The Tool for the Rapid Assessment of Urban Mobility in Cities with Data Scarcity (TRAM)

Prepared by Clean Air Asia and the Institute of Transportation and Development Policy for the UN-Habitat

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<thead>
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<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
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<tr>
<td>CMP</td>
<td>Comprehensive Mobility Plan</td>
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<td>FGD</td>
<td>Focused Group Discussion</td>
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<td>Ha</td>
<td>Hectare</td>
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<td>ITDP</td>
<td>Institute for Transport Development and Policy</td>
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<td>Km</td>
<td>Kilometer</td>
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<td>Kmpl</td>
<td>Kilometer per Liter</td>
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<td>MoU</td>
<td>Memorandum of Understanding</td>
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<td>NGO</td>
<td>Non Government Organization</td>
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<td>PCTR</td>
<td>Per Capita Trip Rate</td>
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<tr>
<td>P-km</td>
<td>Passenger Kilometer</td>
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<td>RoW</td>
<td>Right Of Way</td>
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<td>Sqkm</td>
<td>Square kilometer</td>
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<td>TEEMP City</td>
<td>Transport Emissions Evaluation Model for Projects - City</td>
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<td>TRAM</td>
<td>Tool For Rapid Assessment of Urban Mobility</td>
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1. Introduction

The Tool for the Rapid Assessment of Urban Mobility (TRAM) is designed to quickly gather data to orient municipal stakeholders, including city mayors, municipal authorities and decision-makers on key mobility issues facing their city, with an emphasis on problems facing lower-income communities and other marginalized groups. This information can then be used to develop comprehensive, sustainable and cost-effective solutions to those issues.

A. Need for a Tool for Rapid Assessment

The past few decades have seen explosive economic growth and urbanization. More than half of the world’s population now lives in urban areas, and by 2020 there are expected to be over 500 cities across the world with populations over one million. This rapid urbanization is already straining the infrastructure of many cities. Compounding the problem is the rapid economic growth occurring in many countries. This growth is quickly expanding the number of people who can afford private automobiles and 2-wheelers. This combination is causing dramatic increases in congestion, pollution, greenhouse gas emissions, and crashes. These issues typically have the greatest impact on the poorest residents of a city who often suffer from poor access to services and economic opportunities.

Many cities in developing countries have not developed the institutions to deal with these rapid changes. Local governments often struggle to keep up with the pace of change in cities. In terms of transport, many do not regularly collect data on mobility. This makes developing solutions to a city’s problems particularly challenging, as government agencies often try to catch up with the issue they perceive as the most pressing, namely road congestion, without stepping back to objectively examine other issues or the effects of individual interventions. This often results in projects, such as road expansions, which address the short-term issue of congestion, but fail to account for the long-term effects of repeated road-expansion projects, including deteriorating conditions for non-motorized transportation, and declining air quality. Without data, it is difficult to understand other important issues facing the population, such as the prevalence of road injuries, the time required to travel within the city, and the proportion of trips made by different modes. This places low-income communities at a particular disadvantage, as their problems are often less visible and less discussed than problems facing higher-income populations. The lack of data is due in part to the large amounts of time and resources required for citywide travel surveys, and other traditional methods of collecting mobility data. Many developing cities lack the capacity to perform this type of assessment with existing staff, and lack the funds to hire consultants to perform it.

B. Goals of TRAM

TRAM was designed based on a survey of existing data collection methodologies which show a gap in the available tools for quickly assessing mobility needs in a city. TRAM is designed to fill that gap by providing a methodology for data collection that is less intense and costly than traditional collection methodologies but provides useful information at a medium to high level of detail for small areas and at a low level of detail for the city as a whole. The citywide data is not intended to be statistically representative of the city as a whole, but will be in the correct magnitude and direction. The tool is targeted towards key municipal stakeholders, including city mayors, municipal authorities and decision makers, so that they might make more informed, pro-poor decisions regarding transportation improvements in their cities, including geographical locations of issues across the city. It can also guide decision-makers towards area where more detailed analysis is needed. The TRAM can be applied incrementally, so that detailed data can be collected in some high-priority areas during the first application of the tool and other lower-priority areas as more funding
becomes available later.

The TRAM is intended to be a benchmarking tool for urban mobility and includes both a participatory and analytical components, resulting in both statistics and maps that enable local stakeholders to share, enhance and analyze their knowledge of mobility conditions, so that the knowledge gained serves as a basis for interventions. Unlike traditional citywide transportation surveys, which are expensive and time-consuming, the TRAM is designed to be as fast and as inexpensive as possible, for use in cities with little existing data and with limited resources for more intense data collection and analysis efforts. The results are a detailed picture of transportation in a city~ the groundwork for developing an effective transportation plan.

C. TRAM Components and Overview

The TRAM consists of three components: Stakeholder meetings, Focus Group Discussions, and Household Surveys. The following figure shows the four steps of using the tool.

The tool focuses on the implementation of participatory approaches to transport data gathering, such as focus group discussions and household travel surveys. The information gathered from these approaches feeds into the analysis of the state of mobility in the city and subsequently, in looking at potential interventions. The household surveys provide a quantitative analysis of the city's transportation system, while the focus group discussions supplement this data with analysis specific to the needs of groups that might not be represented in the survey. The data then is scaled up to the city level, providing statistic and geographic trends of mobility issues across the city. This data from stakeholders, focus group discussions, and household surveys provides a nuanced and multifaceted view of mobility issues in the city. This data can then be used by transportation planners and city officials to develop a mobility plan or interventions to address a city’s issues. The TEEMP-City tool is included and may be used in the further analysis of those transportation interventions and plans, including their cost and greenhouse gas emissions impact.

The methodology assumes a survey team with a background in transportation is available to assist with organizing the data collection effort and interpreting the results. The survey team is managed by the local government, often through the urban planning or transportation department. The team itself can consist of the government employees or the work can be contracted out to a consultant to perform the work. When possible and necessary, local Universities can provide staff to conduct and supervise surveys and interviews.

Figure 1. Steps of the Rapid Assessment of Urban Mobility
Time Estimates

The process of making all of the preparations, training staff, and conducting the survey and focus group discussion, and analyzing the data could take as little as six weeks, if all goes smoothly. The data collection preparations will likely take the most time and are hardest to predict. They require coordinating with a variety of stakeholders to assemble a survey team, identify local groups to conduct the survey, and coordinate all of the logistics of the survey and training. Each task could take significantly more time depending on the circumstances. The actual staff training and data collection, which require the most time on-site from the survey team, could be completed in about two weeks with proper preparation and sufficient local assistance, including people on the ground beforehand. The data analysis may require an additional two to three weeks to enter all data, analyze statistics, create maps, and publish the results in a report.

Resource Requirements

The tool requires the following resources to complete the methodology:

- Clipboards
- Survey sheets
- Pens
- Recording devices (for FGDs)
- Large board for taking notes (during FGDs)
- Street and aerial maps of the city (varying levels of detail)
- Transparency paper (for drawing over maps)
- Chairs (for FGDs)
- Microsoft Excel (to analyze survey data)
- GIS software (to map citywide typologies)

D. Goals of TRAM Report

The objective of this guide is to introduce the user to the tool and its purpose and describe the steps and elements needed to use the tool effectively. The guide is not intended to answer every question about the use of the tool but rather to provide enough detail about how the tool is designed so that it may be best used in a variety of different situations. The report concludes with an analysis of the current state of the tool, areas for improvement, and recommendations for future use of TRAM.
II. Preparation

Preparation is the most important step of using the tool. All subsequent activities depend on a proper setup, and once the setup is completed, it is increasingly difficult and expensive to alter the setup components. The setup involves gathering preliminary city-wide data, which sets the stage for more detailed data collection.

A. Appropriate Cities for Use of TRAM

The beginning point of using the tool is determining if the city in question is an appropriate place to apply the tool. The following describe the fundamental characteristics of cities where the tool may be applied with the most effective results. In cities that do not meet the following criteria, the tool will be of limited value and may be very difficult to use.

Cities with Data Scarcity

The tool is designed for use in cities with data scarcity. Therefore, in a city with an abundance of data on urban mobility, the tool will provide little added value and due to the priority placed on rapid assessment, may provide less accurate data than already exists.

Cities with Internal Cooperation

The tool requires significant cooperation and coordination between the survey team and other government officials to support the survey work with resources and expertise. This support must extend to the upper levels of government. Without this support, surveyors may not be able to conduct surveys, the survey team may not have the resources needed to complete the survey and focus groups, and the team may have difficulty selecting the most appropriate neighborhoods to survey and applying those results to the rest of the city.

B. Collecting Existing Data

The survey team should first collect as much basic data and information related to population, income, economic activity, and other studies developed for the city. This information should be reviewed to provide a baseline of information from which to build. In cities with scarce data, even this information may be difficult to obtain, and partners at other government agencies or at Non-Governmental Organizations (NGOs) should be asked to help obtain this information. As many relevant maps, street and aerial, should be obtained as possible. If possible, these should include geographic information system (GIS) basemaps for use in later analysis. If existing basemaps

![Figure 2. Steps of the Rapid Assessment of Urban Mobility](image-url)
are unavailable, they can be created by georeferencing data from Open Street Maps or other sources.

C. Interview Local Experts and Key Stakeholders

To gain a general sense of the existing mobility and access issues in the city, several of the local experts identified above should be interviewed individually. This will provide a context for the rest of the data collection and analysis process as well as a sense of how local experts view the subject. A minimum of three interviews should be conducted, and the interviews should not exceed 30 minutes, if conducted well. The interviewer should have a series of questions prepared to guide the interview and ensure that the discussion remain on-topic. Below is a suggested set of questions which asks a diverse set of questions about the moving around the city. With 3-4 minutes devoted to each question, this series can be completed in around 30 minutes.

- What is it like to walk/cycle/ride a bus/ride paratransit/drive in the city?
- What does the existing transportation system do well?
- What does the existing transportation system do poorly?
- What groups & neighborhoods are best served by the current transportation system?
- What groups & neighborhoods are least served by the current transportation system?
- How easy is it for the poor to move around the city, in terms of time & money?
- What aspects of transportation are getting better?
- What aspects of transportation are getting worse?
- What would you suggest to improve conditions?

D. Citywide Classification

The survey team should classify the entire city based on the 12 possible typologies defined around three primary characteristics: centrality (central or peripheral), transit access (well-served, poorly-served), and income (low-, middle-, or high-income). The classification can most easily be done in conjunction with the stakeholder interviews described above. First, the team should work with the other agencies to define a central area of the city, typically surrounding the historic and economic core of the city. This area is often distinct, in terms of density, land use mixture, street size and width. It is also possible that a city will have separate economic and historic centers. The tool allows additional categories to be added to each characteristic, but this will require additional surveys to be conducted, as this increases the number of typologies. The goal is to define the clearest point of distinction between central and peripheral. This can be done using GIS software or free mapping software, such as Google Earth or Google Maps. Using a computer, local officials can draw the boundary of the core area on a map.

The 12 recommended typologies are listed below:

1. Central Low-Income Well-Served
2. Central Middle-Income Well-Served
3. Central High-Income Well-Served
4. Central Low-Income Poorly-Served
5. Central Middle-Income Poorly-Served
6. Central High-Income Poorly-Served
7. Peripheral Low-Income Well-Served
8. Peripheral Middle-Income Well-Served
9. Peripheral High-Income Well-Served
10. Peripheral Low-Income Poorly-Served
11. Peripheral Middle-Income Poorly-Served
12. Peripheral High-Income Poorly-Served
Next, the boundaries of areas well-served by transit can be defined in much the same way. Local officials can provide their knowledge of transit and paratransit routes in addition to any available data on transit service to designate areas well-served by transit on a map layer. Again, this involves a certain amount of judgment.

Finally, the city should be divided a third time into low, medium, and high-income areas. The goal of this process will be to divide the city into roughly equal divisions. As each city is different, the definition of low, medium, and high-income will vary, depending on the city. Local officials and informants will help to define appropriate income divisions and provide input into this endeavor. If local informants are unable to classify the city, an alternative, more resource intensive methodology may be used to classify income across the city. In this methodology, building typologies will be identified and classified as corresponding to each income designation. Then, one or more members of the survey team will procure transport and travel across as much of the city as possible, classifying points at regular intervals according to the prevailing building typology. From building typologies, a rough estimate of area income and density can be determined across the city.

Once all three inputs are completed, they should be presented to a panel of at least three local experts, recommended by local officials. These experts can range from staff of local non-governmental organizations (NGOs) that deal with poverty alleviation, elected officials, and civil society leaders involved with local transportation issues. The experts should validate the results of the analysis and suggest improvements. Based on the feedback from the local experts, the three layers should be adjusted to create the most accurate map possible. The three layers can then be combined so that all parts of the city fall into one of the 12 typologies. The resulting maps will be used later on to select household survey locations and to expand survey results to the city as a whole.

Once the typologies are finalized, each section of the city must be assigned a population. The easiest way to do this is to assign a population density to each typology, and then, using GIS software, multiply the population density by the area of land for each section of the city, resulting in a population for each section. This method is not very rigorous, but it can provide a rough estimate of population distribution, based on existing knowledge of the city. Again, local
experts should be consulted to assist in assigning reasonable population densities to each typology. The sum of the populations for the sections of the city should be compared to the city as a whole, and then adjusted to best match the citywide population. This is an iterative process that will likely require multiple rounds of adjustments before the populations of each area are finalized. Once the population has been finalized, the percent of the city population residing in each of the 12 typologies can be determined. This will determine the percentage of the city’s population represented by each typology, which will help develop a picture of the transportation conditions in the city.
III. Focus group discussions on mobility

The Focus Group Discussion, along with the Household Survey comprise Step 2 of the TRAM methodology.

A. Introduction

Focus group discussions (FGDs) are semi-structured discussions with groups of people with common interests or characteristics (UN Habitat, 2012). Sherraden (2001) regards focus group discussions as exploratory research tools to explore people’s thoughts and feelings and obtain detailed information about a particular topic or issue. They are especially effective in capturing information about social norms and the variety of views within the population (FHI, 2006).

FGDs are advantageous since small groups enable easier facilitation of interaction as opposed to large groups. Participants may be selected based on a set criteria; it is an inclusive data gathering method as people who cannot read or write can still participate in the exercise. However, because the group is small enough, discussions may be dominated by participants who are more vocal than others; a wrong mix of participants can lead to further problems, such as the misrepresentation of the target population and/or biased research results.

The data can be used to identify transportation problems that might not surface in other data collection efforts. For example, a women’s focus group may show that many women don’t feel safe riding the bus at night. Planners can then use this information and coordinate with this group to develop solutions, such as better lighting at bus stops and additional security measures on board buses.

B. Objectives

Results of the FGDs on urban mobility will supplement information and data gathered through the household surveys. Specifically, it will:

- Give voice to groups that might not be captured by a randomized survey
- Identify what mobility improvements the population most desires to see implemented
- Obtain people’s experiences and perceptions on the current state of mobility in their city;
- Enable the participants to identify major challenges to/main areas for improvement in urban mobility; and
- Gather recommendations as to how (facilitating) factors can be enhanced, challenges addressed, and identify participants’ (perceived) priorities.
C. Planning the FGDs

The FGDs need to be planned ahead of time, and local community leaders are invaluable to ensuring proper coordination and conduct of the FGDs. The community leaders will also be able to help out in identifying the potential participants for the FGDs as well as venues for the meetings. The following elements need to be taken into consideration when planning the FGDs in the different communities:

Time and Location

Consideration should be given to maximizing participation and minimizing the inconvenience for the intended participants (Seymour, 2004). The location should be accessible to all participants. If possible, it should be at a centrally located venue within the community. Also, the organizers should consider conducting the discussions during weekend or week nights if the FGD participants work during the day.

Participants

As stated earlier, focus group discussions are group interviews of approximately six to twelve people who share similar interests or characteristics. The group needs to be large enough to encourage discussion, but not too large so that some of the participants are left out of the discussions. FGDs are based on key stakeholders and can cut across geographic boundaries or typologies. The participants in FGD surveys will vary based on the country, city, and neighborhood context. The FGDs, however, add the most to a data collection effort when they are able to provide a greater depth of information than can be gained from the household survey or when they involve groups with needs that might not show up in the results of a household survey. A sample of groups that might be considered for inclusion in a focus group discussion is provided below:

- low-income women
- differently-abled individuals
- middle-income women
- low-income men
- representatives of business/traders
- representatives of haulers and shippers
- paratransit and transit vehicle operators

Participants of each group can be homogeneous and represent a particular segment of the population. The main aim would be to create a comfortable atmosphere for the participants for discussions.

Number of Focus Group Discussions

It is important to identify the number of FGD that are going to be held in the different communities beforehand. This is very much dependent on the recommendations during the discussions with the community leaders, the budget needed for each FGD, as well as the time available for conducting the FGDs. This may also be dependent on the size of the target population or community or the groups of people you want interviewed. Example, you might want an FGD with key local government officials and other stakeholders at the community/local level - as implementers of urban mobility initiatives to complement, confirm, or negate perceptions of the people/residents in another FGD group. A minimum number of FGDs is two: one for low-income women and one for differently-abled individuals. For additional FGDs, the survey team should use the list above to prioritize further group discussions.

Informing Local Authorities and Working with Local Groups

The team should contact and work with community leaders to facilitate communication with target participants. Community leaders may also be consulted in the selection of respondents.

D. Conducting the FGDs

The FGDs are to be conducted in support of the household interviews (described below) that are done in the neighborhoods. The section below looks at some of the important elements that need to be taken into consideration when conducting the FGDs.

Personnel

Ideally, the FGD should be conducted by a facilitator and one or two assistants. The assistants should take care of tasks such as arranging the room, taking down notes, operating the recording device/s (if used), assisting in data analysis.
Materials
• Consent forms
• Focus group discussion guide for facilitator
• Recording device (if permission for use is granted by the group)
• Pen and paper for the documenter
• Tokens¹
• Name tags
• Large, detailed City Maps

Questions for Discussions
The set of questions below serves as a guide for starting the discussions but the discussions are envisioned to be free-flowing and issues brought up by participants should be followed up in more detail.
• How would you describe the state of transport in the city?
• How does this affect your daily life – going to work or school, financial implications (on overall household income)?
• What are the factors that help you go around the city more easily? What makes mobility (in the city) challenging for you?
• What are the most important issues related to transportation? Please explain.
• What do you think should be done to address these issues?
• What challenges or hindrances do you see in implementing these measures?
• What are the main destinations that you travel to by public transport?
• What are the main destinations that you travel to by walking?
• What are the main destinations that you travel to by bicycle/motorbike/automobile?

Agenda
The following items normally constitute the agenda for focus group discussions:

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<tr>
<th>Agenda Item</th>
<th>Description</th>
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<tbody>
<tr>
<td>Welcome</td>
<td>The facilitator welcomes the participants to the FGD and gives a clear background on why they have been chosen to participate</td>
</tr>
<tr>
<td>Goal and agenda of the FGD</td>
<td>The facilitator should clearly define the goal of the FGD to the participants as well run through the flow of the meeting. The facilitator should also mention that while the proceedings are recorded, the responses made will remain anonymous and that the report will not mention names.</td>
</tr>
<tr>
<td>Setting of ground rules</td>
<td>See section below for some examples of ground rules for the FGD.</td>
</tr>
<tr>
<td>Introduction of participants</td>
<td>Participants are asked to introduce themselves.</td>
</tr>
<tr>
<td>Facilitated discussions</td>
<td>See the section below for the recommended set of questions for the discussions</td>
</tr>
<tr>
<td>Mapping Exercise</td>
<td>Participants will be asked to indicate on a series of maps where they experience the greatest difficulty moving about the city.</td>
</tr>
<tr>
<td>Wrap up</td>
<td>The facilitator shall ask the participants if they have any final inputs or thoughts, thank them and explain how they can get copies of the outputs of the analysis.</td>
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¹ Discuss with the local organization or authorities if this is needed and appropriate in the local situation.

Ground rules
The following ground rules can be put in place during the focus group so as to put order into the discussions (Eliot & Associates, 2005):
• The participants will do the talking
• There are no right or wrong answers
• What is said in the room stays in the room
• Respect everyone’s opinions, even if you disagree
• Ask questions if instructions / discussions are not clear
• Remind everyone that the meeting is held within a certain time limit
**Tips for Facilitation**

The main role of the facilitator is to maintain the focus of the group on the topic at hand to gather the necessary information based on the objectives. It is essential that the facilitator is very familiar with the topic and the neighborhood or city so that she/he will also be able to address inquiries that might arise during the discussions. It is important that the facilitator also remain an unbiased part of the discussion and be open to the ideas of the participants.

The facilitator should also:

- Make sure that the goal of the meeting is clear to the participants
- Make sure that the questions are understood by the participants
- Use flip charts to document conclusions during the meeting and guide discussion
- Use nominal group technique (NMT) to gather ideas from all participants and rank them accordingly. This allows for a wide range of ideas coming from all the participants.
  - Ask participants to silently write down ideas
  - Ask each participant to share ideas with group, recording each unique idea on flip chart
  - Ask group to discuss all ideas, rearranging and adding to the list
  - Rank ideas through a voting process
- During discussion, listen, paraphrase and probe into the points that are being given by the participants.
- Record geographic-specific ideas on the maps or ask participants to draw on maps as well
- If a few participants are dominating the discussion, call on other, less vocal participants.
- Remain neutral and be able to keep personal views out of the discussions and be sensitive to the points being given by the participants

**Tips for Documentation**

The facilitator must first ask the group for permission to record the discussion via audio recorder. This question must be asked delicately as many communities are sensitive to being recorded. To help participants feel comfortable sharing their opinions, the facilitator should also emphasize that the reports will not mention any names of participants. The assistant will record salient points that are made by the participants during the discussions, in addition to them being recorded, if recording is permitted. A standard form for taking down notes may be utilized (see Appendix 4). The form encourages the note taker to draw the layout of the seating arrangement in the room and assign codes/fictitious names on the seats to easily note down the comments of the participants. Responses as well as observations (e.g. on non-verbal response, attitude when answering) will be recorded in the form.

Information from the flip charts also needs to be summarized and analyzed.

**Mapping of Ideas**

During the discussion, maps should be used so that participants can record the locations where they experience the greatest difficulty moving about the city. A series of aerial maps with labels of individual streets and major destinations will help the participants identify specific locations on a map. Participants, with assistance of facilitators, will use markers, stickers, or other utensils to label these locations, including a very brief description of the issues at each location, written on the map.

The maps will also serve to generate discussion among other participants who can retrace their travels on the map. Hearing about specific locations from others may trigger similar memories of locations that have been difficult for them. Once the session is concluded, the facilitator should photograph the maps to record the locations of difficulty.

**Data compilation and analysis**

Essential information must be distilled from the comments made by the participants. Ideally, all recordings are transcribed and the transcripts are then stripped off of the non-essential elements. The remaining comments and quotes are then organized and coded with participant and group numbers for proper referencing. Common categories and themes across the comments are then identified and the individual comments are then categorized according to these themes. Short paragraphs summarizing the findings for each category can be distilled from the set. Ultimately, the results of the focus group discussions are to be compared with the results of the household surveys in order to validate transportation data as well as add insights that may not be captured in the household surveys.
A. Introduction

Household travel surveys aim to assist in understanding the current state of mobility in the city and identify potential interventions. The implementation of such surveys is integral in a comprehensive approach towards transportation planning in cities. It is the first step towards having a good understanding of the travel demands and needs of the population. This quick guide will serve as a basis for conducting rapid surveys in cities with scarce data.

Traditional mobility surveys collect a random sample of data across an entire city. To do this accurately requires a very extensive survey effort at great expense. To dramatically reduce the resource requirements but still provide a reasonable portrait of mobility trends in a city, the TRAM requires only a small set of samples in carefully selected areas that represent 12 typologies found in a city. A total of three characteristics are used: centrality (central or peripheral), transit access (well-served, poorly-served), and income (low-, middle-, or high-income). There are a total of twelve combinations of these characteristics, for example a central, low-income area with good transit access is one typology. By conducting a survey in each of the 12 typologies and then categorizing the rest of the city based on the same typologies, general mobility patterns for the city can be quickly estimated from a relatively small sample size.

The process discussed in this guide assumes little or no prior available data is available on travel activities in the study areas and that there is an urgent need to design a very time and resource efficient set of surveys to estimate basic transport parameters for further analysis. The suggested process will not replicate full-blown O-D surveys, but is designed in a way that it heavily considers the resources that are required to conduct these surveys but it will make sure that the most relevant parameters for the conduct of a rapid assessment are collected.

B. Objectives

The household surveys have the following specific objectives:
- Gather data on the travel characteristics of the people in target neighborhoods and have detailed information on the variability based on factors such as economic condition, gender, and age
- Include data gathering on pro-poor modes such as walking and cycling
- Gather thoughts on mobility issues and proposed solutions from the people
- Infer preliminary citywide travel characteristics to be used to develop general recommendations for city policies

These are the data that are going to be captured by the survey:
- Basic socio-economic data: income, type of income/employment, length of residence at current location, housing tenure (own/rent), number of people in household, age, gender
- Trip purpose
- Trip destination
- Mode share
- Time spent travelling
- Income spent on transport
- Ownership of motorized and non-motorized vehicles
- Perception on the acceptability/quality of transport modes

Data gathered on the travel characteristics will be used as input to the TEEMP-City analysis portion of the TRAM. Through the citywide analysis described in Section II C above and the neighborhood selection described below, the data will be collected in such a way as to interpolate general citywide travel characteristics.

C. Planning the surveys

This section discusses the important elements that users need to take into consideration during the planning stage of the survey such as general guidance on defining the survey populations, sample size determination and selection.

Defining the survey populations

To quickly produce results that can be expanded to represent the entire city, survey locations must be chosen carefully. Local subject experts and other qualified informers, including relevant potential academic partners and poverty reduction NGOs, should be consulted in selecting the neighborhoods
to survey. Full use must be made of existing earlier studies, including student theses and consultant reports.

Through the 12 neighborhood typologies, the TRAM creates an easy method of selecting neighborhoods to survey. A minimum of twelve neighborhoods should be surveyed, one in each of the twelve typologies, as defined in the mapping exercise in Step 1. If a typology is not found in the city, a survey area for that typology is not necessary or possible. If more resources are available, more than one neighborhood in each typology can be surveyed, but all should be represented if possible. It is also important to exercise some discretion in selecting survey locations. Locations with highly distinct or unusual characteristics should generally be avoided, as they are less likely to representative of other parts of the city. However, to allow citywide conclusions to be drawn, it is highly recommended that neighborhoods be selected in a manner that is geographically dispersed throughout the city. The geographical scopes of the identified communities also need to be verified with the local community leaders.

Determining sample size

There are three basic approaches towards determining sample sizes: through calculation; by using accepted standards that have been used before in other studies; and by considering budgets, either time or financial resources available as the limiting and determining factor.

For the sake of time and practicality, this guide determines sample size through the latter two methods. The Transport Research Laboratory (TRL) suggests a rule of thumb where the sample size for the surveys should be in the order of 50 households per community location. Alternatively, 5% to 10% of the households can be sampled as a practical rule (TRL, 2003). However, the sample size determination will have to be pegged to the budget available for the surveys. The Metro Manila Urban Transportation Integration Study, for example, only had a sampling rate of 2.5% for each barangay in the metropolitan region and 0.8% per barangay in the peripheral areas. Ultimately, choosing the sample size will be a trade-off between the degree of precision desired and the available budget (Godard, et al. 2001). As Wild and Seber (2000) put it - “How big should my sample size be? - As big as you can afford.”

It should also be considered that some surveys will not produce the level of quality required to be included in the results. This should be factored into the preparation for the survey sample size.

Selecting households in the neighborhoods

Once the neighborhoods have been identified, a method for randomly selecting households must be employed so that every household would have an equal chance of being selected. The set of source materials from which the sample is selected is referred to as the sampling frame (UNDESA, 2005). In cases where updated and complete listings of the households are available (e.g. in high income neighbourhoods or subdivisions), then the survey team can employ a simple random sampling method for selecting the households. Under a simple random sampling method, the list of households will be assigned specific numbers from 1 to N (total number of households in the area). A random number generator is utilized to randomly select numbers up to such time that the desired sample size is satisfied (CDC, 2008). Getting updated and appropriate sampling frames may be very difficult in cities with scarce data, particularly in areas of informal development, often referred to as slums. There may not be formal listing of dwellings, streets may not be named, house may not be numbered, and dwellings may include extended families and informal sublet arrangements (Reis 2000). In cases where the list of households is not available or is outdated, other means of randomly selecting households should be employed. A quick way of doing this is to utilize a map of the area that is overlaid with a grid (e.g. 500 x 500 meters or smaller as appropriate, especially in densely-populated low-income areas). Each cell can be assigned with a number and the

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2 Barangay is the smallest unit of governed areas in the Philippines.
3 A simple excel function can be used to generate numbers between 1 and N : =randbetween(1,N)
random number generator can be used to pick out cells wherein the interviewers can start their survey interviews. The research team can decide on rules which can facilitate random selection such as each nth (e.g. 5th) household from the first household interviewed will be selected for an interview. If the nth household refuses to be interviewed, the researcher must attempt to interview the next household and resume counting the nth household from that one instead. Sometimes in extremely poor areas this may not even work (e.g. informal settlements) as many houses are attached with each other. It is proposed to interview every nth family encountered in such a scenario. Another approach is to use an overlay grid of much smaller size (30 x 30 m up to 100 x 100 m depending on the sample size) superimposes over an aerial photo or a detailed local map, and choose the households residing at locations nearest to where the grid lines cross. These details should all be discussed during the preparatory meetings and trainings for the interviewers.

Assembling a Survey Team

Once the size of the survey becomes clear, it is important to begin assembling a survey team. The team, supervised by the local government, should be large enough to conduct a sufficient number of surveys is the required amount of time. It is often useful to seek partners among local universities and non-profit groups, when funds are limited. Government officials may be helpful to establish contacts with these institutions and organizations. Surveyors should be able to communicate easily in the local language(s) where the surveys are conducted.

To conduct the survey, it is necessary to budget for payment of local surveyors. Paid workers tend to be more motivated to work hard and produce higher-quality results.

Training and Field testing

This first step in training should be to conduct a Process Design Workshop with survey team leaders. The goal of this workshop should be to prepare materials and plans to train interviewers. It should also cover meeting with local leaders and stakeholders in each survey location. More detailed discussion on the specifics of training interviewers is below.

The next step is to introduce interviewers to the survey materials and the survey process. This should be scheduled for at least two days before the survey is to be conducted. Interviewers should plan to spend 3-4 hours in a session at a predetermine location, typically an auditorium where many surveyors can be trained at a time. During this portion of the training, each interviewer should be given a sample survey sheet to become familiar with. A member of the survey team should present the materials to the group, explaining the purpose of the survey and the requirements for the interviewers in terms of time and money. A member of the survey team should present the materials to the group, explaining the purpose of the survey and the requirements for the interviewers in terms of time and money. Then, the presenter will explain each item on the survey sheet, providing examples of the types of responses that the interviewer may receive and explanations of what to do in each situation. For example, if a male member of the household is reluctant to describe the travel patterns of female residents, he should be reminded that the survey is anonymous and designed to improve mobility for all residents. During the presentation, the interviewers should be encouraged to ask questions to better understand the survey process and prepare for the interview. The session should also discuss issues such as clarity and complete-

Figure 7. Use scaled maps and to randomly select households
ness, which are crucial to obtaining useful data from the survey. This session should conclude with the logistics of conducting the survey, including meeting locations, transportation to the survey location, payment, supervisors, and lunch breaks.

The following day, the interviewers should be given a field test of the survey. The field tests should ideally be done in areas similar to those which will be surveyed in small groups of no more than 15 surveyors. Each test survey should be monitored by someone from the survey team for accuracy. The interviewers should also be able to comment and ask questions after the field testing is done in order to allow for improvement in the whole process. Any corrections or areas for improvement should be explained to the surveyor as well as to the other surveyors at the location. After the test surveys have been completed, the group should reassemble and common issues and questions should be explained to the entire group of surveyors so that all can learn from each other’s experiences.

Informing and Working with Local Authorities and Organizations

It is imperative that the research teams work with the local authorities and organizations when doing the surveys. Involving them will make the tasks easier to conduct as they are familiar with the culture, rules and people. Each site should be visited before the survey begins to inform local leaders and key stakeholders about the upcoming survey, including the purpose of the survey, the specific times, and the people that will be doing the survey. This is especially important to ensure interviewer security and access in slum areas, where the survey team must obtain an advanced “blessing” of local leaders and other key stakeholders, including local gangs. Following the Process Design Workshop, the research team leaders, preferably jointly with their teams, should familiarize themselves with the power and security issues in their localities. Based on that information, they can arrange to meet the relevant local stakeholders as described above. This will increase compliance and improve survey results.
D. Conduct of the survey

General guidelines

Preliminary ground work would have been done with the local authorities and/or people's organizations in the area in order to make the people aware of the survey interviews that are going to be conducted. However, during the actual conduct of the survey, it would be important that the interviewers also carry a basic information sheet about the survey which can be used to quickly explain what the survey is about, what information will be collected and how it will be used. Approximately, a properly trained interviewer can finish the interview for one household of 5 in about one hour. It is highly advisable that the surveyors work in pairs, not individually. One surveyor should do most of the speaking, while the second takes notes on the dwelling and surrounding environment. This also helps to verify the information and is much safer. Interviewing households in man-woman pairs has been shown to be the most effective method.

Guidance on the Questions

This section will focus on the questions that are proposed for the survey. The survey instrument has 3 main parts, found in Appendices 1 to 3, namely:

- Form 1: Household Information
- Form 2: Household members and travel characteristics
- Form 3: Additional questions regarding the state of transportation

Form 1: Household Information

This form contains questions regarding the general characteristics of the household such as the number of household members, expenses and income and vehicles owned. This form is needed to be answered by only one respondent in the household.

Item 1: Name (What is your name?)

Ask the complete name of the main respondent for the interview. This will be important for documentation purposes, particularly if further clarifications will be needed after the conduct of the interview.

Item 2: Residence address

Ask the respondent to state the complete address of their residence, if applicable, as well as the number of years living at that location and the tenure of the housing. Housing addresses may be difficult to obtain when surveys are conducted in slum areas. In cases where the address is not available (e.g. if the house does not have a number, or if there are no street names), the interviewer must try to note down the following information in the “notes” box:

- Smallest geographical unit which the area belong to
- People’s organization that the household belong to (if any)
- Location of house in relation to an identifiable landmark
**Item 3: People in the household**

The respondent will be asked to enumerate the number of people within the household and note down characteristics such as age, gender and the presence of disabilities that affect their travel.

<table>
<thead>
<tr>
<th>Household member #</th>
<th>Occupation</th>
<th>age</th>
<th>male</th>
<th>female</th>
<th>Age / Pain / Disability that affects travel?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>shopkeeper</td>
<td>35</td>
<td>x</td>
<td></td>
<td>(leave blank if none)</td>
</tr>
</tbody>
</table>

Figure 10. Screenshot for Form 1, Item 3

**Item 4: Monthly Household Expenses (How much are the total household expenses per month?)**

Household expenses refer to the total money spent by all family members in a household. This serves as a proxy for household income. Since many people may be uncomfortable providing exact information, a series of ranges are provided to make the question less intrusive. If answers are refused, the surveyor should assess the building quality, furniture, vehicles owned, etc to make an educated guess regarding the expenses.

<table>
<thead>
<tr>
<th>Household EXPENSES per month in local currency (circle one)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5,000</td>
</tr>
</tbody>
</table>

Figure 11. Screenshot for Form 1, Item 4

**Item 5: Monthly transport-related expenses (How much is spent on transportation?)**

The interviewer must ask the amount (total, in local currency) that is spent on transportation by the household each month.

<table>
<thead>
<tr>
<th>Household Transport EXPENSES per month in local currency (circle one)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2,500</td>
</tr>
</tbody>
</table>

Figure 12. Screenshot for Form 1, Item 5

**Item 6: Vehicle Ownership (What vehicles do the household own and how many for each type?)**

The interviewer will ask the respondent what types of vehicles are owned by the household and how many vehicles per each type. A list of default vehicle types is given below. Other special vehicles types including bicycles and pushcarts (those not included in the list) should be included in the answer form.

<table>
<thead>
<tr>
<th>Vehicles owned</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of Vehicle (circle one)</strong></td>
</tr>
<tr>
<td>AR - Auto Rickshaw</td>
</tr>
<tr>
<td>2 - 4 Wheeler</td>
</tr>
<tr>
<td>C - Cycle</td>
</tr>
<tr>
<td>AR - 2 - 4 - C</td>
</tr>
<tr>
<td>AR - 2 - 4 - C</td>
</tr>
<tr>
<td>AR - 2 - 4 - C</td>
</tr>
<tr>
<td>AR - 2 - 4 - C</td>
</tr>
<tr>
<td>AR - 2 - 4 - C</td>
</tr>
<tr>
<td>AR - 2 - 4 - C</td>
</tr>
</tbody>
</table>

Figure 13. Screenshot for Form 1, Item 6
**Item 7: Accidents** *(Have you or any of your household members been involved in a road/traffic accident with a vehicle in the past year?)*

<table>
<thead>
<tr>
<th>Number of times</th>
<th>Who in the household (Household member #)</th>
<th>Situation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>While walking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>While cycling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When inside a public transport vehicles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When inside a private vehicle</td>
</tr>
<tr>
<td>Other, please specify</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 14. Screenshot for Form 1, Item 7

**Form 2: Household member and trip information**

The main purpose of the Form 2 is to gather information on the travel characteristics of the members of the sampled household. Ideally, each member of the household who engage in daily travel must answer Form 2, but as explained earlier, the main respondent can narrate the normal travel pattern of the household members if they are not present, or are unable to answer due to various reasons.

Forms need to be completed for all the household members that engage in daily travel. If the person is there, it would be good if he/she can answer directly, otherwise it will be the main respondent (who also gave answers to the first form) who will answer in behalf of the others.

The table below (as shown in the form) should be answered for the person whom the transport characteristics are being shared for (either by the person directly, or through the proxy respondent). For example, if the mother in the household is telling the travel characteristics of her son, the details that would go into the table would refer to the son, not the mother, who is acting as a proxy in this case. The interviewer is expected to note down the name of the proxy (if applicable).

<table>
<thead>
<tr>
<th>Household Member #: (max 2)</th>
<th>Age</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 - 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 - 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 -</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 15. Details of the person whom the travel characteristics are being narrated for

Trips are defined as the basic unit of travel, these are “one-way course of travel from one place to another with a single main purpose” (Rofique, et al. 2011). A trip can consist of one or more stages, a new stage is said to occur if there is a change in the form of transport. This particular survey treats short walking trips as stages in the trip (e.g. walking trips that are more than 50 meters). This is done to fully account for the importance of walking as a mode and its importance in transfers.

The main focus of the form is personal travel, which is travel for work or education or for private purposes, provided that the main reason for the trip is to reach a destination (U.K. DfT, 2011). Trips that are made during the course of work are to be included, again, provided that the main purpose is for the person to reach a destination. Travel done to deliver goods or to convey vehicles or passengers are not covered in the survey.

This survey instrument also adopts the U.K. DfT (2011) definition that trips cannot have two separate purposes. If a single course of travel involves mid-way change of purpose, then it will be split into two trips, except for trivial subsidiary purposes (e.g. a stop at the street vendor spot to

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4 Stages are also referred to as “unlinked trips”
5 Coverage is mainly adopted from the U.K. DfT (2011) Note and Definitions for the National Travel Survey Notes and Definitions so as to clarify the coverage of the trips that are to be recorded in the form.
The figure below aids in visualizing the data items that are needed to be collected. The numbers in the balloons correspond to the items discussed below.

**Item number**

1. **Purpose of the Trip**
2. **Time when the trip was initiated**
3. **What mode did you use for each stage?**
4. **How many minutes?**
5. **How far did you travel for each stage?**
6. **Public transport:**
7. **Describe the locations of any major bottlenecks (slow or difficult sections) in the trip**
8. **Figure 16. Main Table in Form 2**
9. **Table 3. Trip Purpose Categories**

The interviewer can start the conversation by statements such as “can you state all the trips that you made yesterday? Many people change routines daily or have a harder time describing a typical day; therefore, it is recommended that they are asked about “yesterday’s” trips.

**Item 1: Purpose of the Trip**

The main purpose of the trip is usually connected to the activity at the destination, which may include the following most frequently seen categories:

<table>
<thead>
<tr>
<th>Trip Purpose</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>To work</td>
<td>Trips to usual place of work</td>
</tr>
<tr>
<td>To market</td>
<td>Trips to shops, market</td>
</tr>
<tr>
<td>To school</td>
<td>Trips to school</td>
</tr>
<tr>
<td>To meet friends</td>
<td>To meet friends or relatives or other people; all types of entertainment-related trips</td>
</tr>
<tr>
<td>To go back home</td>
<td>Trips going back home</td>
</tr>
<tr>
<td>Others</td>
<td>Other trips made</td>
</tr>
</tbody>
</table>

Table 3. Trip Purpose Categories

**Item 2: Time when the trip was initiated (What time did you leave?)**

This will indicate the estimated time when the trips are made. Summary statistics regarding the time when trips are done can be useful information to have when looking at interventions as well.
**Item 3: Origin of the trip (Where did you start the trip?)**

If the trip was made from home, the box should be marked, otherwise, a specific area and area category should be indicated. Summary statistics will not be derived from this information, but these might be very useful for the local government to know.

**Item 4: Destination of the trip (Where did you go?)**

Name the area of destination and the type of destination (e.g. office, shop, school, etc….)

**Item 5: Modes used in the different trip stages (What modes did you use for each stage?)**

At this point, the interviewer would need to ask the specific details regarding the trips made, starting with the different modes that are used in making the trips. As explained earlier, each trip can be dissected into different stages. Each stage is said to occur if there is a change in the form of transportation. Walking trips are also included in the stages (even those walking trips that are needed in order to transfer from one mode to another, given that they are at least 50 meters in length).

![Figure 17. Trips and Stages](image)

It would be easier for the interviewer to go through items 5, 6, 7, 8 chronologically for each of the stage of the trip, rather than asking the respondents to identify answers for item 5, then 6, then 7 and then 8.

The figure depicted above gives a depiction of how a trip can be broken down into different stages and what modes are used. A sample trip going to the office building by an employee is composed of four stages: a) walking towards the rickshaw station from the house; b) rickshaw ride to the bus station; c) riding the bus towards the area of the office; d) walking from the bus stop to the office building. The time, distance and costs will differ for the different modes used in the trip.

**Item 6: Time spent on travelling (How much time was used in travelling and waiting)**

The respondents will be asked to give the time spent on travelling and waiting done for each of the modes used in the different stages of the trip. Many people are said to be more accurate in describing time spent rather than distance covered, this is why this item is included in the survey. Waiting times for public transport are important to be captured.

**Item 7: Distance (How far did you travel for each stage?)**

The survey instrument also asks for the distance travelled for each stage of the trip. Ultimately, the calculation of the different indicators will be a lot dependent on the distance travelled during the trip and its stages.

**Item 8: Cost of transit (How much did you pay?)**

Transit costs will be recorded for each stage involving bus, paratransit, rickshaws, or shared taxis. The value should be recorded in the local currency and will be used later on in calculating sample averages for transit costs.

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7 Assumes that the walking stages are more than 50 meters in length.
**Item 9: Locations of significant delay/difficulty** *(Where was your trip significantly impeded?)*

The location of bottlenecks will be recorded so that existing locations of heavy congestion and/or locations that are particularly difficult to traverse can be identified. It is important here to describe these locations in detail so that they can be located on a map later.

**Form 3: Additional Questions**

Form 3 focuses on getting additional information on the perception of the people on the status of transportation in the city and their suggestions on how to improve it.

**Item 1: Satisfaction rating** *(How will you feel about the following issues?)*

The respondents will be asked to state how they feel about the issues related to transportation as given below. Five choices are given (highly dissatisfied, dissatisfied, satisfied, highly satisfied, don’t know). This method of answering is adopted from the recommendation of Reis (2000) who stated that “short verbal rating scales are most valid and reliable measures to use” in these types of questions.

<table>
<thead>
<tr>
<th>Question 1: What are your attitudes about transportation in your city? (read out the choices - circle the response)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The streets in my area have usable footpaths.</td>
</tr>
<tr>
<td>I feel safe walking in my area.</td>
</tr>
<tr>
<td>It is easy for me to reach places by walking.</td>
</tr>
<tr>
<td>The streets in my area are shaded and pleasant.</td>
</tr>
<tr>
<td>I feel safe crossing the street.</td>
</tr>
<tr>
<td>Only poor people bicycle in my area.</td>
</tr>
<tr>
<td>I feel safe bicycling.</td>
</tr>
<tr>
<td>Secure bicycle parking is available in my area.</td>
</tr>
<tr>
<td>It is easy for me to reach many places by bicycle.</td>
</tr>
<tr>
<td>Public transport access was important factor in choosing where my family lives.</td>
</tr>
<tr>
<td>There is frequent bus service at bus stops near my house.</td>
</tr>
<tr>
<td>I feel safe riding the bus.</td>
</tr>
<tr>
<td>Buses in my area are too crowded.</td>
</tr>
<tr>
<td>I feel that bus fare is a good value.</td>
</tr>
<tr>
<td>I feel safe going by shared auto</td>
</tr>
<tr>
<td>Finding a shared auto is convenient</td>
</tr>
<tr>
<td>Shared autos in my area are too crowded.</td>
</tr>
<tr>
<td>I feel that shared auto fares are a good value.</td>
</tr>
<tr>
<td>The air in my city is clean and healthful.</td>
</tr>
<tr>
<td>I feel that vehicles in my city are highly polluting.</td>
</tr>
</tbody>
</table>

Figure 18. Screenshot Form 3, Item 1

**Item 2: Ranking Improvements** *(What course should the city take to improve transportation?)*

The respondents will be asked to rank the importance of multiple choices of interventions that affect each mode. This question aims to get a sense of how the respondents feel about the relationship between the issues affecting the households and the improvements that would most benefit them.

The respondents will be asked to choose 5 interventions that they like among the choices given below. These choices are from the list that is present in the current Transport Emissions Evaluation Model for Project – City (TEEMP City). (See Figure 19, next page)

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8 The TEEMP City Model, developed by CAI-Asia and ITDP and funded by the Veolia Environment Institute, has been designed to look at long-term city-wide impacts of a combination of project interventions and policies with many transferable default values so it can be applied in cities with sparse existing data. This allows comparison of business-as-usual trends against one or more alternative project and plan scenarios that specify generalized investment types, such as building new bus rapid transit lines vs. building new highways.
Figure 19. Screenshot Form 3, Item 2

**Item 3: Built Environment**

The interviewers will visually survey the built environment for each survey household. This includes an estimate of the age of the structure, parking provided, the typology of the structure, and the floor area of the unit. For each of these, the surveyor must use his judgment to estimate the most appropriate description. For best results, the survey team should include photos of different typologies in the surveyor training.

Figure 20. Screenshot Form 3, Item 3
To obtain an even more detailed perspective on travel behavior in each area, detailed case study interviews should be conducted for a very limited number of households. These households should be identified as being of particular interest, once the household survey is completed. Households identified for case study interviews might include households with travel patterns typical of low-income communities, of disabled groups, or of other specific groups. The interviews will provide a more qualitative look into the specifics of the transportation system from the perspective of particularly interesting households.

Approximately 4 or 5 case study interviews should be conducted, each lasting approximately 30 minutes. More households should be identified for case study interviews, should some household not be available. Local residents should conduct the interviews in the local language. With permission, all interviews should be recorded. After the interview is complete, they should be stored in a secure electronic location, transcribed and translated into English.

For the case study interviews, the format of the interview can be looser to facilitate a nuanced view of the household and individual. To encourage a dialogue, the following questions can be used to begin and guide discussion:

- Describe your typical travel in a day
- How easy is it to move around the city?
- How safe do you feel getting around the city?
- What is the most difficult aspect of traveling in the city?
- What could be done to improve this aspect of travel?
- What are the obstacles to this type of improvement
- How has transportation changed for you in the last 10 years?
- What has gotten better?
- What has gotten worse?
- How have your transportation options affected where you live and work?
VI. Survey Data Encoding

Once the data has been collected, it must be cleaned and encoded to prepare for analysis. This corresponds to Step 3 in the use of TRAM.

A. Raw Data Field Cleaning

Once the raw data is collected in the field, the individual survey sheets should be reviewed for quality and completeness. Survey sheets that are incomplete, illegible, or otherwise detrimental to the results of the survey, should be removed. There is some discretion needed for this process, and the survey team should decide a minimum level of acceptability for survey results. The team should, however, decide on a single level of acceptability for all the surveys. This will ensure consistent level of quality for all survey results for each survey implementation.

B. Electronic Data Input and Validation

Once the surveys have been reviewed for initial quality, they must be input electronically. This can be a long process, and it is advisable to hire a data entry subconsultant to perform this duty. The data should be input into the Microsoft Excel survey data input file, as shown below. There are three survey sheets and five input forms (sheet 1 is divided into three input forms). The surveys forms for each of survey locations should be input into a separate Input File so that summary information can easily be obtained for each typology.
The input file will produce a set of summary statistics. The statistics should then be reviewed for each location to determine the logical validity of the results. Key features to examine are the average trip speed and trip lengths for each mode. Walking speeds, for example, that exceed the speeds of motorized trips should be reexamined for accuracy. Excessively long walking or cycling trips may also be suspect. Again, trips that do not make sense should be removed from the results. It is up to the discretion of the reviewer to determine a metric of acceptability for data. The metric, however, should be applied uniformly to all data.

C. Neighborhood Level Data Mapping

Once the survey data has been fully converted to electronic form, it should be mapped using Geographic Information System (GIS) software. First, maps should be created showing the following information for surveyed neighborhoods in the city:

- **Mode Share:** In each neighborhood, a map can be made showing the mode share for walking, cycling, transit, paratransit, 2-wheeler, and automobile to quickly highlight areas with higher and lower percentages of trip made by each mode.
- **Trip Origins and Destinations:** First, a set of maps can be made showing the trip origins and the trip destinations from the survey. Then, using the Network Analyst or similar extension for GIS, a map can be made showing likely desire lines between origins and destinations. This requires a table of the origins and destinations as well as a georeferenced street network.
- **Bottlenecks:** A map of potential bottleneck can be created quickly by adding the number of desire lines that pass through each street and displaying the streets accordingly.

All maps should include local features such as waterways and major streets and roads that provide context to the reader.
VII. Evaluating the Current State of Mobility

Evaluating the current state of mobility in the city is Step 4 of the TRAM methodology.

| Step 1: Meet with relevant stakeholders | Establish early coordination within the city  
|                                        | Collect city-level data  
|                                        | Interview key stakeholders and local experts |
| Step 2: Data collection at the selected neighborhoods | Identify areas for detailed data collection  
|                                                    | Conduct focus group discussions and household surveys in selected neighborhoods  
|                                                    | Conduct in-depth interviews with households selected from the survey |
| Step 3: Survey Data encoding | Input and collate the data gathered from the surveys and focus groups into electronic form  
|                                                    | Map origins & destinations, and other features to place them in context of the city & local neighborhoods |
| Step 4: Evaluation of current state of mobility | Transform survey data into citywide statistics  
|                                                    | Use summary statistics and knowledge gained from FGDs and city meetings to provide a picture of the current state of mobility in the city  
|                                                    | Map location of existing transportation issues |

Figure 23. Steps of the TRAM Methodology

To evaluate mobility across an entire city, the data for citywide characteristics and data from the input files for each of the survey locations must be input into the Summary Statistics portion of the tool. This is an Excel-based method of transforming neighborhood-level results so that they represent the city as a whole. From this data and the input from major stakeholders, focus group discussions, and follow-up interviews, citywide maps can be created showing the existing issues in the city.

A. Transform Data into Citywide Statistics

To assess mobility across the city, data from the neighborhood surveys must be transformed to roughly represent the entire city.

Citywide data was calculated at the beginning of the survey process in Section IIc, will be organized by each of the 12 unique community types, which are combinations unique typologies. This should be input into the Scaling Up tab of the TEEMP-City tool.

<table>
<thead>
<tr>
<th>% distribution of households</th>
<th>Trip mode per person</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bus</td>
</tr>
<tr>
<td>Low income-Core-Good access</td>
<td>6%</td>
</tr>
<tr>
<td>Low income-Core-Bad access</td>
<td>8%</td>
</tr>
<tr>
<td>Low income-Peripheral-Good access</td>
<td>8%</td>
</tr>
<tr>
<td>Low income-Peripheral-Bad access</td>
<td>6%</td>
</tr>
<tr>
<td>Middle income-Core-Good access</td>
<td>9%</td>
</tr>
<tr>
<td>Middle income-Core-Bad access</td>
<td>8%</td>
</tr>
<tr>
<td>Middle income-Peripheral-Good access</td>
<td>1%</td>
</tr>
<tr>
<td>Middle income-Peripheral-Bad access</td>
<td>1%</td>
</tr>
<tr>
<td>High income-Core-Good access</td>
<td>12%</td>
</tr>
<tr>
<td>High income-Core-Bad access</td>
<td>6%</td>
</tr>
<tr>
<td>High income-Peripheral-Good access</td>
<td>9%</td>
</tr>
<tr>
<td>High income-Peripheral-Bad access</td>
<td>9%</td>
</tr>
</tbody>
</table>

Figure 24. Sample Typology Distribution Input
The household survey input file will produce summary statistics for the parameters below and others which are used as inputs for the TEEMP-City analysis portion of the tool. The following figures show a sample of the data produced by the input file:

The full list of indicators produced by the input file is shown below.

### Summary of Transport Characteristics

#### Average number of stages per trip

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 21</td>
<td>2.16</td>
<td>1.79</td>
<td>1.97</td>
</tr>
<tr>
<td>21 to 60</td>
<td>1.92</td>
<td>2.04</td>
<td></td>
</tr>
<tr>
<td>61 and above</td>
<td>1.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>1.96</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Mode share By number of trips (Stages)

<table>
<thead>
<tr>
<th></th>
<th>below 21</th>
<th>21 to 60</th>
<th>61 and above</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>22.2%</td>
<td>10.7%</td>
<td>11.5%</td>
<td>14%</td>
</tr>
<tr>
<td>Female</td>
<td>28.1%</td>
<td>8.7%</td>
<td>4.2%</td>
<td>5%</td>
</tr>
<tr>
<td>Bus</td>
<td>37.8%</td>
<td>38.2%</td>
<td>69.8%</td>
<td>47%</td>
</tr>
<tr>
<td>Car</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Walk</td>
<td>3.3%</td>
<td>6.3%</td>
<td>10.4%</td>
<td>27%</td>
</tr>
<tr>
<td>2 Wheeler</td>
<td>6.7%</td>
<td>15.6%</td>
<td>5.4%</td>
<td>6%</td>
</tr>
<tr>
<td>Auto Rickshaw</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Figure 25. Sample Output of Travel Characteristics

### Per capita trip rate

This is defined as the average number of daily trips taken by each person. The input file produces average per capita trip rates for the following:

- **Trips** - “one-way course of travel from one place to another with a single main purpose” (Rofique, et al. 2011) and is defined based on the activity/purpose of the trip
- **Trip stages** – Defined as the separate components of a single trip. Stages of a trip are distinguished by changes in mode but within a single trip all move towards the same destination with the same purpose/activity.

For example, a person going to the office for work who: a) walks to the bus stop from his house, b) rides the bus and c) walks again from the bus stop to the office building is considered to have made one trip that consists of three stages. This data is especially helpful when tracked over time and combined with population growth rates to create a picture of aggregate transportation demand in the future.

### Mode share

Mode shares give good insights on the type of travel that prevails in cities and is especially useful for understanding which modes should be encouraged and discouraged with additional investment. It is traditionally calculated using the primary mode of each trip. This tends to under-represent non-motorized transport modes, which are almost never considered the “primary” mode. The TRAM, however, calculates the mode share based on door-to-door trip segments, with all segments weighted equally. For example, a trip that involves a 10 minute walk, a 20 minute bus ride, and a 5 minute auto rickshaw ride will count as one walk segment, one bus segment, and one auto rickshaw segment. This method places a greater emphasis on walking and other non-motorized transport modes. While a relatively small number of trips occur solely by walking, walking accounts for a large portion of travel, especially for lower-income communities and women. This method attempts to better accounts for those trips.

Mode Share is also calculated as a percentage (%) share of each transport mode per passenger kilometer. This gives a sense of the distance covered by each mode.

### Average trip length

The average trip length is determined through a direct question in the survey about travel distances for trips over the course of a day. This piece of data should be viewed with some skepticism, as many people have difficulty estimating trip segment distances. Two types of trip length summary statistics are produced from the input sheet:

- Average trip length of trips (km)
- Average lengths of trip stages (km)

Average trip length is a very helpful piece of data to understand for analyzing the types of transport investments needed (NMT for short trips, transit for longer trips), the types of urban development required. For instance, a city with very long trips may need more affordable housing developed near jobs and more amenities near residential areas.
Average travel time

This indicator refers to the average travel time for each mode used for completing each trip stage (minutes). This metric is especially useful to understand the performance of various modes. If, for instance, bus speeds are very low, investments like BRT may speed them up considerably. Also, some people might have a better sense of the time they spend on transportation, rather than the distance (km).

Average daily cost of transportation per capita

This refers to the actual cost of transportation per day per capita. Cities with high daily cost of transport may require special initiatives, such as investment in lower-cost modes, subsidies, or fare policies to ensure transport is not causing undue financial stress on citizens.

Average % of income spent on transport

This is the total costs of daily travel for all members of the household (based on Form 2) multiplied by 30 expressed as a % of the total monthly household income (based on form 1).

Others

Summary statistics on the following are also calculated:

- Basic characteristics of the household (average number of members; distribution of members by sex, age)
- Average household income
- Occurrence of accidents
- Vehicle ownership

These indicators provide important insight for the policy makers regarding the availability, accessibility, affordability and acceptability of transportation in the city. They can also break out specific characteristics useful for analysis of interventions. These characteristics include:

- The number & percent of people with long (> 20 minute) transit/paratransit trips or trip stages,
- The number & percent of people with short (< 20 minute) transit/paratransit trips or trip stages,
- The number & percent of people with long (> 15 minute) walking trips or trip stages,
- The number & percent of people with short (< 15 minute) walking trips or trip stages, and
- The number & percent of people who live in households that own a motor vehicle.

Once they are input into the modified TEEMP-City model, they will produce estimates for the characteristics for the city as a whole, as shown in Figure 26, below.
Based on the results from the different neighborhoods surveyed, the survey team can begin to develop a picture of the city as a whole. This will include averages for the indicators above as well as the feedback gathered from the focus group discussion and the qualitative questions from the household survey. These can be used by transportation planners and other experts in the field to evaluate existing transportation characteristics and assess problems in the city. For example, from the data the mode share can be determined for the city as a whole as well as by income group, centrality, and access to transit, and all combinations of these. A city with a much higher mode share for cycling within low-income groups but not in the middle- and upper-income groups may show that many low-income people are using bicycles due to a lack of other options and replace them with other modes as soon as they can afford to do so. A city with much higher bus commute times in central areas than for more peripheral areas may have problems with congestion on bus routes.

B. Map Citywide Transportation Patterns

The results from the citywide data can then be mapped across the city. A variety of maps can be created to show the geographic locations of areas with different characteristics. Maps can specifically be made for the following categories, among others, for each area:

- Average trip length of trips (km)
- Average lengths of trip stages (km)
- Mode Share
- Average household income
- Occurrence of accidents
- Vehicle ownership

Again, important features, such as bodies of water and major transportation infrastructure should be included on the maps to provide context. The maps, however, will be limited to data for each typology, commonly resulting in 12 typologies, each with the same characteristics in each location across the city. For example, all areas with the central/low-income/good transit access typology will have the same mode share, trip lengths, and other characteristics across the city. These maps will show geographical trends in mobility across the city. Data from the From this data and the input from major stakeholders, focus group discussions, and follow-up interviews, citywide maps can be created showing the existing issues in the city.

C. Review and Analyze Results

Before beginning a review, city officials should reflect on the goals of a transport system, which is to provide individuals and businesses with efficient access to markets as well as economic and social opportunities while minimizing negative externalities like pollution, crashes, and costs. The analysis of the data collected with the TRAM should keep this definition in mind. In their analysis, planners and city officials must examine the summary statistics, focus groups and interview summaries, and city maps, and ask themselves the following questions, which are related to those asked at the beginning of the process:

- How well does the existing transportation system meet the definition above?
- Where is the transportation system performing well?
- Where is the transportation system performing poorly?
- What groups & neighborhoods are best served by the current transportation system?
- What groups & neighborhoods are least served by the current transportation system?
- What aspects of transportation are getting better?
- What aspects of transportation are getting worse?
- What problems are described by each group?
- How does the data compare to existing views of the city government?
- What kind of city is envisioned for the future?

The last question can provide an excellent means of analyzing the results of the data collection. City officials can compare the data from their city to data from cities they wish to emulate. For example, when examining a city's street grid, planners might refer to the UN-Habitat’s forthcoming paper The Relevance Of Street Patterns And Public Space In Urban Areas, which surveys existing street grid networks in cities across the globe, in both highly
developed and developing countries. The same can be done for safety statistics. Many cities publish their crash rates, and officials using TRAM could compare the crash and injury rate in the sample population to that in cities that they wish to emulate.

An analysis of the results can be a first step towards developing an effective plan to improve transportation in the city. By understanding the existing problems in a city, including problems that are not as visible or as well discussed, officials are much better prepared to formulate effective solutions to those problems.
VIII. Review and Next Steps

This final section provides an overall assessment of the tool in its present state, examining its strengths, weaknesses, and opportunities for improvement. Then, a course of action for future use of the tool is plotted.

A. Strengths

The Tool for the Rapid Assessment of Urban Mobility provides a quick method of gathering data needed for transportation planning in cities without the time or resources to pursue more robust data collection efforts. The test of the tool in Nashik was conducted over the course of a single week, while a full-scale mobility survey can take over a year to complete, even in well-funded scenarios in highly-developed countries. Typical citywide mobility surveys have been conducted at rates ranging from approximately one survey per 60 people to one survey per 500 people. By contrast, the test of the survey in Nashik, India was conducted at a rate of approximately one survey per 1,500 people, roughly a third the number of surveys as the lowest level of traditional household travel surveys. Through the neighborhood typology method, the tool reduces the amount of time and resources needed to collect transport data in a city. While the results of a traditional household survey are more statistically rigorous, the TRAM methodology provides highly relevant and detailed information for cities that lack the resources to perform large-scale surveys. Through the relatively simple and low-cost methodology, the TRAM lowers the barriers for data collection and analysis in a city, greatly improving transportation planning.

By having both a data-driven and discussion-driven approach, the tool provides a level of redundancy, which also strengthens the validity of the results, despite a smaller sample size. In addition, the tool can also be applied incrementally across a city, as funds become available. In this way, if higher-quality data is needed for neighborhoods not covered in the initial implementation, they can be surveyed later as funds become available. Eventually, the entire city can be surveyed in detail.

Another important feature of the tool is that it systematically highlights the mobility needs of frequently overlooked groups such as women, children, and the poor, and provides a framework for addressing those groups directly. The methodology specifically calls for surveys to be conducted in low, medium, and high-income districts. The focus group discussions also address the problems facing disabled, impoverished, and other disadvantaged groups. Through a high level of detail about transportation for these often neglected groups, a city can obtain the information necessary to improve conditions for poor and otherwise disadvantaged groups in a more effective manner.

B. Weaknesses

The TRAM was revised and improved as a result of a test in Nashik, India. Despite these improvements, the tool has some shortcomings which may lessen its effectiveness. The following section describes those weaknesses.

TRAM is intended as a “shortcut” planning tool. While it quickly highlights existing issues in the city, it is less able to address long-term problems facing a city. A growing city will expand in population, area, and wealth, bringing about rapid changes to transportation pattern. This may make existing problems worse and may cause entirely new problems. As a rapid assessment tool, however, the TRAM only addresses existing problems.

In addition, the tool refrains from providing in-depth guidance on interpreting the citywide survey and data collection results, due to the near infinite number of conclusions that could be reached from the interviews, survey and FGD results. This analysis was beyond the ability of the tool to assess in an accurate, useful manner. Instead, the task is left to planners and other experts in the field who are trained to examine such results and draw appropriate conclusions. To help future analysis, the TRAM package includes the TEEMP-City tool, which can be used to analyze future transportation plans for the city. The development of these plans is a separate step, outside of the tool.

To develop citywide statistics, the tool requires each city to be classified based on income, transit access, centrality, and density. While the transit access and centrality appear to be relatively simple to delineate based on local knowledge and available data, the income...
classification can be quite difficult to assess on a neighborhood level. According to the methodology, a team of local experts should provide information about income levels and densities across the city, but the test of the tool in Nashik showed that it can be difficult to assemble a team of experts with a combined knowledge of the entire city. For larger cities, this is a bigger problem. Without experts, ad hoc methodologies must be developed to obtain a reasonable estimate of the citywide characteristics. Further, income levels in neighborhoods may not always be highly uniform.

By sampling a small number of neighborhoods and extrapolating the results to neighborhoods with similar characteristics, the tool can, in theory, only provide lower-confidence results than a more typical approach. However, the exact confidence level of this approach is difficult to know. The methodology assumes that each surveyed area is representative of a specific typology as it exists across the entire city. With careful guidance when selecting survey locations, this can be generally true, but it is nonetheless an assumption that is exposed to error. When applied to larger cities or if applied without careful selection of survey neighborhoods, the tool could extrapolate characteristics not typical of each typology, skewing the results for the city. It is also possible that a city could have significant variations in travel patterns among neighborhoods of the same typology. The typologies were carefully crafted to minimize this issue, but it remains a possibility.

C. Potential Improvements and Additions

The testing of the model showed that this data collection methodology presents a highly-effective means of quickly gathering detailed data about mobility in a city at a greatly reduced cost compared to traditional household travel surveys. To continue to improve the tool, several items below are proposed as additions that could add to the tool’s effectiveness.

A more intense revision to the data collection methodology could include the expanded use of technology, which could save time and money, if done effectively. Since the TRAM was first commissioned, a number of new applications (apps) have been developed to improve the data collection process. First, there are several survey apps, such as “iSurvey” (https://www.isurveysoft.com/), which allow users to define survey questions and have data immediately ready for digital use, saving time and money in the data processing step. Apps could be developed to direct surveyors to specific locations, using GPS, ensuring a highly random sample and less time spent searching for locations and training surveyors. With greater productivity from these apps, a greater number of surveys could be performed, increasing the accuracy of the data collection.

To further improve the data collection methodology, transit and walkability survey apps could be employed to provide more detail about existing conditions for these modes. Transit Wand (http://transitdata.openplans.org/) and similar apps streamline the process of gathering data about existing public transportation networks. With this tool, surveyors can board a mass transit vehicle and automatically record route information to quickly develop transit maps, transit schedules, and other information useful to evaluating a city’s existing transit network and developing improvements. Walkability apps allow a surveyor to quickly assess the walking conditions in a given area. This allows the walking facilities in a city to be compared to one another to develop more specific notions of where improvements are most needed.

The combination of these improvements would result in an even more robust data collection tool, capable of collecting more data, quicker, and with a higher level of accuracy. The improvements would also help to place a better geographical reference for the analysis of existing conditions and potential improvements.

D. Conclusion and Next Steps

The initial test of the tool and subsequent analysis indicates that the TRAM can provide a quick and inexpensive way to assess transportation conditions in developing cities. The tool development team recommends implementing the TRAM tool in another data-poor city that is markedly different than Nashik, the original test location. This will allow the tool to be further refined to ensure that it can be applied successfully in a variety of contexts. After a second round of testing, the tool will likely be ready for more widespread use.
References


Godard, X., L. Diaz-Olvera, A. Dieng and Cisse Kane. 2001. Guidelines for Household Travel Survey in Developing Countries.


United Kingdom Department for Transport. 2011. National Travel Survey: 2010 Notes and Definitions


Appendices
Appendix 1: Survey Form 1

FORM 1: HOUSEHOLD INFORMATION

<table>
<thead>
<tr>
<th>Interviewer(s):</th>
<th>Household ID:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of interview:</td>
<td></td>
</tr>
<tr>
<td>Time of interview:</td>
<td></td>
</tr>
</tbody>
</table>

Instruction: To be completed by an adult in the household, 18 years old or above

- **Name** *(optional)*
  - Family Name (Surname)
  - First Name

- **Address**
  - No.
  - Street (if available)
  - Neighborhood/Area Name
  - # years at current home
  - Own / Rent

- **People inside the household**

<table>
<thead>
<tr>
<th>Household member #</th>
<th>Occupation</th>
<th>age</th>
<th>male</th>
<th>female</th>
<th>Age / Pain / Disability that affects travel?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>shopkeeper</td>
<td>35</td>
<td>x</td>
<td></td>
<td>(leave blank if none)</td>
</tr>
</tbody>
</table>

- **Household EXPENSES** per month in local currency *(circle one)*
  - 0-5,000
  - 5,000-10,000
  - 10,000-15,000
  - 15,000-20,000
  - 20,000-25,000
  - 25,000-30,000
  - >30,000

- **Household Transport EXPENSES** per month in local currency *(circle one)*
  - 0-2,500
  - 2,500-5,000
  - 5,000-7,500
  - 7,500-10,000
  - 10,000-12,500
  - 12,500-15,000
  - >15,000

- **Vehicles owned**

<table>
<thead>
<tr>
<th>Type of Vehicle (circle one)</th>
<th>Fuel Type (circle one)</th>
<th>Year</th>
<th>Fuel Efficiency (km/liter, if known)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR - Auto Rickshaw 2-Wheeler</td>
<td>P - Petrol D - Diesel L - LPG E - Electric O - Other</td>
<td>2009</td>
<td>55</td>
</tr>
<tr>
<td>AR - 2-Wheeler</td>
<td>P - D - L - E - O________</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AR - 2-Wheeler</td>
<td>P - D - L - E - O________</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AR - 2-Wheeler</td>
<td>P - D - L - E - O________</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AR - 2-Wheeler</td>
<td>P - D - L - E - O________</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Accidents**

Have you or any of your household members been involved in a road / traffic accident in the past year?

<table>
<thead>
<tr>
<th>Number of times</th>
<th>Who in the household <em>(Household member #)</em></th>
<th>Situation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>While walking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>While cycling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When inside a public transport vehicles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When inside a private vehicle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other, please specify</td>
</tr>
</tbody>
</table>

The Tool for the Rapid Assessment of Urban Mobility
## Appendix 2: Survey Form 2

**Form 2: Household Member Information**

**Interviewer:**

**Household ID:**

**Instruction:** To be completed by an adult in the household, for each of the member of the household whose travel patterns are known.

**Travel Information:** Please ask whether the trips listed below refer the last week day trip or normally what the person’s trips look like.

<table>
<thead>
<tr>
<th>C</th>
<th>Purpose of the Trip (circle one):</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>go to Work</td>
</tr>
<tr>
<td>M</td>
<td>go to Market</td>
</tr>
<tr>
<td>S</td>
<td>go to School</td>
</tr>
<tr>
<td>F</td>
<td>meet Friends</td>
</tr>
<tr>
<td>H</td>
<td>go back Home</td>
</tr>
<tr>
<td>O</td>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STAGE</th>
<th>What time did you leave?</th>
<th>Where did you start the trip? (area name)</th>
<th>How far did you travel for each stage? (circle m or km)</th>
<th>Most mode did you use for each stage? (circle one)</th>
<th>How many minutes?</th>
<th>How far did you travel for each stage? (circle m or km)</th>
<th>Public transport: How much did you pay? (local currency)</th>
<th>Describe the locations of any major bottlenecks (slow or difficult sections) in the trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6:30 am</td>
<td>Govind Nagar</td>
<td>W - go to Work</td>
<td>W C B AR 2 4</td>
<td>2</td>
<td>100 m</td>
<td>16</td>
<td>Intersection of MG Rd &amp; Tilak Rd</td>
</tr>
<tr>
<td>2</td>
<td>2:00 pm</td>
<td></td>
<td>W - go to Work</td>
<td>W C B AR 2 4</td>
<td>5</td>
<td>7 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3:00 pm</td>
<td></td>
<td>W - go to Work</td>
<td>W C B AR 2 4</td>
<td>7</td>
<td>10 m</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4:00 pm</td>
<td></td>
<td>W - go to Work</td>
<td>W C B AR 2 4</td>
<td>8</td>
<td>100 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5:00 pm</td>
<td></td>
<td>W - go to Work</td>
<td>W C B AR 2 4</td>
<td>5</td>
<td>7 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6:00 pm</td>
<td></td>
<td>W - go to Work</td>
<td>W C B AR 2 4</td>
<td>7</td>
<td>10 m</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7:00 pm</td>
<td></td>
<td>W - go to Work</td>
<td>W C B AR 2 4</td>
<td>8</td>
<td>100 m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3: Survey Form 3

Question 1: What are your attitudes about transportation in your city? (read out the choices - circle the response)

<table>
<thead>
<tr>
<th>Options</th>
<th>strongly disagree</th>
<th>neutral</th>
<th>strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The streets in my area have usable footpaths.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I feel safe walking in my area.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>It is easy for me to reach places by walking.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>The streets in my area are shaded and pleasant.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I feel safe crossing the street.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Only poor people bicycle in my area.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I feel safe bicycling.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Secure bicycle parking is available in my area.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>It is easy for me to reach many places by bicycle.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Public transport access was important factor in choosing where my family lives.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>There is frequent bus service at bus stops near my house.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I feel safe riding the bus.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Buses in my area are too crowded.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I feel that bus fare is a good value.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I feel safe going by shared auto</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Finding a shared auto is convenient</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Shared autos in my area are too crowded</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I feel that shared auto fares are a good value.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>The air in my city is clean and healthful</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I feel that vehicles in my city are highly polluting.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Question 2: What course should your city take to improve transportation?

Rank the following improvements in order of importance to you within each category.

**Walking**

- Pedestrian walkway improvements and continuity
- Even level changes at crossings
- Clean and clear street edges
- Breakers to reduce vehicle speeds
- More trees and greenery
- Lighting for safe walking at night
- Seating in public areas

**Autorickshaw / Shared Auto**

- Lower fare
- Greater safety
- More auto stands close to you (home / office / school / etc)

**Public Transport**

- Less waiting time
- More seating
- Greater safety
- Lower fare
- More bus stops close to you (home / office / school / etc)
- Improve transfer facilities between transport modes

**Cycling**

- Network of separate tracks for bicycling
- Secure bicycle parking facilities construction
- Bicycles available for short-term (30 minutes) borrowing

**Question 3: Built Environment**


Parking: □ None □ Space for 2-Wheelers □ Space for Cars

Floor area of the unit: ________________

Typology:

- □ Row house: old city □ Row House: rest of city □ Govt. staff flat
- □ Govt. built flat: LIG □ Govt. built flat: MIG □ Bungalow □ Slum
- □ Private flat w/ boundary wall □ Mixed-use building w/o boundary wall
# Appendix 4: Focus Group Discussion: Form for Notes

<table>
<thead>
<tr>
<th>Area:</th>
<th>Start time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>End time:</td>
</tr>
<tr>
<td>Group:</td>
<td>Moderator:</td>
</tr>
<tr>
<td>Number of participants:</td>
<td>Note taker:</td>
</tr>
</tbody>
</table>

Seating chart: (Draw the seating arrangement and assign codes or names to the seats of the participants)

<table>
<thead>
<tr>
<th>Question no.</th>
<th>Responses</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>