



# Public Cycle Sharing System for Pondicherry

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## Table of Contents

1. Introduction .....	1
2. Cycle sharing features at a glance .....	2
3. Project goals .....	3
4. Target user groups .....	4
5. Cycle sharing components.....	4
5.1 Bicycles .....	4
5.2 Stations .....	5
5.3 User interface.....	7
6. Operations .....	8
6.1 Security mechanisms .....	8
6.2 Redistribution and maintenance .....	8
7. Institutional Structure .....	9
8. Outreach .....	10
9. Project Planning .....	11
9.1 Station identification and system size.....	11
9.2 Pricing structure.....	15
9.3 Ridership scenarios.....	15
10. Supporting infrastructure.....	19
10.1 Cycle tracks .....	19
10.2 Traffic calming .....	20

## 1. Introduction

Cycle sharing is a public transport system in which people have access to cycles that can be used across a network of closely spaced stations. With a smart card or other form of identification, a user can check out a cycle from a station and return it to any other station. The Government of Puducherry is planning a public cycle sharing system with approximately 1,000 cycles and an initial coverage area of 27.3 square kilometres for the state capital, Pondicherry city.

The Pondicherry urban agglomeration comprises two municipalities, namely Pondicherry and Ozukarai, and covers an area of 56 sq km. The urban agglomeration has a population of 6,57,209<sup>1</sup> and a density of 11,684 persons per sq km. Pondicherry is well known for its French colonial architecture, waterfront promenade, and the Manakula Vinayagar temple. The city is a major tourist destination, with over 12 lakh annual visitors from India and abroad.<sup>2</sup>

Public transport service in Pondicherry is concentrated along national and state highways such as East Coast Road (ECR), Cuddalore Road, Villipuram Road, and Tindivanam Road. These roads serve as entry points to the city and connect to the other major regions in Tamil Nadu. However, the city core, including the historic French and Tamil quarters, has limited public transport service. City residents predominantly rely on two-wheelers and cars to reach these areas, and mobility options for tourists are limited.

Cycle sharing has the potential to improve accessibility in the central Pondicherry and other areas not served by the conventional bus-based public transport system. Cycling is common in central Pondicherry, both on the part of local residents who use their own cycles to reach schools, workplaces, and markets, and tourists who hire cycles from local rental shops or use cycles provided by hotels. The cycle sharing system can build on this existing cycling culture and make the mode available to a larger segment of residents and visitors. The system will offer the convenience of cycling without the burden of ownership and the flexibility to accommodate one-way trips.

In implementing the system, Pondicherry will join over 500 cities in 49 countries that are enjoying the benefits of cycle sharing.<sup>3</sup> Some of the largest cycles sharing systems are in Chinese cities like Hangzhou and Shanghai. Washington, D.C. (USA), Paris (France), and London (U.K.) have hugely successful systems that have helped re-energize cycling in those cities and encourage more people to use this non-polluting and healthy mode of transport.

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<sup>1</sup> Government of Puducherry, summary of data from the 2011 Census.

<sup>2</sup> Government of Puducherry, based on statistics through 2012.

<sup>3</sup> Larsen, Janet (2013), "Bike-Sharing Programs Hit the Streets in Over 500 Cities Worldwide," Earth Policy Institute, <[http://www.earth-policy.org/plan\\_b\\_updates/2013/update112](http://www.earth-policy.org/plan_b_updates/2013/update112)>, accessed 20 Feb 2013.

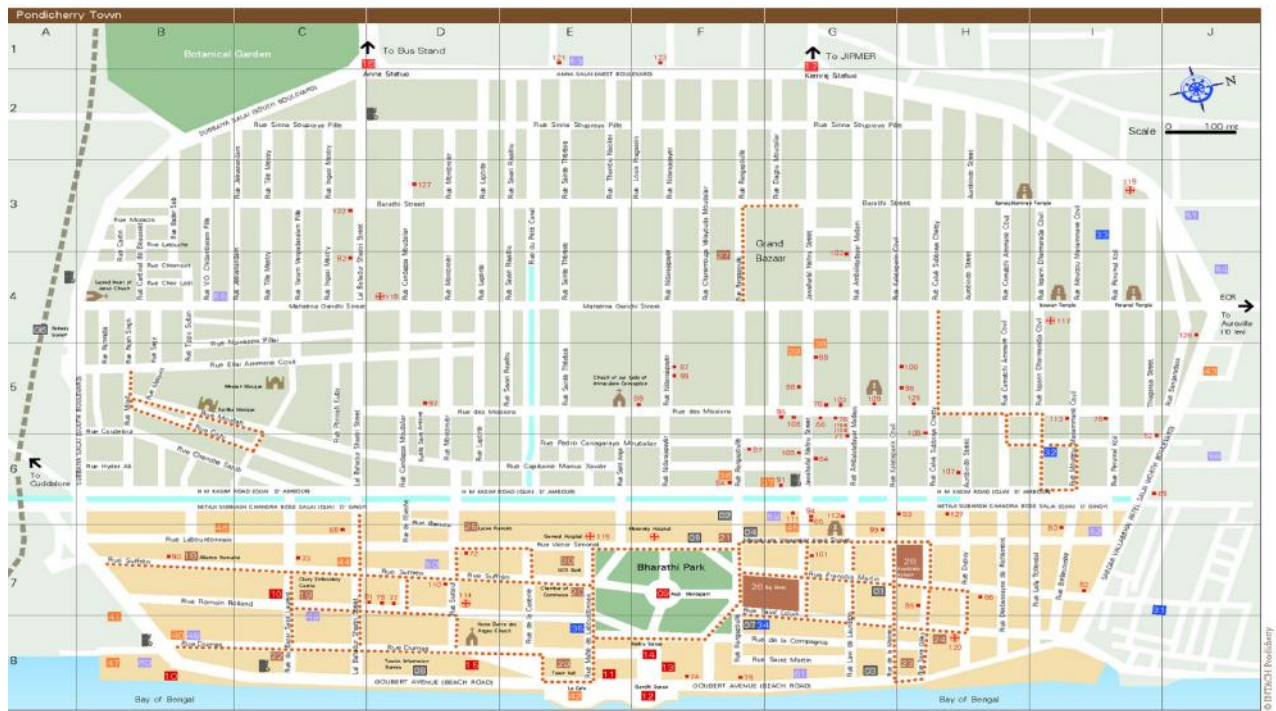


Figure 1. The cycle sharing system will improve access to historic and cultural resources in central Pondicherry, both in the French quarter, east of the canal, and the Tamil quarter on the opposite side of the canal.

## 2. Cycle sharing features at a glance

The Pondicherry cycle sharing system will employ the following best practice features:

- A dense network of stations across the coverage area, with stations every 200 m in the historic city core and 200-300 m in adjacent areas.
- Cycles with specially designed parts and sizes to discourage theft and sale as whole or for parts
- A fully automated locking system at stations that allows users to check cycles in or out without the need for staffing at the station
- Radio frequency identification devices (RFIDs) to track where a cycle is picked up, where it is returned, and the identity of the user
- Real-time monitoring of station occupancy rates through General Packet Radio Service (GPRS), used to guide the redistribution of cycles
- Real-time user information provided through various platforms, including the web, mobile phones, and/or on-site terminals
- Advertising space on cycles and at stations (provides revenue generation options for system operator or city)
- Pricing structures that incentivise short trips, helping to maximize the number of trips per cycle per day.

These characteristics are described in more detail in the sections below.



Figure 2. Modern cycle sharing systems feature a dense network of stations. A user checks out a cycle using an RFID-enabled smart card and can return it to any other station.

### 3. Project goals

The cycle sharing system in Pondicherry will help the city achieve the following goals:

- Increase accessibility in central Pondicherry and nearby areas.
- Reduce congestion and improve air quality by attracting users from private motor vehicles.
- Increase the mode share of cycling in Pondicherry.
- Facilitate the use of the city's public transport system by expanding the reach of popular bus routes.
- Transform the image of cycling, making it a popular means of travel for all the income groups.
- Promote the use of active transport, helping to improve public health.

Since the public transport services in Pondicherry are very limited, the proposed cycle sharing system will help to improve accessibility and providing seamless connectivity to the locations not served by bus service. Cycle sharing stations will be strategically placed to ensure physical connectivity and fill in the gaps where public transport is missing. Cycles will be available on demand, so users will not need to wait for an autorickshaw to appear. In addition, cycle sharing will be less expensive than alternate modes: most trips will be accomplished within a 30-minute time span for which there is no user fee.



## 4. Target user groups

The following user groups are expected to comprise a major portion of the user base for the Pondicherry cycle sharing system:

- Tourists who will use the cycles to access multiple destinations in historic city centre.
- Daily commuters to the main town and commercial areas such as Rangapalli Street.
- Homemakers who will use cycling for midday errands.
- College students who do not own vehicles and for whom the cycle provides connectivity from campuses such as Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Tagore Arts College, and Government Polytechnic College.

The placement of stations, system pricing, and marketing campaigns will be tailored to appeal to these key user groups.

## 5. Cycle sharing components

### 5.1 Bicycles

The bicycle should be attractive, durable, and theft-proof. The following design standards should be followed:

- Protection against theft and vandalism: unique parts, hidden wiring, RFID tags that allow the system to connect the cycle to the user.
- Universal design: should satisfy all genders and clothing
- Distinctive styling: should project a modern image
- Convenience: basket for carrying and mud guards to protect clothing
- Safety: reflectors, LED lights for night riding
- Longevity: solid frame and puncture resistant tyres



Figure 3. A unique, robust cycle design is critical the branding and reliability of the system. The cycle should be a unisex model with an adjustable seat.



Figure 4. Special parts help deter theft and vandalism.

## 5.2 Stations

Cycle sharing station design is a function of the level of demand, the amount of space available, and the nature of the roadside environment. Decisions regarding station design also need to take into account the impact on the city's image. All stations need to accommodate a fully automated smart card check-in and check-out. IT-based management of cycles and users is critical to the delivery of modern cycle sharing systems. It also allows a user to check out a cycle without interacting with an attendant, thus decreasing the time required to take out or return a cycle and limiting the possibility of a station being off-line because an attendant is not present. While fully automated stations may represent higher capital costs, it will help the city save on operating costs because the stations do not need to be manned all the time.



Figure 5. A typical cycle sharing station includes docking positions, a user terminal, and space for advertising.

Stations in the Pondicherry system will be comprised of a separate dock for each cycle. The size of stations will depend on the level of demand, ranging from small stations with 12 docks to large stations with 36 docks. Stations will be placed at frequent intervals, with a distance of 200 m between stations in Central Pondicherry and 300 m in other parts of the city. Close station spacing will help make cycle sharing competitive with other modes and will reduce the distance that a user has to walk to the next station, should s/he find a station either completely full or completely empty.

Stations will be placed near important origins and destinations, including:

- Heritage buildings and hotels in the French quarter
- Public spaces and recreation spaces such as Gandhi Thidal, Le Cafe, Athletic Complex, Botanical Garden, and Bharathi Park
- Public transport hubs such as the New Bus Stand
- Market areas such as Guber Market and Grand Bazaar
- Cultural landmarks such as Manakula Vinayagar temple
- Near major hotels such as Accord and Le Royal
- Academic institutions, such as Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Tagore Arts College, Government Polytechnic College
- Commercial streets like Rangapalli street
- Government offices
- Strategic positions in residential areas



Figure 6. Representative station locations (clockwise from top left): Promenade Beach and War Memorial; École Française; Chinna Subburaya Pillai St, and New Bus Stand.



In the absence of a single important building, stations will be placed at existing nodal points, important public spaces and near intersections to serve origins and destinations in multiple directions.

Stations should be placed in such a location that it is clearly visible to passers-by and should make use of the underutilized and vacant spaces to reduce interference with other activities. A station can fit into a 2 metre wide on street parking lane. It should not be placed on footpaths unless there is sufficient clear space for walking beside the station.



Figure 7. A cycle sharing station can fit in a 2 m wide parking lane.

The specific siting of stations will be determined on a case-by-case basis. Typical placement options include the following:

- On-street parking spaces
- The furniture zone of pedestrian footpaths (where the furniture zone is wide enough to accommodate the station without compromising clear space for pedestrians)
- Plazas and other public spaces
- Premises of government offices

### 5.3 User interface

Customer service platforms will collect and disseminate information from and to the user through various media, including the web, mobile phones, terminals, and face-to-face interaction. They allow customers to set up accounts and receive information about the system and their account. The web is an ideal platform as it has the advantage of being available 24/7 and offers seamless interaction without the hassle of waiting in long queues. It also reduces operational costs and gives the system a modern, hi-tech image. While the majority of users may access the system through the website or station terminals, it is important to have a face-to-face platform at the operational headquarters and/or at large stations. “Brick and mortar” kiosks offer the same benefits of the online system to users who do not have access to technology. An optimal location for the customer service centre would be the existing tourist information centre on Goubert Avenue, currently operated by the Department of Tourism, Government of Puducherry.

Users who want to want to avail of long-term memberships to the cycle sharing system will be required to complete a registration online or fill out a membership form at the customer service kiosk. Along with a registration form, the prospective user will be required to submit identification proof and pay a registration fee. Besides the registration fee, around Rs 50 shall be paid towards the user's opening balance to cover initial user fees. Once the registration is completed, the cycle sharing operator will carry out a background check to verify the information submitted. The operator will mail a smart card within 24 hours to the address listed on the identification document submitted by the user. Upon receipt of the card, the user may begin using the system. For daily subscriptions, users may register online or at specific cycle sharing stations using an active credit card.

## **6. Operations**

### **6.1 Security mechanisms**

Cycle sharing systems ensure security by tracking the identity of both users and cycles. On the user side, the system obtains identification details during the registration process (see Section 5.3) and the user is issued a smart card with an RFID chip linked to the user's account. RFID chips are also present on the cycles. When a user checks out a cycle using a smart card, the identity of the user is linked that of the cycle that s/he checks out. If the cycle is not returned within a specified time period, say 24 hours, the user's balance is forfeited and his/her smart card is deactivated. In addition, the user will be barred from registering for the system again.

In the case of daily or weekly subscriptions by walk-up users who pay by credit or debit card, the system places a hold on the user's credit card account for the duration of the subscription. If the user is in good standing, the hold is removed at the end of the subscription. However, if a cycle is not returned then the hold remains on the user's account.

Under a Police modernisation programme, the Government of Puducherry plans to install around 100 closed circuit television (CCTV) cameras at key locations in Pondicherry. To ensure additional security for the cycle sharing system, the placement of CCTV cameras should be coordinated with the location of cycle sharing stations. Another means of improving security for the system is to locate cycle sharing stations on premises of government facilities and police stations where such facilities are near an optimal location from the standpoint of cycle sharing operations.

### **6.2 Redistribution and maintenance**

Redistribution is broadly defined as the rebalancing of bicycles from stations that are near or at capacity to stations that are nearly empty. The operator will be responsible for redistributing bicycles during peak periods to ensure that bicycles remain available at all stations and that some docking positions remain open at each station. Redistribution is one of the greatest challenges to operating the cycle sharing system, and accounts for a large portion of operating costs.

The cycle sharing system will be operated on a day-to-day basis by a private sector contractor appointed by the Government of Puducherry (see Section 7, below). The private operator will have several responsibilities, including redistribution, maintenance, and customer service. For an experienced operator, redistribution becomes predictive, and is better thought of as the rebalancing of cycles to stations where the operator expects a shortage to occur. The RFID devices on the cycles allow the operator to record all of the trips that are made with the system. After a short period of operation, the IT system generates a full record of the trip patterns and station occupancies. This

information can be used to guide the redistribution process. Many operators use logistics software to assign routes and schedules to redistribution crews.

Regular preventative maintenance is necessary to keep the cycles in good working condition. Cycle redistribution vehicle maintenance teams will be responsible for carrying out minor repairs onsite and notifying redistribution teams to collect major repairs that need to be completed at the depot. In addition to cycle maintenance, maintenance teams need to have basic knowledge of fixing minor problems at docking stations and terminals. Station and cycle cleanliness is an important aspect of the image of the system. Cycle maintenance teams should wipe down all cycles at least once a week. They should also clean the station area. The implementing agency will set service level standards to ensure that redistribution and maintenance activities are carried out diligently.

## 7. Institutional Structure

The cycle sharing system will be implemented by parastatal entity appointed by the Government of Puducherry. This nodal agency will oversee planning and implementation activities. To handle day-to-day operations and maintenance, a private operator will be contracted by the parastatal agency. The following table indicates the respective roles of the government and the private sector.

Table 1. Respective responsibilities of the government and the private operator

Government	Private operator
<ul style="list-style-type: none"> <li>• System planning and implementation</li> <li>• Cover system operating costs</li> <li>• Provide space for stations and control centre</li> <li>• Set service level benchmarks</li> <li>• Monitor the operator’s performance</li> <li>• Collect fares and revenues</li> <li>• Market and conduct outreach</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance of cycles and stations</li> <li>• Redistribution of cycles within stations to maintain optimum number</li> <li>• Customer service</li> <li>• Operate the control centre</li> <li>• Provide information on real time basis</li> </ul>

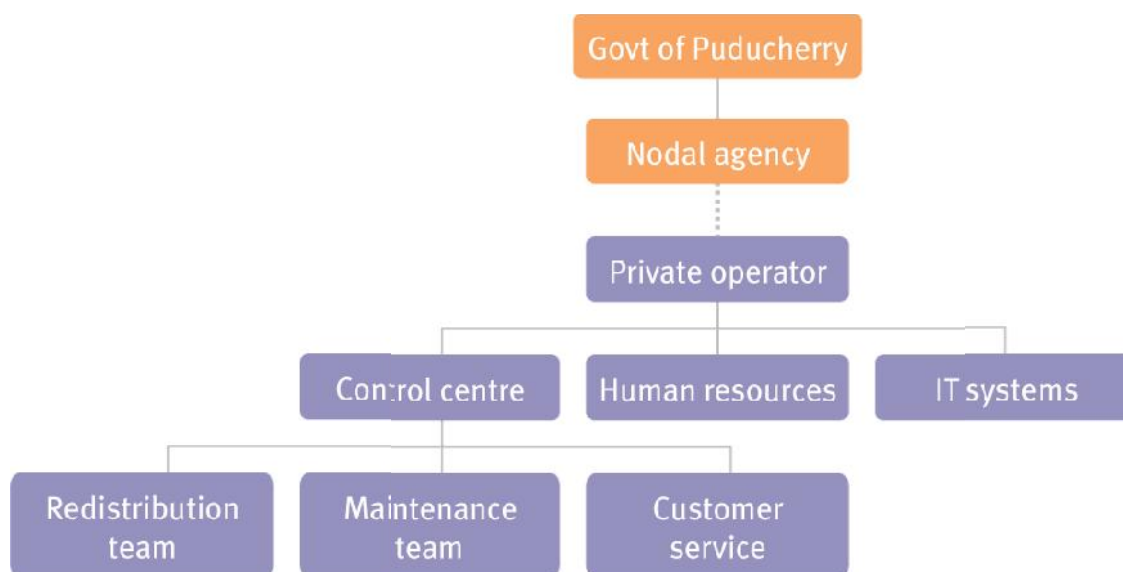


Figure 8. Management structure for the Pondicherry cycle sharing system

The cycle sharing operator will be compensated on the basis of the number of cycles operated in the system. Beyond a base payment, the operator will receive an incentive payment that will increase with system usage (i.e., the number of rides per cycle per day). At the same time, penalties will be applied if system performance falls below service levels stipulated in the operator's contract. Categories of service level standards include the following:

- How many hours per day a station can remain completely full or empty
- How long a damaged cycle can stay in the system before being fixed or taken to a depot
- The fraction of the total fleet that can remain in repair facilities at any particular time
- How often cleaning of cycles and stations should be performed
- How often a terminal can remain out of service

These standards need to be measurable and will be spelled out in detail in the operator contract. The contract will require the operator to deliver the service level statistics to the nodal agency on a real-time basis to enable the nodal agency to monitor the operator's performance. Compensation will be calculated based on these operational data.

## 8. Outreach

Marketing of the Pondicherry cycle sharing system will begin well before the system is operational and carry on through the life of the system. Initial marketing efforts include promoting the system name, tag line, and logo. A user doesn't take a cycle—s/he takes "Velib" (Paris) or "Bicing" (Barcelona). A trendy name and logo will be established for the system. Due to cultural barriers, women are mostly prevented from taking cycles, thus it is important to actively encourage them to use the system and generate awareness through media / social campaigns at schools, colleges/universities covering on what works best in cycle sharing system, the healthy lifestyle and safety of women.

The early marketing efforts will focus on the following points:

- What is cycle sharing?
- The process of checking out a bicycle
- How to register for the system
- Station locations
- Hours of operation
- The pricing system
- Phone numbers and websites for obtaining more information

The marketing campaign needs to put forth that a cycle sharing system is a trendy, health and environmentally friendly, more efficient alternative to their crowded buses, uncooperative auto rickshaw drivers, or long walks. The nodal agency can bring in celebrities and prominent citizens to project a positive image. The system will be promoted through give-aways and promotional events prior to the launch. The nodal agency should retain a professional public relations firm to handle these events. Even after the launch, an on-going campaign will communicate with existing and potential customers and public at large through newspapers, a website, blogs, and smart phone apps, advertisements on cycle sharing stations and bus stops, and other collateral.



Moreover, other initiatives such as involving the health and recreational clubs to actively promote the concept of cycle sharing system. The nodal agency body shall tie up with major hotels in Pondicherry where the hotels lend the cycles to tourists at no cost. Yet the hotels are responsible for the cycles and shall ensure that no theft or significant damage is done.

## 9. Project Planning

The delineation of a coherent coverage area and the saturation of the coverage area with stations at frequent intervals are critical to the success of the Pondicherry cycle sharing system. From the first day of operations, the coverage area needs to be sufficiently large to cover a robust set of origins and destinations. It also needs to enhance the city's public transport system in a meaningful way.

### 9.1 Station identification and system size

The cycle sharing system in Pondicherry will be implemented under Phase 1 with a coverage area of 27.3 sq km. The Phase 1 coverage area begins east of the East Coast Road (ECR), covering central Pondicherry, important residential areas such as Ventaka Nagar, Annamalai Nagar, and Kamaraj Nagar, and commercial areas off Cuddalore Road and ECR. In addition to these areas, college and university campuses including the Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Tagore Arts College, and Polytechnic College west of ECR have been identified for cycle stations as these are expected to generate significant ridership to and from the rest of the coverage area. The Phase 1 coverage area is displayed in Figure 9.

The planning team visited the coverage area and identified station locations in the following areas:

- Heritage buildings
- Public spaces
- Recreational spaces
- Colleges and universities
- Markets and commercial/shopping areas

Station locations are identified in Figure 10 and Figure 11.

Stations were sized according to the level of patronage at nearby destinations, using proxies such as observed foot traffic and the number of vehicles parked nearby. Stations were categorised into three groups: small stations with 12 docks, medium stations with 24 docks, and large stations with 36 docks. The number of cycles was calculated assuming a ratio of 1.5 docks per cycle. Phase 1 system parameters are presented in Table 2.

**Table 2. Phase 1 system parameters**

Coverage area (sq km)		15.8
Number of stations	Small (12 docks)	89
	Medium (24 docks)	10
	Large (36 docks or parking area)	5
	Total	104
Number of bicycles		992

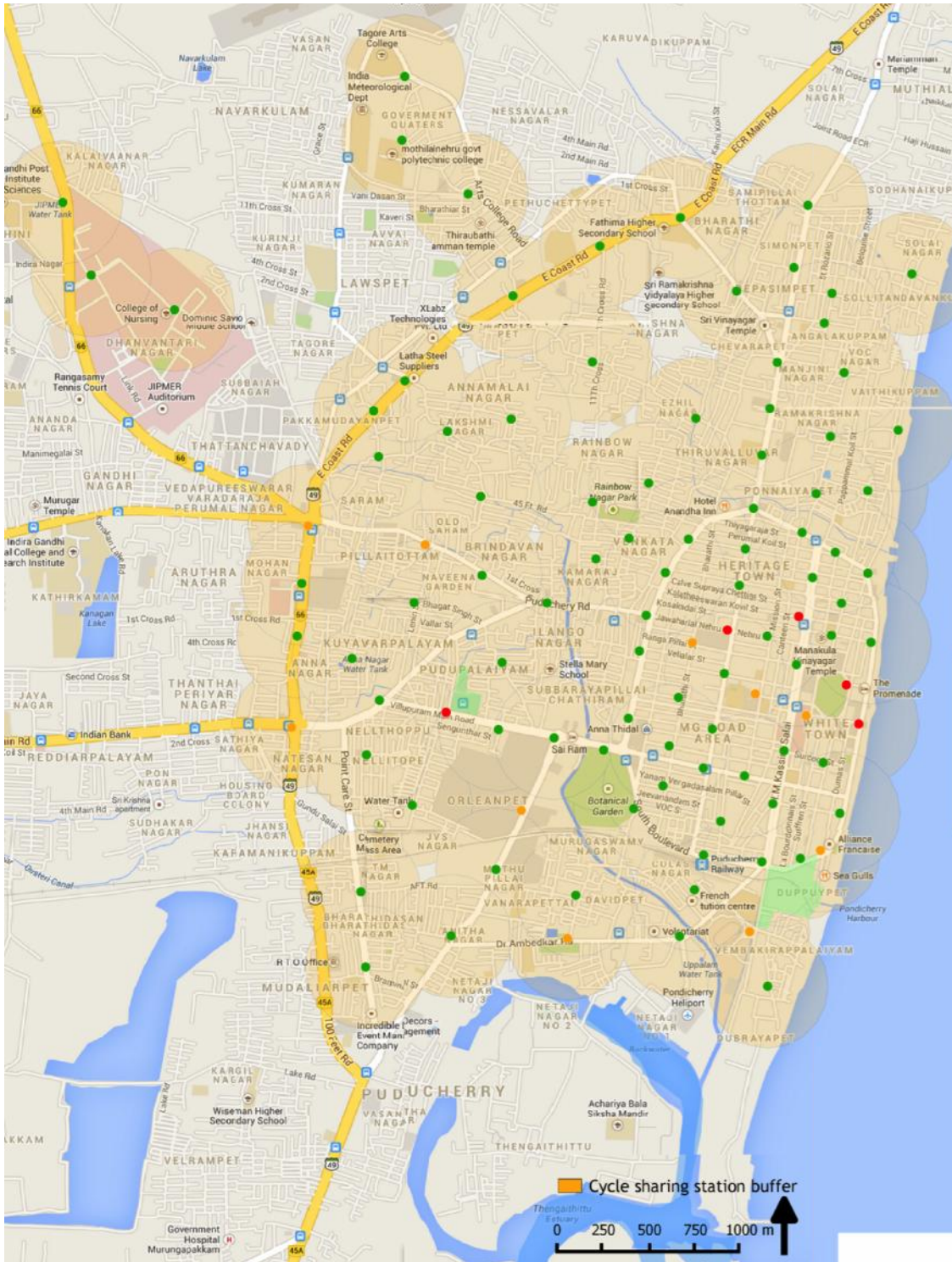


Figure 9. The cycle sharing coverage area, shown as a 300 m radius around each station.



Figure 10. Station locations of Pondicherry cycle sharing system (small = 12 docks, medium = 24 docks, large = 36 docks).





Figure 11. Station locations in central Pondicherry.



## 9.2 Pricing structure

This section presents a possible pricing structure for the Pondicherry cycle sharing system. The annual membership rate should be set at a rate that is high enough to discourage theft of cycles but low enough to encourage broad uptake within the study area. Daily memberships are targeted primarily at tourists and are priced considering the greater spending power of these visitors. However, the daily membership rate should be offered at a lower price for the first month of operations in order to encourage new users, including local residents, to try out the system. The usage rates should be calibrated so that the cycle sharing system remains competitive with other modes in Pondicherry. Annual memberships can be offered in monthly instalments of Rs. 100 to expand access to the system to lower income residents.

**Table 3. Tentatively proposed membership rates**

Membership type	Rate (Rs)
Daily membership	100
Monthly membership	300
Annual membership	600

The objective of the user fee structure is to incentivise short trips. This increases the number of times that each cycle in the system can be used. Trips with duration less than 30 minutes are not charged.

**Table 4. Proposed usage fees**

Time period	User fee (Rs)
First 30 minutes	free
30-90 minutes	5
90 minutes-4 hours	10
Each additional hour	15

## 9.3 Ridership scenarios

Some initial estimates of the number of potential subscribers and daily users were prepared using the following demographic data:

- Population density in Pondicherry: 11,684 persons per sq km
- Study area size: 15.82 sq km
- Trip generation rate: 1.20<sup>4</sup> motorised trips per day

The following table indicates the subscriber base as a fraction of the population residing in the study area ( $15.82 \text{ study area} * 11,684 \text{ persons} / \text{km}^2 = 1,84,836$ ). It also estimates the number of trips per day assuming that each subscriber makes 1.20 trips on the cycle sharing system. These trips include

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<sup>4</sup> Source: Wilbur Smith (2008), Report on Traffic and Transportation Policies and Strategies in Urban Areas in India. The trip rate for cities of the same size as Pondicherry is used as a proxy because local data were not available.

users of personal motor vehicles who switch to cycle sharing as well as public transport customers who begin using cycle sharing as a feeder mode.

**Table 5. Estimated subscriptions and trips by residents**

Uptake rate (% of population residing in the coverage area)	Number of subscribers	Number of trips	Number of trips per cycle per day
1% of 1,84,836	1,848	2,218	2.24
2% of 1,84,836	3,697	4,436	4.47
3% of 1,84,836	5,545	6,654	6.71

In addition to local residents, tourists are expected to make up a significant portion of the ridership of the Pondicherry cycle sharing system. As per statistics from the Department of Tourism, 12.8 lakh tourists visited Puducherry in the 2012. The following following assumptions have been used to estimate the number of daily subscriptions from tourists.

- Number of tourists per year: 12,76,495
- Average days per tourist stay in Pondicherry: 2
- Average tourists present in the city per day:  $12,76,495 * 2 / 365 \text{ days} = 6,994$
- Number of trips per day made by tourist : 3

The number of trips per cycle per day is calculated for various uptake rates ranging from 2 to 6 per cent of all tourists.

**Table 6. Estimated subscriptions and trips by tourists**

Uptake rate (% of tourist population in the coverage area)	Number of daily subscriptions	Number of trips	Number of trips per cycle per day
2% of 6,994	140	420	0.42
4% of 6,994	280	840	0.85
6% of 6,994	420	1,260	1.27

Combining mid-range scenarios for resident and tourist usage (2 per cent and 4 per cent uptake, respectively), the system will see approximately 5.3 rides per cycle per day.

### 9.3.1 Financial analysis

As in most public transport systems, cycle sharing systems generally require supplemental revenue sources to cover operating and investment costs. Revenue streams used in major cycle sharing systems around the world include advertising, sponsorships, and on-street parking fees. Table 7 presents an itemised list of capital costs, operating costs, and potential revenue streams.

**Table 7. Capital cost, operating cost, and revenue categories for cycle sharing systems**

Capital costs	Operating costs	Revenue streams
<ul style="list-style-type: none"> <li>• Stations</li> <li>• Bicycles</li> <li>• IT equipment</li> <li>• Software</li> <li>• Redistribution vehicles</li> <li>• Control centre</li> <li>• Website</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance</li> <li>• Stations</li> <li>• Bicycles: cleaning + repair</li> <li>• IT: software + web</li> <li>• Docks</li> <li>• Administration: supervisors, managers, call centre, membership process</li> <li>• Redistribution of Bicycles: diesel + vehicle repair</li> </ul>	<ul style="list-style-type: none"> <li>• Subscriptions (annual and temporary)</li> <li>• Advertising</li> <li>• System sponsorship</li> <li>• On-street parking fees</li> </ul>

The following cost estimates have been prepared taking into account the costs listed in .

**Table 8. Capital cost**

Capital costs (crore Rs)	
Aggregate capital cost @ Rs 100,000 per cycle	9.92

**Table 9. Annual operating cost**

Operating cost (crore Rs)	
Aggregate operating costs @ Rs 10,000 per cycle per year	0.99

**Table 10. Annual earnings (assuming 2% residential uptake and 4% tourist uptake)**

Source	Earnings (crore Rs)
Advertising: 104 stations @ Rs 60,000 per station per year	0.62
Annual subscriptions: 3,697 @ Rs 600 per subscription per year	0.22
Daily subscriptions: 840 @ Rs 100 per subscription per year	0.01
<b>Total</b>	<b>0.85</b>

As per the proposed contracting structure (see Section 0, above), Government of Puducherry will receive all system revenues, including subscription fees, usage fees, and advertising revenue. Government of Puducherry in turn will compensate the cycle sharing operator on a monthly basis for the services performed, subject to penalties associated with the stipulated service levels.

Subscriptions are estimated to account for the bulk of system revenues. User fees are not expected to be a significant revenue source because most trips will be under 30 minutes—the period for which there is no charge. Another potential source of revenue is advertising on large and medium sized stations, which are likely to be in highly visible locations. In addition to the revenue sources outlined above, Government of Puducherry can allocate an annual reserved fund in the budget to cover the

operating shortfall. This supplementary funding can be generated through other sources, such as fees for on-street parking.

### 9.3.2 Implementation timeline

The proposed timeline for the rollout of Phase 1 is presented below. The total timeframe required for the implementation of the system is approximately one year.

Figure 12. Implementation timeline for Phase-1

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Tendering	■	■										
Cycle & station design specifications			■									
Station location surveys, drawings				■	■							
Demonstration of prototype station & cycle					■							
Website launch						■						
Manufacturing and installation of stations							■	■	■	■	■	
System testing									■	■	■	
Applications accepted											■	■
System launch												■



## 10. Supporting infrastructure

Cycle sharing can achieve greater results when paired with measures to improve safety and convenience for cyclists on city streets. Such cycle infrastructure can take the form of physically separated cycle tracks or traffic calming measures to reduce motor vehicle speeds.

### 10.1 Cycle tracks

Cycle tracks are typically built on larger streets where there is a large differential between the speed of mixed traffic and that of cyclists. Cycle tracks can be placed in the median or at the outer edges of the carriageway, with a minimum width of 2 m for one-way movement and 3 m for two-way movement.



Figure 13. Continuous cycle tracks can enhance safety and convenience for cyclists on major arterial streets in Pondicherry.

Figure 14 shows a proposed network of cycle tracks in central Pondicherry, covering a length of 15.2 km. The network will complement the existing pedestrian/cycle zone along the waterfront promenade. A future phase can extend the infrastructure further south along ECR, Cuddalore Road, and other



Figure 14. Proposed cycle track network.

Table 11. Approximate costs of cycle tracks (at Rs 2 crore per km)

Total length km	Costs (crore Rs)
15.2	30.4

### 10.2 Traffic calming

Traffic calming can help ensure that streets like MG Road, LB Road, and Mission Street are safe for cyclists. Devices such as speed breakers, speed tables, and neck-downs can reduce vehicle speeds, ensuring safety for cyclists who share the road space with mixed traffic. Traffic calming measures will also improve safety for pedestrians. An initial 12.9 km network of traffic calmed streets for Pondicherry is shown in Figure 16.



Figure 15. Traffic calming measures such as speed tables (left) and staggered driving lanes (right) can ensure safety for cyclists on streets that are too narrow to accommodate separate cycle tracks.

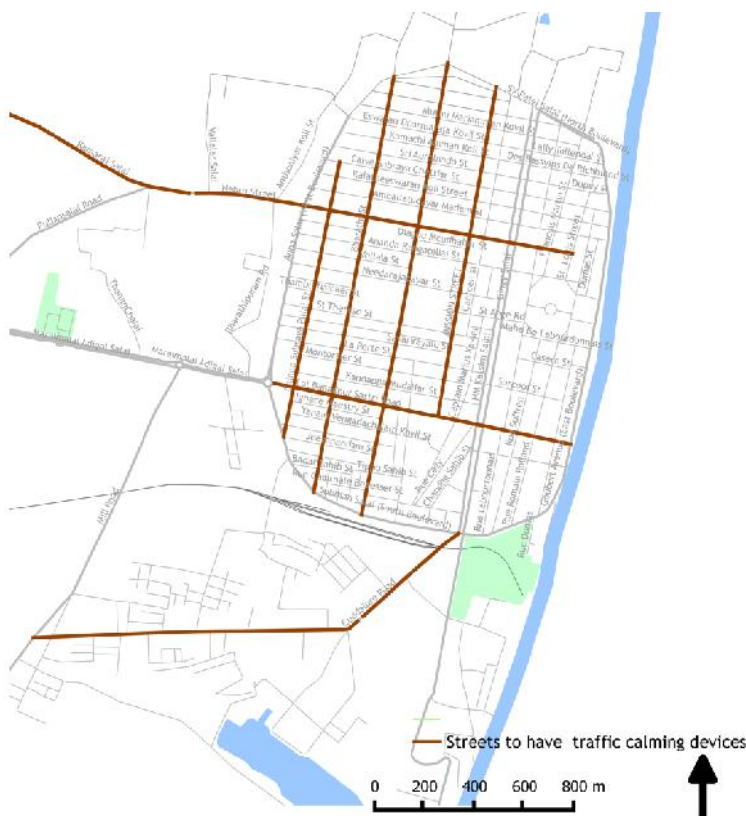


Figure 16. Streets identified for implementation of traffic calming.

Table 12. Approximate costs of traffic calming (at Rs 0.25 crore per km)

Total length (km)	Cost (crore Rs)
12.9	3.2