/vacant land.
- Land parcels have amalgamated to take leverage of permissible higher development opportunities in terms of FSI and building heights.

**Land Value Increment**
- Metro have a **positive impact on land values in nearby areas** land along the metro corridor. Partial benefits are leveraged due to the existing land ownership/use profile.
- The CAGR in prices since the metro initiation is around 9%- 11%.
- Absolute increment in land prices is higher in immediate vicinity. Highest rise has been seen in between the **buffer of 150m- 500m**.

**Built form Densification**
- Land use densification has emerged in terms of **increased building heights**.
- Due to increased demand of commercial & retails spaces, land scarcity for horizontal expansion and favorable development opportunities, buildings have grown vertically.
- **Higher usage of FSI in the immediate vicinity** of metro station.
Higher Land Value closer to station but further it dropped of immediately.
Higher Land Value closer to station but further it dropped off immediately.

More consistency and Land value benefits have been realized to a greater distance.
Land value as Distance Decay Function

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Land prices have became stagnant till a buffer of approx. 200m.
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With use of deviation factor, higher stagnation of land values have been determined.
Land value as Distance Decay Function: Forecasted Benefits

Higher Land Value closer to station but further it dropped of immediately.

More consistency and Land value benefits have been realized to a greater distance.

Land prices have become stagnant till a buffer of approx. 200m.

With use of deviation factor, higher stagnation of land values have been determined.
### Comparison with other empirical studies

<table>
<thead>
<tr>
<th>Project</th>
<th>Premium rate</th>
<th>Property type</th>
<th>Catchment Area (Within)</th>
<th>Author, Year Published</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Francisco BART, California</td>
<td>50%</td>
<td>Residential: Unit rents</td>
<td>400m</td>
<td>Bernick, 1991</td>
</tr>
<tr>
<td>MARTA, Atlanta</td>
<td>11 to 15.1%</td>
<td>Residential and Commercial</td>
<td>90m</td>
<td>Cervero, 1993</td>
</tr>
<tr>
<td>Sacramento LRS, California</td>
<td>62.0%</td>
<td>Residential</td>
<td>275m</td>
<td>Landis, 1995</td>
</tr>
<tr>
<td>San Francisco BART, California</td>
<td>50%</td>
<td>Residential and Commercial</td>
<td>400m</td>
<td>Bernick, 1991</td>
</tr>
<tr>
<td>Chicago METRA CRS, Illinois</td>
<td>20%</td>
<td>Residential</td>
<td>300m</td>
<td>Gruen, 1997</td>
</tr>
<tr>
<td>Tokyo Tokaido Line, Japan</td>
<td>57%</td>
<td>Commercial</td>
<td>50m</td>
<td>Cervero, 1998</td>
</tr>
<tr>
<td>San Diego Trolley System</td>
<td>25%</td>
<td>Commercial</td>
<td>400-800m</td>
<td>Cervero and Duncan, 2002</td>
</tr>
<tr>
<td>Dallas DART, Texas</td>
<td>18.2%, 12.6%</td>
<td>Residential sales</td>
<td>Undefined 400m</td>
<td>Cervero, 2002, Weinstein and Clower, 2002</td>
</tr>
<tr>
<td>Breda, Arnhem and Scheidam stations, Netherlands</td>
<td>0.4% to 12%</td>
<td>Commercial: Office rents</td>
<td>Immediate area</td>
<td>Van der Krabben, 2008</td>
</tr>
<tr>
<td>Santa Clara Light Rail, California</td>
<td>15%</td>
<td>Commercial: Office sales</td>
<td>800m</td>
<td>Weinberger, 2001</td>
</tr>
<tr>
<td></td>
<td>120% (San Jose stations only)</td>
<td>Commercial</td>
<td>400m</td>
<td>Cervero, 2002</td>
</tr>
<tr>
<td>Market Square, Denver, Colorado</td>
<td>60%</td>
<td>Commercial: Office rents</td>
<td>Immediate area</td>
<td>Cervero, TCRP, 2009</td>
</tr>
<tr>
<td>Bangalore Metro (All Stations)</td>
<td>18%- 20%</td>
<td>Residential and Commercial</td>
<td>1000m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22%- 25%</td>
<td>Residential and Commercial</td>
<td>500m</td>
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<tr>
<td></td>
<td>30%- 32%</td>
<td>Residential and Commercial</td>
<td>250m</td>
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<tr>
<td></td>
<td>30%- 34%</td>
<td>Residential and Commercial</td>
<td>150m (Immediate area)</td>
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<tr>
<td>Bangalore Metro, MG Road Station</td>
<td>22%- 25% (3800/sq.ft.)</td>
<td>Residential and Commercial</td>
<td>1000m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>28%- 32% (6100/sq.ft.)</td>
<td>Residential and Commercial</td>
<td>500m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>36%- 40% (5900/sq.ft.)</td>
<td>Residential and Commercial</td>
<td>250m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40%- 45% (7500/sq.ft.)</td>
<td>Residential and Commercial</td>
<td>150m (Immediate area)</td>
<td></td>
</tr>
</tbody>
</table>
Potential for Value Capture
Development Precincts

Concept of Property Development:

• Proposed corridors are **not financially viable** but are very attractive for economic growth.

• To finance part cost, it has been proposed develop and exploit the potential of commercial utilization of real estate along/close to the proposed alignment.

Issues:
Govt. land or cheaper land is not available along two corridors.
Defence Land: Activity Areas

1. Army Public School, Public Relation Office, Quarters and Canteen area.

2. ASC College, Workshop, Mess area and Offices.

3. Madras Eng. Group (MEG)

4. Defence Office Areas

5. HAL Engine Division and DRDO
Defence Land: Activities

Activities:

- Defence Offices,
- Educational Areas,
- Residential Quarters,
- High Tech Industries,
- Workshops,
- Mess,
- Canteen areas etc.
Public and Semi Public: Activity Areas

1. Schools and Colleges

2. RBANM Educational Complex and Hasanth College.

3. Kendriya Vidyalaya ASC & Hostels and Office of ADGP to Police

4. Govt. Hospital and School and BWSSB Office Areas

5. HAL Officer Quarters

Legend
- Bangalore Metro
- Core Ring Road
- Metro Route

Rocks
- Major Road
- Intermediate Road
- Minor Road
- Water Bodies
- Green/Open Spaces
- Restricted (Defence)
- Builtup Public Semi Public
- Public Semi Public Landuse

Landuse
- Educational
- Government
- Worship
- Private Land
Activities:

- Government Offices,
- Educational Areas,
- HAL Residential Quarters,
- Worship Areas,
- Health Facilities etc.
Due to the land ownership type minimal land use change and land value gains have been perceived.

But there is potential of densification, institutional development, redevelopment, and conversion.

How can Public/Semi Public area be more intensified?

Should Defence Land remain in the core city area?

How much of this area have potential to cash benefits?
THANK YOU.