Dr. Paul Barter,
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WEBINAR

Parking and Transit-Oriented Developments
Presentation Content

1. What is Transit-Oriented Development?
2. TODs in Indian cities
3. Approaches to Parking
4. Parking as a Travel Demand Management Tool
5. Ghatkopar, Mumbai Parking Study
6. How to approach parking in TODs in India

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What is Transit-Oriented Development?

Image from presentation by Himdari Das at Connect Karo, Mumbai, 15-16 April 2013.
What is Transit-Oriented Development?

A model that guides the design and planning of urban development around key transit nodes.

- Compact, high-density
- Diversity of uses, and services
- Safe and active public spaces

Results in the creation of compact, walkable and liveable communities with safe access to jobs, amenities and homes centred around high quality mass transit stations.

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TOD Principles

Walking and Bicycling

Public Transit

Open Spaces

Mixed Uses and Density

Active Edges

Demand Management

Public Participation

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Delhi: TOD zones defined as 500m from each transit node. A special land use is applied within the zone, called a ‘white land use’ that mandates special standards and density allowances within the zone.

Parking minimums not parking maximums.
TODs in Indian Cities - Mumbai

**Mumbai (DP Preparatory Studies):** Adopt “Transit first” as a guiding principle and in turn formulate a spatial plan which will promote Transit Oriented Development.

Minimum Parking requirements will be stipulated that will be considered free if FSI.
Ahmedabad: special regulations and norms for a zone of 200m on either side of the entire BRTS corridor

A special tax called “betterment charge” is levied on property owners within the 200m influence zone

Parking norms are only 10% lower than usual for commercial land use.
Indian Cities and TOD

- Already high population density, especially in Mumbai
- High percentage of public transport users
- Surcharges: development benefits city coffers but may burden economically weaker sections
- Parking minimums
- Densification of floor space (higher FSI)

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Indian Cities and TOD

BUT WE HAVE A PROBLEM!

- For complex reasons, high FSI developments in India usually target high to middle income residential and high-end retail and office.
- Car population would rise
- But human population would fall!
- And would include more car owners/users.

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The Vicious Cycle...

Cycle of Automobile Dependency

- Increasing Vehicle Ownership
- Automobile Oriented Transport Planning
- Automobile Oriented Land Use Planning
- Generous Parking Supply
- Decreased Dependency on Public Transport
- Suburbanization and Long Commutes
- Alternative Modes Marginalised (Walking/ NMT)

Adapted from: VTPI

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Poll Question # 1

Should reforms to make real TOD much easier to develop be a high priority for India’s cities?
Approaches to Parking
Aiming to become New Transit Cities?

Pathways for cities that enter mass-motorization era without significant mass transit

**Traffic-saturated cities**
- Chronic traffic saturation
  - Continued rapid motorization
  - Low transport investment
  - Some increase their efforts to welcome cars
  - Motorization; very high road investment, suburbanization
  - Car dependence “built in”

**Automobile dependent cities**
- Some muddle on

**Newly motorizing cities without much traffic-immune mass transit**
- Rapidly rising car ownership
  - Low transport investment
- Some cities act early to change mindsets and policies on cars
  - Avoid car subsidies and restrain growth of car ownership and/or use

**NEW Transit Cities**

Responses to traffic saturation crises

- Cars as luxury not necessity
- Public transport investments AND effort on institutions AND spatial priority
- Transit-oriented planning
- Walkability and “placemaking” (places worth saving from traffic!)

**Low mobility**
- Improve public transport institutions, investment, capacity and quality
- Transit-oriented land-use planning and development
- But how late is too late?

**High mobility**
- A spectrum between the extremes (depending on priority for cars versus alternatives)
Conventional site-focused approach

Based on suburban USA parking policies:

Every site needs “enough”

(Like toilets with buildings)

Source Seth Goodman [http://graphingparking.wordpress.com/2013/02/06/parking-requirements-for-restaurants/](http://graphingparking.wordpress.com/2013/02/06/parking-requirements-for-restaurants/)
### Three mind-sets on parking

<table>
<thead>
<tr>
<th>Parking is “infrastructure”</th>
<th>Parking is a “real-estate based service”</th>
<th>Parked facilities serve whole neighbourhoods</th>
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<td>Every site should have its own parking</td>
<td>1. Conventional site-focused approach</td>
<td>2. Area management approaches</td>
</tr>
<tr>
<td>3. Responsive approaches (market-oriented)</td>
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<td></td>
</tr>
</tbody>
</table>

With sub-types distinguished by parking policy goals (especially regarding parking supply)

In dense cities, the wise choices are in this column.
Area management approaches

Parking spaces serve whole area

Parking seen as local area infrastructure, like bus stops and walkways

Active management

Pricing, restricted eligibility, time-limits, design, sharing, public parking not private, parking taxes, supply adjustments including caps

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The idea is to make parking more responsive to market signals

Make *prices* more responsive to demand

Allow more *off-street supply choice*

Involve local stakeholders

See http://www.seattle.gov/transportation/parking/paidparking.htm
### Three kinds of reforms

<table>
<thead>
<tr>
<th>A. Make this approach less extreme (for example, ‘right-size’ the norms)</th>
<th>B. Shift to area parking management</th>
</tr>
</thead>
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<td></td>
<td>C. And/or add some market responsiveness</td>
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With sub-types distinguished by parking policy goals (especially regarding parking supply)

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[www.reinventeparking.org](http://www.reinventeparking.org)
The key to parking success = ON-STREET parking management

Otherwise off-street parking will be under-used while there is chaos on the streets

Shenzhen, China
A framework for classifying parking policy approaches.

A framework for classifying parking policy approaches.

Poll Question # 2

Improved ON-street parking management is needed to enable reform of OFF-street parking regulations in India’s cities.

Do you believe local authorities in India can dramatically improve their management of on-street parking?
Parking as a TDM Tool
High parking minimums: ‘fertility drug for cars’
Using parking as TDM means ...

LIMITING PARKING SUPPLY!

Prices like these in Sydney’s Chinatown don’t happen by magic.

Gradual market result of supply limitation begun decades ago.

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Tools to limit supply

- Norms as maximums
- Area parking caps
- Low minimums AND parking supply disincentives

Seoul

www.reinventingparking.org
Parking norms in Paris TOD zones

What are the parking norms at this Paris location?

The minimum here is ZERO

Within 500 m of metro stations there is a 100% discount on parking minimums

140 Boulevard Victor Hugo
93400 Saint-Ouen, France – approximate address
D410

Street View - Aug 2012

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What are the parking norms in Tokyo?

Zero for small buildings <1500 m² of floor area

For buildings with 6,000 m² or more:

- Office: 0.3 spaces per 100 m²
- Retail: 0.4 spaces per 100 m²
- Residential: 0.2 to 0.3 spaces per 100 m²

(Gradually rises to this between 1500 and 6000 m²)

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What are the parking norms for office buildings here in London’s Canary wharf area?

MAXIMUM of 1 space per 1100 m² of floor space (and no minimums except spaces for people with disabilities)
An iconic London building

How much parking does London’s “Gherkin” building have?

None for private cars!
Single basement for essential parking (bicycles, people with disabilities, loading/unloading)

Image via Wikimedia Commons user BaldBoris

Image via http://www.archinomy.com/case-studies/669/30-st-mary-axe-the-gherkin-london

www.reinventparking.org
Parking maximums (50% of usual minimums) in high density transit-oriented commercial zones, congested areas and transit transfer areas.

Minimums in same zones are 10% of usual (for example 0.1 spaces not 1.0 per 100 m² for offices).

The highest on-street prices are in the most intense commercial areas and around them.

Source for map: Presentation by Sang Bum Kim (Assistant Mayor for City Transportation), “Policy Directions of Seoul for a Clean and Green City” to CUD Global Conference Seoul 2009.
Netherlands and its ABC location policy

In the multi-city metropolitan area known as the Randstad:

‘A’-locations = high quality Public Transport (PT) but limited car access (1 parking place for 10 employees)

‘C’ locations = little Public transport so more parking allowed (1 place for 2 employees)

‘B’ locations are in between (1 parking place for 5 employees).

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To economists, what is the right supply level for parking? And the right price?

Imagine a city with no on-street parking and no government intervention in off-street parking.

Parking supply and prices per m² would adjust until prices are a little lower than the average price of floor space per m² in the area.

In most CBDs, market prices of parking per m² are far below market price of other floor area.
CBD parking supply limitation

→ higher market prices for CBD parking

CBD parking prices compared with CBD Grade A office rents (both on a rent per square metre basis) in many international cities, based on Colliers International data sources.

Note: In calculating the parking price per square metre, Colliers figure was divided by 19.5 square metres on average (as an estimate of the typical space required for a parking space, including aisle space, etc.).

Paul Barter, Reinventing Parking
São Paulo’s new master plan eliminates parking minimums citywide and imposes parking maximums within the TOD zone along transit corridors (one space per residential unit). If developers want to build more, they will be charged an extra fee per parking space in excess of the maximum (like a ‘deficiency charge’ in reverse).

Would you support such a maximum along with an excess parking fee for TOD zones in India?

Source: https://go.itdp.org/pages/viewpage.action?pageId=60294380
Ghatkopar, Mumbai
<table>
<thead>
<tr>
<th>All Mode</th>
<th>% based on trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>52</td>
</tr>
<tr>
<td>Train</td>
<td>25</td>
</tr>
<tr>
<td>Bus</td>
<td>13</td>
</tr>
<tr>
<td>Rickshaw</td>
<td>4</td>
</tr>
<tr>
<td>Taxi</td>
<td>1</td>
</tr>
<tr>
<td>Two Wheeler</td>
<td>4</td>
</tr>
<tr>
<td>Car</td>
<td>2</td>
</tr>
</tbody>
</table>

More than 50% of Mumbai walks

<table>
<thead>
<tr>
<th>Only Vehicular Mode</th>
<th>% based on trips</th>
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<tr>
<td>Train</td>
<td>52</td>
</tr>
<tr>
<td>Bus</td>
<td>26</td>
</tr>
<tr>
<td>Rickshaw</td>
<td>8</td>
</tr>
<tr>
<td>Taxi</td>
<td>2</td>
</tr>
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<td>8</td>
</tr>
<tr>
<td>Car</td>
<td>5</td>
</tr>
</tbody>
</table>

More than 75% of the remaining people use public transport

Source: CTTS for MMR
Mumbai has adapted to the railways and development has been concentrated around station areas with vibrant markets and street life.

But formal land use planning lags this reality giving rise to chaotic station environments.
With new transport systems planned through existing precincts, developments are merely adjacent to transit with no relationship to the station area.
Low private vehicle ownership but rising rapidly, thus increasing traffic congestion, parking chaos and threatening to cause dispersed growth.
Ghatkopar presents an interesting case of multimodal TOD

Important transit hub with more than 300,000 commuters using the railway station every day

Addition of a metro station this year altered the role of Ghatkopar into an interchange facility

Mumbai TOD Influence Map
- **Suburban Rail**
- **Metro Line**
- **Monorail**
Ghatkopar – Mobility Patterns

High NMT and public transport usage

Mode-share in Ghatkopar west
- BEST: 33%
- IPT: 18%
- Walk: 48%
- Cycle: 1%

Mode-share in Ghatkopar east
- BEST: 35%
- IPT: 10%
- Car: 2%
- 2-Wheeler: 3%
- Walk: 49%
- Cycle: 1%
Existing Land Use

23% Commercial
77% Residential

A range of affordable housing options
Average building heights is ground +5 storeys

Some tall buildings which are new and have multi-level parking facilities
Average 1.63 bulk FSI; only 6% of plots, mostly new developments, consume more than 4 FSI

Commercial developments, mostly new developments, consume as high as 7.5 FSI (much of it parking!!)

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Vehicle Ownership

Vehicle ownership 79 per 1000 residents (high for Mumbai)
Ghatkopar Neighbourhood

- New developments within 500m tend to have high built-up densities, large plot sizes with significant parking provision.

- New building types fail to retain some of the traditional NMT streets that are used to access the station area.

- Issues of concern:
  - high parking provisions in Mumbai means increase in traffic congestion and subsequent decrease in safe transit access
  - an unfriendly pedestrian environment

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Parking Analysis

- 50% average occupancy of parking spaces in area
- 67% average occupancy of parking spaces along station road
- High provision of off-street parking – 64% of buildings have parking
- Quite high availability of regulated and unregulated on-street parking
- Low parking occupancy – only 12% at 85% threshold
Flow Capacity Ratio

Extreme congestion outside the station, due to private vehicle movement
Ghatkopar - Issues

- High NMT and public transport use, particularly closer to the station
- Highly residential with other mixed uses
- High vehicle ownership
- High provision of parking
Ghatkopar Station Area

The overprovision of parking is inefficient – it incentivizes car use and increases traffic congestion within the TOD zone.

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Poll Question # 5

For a place like Ghatkopar TOD Zone, would you support a cap on parking supply?

(so that the net number of car parking spaces is fixed at the existing number or less)
How to Approach Parking in TODs in India
## Three kinds of reforms (examples)

<table>
<thead>
<tr>
<th>Moderate the conventional site-focused approach</th>
<th>Lower parking minimums to avoid oversupply but still match demand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Contingency planning to manage spillover outside sites</td>
</tr>
<tr>
<td>Area Parking Management Steps</td>
<td>Plan for walkable park-once neighbourhoods with mostly public parking</td>
</tr>
<tr>
<td></td>
<td>Parking norm flexibility (often with deficiency charges)</td>
</tr>
<tr>
<td></td>
<td>Strong on-street management (often with pricing as a key tool)</td>
</tr>
<tr>
<td></td>
<td>May adopt parking as a TDM tool (by limiting supply)</td>
</tr>
<tr>
<td></td>
<td>Change to parking maximums and set them low in CBD and TOD areas</td>
</tr>
<tr>
<td>Responsive (market-oriented) steps</td>
<td>Walkable park-once neighbourhoods with mostly public parking</td>
</tr>
<tr>
<td></td>
<td>Abolish parking norms (or have only maximums)</td>
</tr>
<tr>
<td></td>
<td>Strong on-street management with prices responsive to demand</td>
</tr>
<tr>
<td></td>
<td>Encourage unbundled parking costs (not included in house price)</td>
</tr>
<tr>
<td></td>
<td>Involve local stakeholders</td>
</tr>
</tbody>
</table>

[www.reinventeparking.org](http://www.reinventeparking.org)
Parking and mixed use in TOD zones

Mixed use is a **problem** when parking planning focused on minimum norms and private on-site parking.

Mixed use becomes a **blessing** when public parking is emphasised because different uses have varied peak times for parking.

Shared parking, like shared seating at food courts, is much more efficient.
TODs need high accessibility by non-car modes

➢ Traffic drawn by excessive parking in TOD zone
➢ An obstacle to easy bus, taxi, auto, cycle rickshaw and bicycle access
➢ Risk that road capacity efforts further harm non-car modes
TODs need density of people

- High parking norms are an obstacle to population density
- High parking supply generally is an obstacle to high population density

Photo credit: Rejeet Mathews, EMBARQ India

www.reinventparking.org
TODs benefit especially from density of people with low car ownership

- Curitiba’s mistake
- Despite excellent link between density and transit
- Most households in core TOD zones are high-income, car-owning

Image credit: Fabio Duarte

www.reinventingparking.org

EMBARQ India
Limiting parking in TOD zones (with maximums and caps)

- Lower development costs

- Would prevent high-FSI residential development from targeting only high-end residents

Kuala Lumpur, Malaysia
TODs need walkability

- Weak parking management harms walkability
- High parking norms are an obstacle to walkability too
  - Driveways
  - Blank walls
  - Plot amalgamation (high-density on small plots financially feasible only with low or zero parking)

www.reinventingparking.org
Does Park-and-Ride belong in a TOD zone

Car-based Park-and-Ride conflicts with TOD goals

Space is very precious in a TOD
A costly and space-inefficient way to get transit riders
Adds to peakiness problem

One OK P&R option may be daytime sharing of residential parking in TODs

Park-and-ride facility at Chatuchak, Bangkok
Does Park-and-Ride belong in a TOD zone

Bicycles YES! And Motorized two-wheelers not too bad

Two-wheeler parking is space efficient

My measurements of parking dimensions in a park-and-ride lot in Bogor, Indonesia

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What is the best parking minimum norm for a TOD zone

- In my view, ZERO

- Actually this is a good minimum everywhere, because abolishing parking minimums is a good idea
  
  Sao Paulo just did so
  Berlin did so years ago
  Many places in England and Scotland did so in mid-2000s

- This does not mean there will be no parking

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Is reducing minimums a TDM policy?

- Not exactly. Some developers will build more than the minimum.

- But if extra parking is included in the allowed FSI, then developers may treat minimums as maximums (as in Singapore).

Mixed use apartment building being built in Portland with 0 car parking space (Photo by Sam Tenney/DJC)
The right parking maximum in a TOD zone?

- How much traffic do you want? How much can the area handle?
- How many will arrive by other modes?
- Has space for non-car access been secured?
- What kind of place do you want?
- How many low-car or zero-car households do you want?
- Will developers build too much parking if allowed to?

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High parking minimums are a key obstacle to transit-oriented development

Transit line

Medium-density residential

High-density residential

High-density commercial and residential

Transit station

www.reinventingparking.org
A Paradigm-Shift
<table>
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<td>Reduce parking in TOD areas to enable better access to mass transit by other modes</td>
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<tr>
<td>Shared Parking to make efficient use of existing supply</td>
</tr>
<tr>
<td>Very strong management of on-street parking</td>
</tr>
<tr>
<td>Pricing Parking: Pay as you use</td>
</tr>
<tr>
<td>Smart Growth: integrating transport and land use</td>
</tr>
<tr>
<td>Maximums rather than minimum requirements, particularly in TOD areas</td>
</tr>
<tr>
<td>Improving walkability and public spaces: parking facility design should favour street life</td>
</tr>
<tr>
<td>Unbundling parking costs from residential and other costs</td>
</tr>
<tr>
<td>Regulating use based on type of vehicle, duration, time, etc</td>
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</table>
Thank You!