

NMT Guidance Document



**CONSULTANCY SERVICES FOR DEVELOPING GUIDANCE
DOCUMENTS FOR TRANSIT ORIENTED DEVELOPMENT (TOD),
NON-MOTORISED TRANSPORT (NMT) AND PUBLIC BICYCLE
SHARING (PBS)**



Non-Motorised Transport Guidance Document

Cover page:

Well designed walkable environments
offering direct, comfortable, and vibrant
routes to destinations

Source: Adapted from Town Centre Master Plan,
Bhubaneswar, prepared for BDA, by IBI Group



Prepared for Ministry of Urban Development, Government of India
By IBI Group, in association with iTrans

Foreword

Prior to the launch of the National Urban Renewal Mission (2005) and the National Urban Transport Policy (2006), investments in public transportation systems to meet the mobility needs of the current and future population were limited in Indian cities. Planning for essential city systems — environmental, land, mobility, economic and social — has largely been attempted in piecemeal manner. The need to induce a paradigm shift, putting people first in planning our regions, cities and neighbourhoods, implies providing for increased mobility choices from dependence on private vehicles to the availability of good public transportation and safe non-motorised transport.

Non-Motorised Transport (NMT) is a foundational sustainable mobility concept that prioritizes planning for walking and cycling over automobiles. This NMT Guidance Document presents a compendium of strategies and recommendations for integrating accessibility with land use and infrastructure investment decisions in shaping NMT-friendly street designs. It also identifies a five-step planning process for local authorities, central government agencies and development professionals to follow in implementing transit oriented development projects.

This Guidance Document brings out clarity in the discourse around promoting NMT in Indian cities by analyzing challenges encountered in attempting to invest in pedestrian and cycling infrastructure around the country. The purpose is first to document the state of the practice and finally to assemble the resources necessary to assist cities, transit agencies and professionals who wish to embrace NMT as a sustainable mobility concept.

It is of utmost importance that the knowledge contained in this document is transferred to on-the-ground practices to bring about sustainable changes in urban development in India's cities.

Preface

The Guidance Documents for preparing Non-Motorised Transport (NMT) plans, Transit Oriented Development (TOD) plans and Public Bicycle Sharing Schemes (PBS) have been undertaken by the Sustainable Urban Transport Project, Ministry of Urban Development (MoUD), Government of India (GOI) with support from Global Environment Facility (GEF), UNDP and World Bank. The primary objective of GEF-SUTP is to apply National Urban Transport Policy principles to achieve a paradigm shift in India's urban transport system for more favourable sustained developments and alternatives.

Under the guidance of MoUD, these documents are envisioned to assist various government organizations, public authorities and development professionals in India, embarking on the process of integrating sustainable transport planning principles in diverse urban contexts. In addition, central government officials and representatives may refer to these documents when evaluating the implementation of the Smart City Mission in selected cities and future policy formulation initiatives by think tanks such as NITI Aayog.

A state of the art review was conducted as a first step to highlight successes and failures in application of NMT, TOD and PBS globally and in Indian cities. Building on the lessons learned from these experiences, the focus of the Guidance Documents was directed to establish a systematic process for plan preparation, serving more as an implementation manual with checklists of potential alternatives, rather than providing technical standards for development of detailed specifications. Based on local conditions, it is expected that state, city and special authorities will adapt the steps presented in the Guidance Documents to each city's own individual situations.

This Guidance Document on preparing NMT Plans goes beyond discussing the principles and includes a step-by-step planning process, supported with tools for quick reference and application of standards in Indian cities. To test the practical value of the guidance document in Indian cities, NMT city specific plans were also prepared for Aizawl and Visakhapatnam. This document serves as a handbook of ideas and strategies for promoting NMT as the foundation for creating sustainable cities in India.

Acknowledgment

The NMT Guidance Document was prepared under the direction of Shri. Rajiv Gauba (Secretary, MoUD), Shri. Durga Shanker Mishra (Additional Secretary, UD), Shri. M.K.Sinha (OSD, UT), Shri. R.K.Singh (Director, UT-I), Shri. I. C. Sharma (National Project Manager, PMU, SUTP), Shri. Sudesh Kumar (Team Leader, Project Management Consultant, SUTP) and Ms. Nupur Gupta (Team Leader, World Bank).

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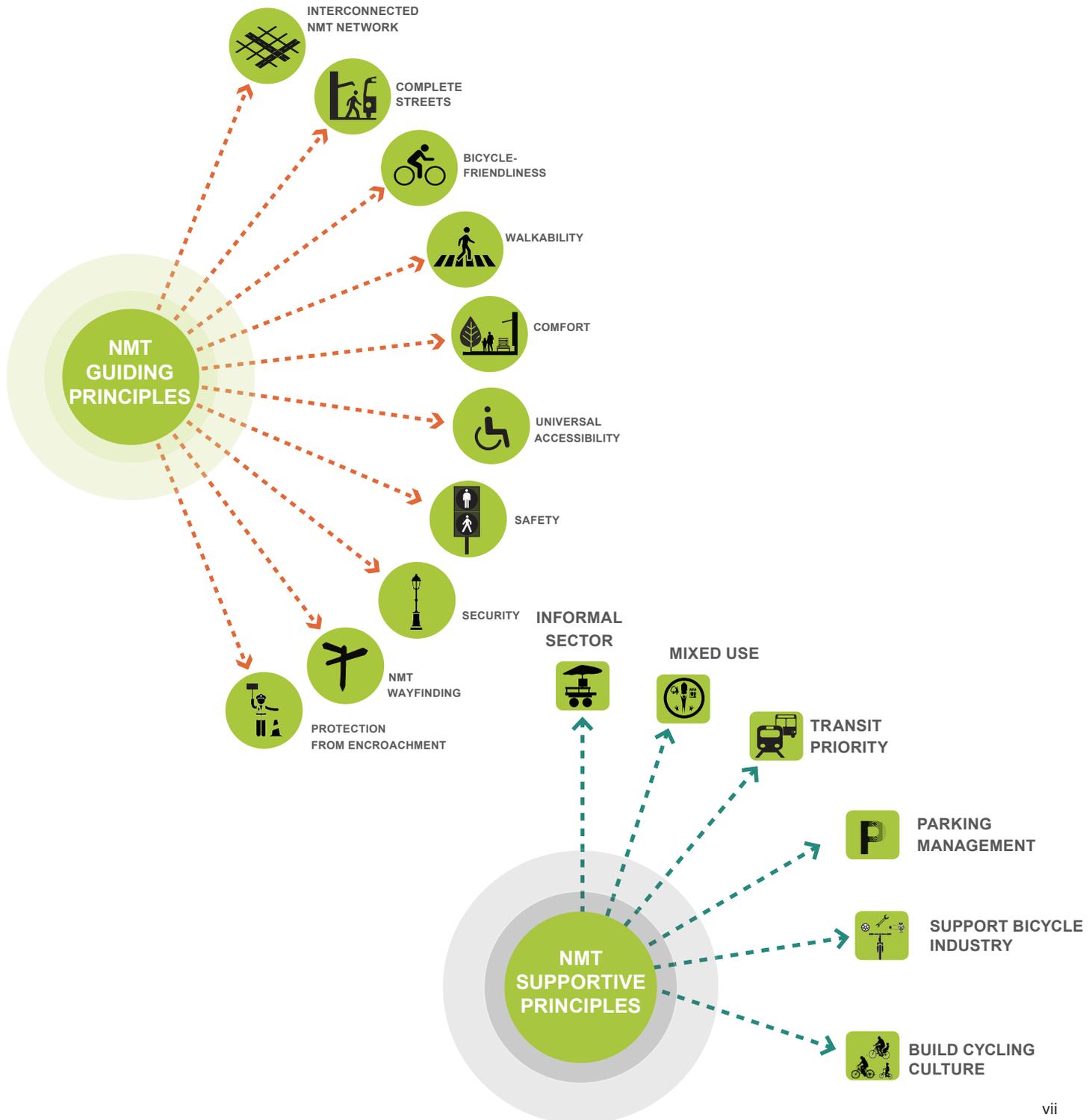
EXECUTIVE SUMMARY

DEFINING NON-MOTORISED TRANSPORT

Non-Motorised Transportation, better known by its acronym NMT, means far more than simply walking and cycling in the Indian context. It encompasses a wide array of people on streets riding in cycle rickshaws, pulling handcarts, selling wares on vending carts, riding handicap tricycles and bullock carts. All of these modes conflict with a number of motorised modes on city roads, which lead to unsafe and congested conditions.

Principles of NMT

The document identifies 10 NMT Guiding Principles and 6 NMT Supportive Principles derived from a study of Indian urban conditions and global best practices of NMT design and planning.





This document goes beyond discussing the theory of NMT, especially as it relates to developing planning and design components. In order to capture the entire NMT process from feasibility assessment to completion, the step-by-step guide is organized into five key steps. Each step is further guided by a series of task-based actions that will assist cities in making informed decisions related to implementation of NMT infrastructure investments.



STEP-1

ASSESS



STEP-2

ENABLE

- 1 Review city characteristics and transport situation
- 2 Conduct review of current institutional support and regulatory environment
- 3 Map existing initiatives and their impact
- 4 Define scale and type of NMT Plan
- 5 Identify funding opportunities for undertaking NMT studies
- 6 Identify stakeholders and conduct an Actors analysis

- 1 Establish leadership support and project champions
- 2 Establish NMT Vision and time-bound targets
- 3 Identify and address policy barriers
- 4 Define planning methodology and delivery mechanism
- 5 Develop technical capacity





STEP-3

PLAN+DESIGN

- 1 Map existing infrastructure and develop NMT demand estimates
- 2 Conduct stakeholder workshops/ meeting(s) to revalidate vision
- 3 Identify gaps and plan rehabilitation/ expansion of NMT network
- 4 Formulate context-specific NMT proposals
- 5 Identify pilot projects and signature projects
- 6 Develop and compare current and horizon year alternative scenarios
- 7 Identify implementation and phasing strategy



STEP-4

INVEST

- 1 Prioritize NMT proposals for city budget allocations
- 2 Identify alternative financing sources
- 3 Develop incentives for private stakeholders to invest in NMT infrastructure
- 4 Establish budget allocations for NMT rehabilitation and maintenance



STEP-5

IMPLEMENT

- 1 Define clear roles and responsibilities for NMT development and maintenance
- 2 Conduct advocacy and awareness campaigns
- 3 Ensure high quality project delivery
- 4 Conduct NMT sensitization workshops with enforcement officials
- 5 Develop monitoring and evaluation framework to measure success



FREQUENTLY ASKED QUESTIONS (FAQs)

1. What is NMT?

Non-Motorised Transport (NMT), also known as active transport, refers to modes of transport which are powered by human power rather than other forms of energy like fossil fuels. NMT includes walking, cycling, cycle rickshaws (both passenger and goods), 4 wheel vendor carts, handcarts (for transporting goods), and even the tricycles used by persons with disabilities. The term cycling in this document is used generically, including all non- motorised vehicle (NMV) types.

2. Do we need to plan for NMT in cities?

Yes, walking and cycling are two of the most popular transportation modes in Indian cities. Everyone walks, even public transport and motor vehicle users have to walk the first or last kilometer. In most cities, the share of cyclists is also extremely high. Planning for NMT not only makes economic sense because of the high prevalent mode shares, but also contributes to social equity by improving accessibility to jobs and houses. In addition, NMT modes are completely non-polluting and help to reduce the environmental burden of the city.

3. Why should NMT require special attention in transportation planning in our cities?

Conventional planning approaches have focused on the movement of vehicles rather than people while a large percentage of trips in Indian cities, falling below 3 to 4 km lengths, are performed solely by walking and cycling. NMT modes are environmentally friendly modes that promote healthy lifestyles and economic independence. They also contribute to social equity by providing increased accessibility and mobility to all economic classes. Despite this, the importance and safety of pedestrians and non- motorised vehicles (NMVs) in Indian cities has been largely undermined. There is a severe need to realign planning priorities and pay special attention to NMT in transportation planning.



4. If modal shares of NMT are already high in Indian cities, why do we need to still plan for them?

Pedestrians and cyclists are the most vulnerable street users. The physical road conditions for walking and cycling in Indian cities are abysmal, despite having such a high modal share. These choices are a reflection of the captivity and lack of choices the commuters have due to low income levels and the unreliability of other systems like public transport. Given a choice, people will move out of walking and cycling to private motorised modes which have better support infrastructure. This is why economic development is leading to increased motorisation in our cities. The primary challenge of NMT in our cities is to convert this captive use to choice use by planning and designing better infrastructure and policy environments for them.

5. What are the different planning and design interventions that can be considered for NMT upgradation?

Typically, NMT facilities are planned and designed to include, for pedestrians: footpaths (sidewalks), pedestrian crossings, pedestrian (pelican) signals; and for cyclists: cycle lanes, cycle routes, cycle signals, cycle -parking, cycle rickshaw (passenger and freight) standing/parking areas, and other measures for universal accessibility, including barrier-free designs like ramps, audible signals, etc. Planning and design of NMT facilities have to be undertaken based on an assessment of city specific requirements. At a systemic level, NMT facility upgradation also includes integration with public transit and provision of public bike sharing facilities.

6. Cycling is not perceived as a mode of choice in Indian cities. Will provision of cycling facilities be beneficial?

Most of the captive cycling population in our cities come from lower income households. Consequently owning a motor vehicle is seen as a sign of economic success. It is important to disassociate cycling from this social stigma and promote it as a sustainable mode of choice. The availability of expensive and branded bicycles has already paved the way for a new generation of choice cyclists. In addition, like new road facilities induce travel demand, new user friendly and high quality cycling facilities can induce cycling demand, provided it is part of a comprehensive NMT upgradation plan comprising of multiple initiatives. Shift of motorized trips to cycling, even for short distances, will help reduce per capita CO₂ emissions.



Figure 2: Gurgaon Raahgiri Day, an initiative encouraging people to walk, cycle and relax, rather than driving

Source: Raahgiri Day: Facebook Album

7. Is it important to introduce segregated walking and cycling paths on narrow streets?

Yes. Segregated NMT facilities are safer, faster and offer a higher sense of security and thus encourage NMT travel. Irrespective of the character and widths of streets, walking and cycling needs to be prioritized over other modes. A continuous, appropriately wide, clear segregated footpath should be considered a core requirement for every street. Treatments such as segregated facilities or traffic calming measures are primarily decided based on service level parameters which will vary based on context. For example, if the street functions more like a residential access street, traffic calming measures can reduce speeds and allow for mixing of motorised and non-motorised traffic whilst ensuring NMT safety.

8. How can we promote walking and cycling in our cities?

Promotion of walking and cycling in cities require a multi-pronged approach which involves policy, planning, design and implementation. Some of the actionable steps taken by leading cities across the world which can help promote NMT usage are:

- Provision of dedicated, high quality and user friendly facilities such as shaded pedestrian pathways and cycle tracks supported by public amenities.
- Provision of a safe and secure environment such as parking of bicycles, street lighting and organized spaces for the informal sector
- Integration of walking and cycling facilities with transit
- Planning for compact and walkable neighbourhoods with mixed land uses
- Leveraging public events such as Car Free Day, Raahgiri, and other similar initiatives to promote the message of sustainable transportation
- Disincentivise usage of motorised modes by making motorists pay the full societal costs of their transport.

9. What are the ways in which National and State Governments provide support to NMT projects in Cities?

The National Urban Transport Policy states that the government should support:

“(i) construction of bicycle lanes and pedestrian paths; (ii) the construction of pedestrian crossings at busy intersections and road sections with busy traffic; and (iii) formulation and implementation of pilot projects for NMT improvement”.

These can be included as part of larger infrastructure projects, traffic management packages and any other investments which are financially supported by the Centre or the State under various programs – JnNURM, SUTP, Smart Cities, AMRUT, and other urban development or transportation funding programs. State Governments could also support smaller initiatives that reach out directly to the public such as Raahgiri and NMT user incentives through individual arrangements.



Figure 3: Ramps at crossings are provided along cycle tracks in Delhi for easy crossing

Source: iTrans

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ACRONYMS

AAI	: Airports Authority of India
AASHTO	: American Association of State Highway and Transportation Officials
ARRA	: American Recovery and Reinvestment Act
BBMP	: Bruhat Bengaluru Mahanagara Palike
BCA	: Building and Construction Authority
BMZ	: German Federal Ministry for Economic Cooperation and Development
BRT	: Bus Rapid Transit
CAD	: Computer Aided Design
CDPs	: City Development Plans
CMAQ	: Congestion Mitigation and Air Quality
CMPs	: Comprehensive Mobility Plans
CO ₂	: Carbon dioxide
CPWD	: Central Public Works Department
CRRRI	: Central Road Research Institute
CSE	: Centre for Science and Environment
DOT	: Department of Transportation
DULT	: Directorate of Urban Land Transport
EIA	: Environment Impact Assessment
EPA	: Environmental Protection Agency
EPCA	: Environment Pollution Control Authority
FAQs	: Frequently Asked Questions
FAR	: Floor Area Ratio
FHWA	: Federal Highway Administration
GHG	: Green House Gases
GIS	: Geographic Information System
HGV	: Heavy Goods Vehicle
HSIP	: Highway Safety Improvement Programs
HUD	: Housing and Urban Development
IIT Delhi	: Indian Institute of Technology Delhi
IPT	: Intermediate Public Transport
IRC	: Indian Road Congress
ISTEA	: Intermodal Surface Transportation Efficiency Act
IT	: Information Technology
ITDP	: Institute for Transportation and Development Policy
JnNURM	: Jawaharlal Nehru National Urban Renewal Mission
LCMP	: Low Carbon Mobility Plan
LGV	: Large Goods Vehicle
LRT	: Light Rail Transit
LTA	: Land Transport Authority
LTP's	: Local Transport Plans
MoUD	: Ministry of Urban Development
MPC	: Metropolitan Planning Committee

MRT	:	Mass Rapid Transit
MV	:	Motorised Vehicle
NACTO	:	National Association of City Transportation Officials
NAMA	:	Nationally Appropriate Mitigation Action
NDA	:	National Disability Authority
NDOT	:	National Department of Transportation
NGOs	:	Non-Government Organisation
NHAI	:	National Highway Authority of India
NHTSA	:	National Highway Transportation Safety Administration
NMSH	:	National Mission on Sustainable Habitats
NMT	:	Non-Motorised Transport
NMV	:	Non-Motorised Vehicle
NUTP	:	National Urban Transport Policy
NYC	:	New York City
O&M	:	Operations and Management
OEM	:	Original Equipment Manufacturing
PBS	:	Public Bicycle Sharing
PM	:	Particulate Matter
RoW	:	Right of Way
RTP	:	Recreational Trails Program
SEIAA	:	State Environment Impact Assessment Authority
SEZ	:	Special Economic Zone
SRTS	:	Safe Routes to School
STP	:	Surface Transportation Program
SUTP	:	Sustainable Urban Transport Project
TIGER	:	Transportation Investment Generating Economic Recovery
TNUDF	:	Tamil Nadu Urban Development Fund
TOD	:	Transit Oriented Development
TPDM	:	Transport Planning and Design Manual
TRIPP	:	Transportation Research and Injury Prevention Programme
ULB's	:	Urban Local Bodies
UMTA	:	Unified Metropolitan Transport Authority
UNFCC	:	United Nations Framework Convention on Climate Change
USDM	:	Urban Street Design Manual
UTTIPEC	:	Unified Traffic and Transportation Infrastructure (Planning & Engineering) Centre
VPUU	:	Violence Prevention through Urban Upgrading project

DOCUMENT ORGANIZATION

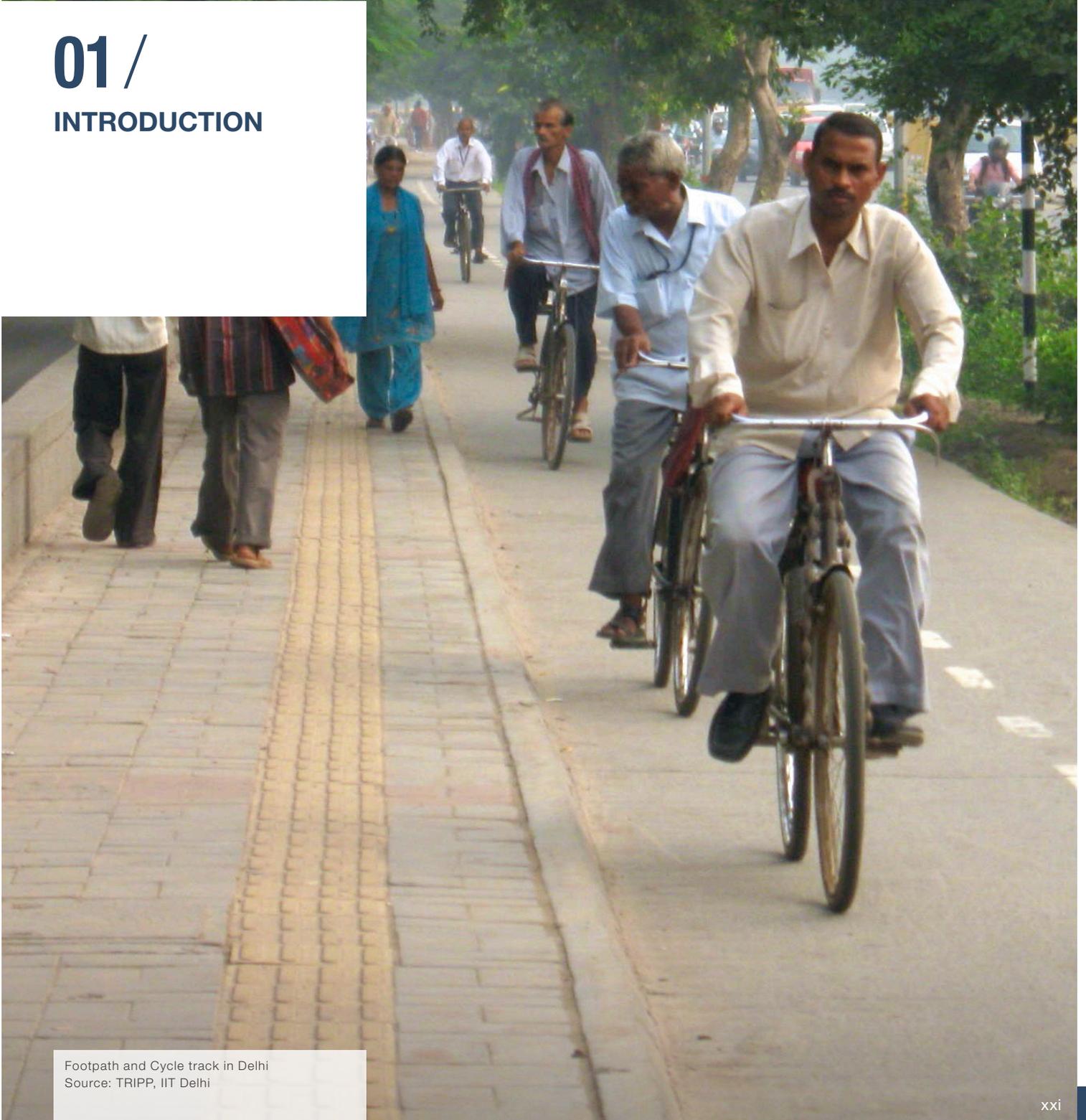
1	UNDERSTANDING NON-MOTORISED TRANSPORT	The Introduction chapter sets the stage for planning NMT through a general discussion of the concept's history, myths, and lessons learned from global practices and Indian experiences.	
2	NMT GUIDANCE DOCUMENT	The need, objectives, target users and structure of the step-by-step process detailed in the NMT Guidance Document is explained in this chapter.	
	NMT FRAMEWORK	3 ASSESS	'Assess' guides authorities for establishing baseline that needs to be carried out to understand the current status of the city.
	NMT FRAMEWORK	4 ENABLE	'Enable' provides the steps necessary to translate the policies into local actions and aims at building commitment and encouraging leadership to change culture and perceptions.
	NMT FRAMEWORK	5 PLAN + DESIGN	'Plan + Design' defines a flexible planning process that city may adapt based on the local context to undertake planning and implementation of NMT infrastructure at varying scales.
	NMT FRAMEWORK	6 INVEST	'Invest' explores the possible financing options that city could use to ensure that funding for NMT is given equal priority as urban roads.
	NMT FRAMEWORK	7 IMPLEMENT	'Implement' focuses on the various components of NMT implementation- from the organizational framework to community engagement, outreach, project management and monitoring and evaluation.

The document concludes with a compendium of survey formats, glossary of terms, best practice case studies, and PBS specifications

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01 / INTRODUCTION



Footpath and Cycle track in Delhi
Source: TRIPP, IIT Delhi

1.1 Background

The evolution of technologies dedicated to the movement of people and goods has brought about significant changes in people's lives. Forms of mobility that were not only convenient and easily accessible but also healthy and environmentally-friendly, have now been pushed quite literally to the anonymous edges of roadways worldwide. The growing popularity of the automobile in the last century has helped it take centre stage in planning for mobility. Traditional modes of travel like walking and cycling are less and less possible on roads engineered specifically for motor vehicles. The problems caused by increasing motorisation (namely congestion, accidents and pollution) however, have encouraged people to start reflecting on how Non-Motorised Transportation can become more of an option.

NMT refers to all modes of transportation that are not powered by a motor. This includes walking, cycling, and other Non-Motorised Vehicles (NMVs) that can attain limited speeds, i.e. less than 25km/hr. The importance of NMT as an affordable and environmentally friendly transport mode is increasingly being recognised for its great potential in reducing emissions, improving safety, and create more sustainable urban environments.

In Indian cities NMT not only suffers from general neglect and lack of attention from policy makers, urban planners, and engineers, but also suffers from the social stigma brought about by the captive nature of NMT use. NMT, therefore, needs to be understood and encouraged from a policy, institutional, planning, culture, and enforcement approach.



Figure 4: Various NMT Users

Source: IBI Group

URBAN CHALLENGES IN INDIA

Challenges with respect to implementing NMT infrastructure in India are a result of multiple factors. To begin, the transport sector policies in India are auto-oriented with over-emphasis on moving vehicles rather than on moving people. The economic policies favour the auto manufacturers, for example, easy access to automobile loans support personal vehicle ownership, which in turn promotes the usage of automobiles. Wider roads, high speed traffic and increased air pollution make it increasingly uncomfortable to walk and cycle in the city, thus forcing a negative modal shift towards motorisation.

The National Urban Transport Policy (NUTP) of 2006, envisions a new planning paradigm which recognizes that, “people occupy centre-stage in cities and all plans should be for their common benefit and well-being”. The objectives of mobility are no longer confined to improving speed. To implement the objectives of the NUTP, however, there are key on-ground impediments that need to be addressed urgently, including:

Imbalanced institutional support and capacity for auto-oriented policies: Several research and policy institutes in the country focus on the needs of the vehicular traffic & their road space requirement. Each major ULB has a department of transport which is primarily focused on registering vehicles, improving road conditions and ensuring fast mobility for vehicles. While there are clear and well established guidelines, that are understood and accepted by the city level engineers on how to design roads and parking for cars, similar knowledge and clarity on design of footpaths, cycle-ways and other NMT infrastructure is missing.

Road engineering knowledge typically comes from highway design manuals which make a minimal reference to the needs of urban roads. The Indian Roads Congress (IRC) codes and other official guidelines refer to designing NMT infrastructure, but do not emphasize the importance of it – it is not mandatory only advisory. As a result, in most cities, sidewalks are either not built or, if built, are quickly sacrificed to the increasing demand for wider roads for cars.

There is no institute or organization supported by government whose focus or area of concern is ensuring the safety & mobility of NMT users. Absence of laws for NMT is a major reason for non implementation/enforcement of guidelines for NMT. While motorised vehicles have a Motor Vehicle Act, NMT lacks a similar nature of legal backing.

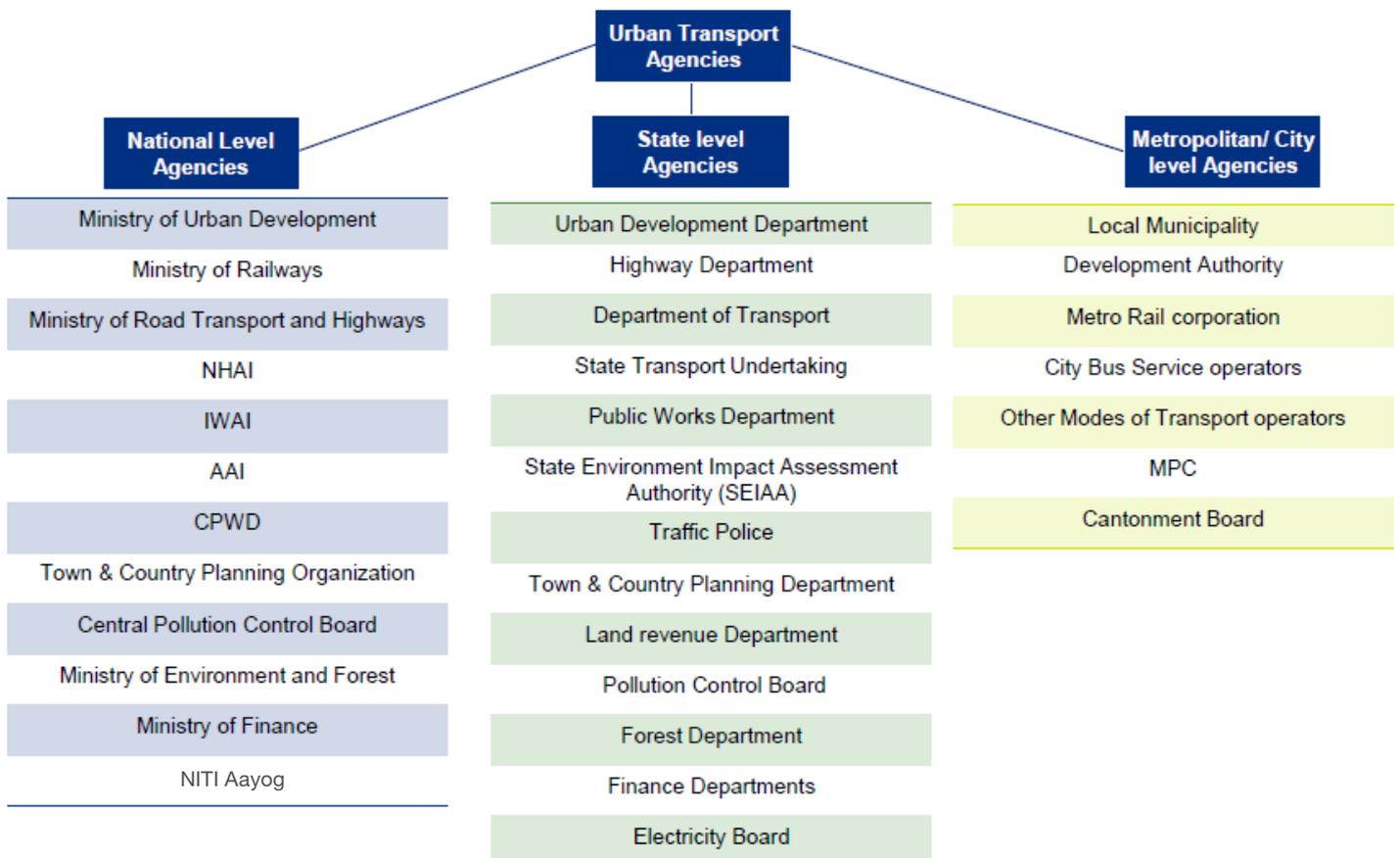


Figure 5: Diagram showing agency hierarchies in urban transport at national, state and city levels

Source: Laws and Authorities governing Urban Transport, Pranavant and Piyush Joshi, Deloitte, SUTP, GoI

Contested public spaces: The outer side of the road, or the slow moving side, is a highly contested space in Indian cities. The needs of the pedestrians and cyclists compete with conflicting demands like hawkers, parked cars and motorcycles, property access, shops' spill overs, advertisements; as well as essential demands of public utilities including electricity and lighting infrastructure, signage and traffic lights, and amenities like toilets and dustbins. Added to the mix are trees, vendors, auto rickshaw and cycle rickshaw stands, bus stops and street furniture. While all of these spaces need to be integrated in the street designs, the current engineering allocates most of the RoW to the motorised carriageway, leaving all these functions to fight for space on the meagre 1.5m shoulders left on the sides. As a result, pedestrians and cyclists are usually found on the carriageway since that is the only clear path available. This results in accidents, congestion and general chaos on the street.

Lack of sensitivity for vulnerable road users: The traffic system has been designed to increase motor vehicle speeds, at the expense of pedestrian and bicycle safety. Our cities make minimal use of traffic lights with zebra crossings and medians which provide a place for pedestrians to cross safely. Pedestrian barricades and one way streets have been used to facilitate long distance motorised trips, which simultaneously impose huge detours for short distance cycling and pedestrian trips.

In India, a large majority of those killed in traffic crashes are bicyclists and pedestrians. The share of pedestrian fatalities has been increasing since in 2004; 50% of traffic fatalities in Delhi were pedestrians and 10% were bicyclists (Pucher et al., 2005). Comparatively in Mumbai, the total share of fatalities of pedestrians is as high as 80%, while for bicyclists it is 8%. As per several studies, the primary reasons for conflict between vehicular and pedestrian movement arises due to a lack of appropriate facilities for pedestrians.

Segregated, spread-out land use patterns: As cities grow in size, and people move farther away from their workplaces, commuting distances increase. This has increased dependence on motor vehicles and is a major barrier for non-motorised transportation.



Figure 6: Spill over of hawkers and on street parking make footpaths inaccessible for pedestrians in Bhubaneswar

Source: IBI Group

WAY FORWARD: PARADIGM SHIFT IN PLANNING INDIAN CITIES

Until recently, planning for essential city systems — environmental, land, mobility, economic and social has largely been driven by a misguided pursuit for development - which mainly referred to mechanization and motorisation. What is emerging as a response is a strong philosophy of putting people first when designing city systems and processes.

The National Urban Transport Policy (NUTP), 2006 has provided the unequivocal policy support needed to promote sustainable transport. The objective of NUTP is stated as “to ensure safe, affordable, quick, comfortable, reliable and sustainable access for the growing number of city residents to jobs, education, recreation and such other needs within our cities.” For the first time, cities that were receiving Jawaharlal Nehru National Urban Renewal Mission (NURM) funds through NUTP were encouraged to prioritize non-motorised transportation.

The National Mission on Sustainable Habitat (NMSH) 2009, one of the eight missions approved under the National Climate Change Action Plan, focuses on the greater use of non-motorised transport as an important strategy for reducing GHG emissions.

What is needed to implement these national policy objectives is a paradigm shift of putting people first in planning our regions, cities and neighbourhoods. This implies providing increased mobility choices from use of private vehicles to the use of public transportation and non-motorised transportation. Engaging the citizens and private sector to participate in city building is equally important to build long-term commitment.

Mutually supportive transport infrastructure, land use patterns and built form cannot be achieved without close cooperation between transportation engineers, planners and urban designers. These disciplines can no longer be carried out independently, which would otherwise continue sprawl development and automobile dependence. The need of the hour is to design processes that ensure transport investments are in sync with land use, and environmental plans and respond to the needs of people.

“If you plan cities for cars and traffic, you get cars and traffic.

If you plan for people and places, you get people and places.”

- Fred Kent, Project for Public Spaces



Figure 7: A before (left) and after (right) aerial view of Yeshwantpur Road near Sandal Soap Factory in Bangalore illustrating how simple street design principles can improve the walking and cycling environment along the same RoW.

Source: IBI Group

1.2 Understanding NMT in India

NMT in India means far more than simply walking and cycling. Instead, it encompasses a wide array of people on streets riding in cycle rickshaws, pulling handcarts, selling wares on vending carts, riding handicap tricycles and bullock carts as well as children being pushed in prams. All of these modes conflict with a number of motorised modes on city roads, which lead to unsafe and congested conditions.

In general terms, NMT users can be classified into two categories: those who walk or cycle out of choice and those who are “captive users” and have no other choice. Indian cities are dominated by the latter, though choice users are substantial in number. NMT use by choice remains a latent demand primarily due to the absence of dedicated infrastructure. Here NMT modes are also classified into commuting and commercial modes - to be able to understand their unique needs. E-rickshaws, even if non-polluting is not included as an NMT mode because it is not powered by human energy.

COMMUTING NMT MODES:



1. **Pedestrians** – almost every city resident is a pedestrian for some distance. Although walking has no gender bias; there are differences in the way each gender perceives walking facilities. Women are discouraged from walking along specific paths, for longer distances and at specific times due to a perceived sense of insecurity. And similarly, even though people of all ages walk, there are variations in the way walking facilities are perceived. For example, young children and older people have shorter walk trip length thresholds and need barrier-free movement in order to walk comfortably. Among all the NMT modes, pedestrian is the most dominant mode.



2. **Cyclists** – Cycling provides personal mobility at minimum cost to a large population. It could serve as a potential means of mobility to cater short trips ranging from three to five kilometres. In Indian cities, a significant percentage of the population are captive users who are dependent on cycling for their livelihood including use of bicycles for delivery of goods and services. However, lack of dedicated cycling infrastructure results in these captive commuters to shift to a more comfortable mode of travel.



3. **Non-Motorised Vehicles (NMVs) for persons with special needs** – this includes wheelchairs and hand cycles. Currently, these users have to use the main carriageway just like all other traffic, because pedestrian footpaths rarely offer barrier-free movement. As such, they come in regular conflict with motorised traffic.

COMMERCIAL NMT MODES:



1. **Cycle-rickshaws** – This is one of the most popular forms of intermediate public transport (IPT) in many Indian cities. Cycle rickshaws serve both for short trips to destinations and as last-mile connections to public transport. Their popularity stems from the fact that they are low cost and compact, which make it easy for travel on narrow winding streets. Their size, turning radius, parking requirements become the controlling variables for designing NMT infrastructure – while they move at similar speeds to the bicycle and will use the same lane, they are more bulky and less flexible. Some Indian cities have banned cycle rickshaws, citing discomfort with having a person use manual labour to carry passengers.



2. **Goods transport NMVs** – These include handcarts, cycle rickshaw trolleys (CRTs) and tricycles. Handcarts are pulled by hand. They are used to carry goods across shorter distances. Normal cycles are also used with a goods cart attached to the posterior. Goods tricycles have a goods cart placed over the posterior wheels. They are used quite extensively to transport goods over short and medium distances. These are not only cheaper forms of goods transport but are also useful in transporting goods to congested areas with narrow access roads.



3. **Vending Carts** – These refer to mobile vending carts that stand on four wheels and have to be pushed manually. These are used by vendors selling vegetables, fruits, and other light weight items. These vending carts are an important retail typology and play a key role in the informal market economy. They have the flexibility of locating themselves at different locations throughout the day. Their needs are very different from those of pedestrians or cyclists. If we don't allocate space for their movement as well as space to stand to earn their livelihoods, they often end up encroaching pedestrian and cyclist space ultimately impacting movement for all NMT modes.

Unlike developed nations where car ownership is extremely high, Indian cities are still traversed mainly by foot, cycle, or cycle rickshaw. Even in Delhi which is largely considered extremely car-friendly, NMT accounts for 38% of all trips. NMT trips in other mega Indian cities with populations over 8 million range between 40-50%. This is in part due to the compact structure of Indian cities allowing shorter trip lengths, as well as due to the lack of available options for the urban poor. While the high NMT modal shares have kept Indian per capita CO2 emissions low, the trend across most Indian cities mimics cities around the world – declining NMT use and increasing dependency on personal motor vehicles. The number of cyclists specifically, is dwindling at a much higher pace compared to pedestrians. The NUTP 2006 notes that the share of bicyclists in Delhi has declined from 17% in 1981 to 7% in 1994.

Improving the environment and attractiveness of NMT in India is going to need much more beyond infrastructural improvements. It will need institutional reform, private sector involvement, interagency collaboration, investment prioritisation framework, and most importantly - cultural change.

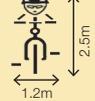
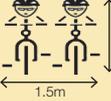
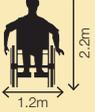
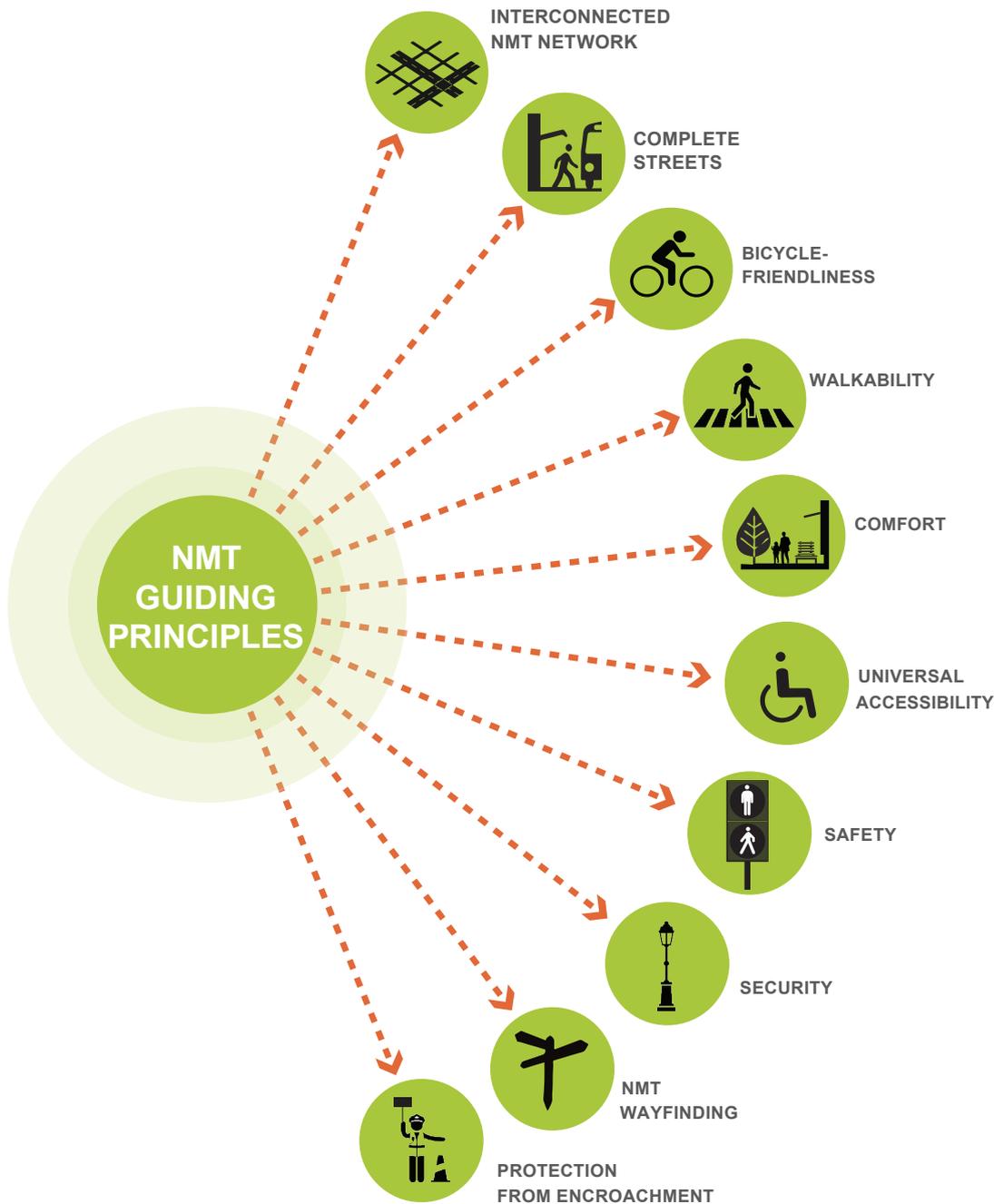
NMT User	Use	Dimensions	Mobility Needs	Trip Purpose	Top Benefits of NMT Facilities	Key Barriers to NMT Use
	Utility		Safety Directness Coherence		Improved Road Safety Affordability Reliable Travel Time Greater Physical Activity Improved Public Transit Access	Weather Safety Threats Topography Segregated Land Use Detouring
	Recreation		Safety Attractiveness Comfort		Better Air Quality Physical Activity Tourist Economy Placemaking Improved Mental Health	Car-Oriented Planning Safety Threats Air Pollution Weather
	Utility		Safety Directness Coherence		Improved Road Safety Affordability Improved Network Connectivity Physical Activity Reliable Travel Time	Weather Safety Threats Topography Social Stigma Detouring
	Recreation		Safety Attractiveness Comfort		Better Air Quality Physical Activity Tourist Economy Improved Mental Health	Weather Safety Threats Topography Air Pollution Car-Oriented Planning
	Utility/ Recreation		Safety Directness Comfort Coherence		Improved Road Safety Improved Network Connectivity Self Dependence Improved Public Transit Access Equitable Spaces	Weather Safety Threats Topography Car-Oriented Planning
	Utility/ Recreation		Safety Attractiveness Directness Comfort		Reliable Travel Time Affordability Tourist Economy Improved Network Connectivity Improved Public Transit Access	Weather Safety Threats Air Pollution
	Commercial		Safety Directness Coherence		Improved Network connectivity Commercial Cycle Rickshaw Job Creation Energy Conservation Affordability	Weather Safety threats Topography Air Pollution Car-Oriented Planning Detouring
	Commercial		Safety Directness Coherence		Improved Network Connectivity Improved Road Safety Reliable Travel Time Affordability	Weather Safety Threats Topography Detouring
	Commercial		Directness Coherence		Job Creation Tourist Economy Neighbourhood Retail	Weather Safety Threats Topography Detouring

Figure 8: User Profile Mapping

Source: IBI Group

1.3 NMT Planning Principles

The following section illustrates key NMT principles organized under two categories - NMT Guiding Principles and NMT- Supportive Principles. These principles have been derived from a study of global best practice examples of NMT design and planning fundamentals contextualized for application in Indian cities. Each principle is further elaborated in detail, complete with descriptive supportive strategies and relevant graphics.



1.INTERCONNECTED NMT NETWORK

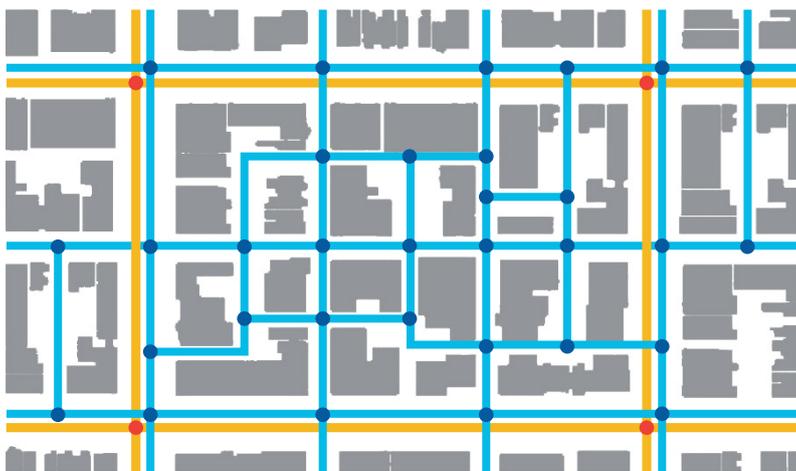


Purpose

An interconnected NMT network **reduces congestion, encourages use of NMT modes and reduces walking distances** between places as well as travel times.

Goals

- Develop interconnected streets and blocks system with routes providing **direct connections** between origins and destinations
- Make NMT connections **more attractive and time saving** in comparison to motorised modes
- **Reduce NMT detours** to provide direct and shorter routes within the cities.



■ Pedestrian and cycling network
■ Vehicular roadway

Figure 9: Urban Infill Areas: Reconnect/dedicate a comprehensive NMT network for the core whereas plan vehicular movement just outside the core

Source: Adapted from TOD- Standard, ITDP



Figure 10: Greenfield Areas: Establish and/or reconnect a comprehensive street grid of small blocks, accommodating pedestrian, vehicular and cycling connections

Source: Adapted from Naya Raipur TOD Study, Prepared for NRDA by IBI Group

Refer detailed components on page



Related NMT Principles:

- Interconnected NMT Network
- Complete Streets
- Bicycle-Friendliness

- Walkability
- Comfort
- Universal Accessibility

- Safety
- Security
- NMT Wayfinding
- Protection from Encroachment



2. COMPLETE STREETS

Purpose

Complete Streets are streets for everyone. They are **designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities.** (Smart Growth America, <http://www.smartgrowthamerica.org/complete-streets/>)

Goals

- Create a **balance between the movement of pedestrians, cyclists, transit, and vehicles.**
- Promote **equitable allocation of RoW** for balanced allocation of space and modes.

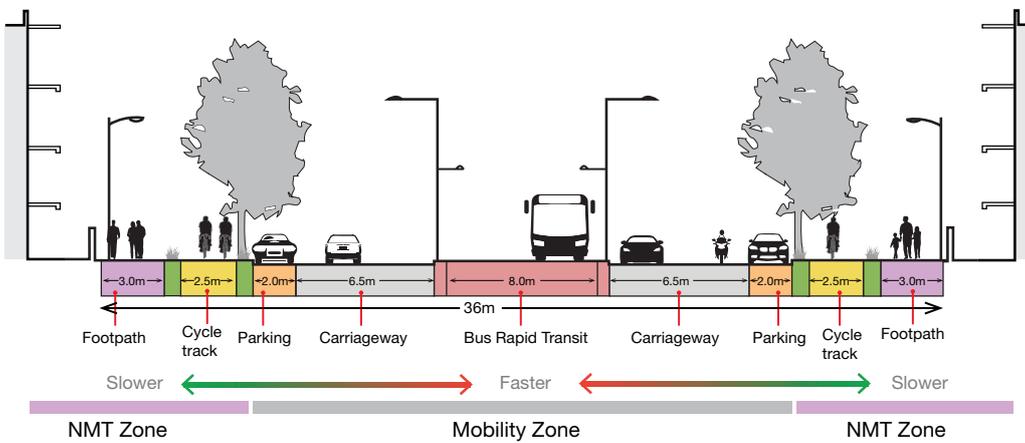


Figure 11: Typical BRTS corridor section for 36m RoW with different street space allocations
Source: Adapted from ITDP Better Cities Better Streets by IBI Group

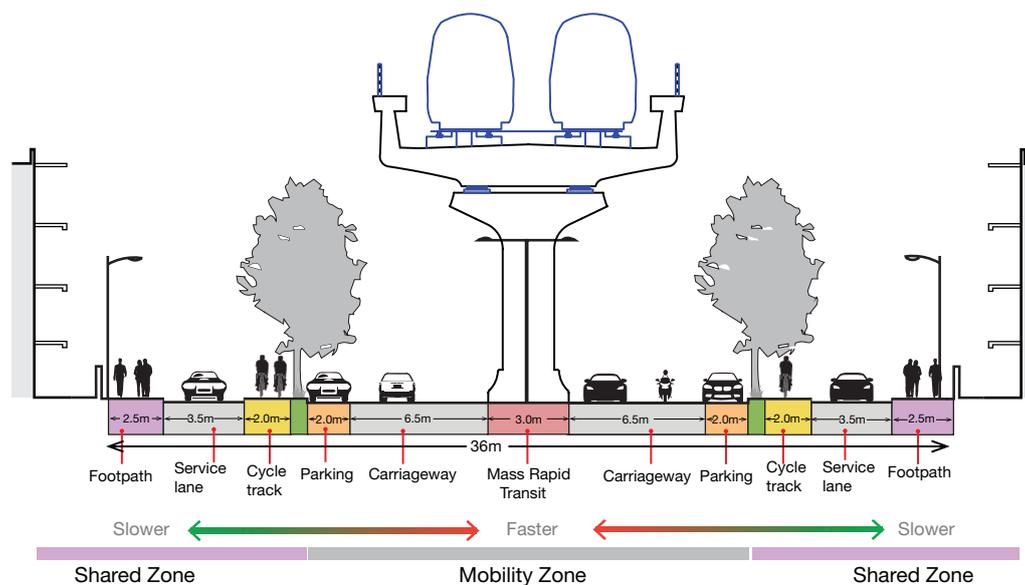


Figure 12: Typical metro rail corridor section for 36m RoW with different street space allocations
Source: Adapted from ITDP Better Cities Better Streets by IBI Group

Related NMT Principles:

- | | | |
|--|---|---|
| <input checked="" type="checkbox"/> Interconnected NMT Network | <input type="checkbox"/> Walkability | <input checked="" type="checkbox"/> Safety |
| <input type="checkbox"/> Complete Streets | <input type="checkbox"/> Comfort | <input type="checkbox"/> Security |
| <input type="checkbox"/> Bicycle-Friendliness | <input checked="" type="checkbox"/> Universal Accessibility | <input type="checkbox"/> NMT Wayfinding |
| | | <input type="checkbox"/> Protection from Encroachment |

3. BICYCLE-FRIENDLINESS



Purpose

Bicycles are **efficient ways to expand accessibility without relying on automobiles** or bus service. Bike lanes, bike routes, and secure bike parking make the bicycle an easy option.

Goals

- Promote cycling as a **viable alternative** to motorised modes of transport
- Encourage active lifestyle with **health benefits and a sustainable** alternative to motorised modes of transport
- Provide **first and last mile connectivity** to public transit systems.



Figure 13: A vision of a residential street in Bangalore allocating road space for cycling facilities
Source: Adapted from Station Accessibility Plan, Bangalore prepared for DULT by IBI Group



Figure 14: Broadway in New York City has been transformed into a shared space roadway, offering balanced space between motorist, cyclist, and pedestrians while creating new public spaces.

Related NMT Principles:

- Interconnected NMT Network
- Complete Streets
- Bicycle-Friendliness

- Walkability
- Comfort
- Universal Accessibility

- Safety
- Security
- NMT Wayfinding
- Protection from Encroachment



4. WALKABILITY

Purpose

A **qualitative measure of the cities that inspires walking trips**. Often used in conjunction with liveability, walkability is a defined more by the quality of the place than by any transport-related metric.

Goals

- Provide an **attractive pedestrian environment with a high level of priority, safety and amenities**.
- **Encourage compact development patterns with rich land use mix**, and active frontage to make walking the preferred choice.



Figure 15: Walkable environments offering direct, comfortable, and vibrant routes to destinations

Source: Adapted from Town Centre Master Plan, Bhubaneswar prepared for BDA by IBI Group

Related NMT Principles:

- Interconnected NMT Network
- Complete Streets
- Cycling Facility

- Walkability
- Comfort
- Universal Accessibility

- Safety
- Security
- NMT Wayfinding
- Protection from Encroachment



Purpose

An attractive streetscape and public realm with design elements, coordinated **to provide shade, weather protection, pedestrian amenities and visual interest** improves the desirability of walking and shortens the perception of distance.

Goals

- Plant trees and landscaping to **provide shade, add interest, ornamentation and continuity between urban spaces**, while contributing to a reduction of noise and air pollution.
- Create a **high-quality public realm with essential amenities such as toilets, dust-bins, and street benches** to make walking inviting.
- Create **vibrancy through formal and informal uses** to encourage people to walk, shop and stroll along main street during both peak and off-peak travel times.



Figure 16: Comfort is provided by dedicated facilities and amenities such as shade, lighting, benches etc.

Source: Adapted from Town Centre Master Plan, Bhubaneswar prepared for BDA by IBI Group

Related NMT Principles:

- Interconnected NMT Network
- Complete Streets
- Bicycle-Friendliness

- Walkability
- Comfort
- Universal Accessibility

- Safety
- Security
- NMT Wayfinding
- Protection from Encroachment



6. UNIVERSAL ACCESSIBILITY

Purpose

Universal Accessibility simplifies navigation and reduces physical effort to an extent that a **physically handicapped person should be able to navigate the pedestrian facilities without external assistance.** It is a design approach that is meant to improve the usability and appeal of places by all types of users.

Goals

- Ensure design principles that **assure barrier-free movement for all types of NMT users** including infant prams, children, physically or cognitively impaired pedestrians, wheelchair and luggage carts, in addition to average pedestrians, cyclists and other non-motorised vehicles.
- Provide **ample scope for ease of access through universal navigational components** that cater to all types of NMT users



Figure 17: Example of a wheelchair accessible road crossing in Singapore.

Source: www.progressth.org

Related NMT Principles:

Interconnected NMT Network

Complete Streets

Bicycle-Friendliness

Walkability

Comfort

Universal Accessibility

Safety

Security

NMT Wayfinding

Protection from Encroachment



Purpose

Developing the pedestrian environment to **maximize safety** will reduce the risk of accidents and enhance pedestrian experience in urban areas.

Goals

- Create prioritized, safe pedestrian and cycling routes to and from major destinations and regional cycling and pedestrian networks.
- Enhance safety by providing a **physical or visible buffer** between motorised and non-motorised modes to **encourage slower traffic speeds**.



Figure 18: Different forms of safety measures for pedestrians- pelican signal, pedestrian crossings, refuge islands etc.

Source: Adapted from Town Centre Master Plan, Bhubaneswar prepared for BDA by IBI Group

Related NMT Principles:

Interconnected NMT Network

Walkability

Safety

Complete Streets

Comfort

Security

Bicycle-Friendliness

Universal Accessibility

NMT Wayfinding

Protection from Encroachment



8. SECURITY

Purpose

Ensuring **security of vulnerable groups such as women and children in the public realm** will increase attractiveness of NMT. Crime Prevention through Environmental Design (CPTED) is an approach intended to discourage criminal behaviour through urban design principles.

Goals

- Ensure design principles that **optimize natural surveillance with strategies such as adequate street lighting, street vendors, and active frontages.**
- Address **gender-specific concerns that prohibit women from using public spaces** such as overcrowding or isolated environments.



Figure 19: Application of CPTED principles along main streets
Source: IBI Group

Related NMT Principles:

- Interconnected NMT Network
- Complete Streets
- Bicycle-Friendliness

- Walkability
- Comfort
- Universal Accessibility

- Safety
- Security
- NMT Wayfinding
- Protection from Encroachment



Purpose

Wayfinding is an essential feature **to assist the users in navigation and improve sense of place.** Develop wayfinding and signage, with focus on NMT users, to support the legibility and permeability of the cities.

Goals

- Make NMT attractive by **providing easy and legible navigation**
- **Promote NMT usage among tourists.**



Figure 20: Wayfinding/Information signage to provide easy navigation and a sense of place.

Source: Adapted from Station Accessibility Plan, Bangalore prepared for DULT by IBI Group

Related NMT Principles:

Interconnected NMT Network

Complete Streets

Bicycle-Friendliness

Walkability

Comfort

Universal Accessibility

Safety

Security

NMT Wayfinding

Protection from Encroachment



10. PROTECTION FROM ENCROACHMENT

Purpose

Protection from encroachment ensures continuity and predictability in NMT use. It allows **uninterrupted non motorised mobility and brings in a sense of order.**

Goals

- **Delineate space for all activities** within the public realm such as hawkers, parking, street dwellers **ensuring clear passage for NMT.**
- Safeguard NMT zones with appropriate measures to **protect vulnerable pedestrians such as the aged and children**
- **Facilitate effective enforcement** in protecting NMT spaces from encroachment



Figure 21: Delineate NMT space physically to prevent encroachment.

Source: Image of Hiranandani Complex, Mumbai by IBI Group

Related NMT Principles:

Interconnected NMT Network

Complete Streets

Bicycle-Friendliness

Walkability

Comfort

Universal Accessibility

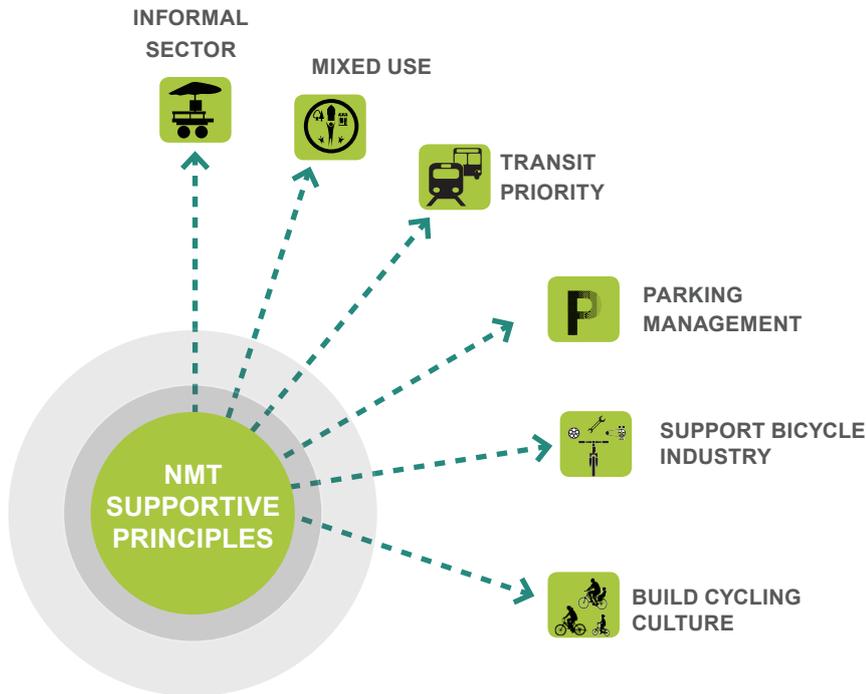
Safety

Security

NMT Wayfinding

Protection from Encroachment

NMT SUPPORTIVE PRINCIPLES



1. INFORMAL SECTOR



To achieve the goal of inclusive mobility, integrate the informal sector such as street vendors and settlements in planning and design of NMT infrastructure within the cities.

4. PARKING MANAGEMENT



Utilize parking management strategies as a travel demand management tool to discourage personal vehicle usage, reduce parking demand, and free up space for sustainable mobility opportunities to build people-oriented neighbourhoods.

2. MIXED USE



A mix of diverse and complimentary land uses in a compact pattern allows residents and workers to walk to work or to shop rather than driving for all daily needs.

5. SUPPORT BICYCLE INDUSTRY



To reverse the declining trends in the bicycle industry, initiate key tax incentives and investment in research and development.

3. TRANSIT PRIORITY



Transit priority planning encourages non-motorised modes for first and last mile connectivity promoting a shift towards increased NMT usage

6. BUILD CYCLING CULTURE



Promote healthy lifestyle and sustainable living principles by encouraging recreational cycling and conducting events like Raahgiri and Cyclothons. This will help elevate the perception of cycling, and promote a cycling culture in cities

1.4 Benefits of NMT



SOCIAL BENEFITS

Equitable and Improved Accessibility: As an end-to-end mode, walking and cycling can improve accessibility of the user by allowing her/him to reach destinations of choice. Walking and cycling can be used by all social classes, and thus contributes to accessibility in a very equitable manner.

Improved physical health: One of the (many) downsides of motorised transport is its enhancement of a sedentary lifestyle, which has detrimental effects for individual and public health. The required (minimum) level of daily exercise (20 to 30 minutes of moderate exercise) equals an average cycling commuter trip.

Improved public transit access: In spite of the longer average trip lengths in the bigger cities, a large share of trips still remain short in length, walking and cycling still have a majority of shares in the modal split. Though the trip patterns and trip lengths in these large cities deter NMT modes from being appropriate for longer trips, opportunities arise when these modes are considered in their integration with multi-modal transport chains. Encouraging NMT use can contribute to a better performance of public transport.

Improved Road Safety: Investing in NMT infrastructure can improve road safety. Undoubtedly, pedestrians and cyclists are vulnerable road users. 'NMT promotion' and 'improving road safety' can result in a self-reinforcing interaction of these two policies. This will increase the numbers of pedestrians and cyclists resulting in the so-called 'safety by numbers' effect.

Placemaking: NMT use makes cities more attractive. Automobile-oriented planning has led to a widening disconnect between people and the environment. The promotion of NMT can help in rebuilding this connection, fostering interaction between people and providing a greater impetus to creation of safe and humane communities.



ECONOMIC AND FISCAL BENEFITS

Reduced Dependency on Fuel: Reduction in numbers of people using motorised private vehicle for daily travel will bring down daily petroleum consumption. This will impact the country's economy as its dependency on imported oil will be reduced.

Affordability: Affordability is an important benefit for a majority of the population in Indian cities. Cycle rickshaws also have minimum operating costs since they do not run on fossil fuels, forming the most affordable form of IPT. The use of cycle rickshaw trolleys (CRT) for delivery of goods is predominant in many cities in north India owing to its low cost of operations.

Tourist Economy: With more interest in active and adventure tourism, as well as local and short vacations, bicycle tourism is a growing economic market, which is particularly relevant in rural areas where there can often be few opportunities to attract visitors. Many European cities have gained tourist popularity on the basis of their pedestrian and cycle friendly environments. In India, many tourist cities exist which would benefit from better NMT facilities, particularly walking and cycling



ENVIRONMENTAL BENEFITS

Reduce Congestion: Walking and cycling can counter congestion. Attractive walking and cycling conditions will help to moderate (or at least delay) people's aspirations to own and use a private cars & motorised 2-wheelers. But to utilise this potential co-benefit of NMT use, the competitive position of NMT (in combination with public transport) should be improved substantially.

Better air quality: NMT use contributes to improving air quality and mitigating climate change if it substitutes motorised trips (a majority of trips in urban areas are short). Those trips contribute substantially to air quality problems (like SO₂, NO_x, PM) and the climate problem (CO₂). It is critical to arrest the shift from NMT to motorised modes and encourage a reverse shift – from motorised modes to NMT.

Noise reduction: Motorised transport is also the cause of the noisy environment in large parts of our cities. Given the restrictions of the mitigating measures, it remains worthwhile to try and prevent this problem by promoting the use NMT, and measures to discourage and restrict car use in sensitive urban areas.

1.5 NMT Planning Considerations

There is no “one-size-fits-all” approach to creating NMT Proposals. Planning for NMTs must take into consideration different aspects of the city and contextual variations. Key variables that influence NMT planning processes and projects include: **1) Scales of NMT; 2) Existing Context; and 3) Types of Intervention**

1. Scales of NMT

While NMT projects are primarily implemented on individual streets, NMT planning needs to be conceptualized from a mobility standpoint at multiple interrelated scales – city-region, corridor, areas, and streets. A city-region includes the entire street network, each corridor includes many streets traversing a number of areas/neighbourhoods, and each area/neighbourhood includes many streets within an area/neighbourhood network. NMT planning can start at the smaller scale and move up the spectrum, or at the larger scale and move down.

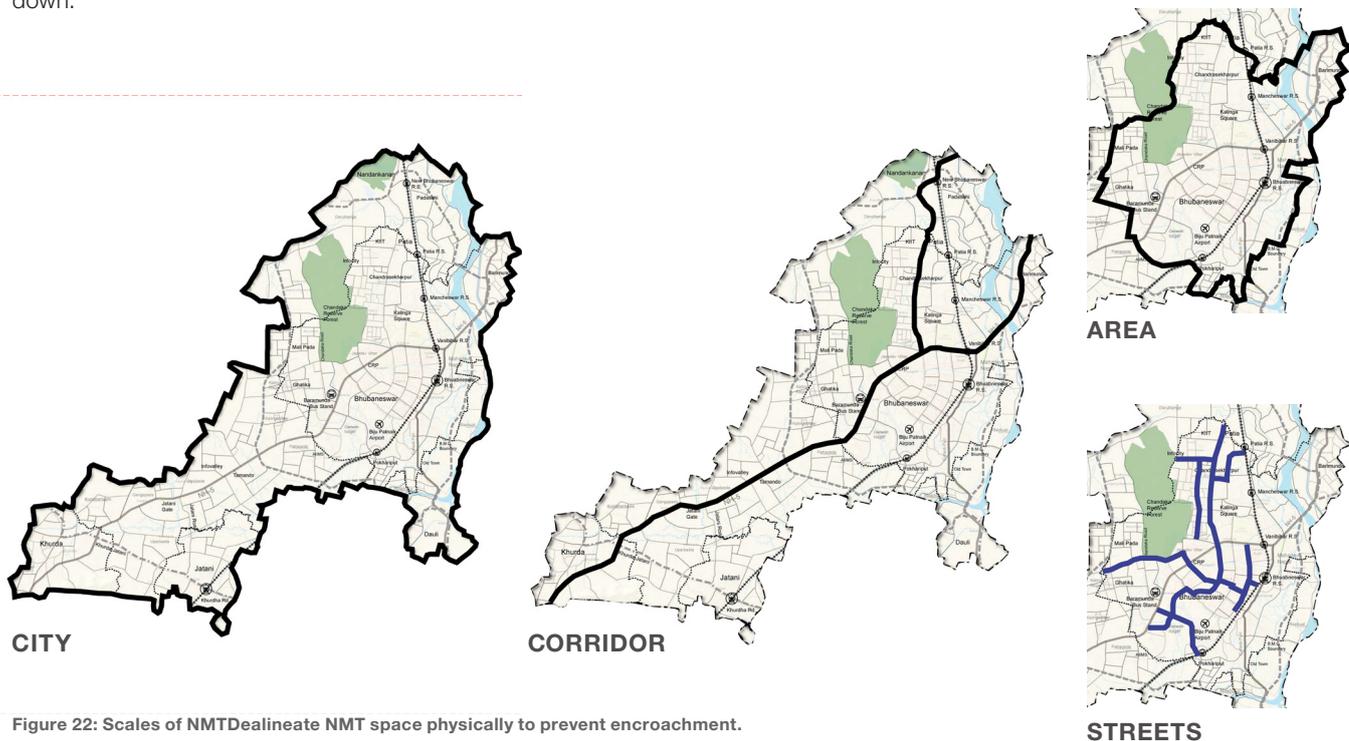


Figure 22: Scales of NMT Deelineate NMT space physically to prevent encroachment.

Source: Adapted from Bhubaneswar TOD Plan, IBI Group

	City-Region	Corridor	Area	Street
Purpose	Involves integration of multiple corridors and modes of mobility as well as integration with land use. Used for decision making related to citywide infrastructure investments. Provides a point of intervention for NMT as a policy in statutory documents (Master Plan/Mobility Plan)	Enables creation of newer/ alternative corridors or revitalization of existing corridors connecting points of origin and destination. Continuity of NMT treatments along an entire corridor can be ensured through corridor plans.	Focuses on areas of homogenous characteristics, such as historic areas, neighbourhoods, station areas. Provides opportunities for integrating NMT proposals with smaller placemaking and developmental initiatives.	Focuses on individual street improvements, addressing specific needs such as footpath upgradation, road diets, traffic calming, cycle tracks etc. Improvements focus on addressing immediate challenges.
Boundary Definition	Administrative Boundaries	Origin - Destination Connectors or Desire Lines.	Neighbourhoods or Areas bound by physical barriers such as roads or utilities.	Individual Streets.
Outcomes	NMT Policies + Network Plan + Identification of Priority Areas/Corridors + Institutional Framework for Implementation. Generic DCR Modifications may also be proposed for NMT inclusion.	Link and Intersection Typologies + Streetscape Detail Design + Phasing + Implementation Plan	Network Plan + Street Typologies + Streetscape Detail Design + Phasing + Implementation Plan	Streetscape Detail Design + Phasing + Implementation Plan

2. Existing Context

Each Indian city is at a different stage of growth. Some new cities like Naya Raipur are still building their transportation infrastructure and offer significant opportunities to integrate NMT into their transport network. Some cities like New Delhi and Bhubaneswar have sprawled urban forms and wide RoWs. They offer more opportunities to retrofit NMT facilities. Dense and congested cities such as Mumbai or historic city centres such as Ahmadabad have intense space constraints and need innovative interventions to prioritize NMT. These different contexts are classified here into three main categories: **1) Greenfield Context; 2) Sprawled Urban Context; 3) Compact Urban Context**

CONTEXT	ADVANTAGES	DISADVANTAGES
Greenfield Context	<ul style="list-style-type: none"> • Opportunities to plan a complete NMT network • Opportunity to induce NMT demand by provision of high quality infrastructure and facilities 	<ul style="list-style-type: none"> • Limited knowledge on how travel behaviour is influenced as the city grows • Lack of public transport may hamper NMT goals
Sprawled Urban Context	<ul style="list-style-type: none"> • Wide RoWs allow enough space to retrofit streets with segregated NMT facilities • Provision of comfort and safety for NMT users can be made by design 	<ul style="list-style-type: none"> • Wide RoWs are usually paired with sprawled development, which means longer distances to travel • Wide RoWs are barriers by themselves. Reducing the barrier effect becomes essential. • Lack of active street frontages can reduce attractiveness of NMT
Compact Urban Context	<ul style="list-style-type: none"> • Narrow streets keep traffic speeds low • Traffic congestion encourages people to walk or cycle. Well-designed NMT facilities will be easily accepted • Compact development patterns add activity and safety to streets 	<ul style="list-style-type: none"> • Space constraints present challenges in equitable RoW allocation • Garnering public and institutional support becomes difficult if NMT facilities compromise motor vehicle mobility



Figure 23: (Left) Empty Streets in a Greenfield Context; (Middle) Wide RoWs with NMT provisions in Delhi; (Right) Narrow RoWs with no space for NMT provisions in Bangalore

3. Types of Intervention

A. Master Planning

Investing in the planning process prior to making investments in physical infrastructure can reap huge benefits when projects are implemented. Master Plans can reduce the risk factor involved in future investments. They also help put project costs in perspective by evaluating long term benefits vis-a-vis short term gains. Most importantly, Master Plans help convert large visions to tangible, implementable action plans. Master Plans also enable integration of non-motorised plans with other infrastructure, health and education plans, as well as with transport management strategies, maximising monetary and external benefits.

Statutory relevance for the Master Plan can be established through the following policies

- City-level Master Plans and Development Plans
- Comprehensive Mobility Plans
- Zonal Development and Local Area Plans
- UMTA and UTF mandates

B. Investment in Public Walking Infrastructure

Strategic investments to improve walking facilities will have a big impact on liveability. Liveability is largely defined by the level and quality of access to housing, employment, social and physical infrastructure, and other basic needs. Walkable cities are friendlier to its people and resulting economies.

Commuting Infrastructure: Investments in building physical infrastructure for walking are needed to ensure safety and reliability for all pedestrians, especially those who commute by foot regularly and have little or no choice. Prioritizing investments in walking infrastructure and promoting walkability underscores the intent of governments in planning cities for people instead of cars.

Active Recreational Infrastructure: Recreational use for pedestrians may include a variety of public spaces. As Jan Gehl notes, good pedestrian spaces cannot be judged by how many people are walking through it but by the number of people who stop to watch and be entertained. Some recreational pedestrian activities include shopping, leisure strolls, and jogging/running.

C. Investment for Public Cycling Infrastructure

Strategic investments in cycling can transform a city. They can empower people previously sidelined on car-oriented city streets, as well as attract others who never imagined cycling as a commuting mode choice. Investments in cycling facilities are also known to impact the qualitative perception of using the mode.

Commuting Infrastructure: Investments in building physical infrastructure for cycling – mainly cycle ways and end-of-trip facilities – are needed on a priority to ensure safety for existing and potential cyclists and other NMVs.

Recreational Cycling Infrastructure: Recreational cycling infrastructure may not seem a priority. However these are important facilities to consider for two reasons:

1. Recreational cycling can drive behavioural change in society to rid the social stigma associated with cycling.
2. Recreational cycling delivers important health and fitness benefits, which are important from a public health and savings point of view.

D. Private Sector Interventions

Private sector involvement is also becoming a common tool to overcome the financial burden of development. With capital as an asset in addition with maximizing efficiencies and innovations of private enterprise, government is seeking private sector involvement for the provision of public infrastructure.

Private Developments: Private residential and commercial developments may be encouraged to create NMT friendly edges as well as provide NMT facilities in and around the development in exchange for development incentives.

Bicycle Manufacturer Partnerships: Bicycle manufacturing companies could be roped in for investing in cycling infrastructure or conducting cycle advocacy events in exchange for tax incentives. A number of foreign bicycle manufacturers such as Trek and Btwin are known to be supporting and funding cycling events in the country. However these are limited to major cities only. Domestic manufacturers such as Hero Cycles could be encouraged to promote cycling through similar investments in smaller cities as well. This will also facilitate growth of the cycling industry locally.



Figure 24: Jumeirah Beach Road Walk is a high street public path created by a private developer in Dubai.

Source: travelplanet.com

E. NMV Interventions

Pedicabs or tricycle taxis as they are called in several parts of the world have gathered prominence as a tourist vehicle. The potential for premium cycle rickshaws for tourist destinations needs to be explored.

Technological Interventions: New technologies must be encouraged to make cycle rickshaws sustainable, economic, weather resistant and human-friendly.

Regulatory Interventions: Regulatory interventions can be considered to encourage cycle rickshaws as a viable IPT mode.

F. Public Bike Sharing (PBS)

PBS Systems offer personal cycles on a short term shared basis. PBS systems are being implemented widely around the globe.

G. Wayfinding and Signage Interventions

Finally, improving directional and information signage for NMT users can make a big difference in improving legibility of NMT infrastructure, and encourage people to walk or cycle instead of using a motorised mode.

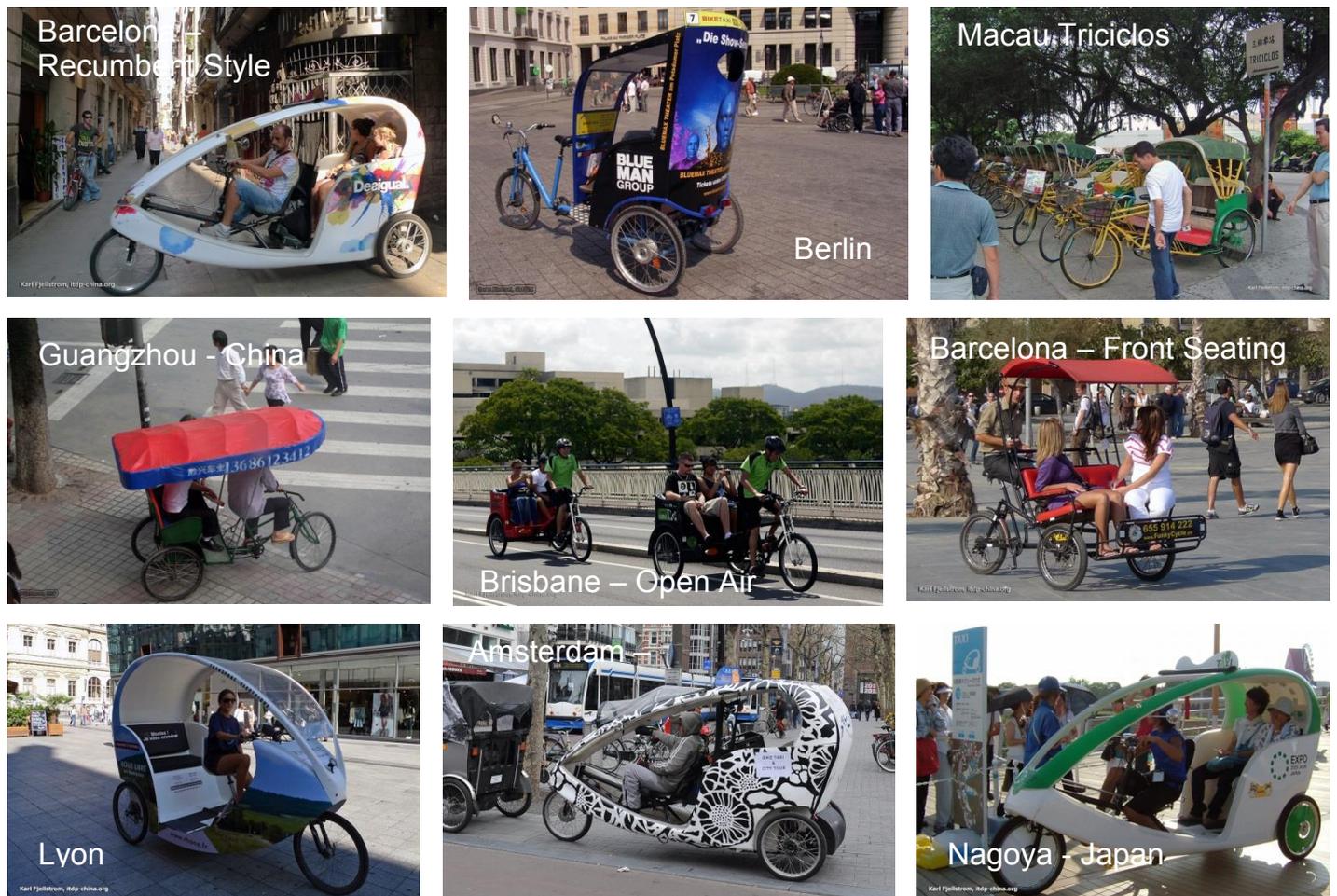


Figure 25: Different technologies and types of pedicabs around the world.

Source: IBI Group and itdp-china.org

1.6 Lessons from Global Best Practices for NMT

The last decade has seen research, projects, interventions and experiments on how to address the needs of the pedestrians and cyclists around the world. There are many interesting lessons to be learnt from the efforts around the world and in the country. While some of these have been illustrated in this section, the entire document is illustrated with case-studies to support the strategies proposed.

Global Best Practices

Bogota – Ciclo Ruta Network: The case of Bogota illustrates the importance of consistent policies and committed leadership. An NMT torch bearer who can align political and executive wills towards NMT-oriented planning can achieve a change as big as in Bogota. Ciclovias, streets that were closed to cars on specific days, have been operational in Bogota since 1976. This has helped generate the demand for NMT use in the city. This demand was then leveraged when the Ciclo-Rutas were constructed. The CicloRutas, which in some ways traded off cycle path quality for network coverage in order to quickly implement a connected set of cycleways, inspired similar NMT networks in many other big cities internationally.

Such ciclovias can help generate interest and demand for NMT among diverse user classes even in India. The Raahgiri Day, started in Gurgaon and now seen in Delhi, Hyderabad and other cities, is one of the first Ciclovias in the country. The CicloRuta network illustrates the importance of a full-fledged network for cycling. An NMT network nearly trebles the advantage obtained by constructing isolated NMT corridors.

This is an important lesson in the Indian context, especially when considering the impact of pilot projects. A pilot NMT corridor may not show the same use on its own as it would attract were it to be part of a substantial network. Effective integration with the Transmilenio BRT has also increased the attraction of the Ciclo-Rutas. This is an important lesson for Indian cities, especially where new public transit corridors are coming up. An integrated NMT network widens the scope and reach of public transportation, thus increasing the attractiveness of public transit. It is also worth noting that the design quality of the CicloRuta cycleways and adjoining pedestrian paths is mostly consistent, even while the quality of vehicular roadways is inconsistent. Bogota still faces challenges in managing traffic violations, discouraging illegal parking.



Figure 26: CicloRuta Bogotá through low income neighbourhood.

Source: ITDP, China

Delft – The Netherlands: Delft was the first Dutch city to have developed and implemented a bicycle (and pedestrian) network in accordance with an officially adopted Bicycle Plan. The Delft Bicycle Plan, launched in 1979, was aimed at developing a coherent bicycle network that would (1) incorporate existing bicycle routes, and (2) propose additional projects to close the gaps in the existing network. The primary objective of the Bicycle Plan was to improve the safety, directness, and comfort for cyclists in Delft. The Plan defined a hierarchical network with three sub-networks: an urban network, a district network, and a neighbourhood network.

Up to 95% of the three sub-networks already existed in Delft when the Bicycle Plan was launched. The Plan was a useful exercise in identifying gaps in the network and closing them. The implementation on the Plan began in 1982 and was estimated to conclude in 1992. A new bicycle plan in 1999 repeated the process of identifying gaps and complemented it with identification of bottlenecks. This process helped the city prioritize projects and implement ancillary facilities like parking and storage that were essential for smooth functioning of the cycling network.

The major quantifiable benefit observed was increase in the speed of bicycle trips, indicating that performance of the existing bicycle infrastructure improved because of network connectivity. A major qualitative benefit was the improvement in the perception towards cycling.

The case of Delft illustrates the three stages of NMT planning – creating the vision and master plan; implementing the specific recommendations, and finally evaluating and monitoring the impacts of the changes made. This process helps in identifying key issues and gaps, as well as in identifying successes, both of which become crucial in developing further plans. Such a process is extremely relevant from an Indian context, as it allows identification of issues, common or unique, as it helps in identifying smaller successes.

NMT planning is still new in India and such an iterative process will help pave the way for future plans to become more and more fool-proof. The Delft master plan was based on the concept of completing the NMT network by filling in existing gaps. The emphasis was on effecting a greater impact through an articulated network. This is an important lesson in the Indian context, especially when considering the impact of pilot projects.



Figure 27: Bicycle lane in Netherlands well defined using pavers

Source: Photo credits Wim Mulder

Hong Kong – Evolving Mobility: To facilitate mobility for 7 million population, Hong Kong has developed an efficient and reliable multi-modal transport system. In order to promote walking and to improve the overall pedestrian environment, Transport Department is currently following an environmentally friendly approach in managing traffic and transport matters and is committed to putting more emphasis on the interests of pedestrians. Since year 2000, the Transport Department has invested liberally in implementing pedestrian oriented schemes in several areas in order to improve safety and mobility for pedestrians, promote walking, discourage access to motorized vehicles, reduce air pollution, and improve the overall pedestrian environment. Hong Kong has always placed strong emphasis on pedestrian planning by providing infrastructure like its famous footbridges. However, recent efforts are focused towards creating “Pedestrian Streets” that are at-grade.

The case of Hong Kong aptly illustrates the effectiveness of grade-separated pedestrian infrastructure. Hong Kong’s steep terrain justified the use of grade separation for pedestrians to some extent. However it was soon found that pedestrians find it inconvenient to use grade separated walkways for short distances for example, for crossing streets or walking a couple of blocks. Footbridges or subways are much more widely used along longer distances, where they provide direct connections, and where ascent is facilitated through escalators and travelators. In the Indian context, grade separated pedestrian infrastructure should be used only if it can reduce pedestrian effort instead of increasing it. Footbridges or subways must provide easier, simpler and more direct routes to important destinations, and must be equipped with escalators. Hong Kong has created a road hierarchy from a pedestrian point of view instead of the reverse, and these streets are called Pedestrian Streets. Such a road hierarchy needs to be emulated in all Indian cities, especially in older cities with limited right-of-ways (RoWs).



Figure 28: Walkway widened near Hung Hom in Hong Kong as part of recent initiatives

Source: ITDP-China

New York City: One of the most important lessons to be learned from the New York case study is its implementation process, primarily consisting of signature projects and pilot projects. Signature projects like the High Line and pedestrianisation of Times Square were used to garner public interest and approval. Pilot projects were used to experiment with different measures. Consistent evaluation and monitoring provided input on the feasibility and benefits of the measures. Such a process, in the Indian context can generate interest and ownership among citizens. Temporary changes were used to experiment with ideas before permanent changes were made. This reduced the financial risk of experimenting with small measures. In the Indian context, where traffic patterns and cultural norms are different from the rest of the world, such an experimentation process must be followed to evolve tailored solutions. For example, universal traffic calming measures may not work in Indian conditions, where traffic discipline is minimal. Innovative traffic calming measures must be experimented with, at minimal risk, and evaluated, so that successful solutions can be emulated elsewhere in the country.

The case of New York also illustrates how federal and state run programs and financial tools enable and encourage individual city departments to take up smaller initiatives that contribute to overall liveability. Such an enabling mechanism in an Indian context should empower individual departments as well as non-governmental agencies to implement smaller initiatives. This lightens the burden of implementation on a single agency, distributing the agenda of NMT across departments dealing with traffic, public transportation, land use, utilities, health and education.



Figure 29: Temporary Street Closure at Madison Square
Source: NYC DOT

1.7 Lessons from NMT initiatives in India

Over the last decade, cities have recognized the importance of NMT in the urban mobility systems. Some of the existing initiatives undertaken by governmental and non-governmental agencies across the country, include:

Delhi Cycle Tracks

The Delhi busway corridor facilitates the use of non-motorised transport by introducing segregated NMT facilities (footpaths and cycle tracks). The NMT tracks along this corridor measure 2.5 m in width allowing bi-directional flow. The wide tracks also enable them to be used by cycle rickshaws and other non-motorised vehicles. However, the traffic congestion caused by inefficient traffic signal cycles create a significant barrier to free and safe NMT use of the designed facilities. Motorised two wheelers are seen to routinely encroach on the NMT lanes. On the other hand, poor condition of footpaths and encroachment force pedestrians to walk on the NMT or vehicular lanes. This has reduced the effectiveness of NMT facilities on the overall traffic scenario in Delhi.

Nanded Complete Streets

To make the city inclusive and environment friendly, the city of Nanded has redesigned 50 km of streets to provide better services for different users. The project was proposed under JNNURM through a Public-Private Partnership between IL&FS and Nanded Waghala Municipal Corporation. The highlight of the project was the successful coordination among various agencies involved in the redesigning of streets and utilities. However, lack of regular site inspection and incorrect translation of drawings on site led to faulty implementation.

Fazilka Ecocabs

Ecocabs “Dial-a-Rickshaw”, a cycle rickshaw scheme started in Fazilka, promotes cycle rickshaws as a public transport mode using technology. The service enabled cycle rickshaws to be made available at a resident’s doorsteps following a simple phone call. The success of Ecocabs demonstrates the need for investment in research and development of technologies in order to upgrade the quality of NMT-based transit services. The coverage area and positioning of stations is planned so as to serve maximum trips. The use of technologies, such as dial-a-rickshaw service, a web portal and an android app has encouraged more people to use the service. Community participation in operating and managing the call centres was successful in creating ownership and awareness. The additional benefits extended to the rickshaw pullers and to their families and facilitated the use of non-motorised transport. Ecocabs associated with BSNL as telecom partner to provide free pre-paid mobile connections with life time validity to the rickshaw pullers through which they can talk to each other for no cost. The project was implemented in phases and with each phase the scheme was improved and expanded.

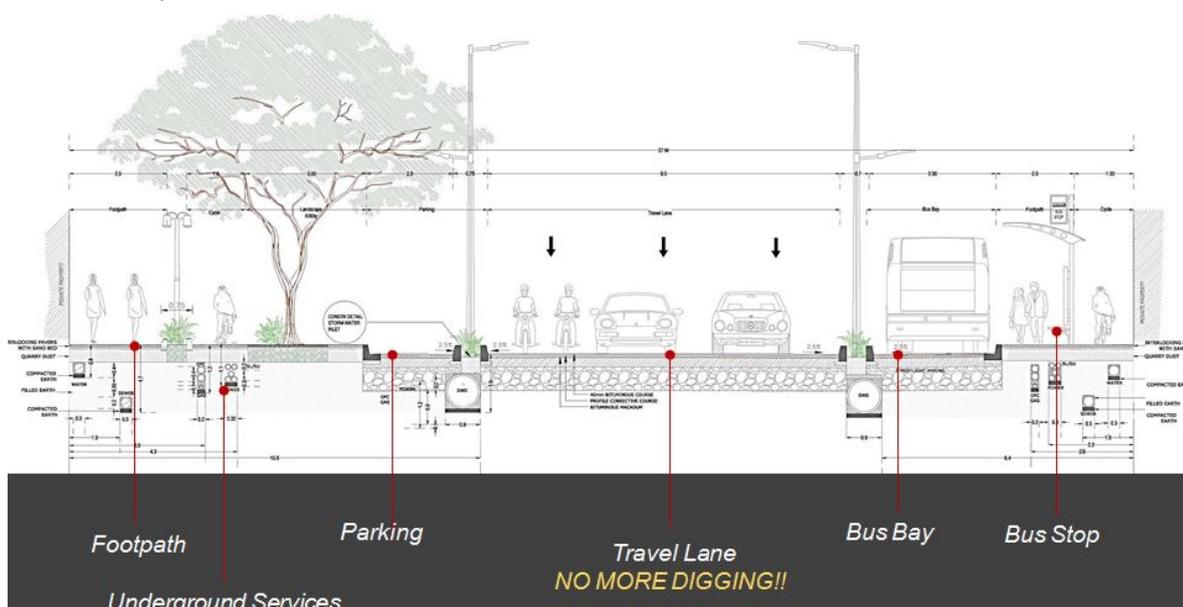


Figure 30: Streamlining the sub-terrain networks along with above-grade and at-grade services

Source: Tender SURE, Bangalore City Connect Foundation, March 2013

Tender SURE - Bangalore

The TENDER S.U.R.E (Specifications for Urban Roads Execution) document, an initiative of the government of Karnataka and Bangalore City Connect, presents guidelines on India's first design, specifications and procurement contract for urban roads execution. Built upon a clearly defined hierarchy of roads, Tender SURE provides specifications for multiple Right of Ways (RoW), which includes pedestrian and cyclist paths, on-street parking, travel lanes for vehicles, and dedicated public transport lanes. It also outlines important procurement process amendments that will improve road execution quality, reduce ambiguity and increase transparency. Tender SURE is a universally applicable document because the RoW specifications caters to the full spectrum of road widths (from 2m to 80m). These specifications do not require the acquisition of more land, or road-widening activities. Volume II of Tender SURE ensures project monitoring. There is provision for third party inspection and use of project management companies. The execution and monitoring of the project is the responsibility of the government agencies with BBMP as the prime agency.

Naya Raipur NMT Master Plan

The Naya Raipur NMT Master Plan redesigned the entire alignment including roads and street to ensure the optimum use of available space within the Right of Way (RoW) for accommodating all functions and demands from the route. It planned the dimensions of cycle tracks and pedestrian paths as per forecasted demand and expected vehicle types (cycle rickshaws, etc) requirements. Special considerations are included for the safety of pedestrians and cyclist by introducing new speed zones, passive enforcement devices such as traffic calming measures and cameras. The Naya Raipur Master Plan was primarily focused on completing the NMT network along the BRT corridor to improve first and last mile connectivity. The emphasis was on affecting a greater impact through an articulated network, rather than sum of the benefits from individual measures.

ATCAG- Bangalore

ATCAG is a private Bengaluru-based enterprise, that provides bicycle hardware and technologies for short term and long-term cycle rentals. The company promoting the products have received continuous support from public organizations including the Bangalore Metro Rail Corporation, Directorate of Urban Land Transport, and the Bruhat Bengaluru Mahanagar Palike for testing the cycle infrastructure at various metro stations. As on the date of this document, the use of bicycles being provided by ATCAG is limited to recreational purposes. Ongoing schemes are limited to small scale i.e. within the central city area. The full potential of the scheme may only be explored by expanding the scheme.



Figure 31: Proposed street design incorporating NMT facilities along BRT corridor in Naya Raipur

Source: Naya Raipur TOD Strategy 2013

A number of street design guidelines have also been prepared in India, the UTTIPEC and Urban Roads Codes having the most statutory relevance:

UTTIPEC Street Design Guidelines which focuses on six mandates;

- I. Multi-modal integration plan for metro stations
- II. Pedestrian crossing facilities at vulnerable/accident spots
- III. Standard typical crossing design
- IV. Synchronization of signals, signage & road markings etc.
- V. Street design guidelines
- VI. Cycle sharing & other intermediate public transit (IPT)

(Accessible at: <http://www.uttipeec.nic.in/StreetGuidelines-R1-Feb2011-UTTPEEC-DDA.pdf>)

Urban Road Codes: The Indian Roads Congress issues Road Codes as a guideline document for developing urban roads. There are 15 such codes with the latest update issued in 2003. Increasing traffic combined with a surge in the mix of modes warrants periodic revision of existing documents to suit the changing urban context. A new Code of Practice for design of Urban Roads prepared by the Institute of Urban Transport in 2009 on behalf of the Ministry of Urban Development focuses on the changing character of the urban roads. The new code aims to serve as a bridge between the current research on safe urban roads and safe road design in cities today. The type and character of each urban road should respond according to the functions it performs i.e. providing accessibility or safety or both. The codes are elaborated in 5 parts:

- Part I: Elaborates various norms and standards for urban road cross section design
- Part II: Elaborates various norms and standards for intersection design;
- Part III: Elaborates various norms and standards for road markings;
- Part IV: Elaborates various norms and standards for signages;
- Part V: Includes various norms and standards for traffic calming methods

(Accessible at: <http://www.iutindia.org/downloads/Documents.aspx>)

01E Continuous Pavement

01E At entry points of properties – introduce “raised driveway” or “table-top” details – where pedestrian and cycle tracks continue at their same level, but the motorized vehicles have to move over a gentle ramp to enter the property.

Typical Detail of Raised Driveway at Building Entries.

Source: TRIPP, IIT Delhi, BRT Design Specifications, 2009

Best Practices

Figure 32: Spread from Street Design Guidelines prepared by Uttipeec

Source: UTTIPEC

R = The perpendicular distance between Compound Wall & M.V. Lane edge.
 x = width of the Gate or Road.
 if R ≤ 6M then
 WIDTH of Raised Crossing = x + 2R
 if R > 6M then
 WIDTH of Raised Crossing = x + (2R/6) = x + 1/3R

R = The perpendicular distance between Compound Wall & M.V. Lane Unpaved.
 x = 4.50M
 R = 5.20M
 WIDTH of Raised Crossing = x + 2R
 = 4.50 + 2 X 5.20 = **14.90M**

Other Indian NMT Manuals/References:

1. Complete Streets Manual by ITDP - "Better Streets, Better Cities: A guide to street design in urban India." A resource to help Indian cities in prioritizing pedestrians, cyclists and public transport users in public spaces and public streets. (Accessible at: <https://www.itdp.org/wp-content/uploads/2011/12/Better-Streets-Better-Cities-ITDP-2011.pdf>)
2. Manual for Cycling Inclusive Planning in the Indian Subcontinent by ICE/iTrans (currently being revised by IIT Delhi).
3. Guidelines for Non-Motorised Transport Measures:Policy and Options (Accessible at: <http://sti-india-uttoolkit.adb.org/mod5/index.html>)
4. Footpath Design: A guide to creating footpaths (Accessible at: <https://www.itdp.org/wp-content/uploads/2014/07/Footpath-design-131030.pdf>)
5. Public Cycle Sharing Systems: A Planning Toolkit for Indian Cities (Accessible at: https://www.itdp.org/wp-content/uploads/2014/07/Public_cycle_sharing_toolkit_ITDP_121204.pdf)

Other than these there are a few acts and enforcements that are used in planning urban roads,

1. India's Motor Vehicle Act 1988 (Accessible at: <https://delhitrafficpolice.nic.in/wp-content/uploads/2014/11/motor-vehicles-act-1988.pdf>)
2. India's Road Regulations Rules 1989 (Accessible at: <http://transport.bih.nic.in/Acts/The-Road-Regulations-Rules-1989.pdf>)
3. Persons with Disability (Equal Opportunities, protection of Rights and Full Participation) Act 1995 (<http://niepmd.tn.nic.in/documents/Amended%20Rules%20for%20Persons%20with%20Disabilities.pdf>)
4. Punjab Cycle Rickshaws regulation of License (1976) (specific to state of Punjab)

02 /

NMT GUIDANCE DOCUMENT



Two way bicycle lane and bicycle docking facility at Barcelona, Spain
Source: IBI Group

2.1 Need for Guidance Document

This Guidance Document is an attempt to provide a step-by-step guide for cities to plan and implement successful NMTs. With increased investment in transportation, the time is opportune to prepare a step-by-step approach to address how a shift to non-motorised transportation is an essential need and can bring about a paradigm shift in how Indian cities grow.

This effort was initiated by the Sustainable Urban Transportation Project (SUTP), Ministry of Urban Development and World Bank, as states and cities in India increasingly aspired to improve liveability. Majority of the acts, regulations and statutory documents are based on automobile-oriented planning principles. This Guidance Document is intended to provide direction to cities in addressing barriers to NMT at local levels, create realistic plans and direct investment to NMT.

The NMT Guidance Document is meant to provide both Transport and Development Authorities with a common vocabulary when discussing transport planning in the city. This Guidance Document reflects emerging central government policies including the National Urban Transport Policy, National Mission for Sustainable Habitats and the Smart Cities Concept Paper prepared by the Ministry of Urban Development, Government of India.

It is important not to perceive the Guidance Document as a 'manual of standards' for creating NMT. Based on local conditions, it is expected that state, city and special authorities will adapt the steps presented to their own individual situations to develop solutions and approaches beyond these contained in this document.

2.2 Objectives

This Guidance Document intends to provide a step-by-step approach to formulating NMT-supportive policies, planning processes and engineering designs, where possible. It provides direction to implementing agencies, through a systematic methodology, for executing interventions within existing institutional frameworks to the maximum extent possible.



A. Communicate

Clearly communicate applicability of NMT principles in the Indian context while planning and implementing plans at various scales- city, corridor, area and streets



B. Guide Creation of Successful NMTs

One of the primary objectives of this Guidance Document is to expand the present NMT discourse beyond the planning and design aspects of the process. This document provides special emphasis on the financing and implementation steps required for creating successful NMTs, including integration with statutory documents and existing institutional framework.



C. One-stop NMT Resource

Serve as a one-stop resource on NMT for municipalities, transit agencies, developers, professionals, state governments, central government ministries and other public agencies interested in embarking on NMT planning and implementation;



D. Capacity Building

Assist stakeholders in delivering NMT policies, programmes and projects by establishing the necessary foundation for the physical, regulatory, financial and political environments.

2.3 Target Users

USING THE NMT GUIDANCE DOCUMENT



PLANNING AUTHORITY

If you are a:

- City Development Authority
- State Urban Development or Transport Department
- Municipal Corporations/Urban Local Body
- Town And Country Planning Department
- Special Planning Authority

And if you want to:

- ASSESS your city's readiness for implementing NMT
- ENABLE capacity building in NMT
- PLAN+DESIGN NMT networks and corridors
- INVEST strategically in improving NMT infrastructure and inducing modal shift
- IMPLEMENT a culture change making NMT viable and attractive for all socio-economic groups.

ROAD ENGINEERING DEPT.

If you are a:

- Road Engineering Department
- Utility Engineering Department
- Public Works Department
- Other Transportation Agency

And if you want to:

- ASSESS the NMT needs on roads in your jurisdiction
- ENABLE capacity building in NMT
- PLAN+DESIGN pedestrian and cycling facilities
- INVEST equitably on non-motorised transportation facilities
- IMPLEMENT and execute successful NMT facilities.

PRIVATE STAKEHOLDERS/PROFESSIONALS

If you want to:

- Contribute to city's growth vision and goals*
- Develop your design/development ideas based on NMT principles*

2.4 Step - by - Step Approach to NMT

This document goes beyond discussing the theory of NMT, especially as it relates to developing planning and design components, that concentrates on providing the decision-makers with the tools necessary to make informed decisions for developing a realistic plan that is implementable and flexible. In order to capture the entire NMT process from feasibility assessment to completion, the step-by-step guide is organized into “five key steps”:



Assess: While many standards and manuals are available in the country on how to plan for NMT infrastructure, it is critical to first assess the preparedness of the city, before giving a road map for interventions needed to achieve the desired vision. The ‘Assess’ section identifies a set of tasks and sub-tasks for establishing baseline needs and understanding the current status of the city. This includes a review of existing institutional structures, physical infrastructure, citizen needs, existing initiatives and stakeholders’ interests.

Enable: With the NUTP, NMSH and other initiatives, Indian cities now have good policy support for NMT, at least at the national level. There is a need to convert these sound policies to lifestyle choices for citizens, that would make a favourable environment for the smooth implementation of these policies. The ‘Enable’ section identifies a set of tasks to translate these policies into local actions and aims at building commitment and encouraging leadership to change culture and perceptions. It also includes a discussion on integrating NMT principles with urban planning and decision making processes and budgets; it builds capacities to enable effective implementation.

Plan + Design: Cities involve multiple stakeholders and it is impractical to assume that everyone in a city will behave the way the design assumes they will. The planning process needs to ensure that the NMT users have direct, coherent, safe, attractive and comfortable routes to complete trips. This process can provide long-term benefits and support the plan’s implementation. The ‘Plan’ component of this section identifies a flexible planning process that cities may adapt based on their local context to undertake planning and implementation of NMT infrastructure at varying scales. This is supported with design guidelines, presented in this section, refers to standards and benchmarks for NMT facility design being used in the country and discusses how to resolve site specific conditions.

Invest: The ‘Invest’ section builds a case for investing in NMT projects and explores the possible financing options that cities could use to ensure that more funding is dedicated for NMT use. Strategies from analysing the city budgets to bundling NMT with larger infrastructure projects are some of the micro and macro-level tools presented in this section.

Implement: Implementing and executing an NMT project on the ground is a complex task not only because of issues faced during implementing street upgradation projects but also because of the multiplicity of stakeholders involved. It becomes important then to clearly define the organizational roles and responsibilities during the construction process. The ‘Implement’ section discusses the various components of NMT implementation- from the organizational framework to community engagement and outreach and from project management and supervision to monitoring and evaluation.

2.4.1. How to Read the NMT Step-by-Step Guidance Document

This section sets the stage for presenting a detailed step-by-step ‘how-to’ guide for preparing and implementing NMT plans. To make the document user-friendly and easy to follow, it is articulated under the five steps, presented as separate chapters (Chapters 3 - 7), in the following sequence:

1. Overview
2. Tasks
3. Sub-Tasks
4. Tools

Appendices are included to provide additional references including sample terms of references for preparing NMT plans, case studies, and glossary of terms.



Tasks: Defines the action oriented steps **3.2.1. Review City Characteristics and Transport Scenario**

Purpose: Describes why is a specific task needed for implementing NMT policies and/or programmes

Sub-Tasks: A list of steps that will aid in completing the larger defined task

Tools: A set of tools designed to be used together for a particular task

References: An indicative list of external references that provide guidance on the said task

Outcomes: For each task, the anticipated outcomes are identified, with the goal of assisting users in identifying tangible deliverables, where applicable.

PURPOSE

To understand the need and urgency for NMT planning in the city by evaluating the current mobility needs, available mode choices, and travel behaviour as well as environmental, health and safety issues within the city.

SUB-TASKS

- Review the city's Master plan / Development Plan for land use and street networks (existing and proposed).
- Study the city's socio-demographic profile including population densities, income levels, etc.
- Review the city's transport scenario including:
 - o Overall modal share
 - o Trip length distribution
 - o Trip rates
 - o Trip purpose distribution
 - o Availability and usage of transit modes
- Review and analyze the city's accident data
- Review and analyze the city's air pollution data and sources of pollution to understand the environmental burden of motorization on the city's air, public health and economy.
- Determine the NMT culture of the city by trying to answer these three main questions:
 - o Is walking a mode of choice? - for which socio-economic demographic and what kinds of trips?
 - o Is cycling a commuting choice of preference? - for which socio-economic demographic and what kinds of trips?
 - o Is recreational cycling a growing phenomenon? What has been the catalyst for this growth?
- Prepare an assessment overview of the issues and concerns related to NMT travel, in the city.

OUTCOMES

- NMT Needs Assessment, including
 - o Environmental, Health and Safety impacts of transportation
 - o Current Mobility Situation

TOOLS AND RESOURCES

Comprehensive Transport Study / Comprehensive Mobility Plan

- To determine the current or projected modal share for NMT modes.
- To determine the current or projected passenger volumes using transit corridors.

Walkability Asia Survey tool-(Clean Air Asia) / Other NMT indices

- To understand where the city stands in terms of NMT infrastructure

Air Quality Index

- To understand environmental burden of motorization

REFERENCES

- IUT Publications on Urban Transport (<http://www.iutindia.org/>)
- Service Level Benchmarks for Urban Transport, MoUD 2009
- The Hub (<http://www.embarqindiahub.org/>)
- Walkability Asia (<http://walkabilityasia.org/>)
- Realtime Air Quality Mapping in India (<http://aqicn.org/map/india/>)

A series of Tools are provided to support the key tasks identified in the step-by-step process.

The tools are intended to provide additional detail on following a logical sequence of activities in accomplishing tasks in varying conditions.

03 / ASSESS



Proposed pedestrian plazas, separate cycle tracks and bus lanes along Pandy Bazaar
Source: Official website of ITDP



3.1 Getting your City Ready for NMT

Pedestrians and cyclists are seen in all cities in the country and yet few projects for walking and cycling are planned or executed. The reasons for this, historically, have been manifold. It is critical to understand the existing ecosystems, knowledge and capacities of the city as well as their readiness to implement infrastructure for walking and cycling.

While many standards and manuals are available in the country on how to make good NMT infrastructure, it is important to first assess the baseline of the city – to establish where the city is – before we give a road map for the set of interventions needed to achieve the benchmark.

The objectives of this step are to:

- To develop the baseline for NMT – institutional and infrastructure
- To identify the actors and stakeholders
- To evaluate the potential and readiness levels of the city

To achieve these assessment objectives a multi-strategy approach of review, interview and evaluate is necessary.

The preparation of a NMT Plan requires the involvement of stakeholders in the planning process to make the plan realistic and with a multi-stakeholder ownership to ensure the successful implementation of projects arising from it. In the preparation of the NMT plan it becomes even more critical to ensure that:

- a. Awareness about NMT needs and strategies is created in the city and consensus to ascribe to it is built up;
- b. The various future scenarios modeled address the vision of the stakeholders for their city; and
- c. The projects proposed for implementation of the plan have political will and popular support, making both their funding and implementation easier.

Assessment of the baseline with the involvement of the stakeholders is an important exercise for various reasons:

- a. *Understanding the city:* It is necessary to engage

with stakeholders who influence and plan transport networks in the city. The on ground experience of the stakeholders with the city is valuable and needs to be captured. This exercise will help us in understanding not only the characteristics of the city but also help us in understanding the main weaknesses and strengths of the city which will have to be dealt with in the course of our work. By understanding the limitations within which the stakeholders work, we will be able to develop more relevant scenarios for the city and make better recommendations;

- b. *The scope of work of each organization:* There are a number of agencies that operate in a city. Sometimes, multiple agencies will be involved in the same area. For example, construction and maintenance of roads in a city may not fall under the jurisdiction of a single agency. Stakeholder consultations help in capturing the exact institutional and organizational framework in the city;
- c. *Building a rapport with city stakeholders:* Engaging with the stakeholders creates a rapport in the city which ensures that the recommendations are smoothly implemented and problems or barriers are minimized in the implementation stage. While certain stakeholders may not contribute to the creation of NMT projects, engaging them will help in ensuring maximum support from the city;
- d. *"Individuals are good, Organizations are better"* It is important to build relationships with the institution and not one individual as this would lead to a situation where if the individual leaves the organization, there would be need to build relationships from scratch; and
- e. *Making informed plans:* The NMT planning process needs to be informed by various other plans and interventions proposed in the cities, visions and agenda of the different stakeholder groups, and framed within the context of their capacities and interests to make it realistic and implementable.



3.2 Assess Tasks, Key Outcomes and Tools

The 'Assess' step defines tasks that will help in determining a city's needs across multiple levels – institutional structures, physical infrastructure, peoples' needs and the stakeholders' interest. A comprehensive assessment of the city should be carried out to evaluate the city's readiness to implement NMT interventions.

	Tasks	Outcomes	Tools
1	Review City Characteristics and Transport Situation	NMT Needs Assessment	
2	Conduct review of current institutional support, legislative and regulatory environment	NMT Readiness Assessment	
3	Map existing initiatives and their impact	Documentation of key findings	
4	Define scale and type of NMT Plan	Scale and Scope of NMT Plan	Tool 1: "How-to" Determine Scale of NMT Plan?
5	Identify funding opportunities for undertaking NMT studies	Funding Sources and Opportunities	
6	Identify stakeholders and conduct an Actors analysis	Actor's analysis	



3.2.1. Review City Characteristics and Transport Situation

PURPOSE

To understand the need and urgency for NMT planning in the city by evaluating the current mobility needs, available mode choices, and travel behaviour as well as environmental, health and safety issues within the city.

SUB-TASKS

- Review the city's Master plan/Development Plan for land use and street networks (existing and proposed).
- Study the city's socio-demographic profile including population densities, income levels, etc.
- Review the city's transport scenario including:
 - Overall modal share
 - Trip length distribution
 - Trip rates
 - Trip purpose distribution
 - Availability and usage of transit modes
- Review and analyse the city's accident data
- Review and analyse the city's air pollution data and sources of pollution to understand the environmental burden of motorization on the city's air, public health and economy.
- Determine the NMT culture of the city by trying to answer these three main questions:
 - Is walking a mode of choice? For which socio-economic demographic and what kinds of trips?
 - Is cycling a commuting choice of preference? For which socio-economic demographic and what kinds of trips?
 - Is recreational cycling a growing phenomenon? What has been the catalyst for this growth?
- Prepare an assessment overview of the issues and concerns related to NMT travel in the city.

OUTCOMES

- NMT Needs Assessment including
 - Environmental, health and safety impacts of transportation
 - Current mobility situation

TOOLS AND RESOURCES

Comprehensive Transport Study/ Comprehensive Mobility Plan

- To determine the current or projected modal share for NMT modes.
- To determine the current or projected passenger volumes using transit corridors.

Walkability Asia Survey tool-(Clean Air Asia)/Other NMT indices

- To understand where the city stands in terms of NMT infrastructure

Air Quality Index (Air Pollution Monitoring Board)

- To understand environmental burden of motorisation

Accident Data (Traffic Police Records)

- To understand the prevailing risks and conflicts associated with NMT modes

REFERENCES

- IUT Publications on Urban Transport (<http://www.iutindia.org/>)
- Service Level Benchmarks for Urban Transport, MoUD 2009
- The Hub (<http://www.embarqindiahub.org/>)
- Walkability Asia (<http://walkabilityasia.org/>)
- Realtime Air Quality Mapping in India (<http://aqicn.org/map/india/>)



3.2.2. Conduct review of current institutional support, legislative and regulatory environment

PURPOSE

To assess the readiness of the city to prioritize NMT in terms of institutional support, plans, policies, investment and implementation

SUB-TASKS

- Prepare a checklist of transportation institutions and their mandates. Assess them based on their willingness and experience in supporting NMT initiatives.
- Review current policies, plans and assess them against NMT principles (see 1.3). Some of the plans and policies to be reviewed:
 - o State Urban Development and Transport Policy (if available);
 - o State Town and Country Planning Act;
 - o Regional/City Development Plans;
 - o Comprehensive Mobility Plans/Comprehensive Traffic and Transportation Plans/Low Carbon Mobility Plans at regional and municipal levels;
 - o Development Code Regulations (including Building By-Laws); and
 - o Local Area Plans/Detailed Development Plans/Zonal Development Plans.
- Review the legislative, regulatory environment and assess them for their approach to NMT modes. Transport regulation and enforcement are under the purview of state and city level. Acts and rules which need to be reviewed
 - o MV Act and rules including provisions applicable to NMT such as safety requirements, right of passage etc;
 - o Dynamic and static traffic regulations like one way, speed limits and NMT prohibition; and
 - o Licensing, taxation, incentives and regulations applicable to bicycles and NMV manufacturers/sellers vis-a-vis those applicable to car and 2-wheeler manufacturers/sellers.
- Conduct Readiness Assessment using a series of questions divided into 5 'E's: engineering, education, encouragement, enforcement, and evaluation. Each 'E' in turn has questions on planning, policy, institutions, financials, and implementation. This creates a 5x5 matrix of assessment.

OUTCOMES

- NMT readiness memorandum including:
 - o Review of institutional and policy framework enlisting supportive and obstructive institutions/policies;
 - o Review of current plans enlisting gaps and consistencies as related to NMT principles; and
 - o Review of legislative and regulatory environment enlisting supportive and obstructive legislations/regulations.

TOOLS AND RESOURCES

Relevant Notified State and Municipal Acts

To determine NMT responsibilities within the existing institutional and policy framework.

Mobility Plans/Master Plans

To identify gaps and consistencies in the current planning framework.

Traffic Laws/Licensing Laws

To identify level of NMT sensitivity within the regulatory framework

REFERENCES

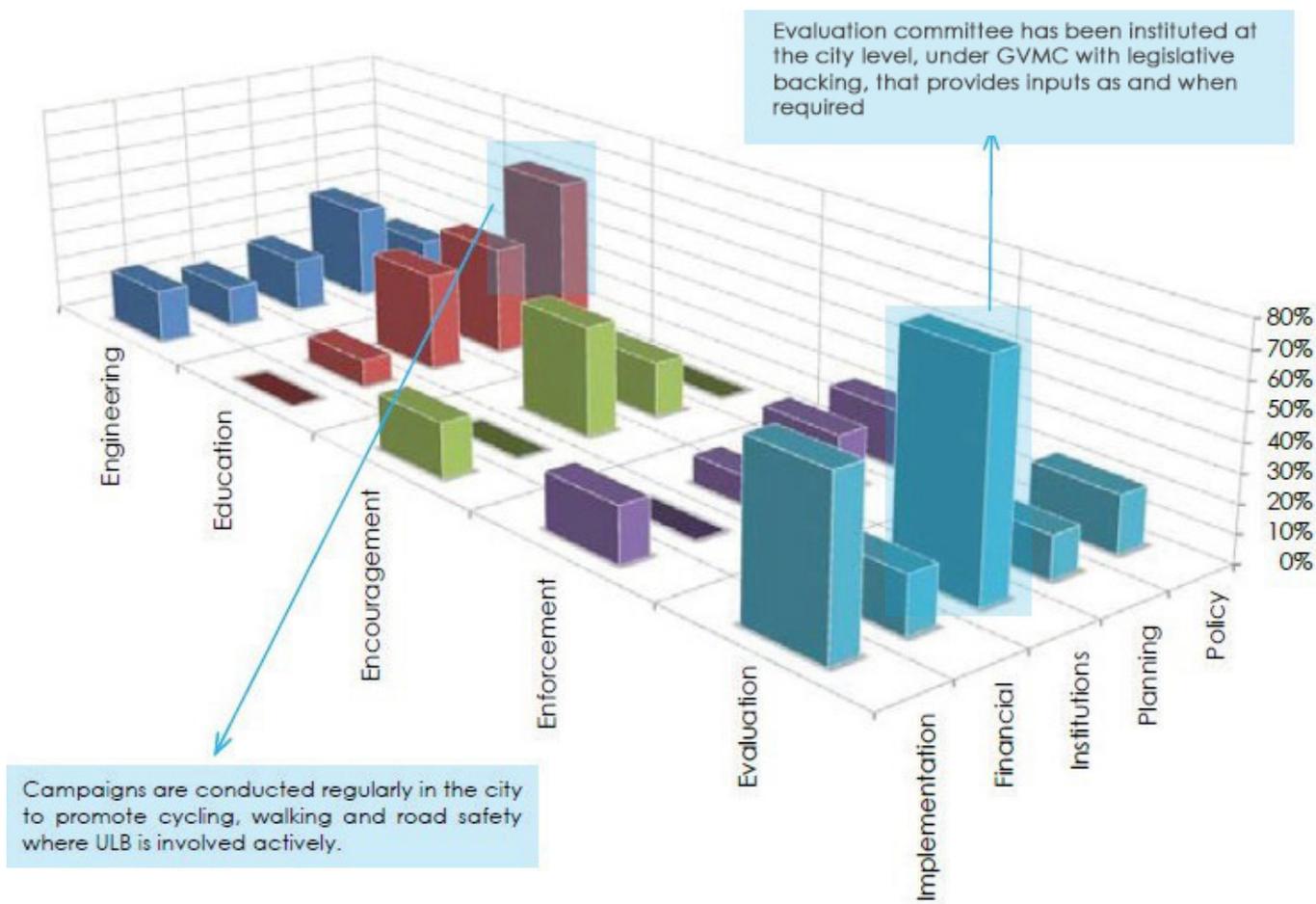
- UMTA Toolkit
- Ecomobility Readiness Assessment - ICLEI South Asia



3.0 ASSESS

Figure 33: Readiness Assessment for Visakhapatnam defined under 5E's to address aspects related to NMT. Based on the secondary sources of information, it measures the potential to improve the relevant components within the current policy, planning, institutional, financial, and implementation framework

Source: Visakhapatnam NMT City Specific Plan (adapted from Ecomobility Readiness Assessment - ICLEI South Asia)





3.2.3. Map existing initiatives and their impact

PURPOSE

To study the response of the citizens to various kinds of NMT initiatives in the city and derive lessons for the NMT plan.

SUB-TASKS

- Study existing infrastructure initiatives by the Municipal Corporation or Development Authority and their impact on NMT usage: These initiatives could be at large or small scale but would have impacted the users. For example:
 - Wide sidewalks in certain areas – has it made walking safer and more attractive?
 - Barrier free access infrastructure
 - Cycle tracks/cycle lanes
 - Cycle parking and/or cycle rickshaw stands
 - Good lighting in certain areas
 - Support infrastructure like toilets, garbage disposal, street furniture or street art
- Evaluate the existing outreach and information based NMT initiatives for their impact on NMT mobility in the city:
 - Maps for walking/cycling/public transit access
 - Pedestrian priority or cyclists reservations signages
 - Campaign for sensitization of cars, HGV, LGV, two wheelers for NMT users
 - NMT maps for tourists
- Enlist and study the success and failures of awareness raising initiatives led by government authorities or NGOs such as:
 - NMT day, every week or month – mandatory for govt. employees etc.
 - Street reclaiming initiatives like Raahgiri or Ciclovias where parts of streets are closed to motorised traffic
 - Cycle days or cycle to work events
 - Pedestrian safety drives

OUTCOMES

- Documentation of key findings, including:
 - Effective strategies that can be replicated and expanded to promote NMT
 - Ineffective strategies to be avoided

TOOLS AND RESOURCES

Plans or Photo-logs of Existing Infrastructure

To document existing NMT infrastructure and document their impact

Print and Social Media Campaigns

To identify NMT informational and awareness building campaigns and document their impact

Discussion Forums and Citizen Interactions

REFERENCES

- The Hub (<http://www.embarqindiahub.org/>)



3.2.4. Define scale and type of NMT Plan

PURPOSE

To identify the focus of the NMT Plan and gain better control of the planning process and its outcomes through selection of an appropriate scale and scope.

SUB-TASKS

- Define the scale and type of the NMT plan based on the following key factors:
 - o Mobility needs identified in the Comprehensive Mobility Plan or Master Plan
 - o Ongoing or completed planning process
 - o Primary agency's mandate and area of interest
 - o Stakeholder interest
- Coordinate and collaborate with key stakeholders (Transport and Development Authority at minimum) to identify the focus of the NMT study and the best scale suited to achieve the stakeholder goals.
- Identify the appropriate Scope depending on the determined scale of NMT intervention.

OUTCOMES

- NMT Scale and Scope, along with an analysis and justification based on selected parameters.

TOOLS AND RESOURCES

Tool 1: "How-To" Determine the Scale of NMT Plan

Figure 34: Checklist to define scale, mode, and context of NMT Plan. An NMT Plan may be developed for one or all NMT modes

SCALE	MODE	CONTEXT
<input type="checkbox"/> City-wide	<input type="checkbox"/> Walking	<input type="checkbox"/> Greenfield
<input type="checkbox"/> Area-specific	<input type="checkbox"/> Cycling	<input type="checkbox"/> Sprawled Urban
<input type="checkbox"/> Corridor	<input type="checkbox"/> NMVs - cycle rickshaws	<input type="checkbox"/> Compact Urban
<input type="checkbox"/> Street		



3.2.5. Identify funding opportunities for undertaking NMT studies

PURPOSE

To identify multiple funding sources to obtain direct financial assistance for preparing NMT plans.

SUB-TASKS

- Identify sources of NMT grants from central, state, local and other sources. Some available options include:
 - Municipal budgets available for transport infrastructure
 - Urban Transport Fund (if established)
 - Tourism departments can dedicate funds for NMT planning from tourism development budgets.
 - Historic preservation institutions such as Archaeological Survey of India (ASI) and Indian National Trust for Art and Cultural Heritage (INTACH) can dedicate funds for NMT planning in historic areas.
 - International development agencies, NGOs and academic institutions to provide technical assistance in undertaking NMT studies.
- Bundle NMT projects with larger projects that have large funds available. Some available options include:
 - Integrate NMT planning with infrastructure and development plans.
 - Collaborate with state agencies to dedicate funds for conducting NMT studies from infrastructure budgets.
 - As part of transit system planning and station design.
- Independent and private entities may be encouraged to undertake NMT planning at small or big scales in exchange for development incentives.

OUTCOMES

- Systematic funding strategy including list of funding sources available for NMT planning studies.
- Identify funding source for intended NMT Plan.

TOOLS AND RESOURCES

Centrally and State Sponsored Schemes

To identify potential funding from the central or state governments.

Local Planning Budgets

Non-Governmental Funding Sources

REFERENCES

- National Institute of Public Finance and Policy
- Planning, Connecting and Financing Cities Now. World Bank (2013) <http://siteresources.worldbank.org/EXTSDNET/Resources/Urbanization-Planning-Connecting-Financing-2013.pdf>

3.2.6. Identify stakeholders and conduct an Actors' Analysis

PURPOSE

To initiate an inclusive process of stakeholder engagement to generate awareness and early buy-in to the process and increase chances of supporting implementation of NMT Sub-Tasks.

SUB-TASKS

- Prepare a list of stakeholders that have a role to play in planning, implementing and supporting NMT processes depending on the scale and scope of project identified. Typical stakeholders in NMT projects include:
 - o Government Bodies like Municipal Corporations, Development Authorities, Public Works Departments, Traffic Police, Transport Department, Environment Pollution Control Authority (EPCA), Fire and Ambulance Services, Environment Department, Cantonment Board, Transport Corporations, etc;
 - o Experts in the field of transport from Academic Institutes and Research bodies and Consultants or practitioners in the field
 - o Media: Both print and electronic media;
 - o NGOs/CSOs;
 - o Elected Representatives: Ward Councilors/Corporators, MPs, MLAs, CM and Transport Minister;
 - o Operators like auto rickshaw unions, private bus operators;
 - o Others like Unions, Bus and Cycle Manufactures, owners and operators of transport infrastructure; and
 - o User groups like resident welfare associations, local businesses, etc.
- Conduct an Actors' Analysis to assess whether the different stakeholders are likely to support or oppose NMT interventions, their level of influence and strategies that are needed to convert opposition into support in the city

OUTCOMES

- List of stakeholders
- Specific strategies to address the concerns of different stakeholders can be identified

TOOLS AND RESOURCES

- Consultations with Local Agencies
- Consultations with NGOs working on urban development issues

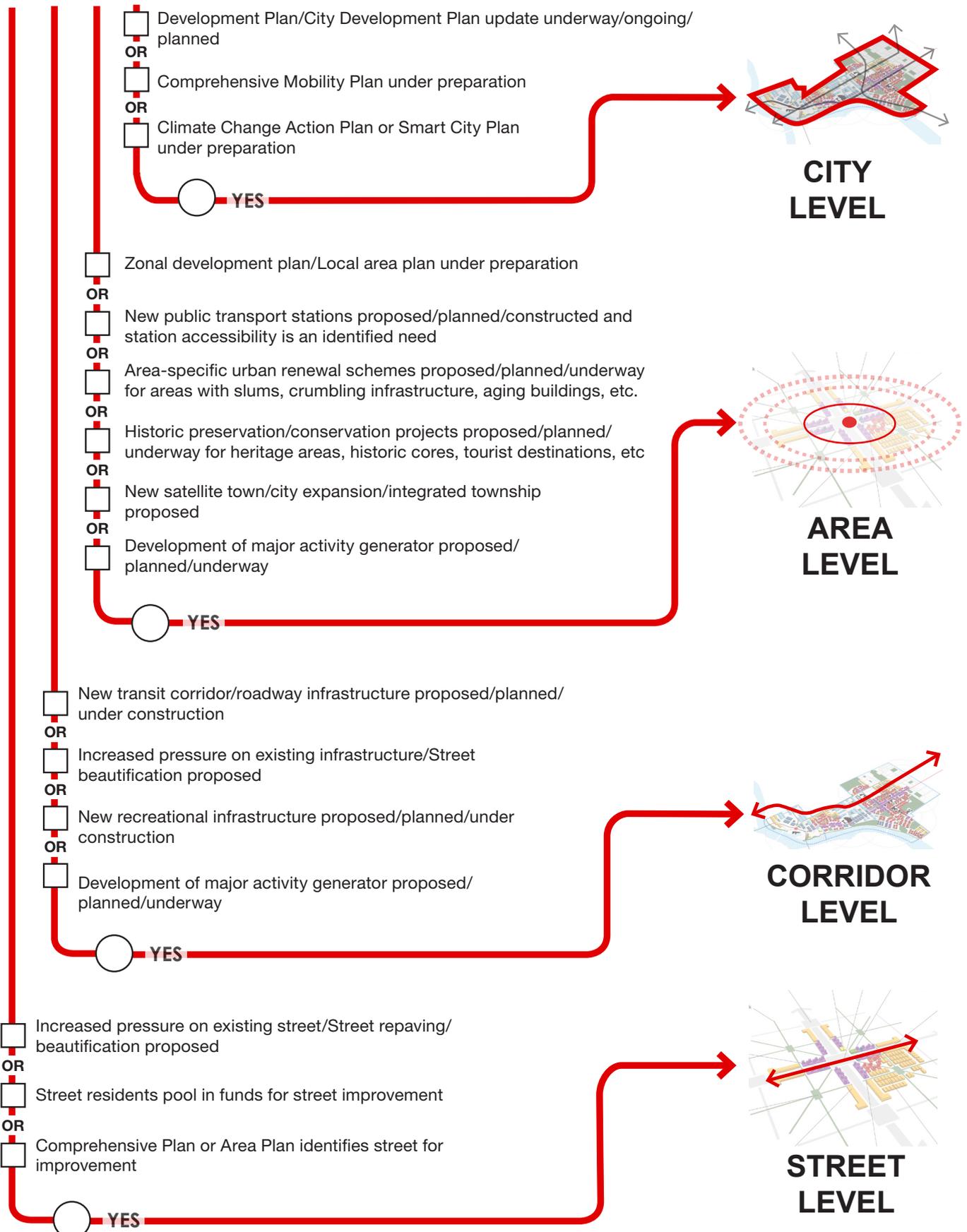
REFERENCES

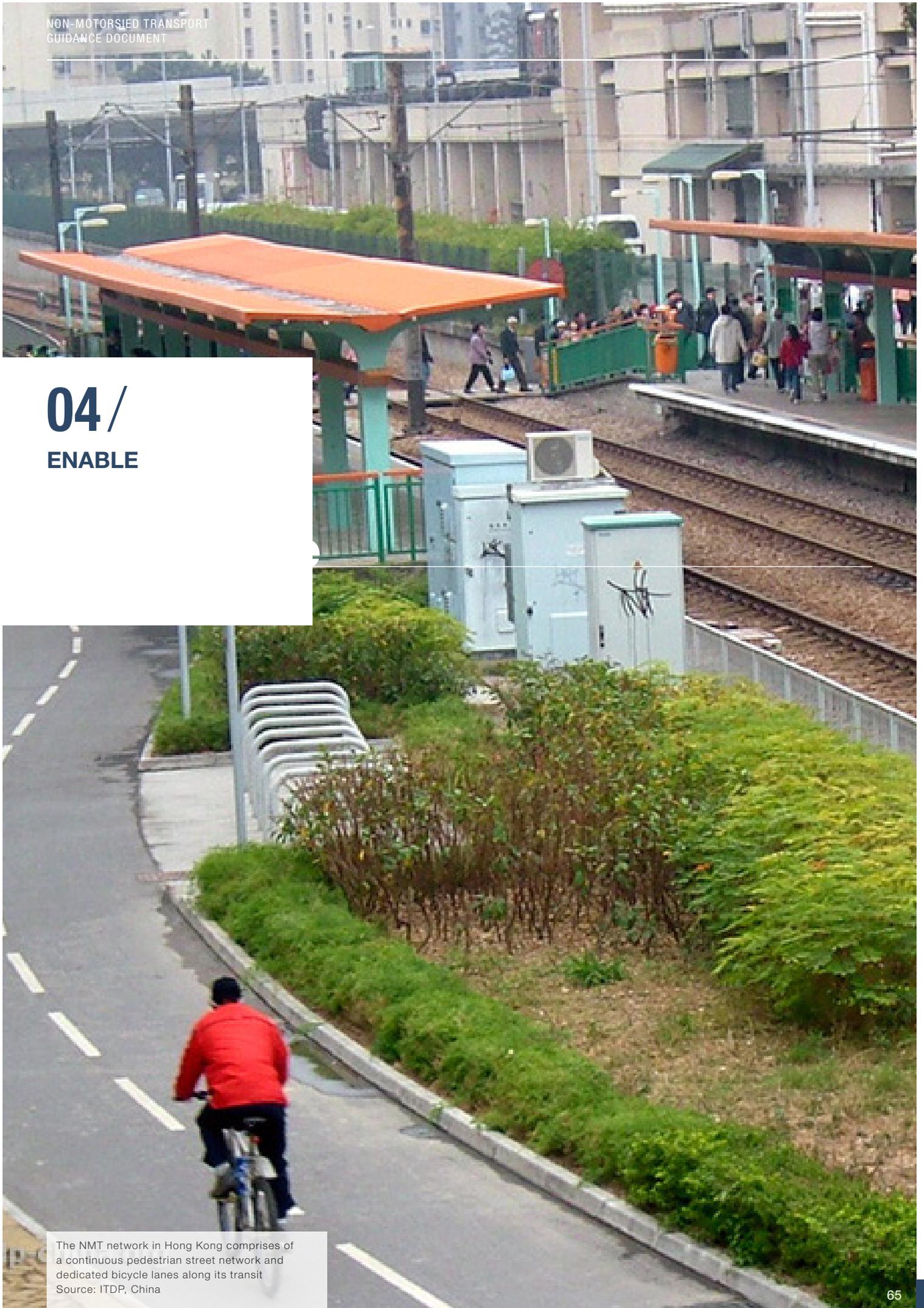
- Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets - IFC
- Good Practice Guide to Public Engagement in Development Schemes - RTPi UK



TOOL 1: “HOW-TO” DETERMINE SCALE OF NMT PLAN?

Where does your city stand on the following?





04/ ENABLE

The NMT network in Hong Kong comprises of a continuous pedestrian street network and dedicated bicycle lanes along its transit
Source: ITDP, China



4.1 Envisioning a low carbon, future ready city

With the National Urban Transport Policy (NUTP) notified in 2006 and the National Mission on Sustainable Habitat (NMSH) formed in 2009 among other initiatives, we now have National level policy support for NMT.

The objective of NUTP 2006 is stated as “to ensure safe, affordable, quick, comfortable, reliable and sustainable access for the growing number of city residents to jobs, education, recreation and such other needs within our cities.” Cities that were receiving funds through NUTP were encouraged to prioritize non-motorised transportation. In particular the following NMT priorities are highlighted in the NUTP:

- The safety concerns of cyclists and pedestrians must be addressed by encouraging the construction of segregated lanes for bicycles and pedestrians. Segregation of vehicles moving at different speeds would improve traffic flow;
- Segregated NMV paths are required not only along arterials but also access roads to public transport terminals. This will increase the use of the public transport system particularly when combined with the construction of NMV parking;
- It is essential that NMT facilities be designed and constructed by consulting experts and community (i.e., potential users);
- Activities on footpaths such as street vendors must be properly controlled to secure pedestrian safety;
- Specific area plans for exclusive non-motorised modes will be supported; and
- Cycling use must be encouraged through public bicycle programs and cycling infrastructure.

The National Mission on Sustainable Habitat (NMSH) is one of the eight missions approved under the National Climate Change Action Plan. The objective of the mission is to make cities sustainable through energy efficiency systems in buildings, waste management systems, and sustainable mobility systems. The NMSH incorporates the following primary principles for sustainable transport planning:

3. **Walk:** Develop neighbourhoods that promote walking.
4. **Cycle:** Prioritize cycle networks.
5. **Connect:** Create dense networks of streets and paths.
6. **Transit:** Support high quality transit.
7. **Density, Diversity and Compactness:** Optimize density and match transit capacity; Create compact regions with short commutes.
8. **Shift:** Shift from unsustainable mobility to sustainable modes by using technology, regulating road use, parking and fiscal measures.
9. **Urban Transport Fund:** Institutionalise fiscal and funding mechanisms to ensure financial sustainability of investments in public transport and non-motorised transport.
10. **Impact Assessment:** evaluation and assessment measures to effectively measure impacts of urban transport policies and projects.

There is need to convert these good policy statements into a favourable environment for effective implementation. An NMT supportive institutional framework supported by political and executive will is essential for a long term commitment to NMT. City governments in an increasing number of countries have received the mandate to plan and manage their transport systems. However, institutionally city governments are often not ready to deal with this important task in Indian cities. In most cities there is a lack of clarity about where NMT falls - under the traffic planning and engineering department; the public works department; or the town planning department. Identifying a place for NMT in the current institutional hierarchy is an important first step.

Building commitment also requires inter-agency collaboration, clarity in the vision and achievable targets, and supportive regulations. The probability of achieving high quality, attractive NMT facilities that are at par with global standards will also require upgrading skill levels. Taking a proactive approach towards setting up the enabling institutions and mechanisms is therefore critical to the ultimate success of NMT.



4.2 Enable Tasks, Key Outcomes and Tools

The Enable step aims at creating NMT champions who can bring about change, supported with clear goals and targets, NMT-friendly policies, well-defined delivery mechanisms and substantive technical capacity. These tasks must be taken up once the needs assessment stage has been completed but must continue throughout the course of the project.

Tasks	Outcomes	Tools
1 Establish leadership support and project champions	NMT Cell	Tool 2: “How-to” Create a dedicated NMT Cell?
2 Establish NMT Vision and time-bound targets	NMT Vision and Targets	
3 Identify and address policy barriers	Gaps, Consistencies and Recommendations	
4 Define planning methodology and delivery mechanism	NMT Plan Terms of Reference	
5 Develop technical capacity	Augmentation of in-house technical skills	



4.2.1. Establish leadership support and project champions

PURPOSE

To get buy-in from political leadership to support NMT as the building block for smart and sustainable cities; and to ensure continuity in NMT-inclusive planning process beyond the office term of elected or appointed officials

SUB-TASKS

- Constitute a dedicated NMT Cell for policy-level and planning-level interventions, with representatives from various city agencies, local government departments, academic institutions, NGOs and private sector.
- Engage political leaders, policy makers and decision-makers, in goal setting and vision building for establishing commitment to NMT. Engagement techniques may include:
 - o Visioning workshops in collaboration with central government agencies, state agencies, and NGOs/advocacy groups
 - o Integrating NMT principles as the backbone of all city-level policy discussions across agencies related to transportation, land use and economic development
 - o Public outreach processes as part of master planning activities.
- Facilitate inter-departmental dialogues that can broaden commitment to NMT and can result in long term political ambitions to raise air quality, reduce carbon emissions, improve public health and increase livability.
- Identify project champions from among the executive or elected leadership at the individual and organizational levels, who will ensure a sustained environment conducive to NMT within the relevant city departments.
- Identify technical leadership preferably from city staff, representatives from NGOs or local advocacy groups, that will remain committed to the planning process.

OUTCOMES

- Formation of dedicated NMT Cells within the Urban Local Body or State Transport Department under guidance of project champion and with clear mandates.

TOOLS AND RESOURCES

NMT Cell Meetings and Workshops

Tool 2: “How-To” Form a Dedicated NMT Cell?

REFERENCES

- MoUD UMTA Toolkit



4.2.2. Establish NMT Vision and time-bound targets

PURPOSE

To establish a common vision for the city that prioritizes NMT and guides development and growth through time-bound targets.

SUB-TASKS

- Assess current goals of the region/city/neighbourhood and identify their transport related objectives.
- Integrate preliminary NMT goals with development and transport goals of the region/city/neighbourhood. These goals may include transformations at macro and micro levels, such as:
 - o Integrated Mobility
 - o Reduced Fuel Consumption
 - o Health Goals focusing on Lifestyle Diseases
 - o Road Safety
 - o Air Quality and Pollution Control Goals
 - o Programmes such as 'Smart Cities', 'Sustainable Development' or 'Eco-cities'.
- Develop time-bound targets to be achieved through NMT interventions. These targets may include:
 - o Increase in NMT and transit mode share
 - o Reduction in pedestrian and cyclist accident rates
 - o Reduction in incidence of lifestyle diseases
 - o Improved performance of local bicycle industry
 - o Improved air quality
- Prioritize goals and targets into short-term, mid-term, and long-term opportunities.
 - o Short-term goals must aim at addressing existing issues at small scales in the immediate term. They should be easy to implement, apply at smaller scales, and be the responsibility of a single agency. For example, a road engineering department may be able to construct footpaths as part of roadway construction.
 - o Mid-term goals must aim at addressing existing issues at larger scales within a timeline of 3-5 years. They may be the responsibility of few agencies to minimize the need for coordination.
 - o Long-term goals should be envisioned for 5-10 years into the future and must aim at addressing larger changes that bring about lifestyle changes.

OUTCOMES

- Concept Note/Memorandum: NMT Goals and Targets
- Integrate NMT early in other planning processes

TOOLS AND RESOURCES

Development Plans/Master Plans/ Sustainable Mobility Studies

To prepare consolidated goals or vision for the City's growth for a horizon year.

REFERENCES

- National Urban Transport Policy
- National Mission on Sustainable Habitat
- IUT Toolkit on Urban Transport - ADB Module 5 - Guidelines for NMT Measures - policy and options (<http://www.iutindia.org/>)

CASE STUDY

The Corporation of Chennai (COC) has listed the following goals and target, which it aims to meet by 2018 through various NMT interventions:

- Increase the mode share for pedestrians and cyclists to at least 40 per cent;
- Reduce the number of pedestrian and cyclist fatalities to 0 per annum;
- Ensure that at least 80 per cent of streets have footpaths;
- Ensure that at least 80 per cent of streets with a right-of-way (RoW) of over 30 m have unobstructed, segregated, continuous cycle track of 2m width;
- Increase public transport mode share to at least 60 per cent of motorised trips; and
- Stabilise private motor vehicle kilometres traveled (VKT) so that there is 0 per cent annual growth in VKT.



Figure 35: Cycling Target Goals from Copenhagen's City Policy | Source: Copenhagen City of Cyclists Bicycle Account 2010



THE THREE TARGET GOALS FOR 2015 FROM THE CITY OF COPENHAGEN'S POLICY, 'ECO-METROPOLIS - OUR VISION FOR COPENHAGEN 2015'

- At least 50 % will go to their place of work or education by bike.
- The number of killed and seriously injured Copenhagen cyclists will be reduced by more than 50 % compared to 2005.
- At least 80 % of Copenhagen cyclists will feel safe in traffic.

	96	98	00	02	04	06	08	10	15
ECO-METROPOLIS - TARGET GOALS									
Percentage that cycle to work or education (%)	30	30	34	32	36	36	37	35	50
Seriously injured cyclists (number per year)	252	173	146	152	125	97	121	92	56
Percentage of cyclists that feel safe (%)	60	58	57	56	58	53	51	67	80
OTHER KEY FIGURES									
Cycled kilometers (mil. km per weekday)	0.93	0.92	1.05	1.11	1.13	1.15	1.17	1.21	
Cycled km between serious casualties (mil. km)	1.2	1.8	2.4	2.4	3.0	4.0	3.2	4.4	
Cycling speed (km/h)					15.3	16.0	16.2	15.8	
Cycle tracks (km)	294	302	307	323	329	332	338	346	
Cycle lanes (km)		6	10	12	14	17	18	23	
Green cycle routes (km)	29	30	31	32	37	39	41	42	
Cycle parking spaces on roads and pavements (1000 pcs)*						42	47	48	

* New method of calculation, which is why the figures have been adjusted in relation to the Bicycle Accounts of 2006 and 2008.



4.2.3. Identify and address policy barriers

PURPOSE

To address regulatory and statutory barriers in national and state-level policies and acts that currently hinder implementation of NMT projects at the local levels.

SUB-TASKS

- Review relevant policies and acts and identify barriers to the creation of NMT-inclusive cities. Some policies and acts to be reviewed include:
 - » Motor Vehicles Act
 - » Town and Country Planning Act
 - » National/State Building Code
 - » Regional and Urban Development Policy Formulation and Implementation (RUDPFI) guidelines
 - » Metro Railways Act
- Work with relevant governmental agencies to incorporate NMT policies in state-level urban development policies and acts. Relevant acts and policies that are within the subject of the state include:
 - o State Town and Country Planning Acts include land conversion and land use amendments
 - o Building Bye-Laws (State) including parking and enforcement
- Recommend modifications to state-level legislations applying to licensing and regulation of non-motorised vehicles such as cycle rickshaws, handcarts, and vending carts.
- Determine coordination strategy with parallel planning processes such as Comprehensive Mobility Plans, Master Plan Updates, Local Area Plans, bye-law amendments or Special Area Plans.

OUTCOMES

- Modifications to state-level transport related Acts and Policies
- Identify opportunities for inclusion of NMT planning process within existing policy framework.

REFERENCES

- National Urban Transport Policy
- National Mission on Sustainable Habitat
- IUT Toolkit on Urban Transport (<http://www.iutindia.org/>)

CASE STUDY

The Punjab Cycle Rickshaws regulation of License (1976) does not put a cap on cycle rickshaws, and therefore no permits are required. Being environmentally friendly, cycle rickshaws do not have to be regulated for emission norms either. In Punjab, however, only a license for the rickshaw puller is required. The conditions for issuing license to the rickshaw puller are:

- Must be a healthy person
- Must be a bell on the rickshaw
- Must be a roof for the rickshaw
- Must be a mudguard on the rear tyre of the cycle rickshaw and there must be a reflector at the back of the cycle rickshaw which should shine at night.



4.2.4. Define planning methodology and delivery mechanism

PURPOSE

To define the planning processes and mechanisms that can make NMT happen within the existing planning and design framework.

SUB-TASKS

- Convene NMT Cell meetings to select an NMT Planning Team. The NMT Cell should assess the existing technical capacity based on the minimum staffing resources and qualifications for NMT planning shown in Figure 37. The two possible approaches to form an NMT Planning Team include:
 - o Use in-house resources, including engineers and planners employed by state departments or ULBs.
 - o If in-house resources do not exist or do not have time availability, retain an external consultant through a competitive and transparent bidding process.
- Prepare for a bid management process if an external consultant is to be retained, including:
 - o Assign a Project Manager to monitor the RFP selection process and actual preparation of NMT plans based on the Guidelines presented in the Plan + Design, Invest and Implement sections of this document;
 - o Prepare a Terms of Reference (ToR) with timelines and deliverables anticipated based on the scale and scope analysis conducted;
 - o Quality and Cost-Based Selection process is recommended with weights determined based on the scope of planning study; and
 - o Refer the list of empaneled consultants prepared by MoUD. Authorities are free to hire consultants other than those empaneled depending on their project needs.
 - o External consultants should be required to assist in capacity building of local institutions to enable long-term commitment to NMT projects.
- Allocate budgets for NMT Planning according to the scale and scope defined in Step 3.2.4.
- Explore innovative tools that can act as supplementary and interim policies to a NMT planning policy, such as:
 - o Street Design guidelines;
 - o Bus stop/Auto stop design guidelines;
 - o Vending policy; and
 - o Form-based codes along streets.

OUTCOMES

- NMT Terms of Reference
- NMT Planning Team with requisite experts and project engineers.

TOOLS AND RESOURCES

- MoUD Empaneled consultants for NMT
- Appendix C: Model NMT Terms of Reference

REFERENCES

- World Bank procurement methods <http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/>
- Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers (January 2011; Revised July 2014)



4.2.5. Develop technical capacity

PURPOSE

To build technical capacity within the institution to develop and monitor NMT projects in the long term.

SUB-TASKS

- Prepare a phased staffing plan to recruit skilled professionals (Figure 37) covering key areas of NMT:
 - o Traffic engineering,
 - o NMT planning and design,
 - o Parking management,
 - o Urban design, and
 - o Infrastructure planning.
- Collaborate with central government agencies under MoUD to design and implement training programmes for augmenting existing capacities of political executives and urban managers for planning, monitoring and evaluation of NMT policies, plans and projects. Training programmes include:
 - o Technical workshops providing information on state of the practice for transportation facility design, environmental impact mitigation, traffic flow analysis, traffic control, and transportation planning;
 - o Multidisciplinary workshops on how to approach specific transportation problems from different perspectives;
 - o Regular workshops to update existing knowledge on technology and to adapt to new knowledge and innovations;
- Work with state governments to provide technical/financial assistance and facilitate the creation of effective regional organizations that are area focused on prioritizing NMT planning implementation at the metropolitan scale such as the Unified Metropolitan Transportation Authority (UMTA).
- Contact local and international NGOs and academic experience with experience in NMT planning to hand-hold municipal staff in monitoring preparation, implementation and evaluation of NMT plans and projects.
- Undertake study tours with assistance from central/state governments both nationally and globally for experiential training on subjects that are new in the local context.

OUTCOMES

- Augmentation of managerial and technical skills related to managing the project and its implementation.

TOOLS AND RESOURCES

- Capacity building/Training workshops
- Study tours

REFERENCES

- JnNURM Toolkit for Comprehensive Capacity Building Programme <http://urban.bih.nic.in/Docs/Capacity-Building-Guidelines.pdf>
- Institute of Urban Transport (India) Capacity Building Toolkits (<http://www.iutindia.org/CapacityBuilding/Toolkits.aspx>)
- Urban Capacity Building Programme, Janaagraha (<http://www.janaagraha.org/content/program/urban-capacity-building>)

Figure 36: Proposed NMT Cell Framework | Source: Adapted from Visakhapatnam City Specific NMT Plan, iTrans

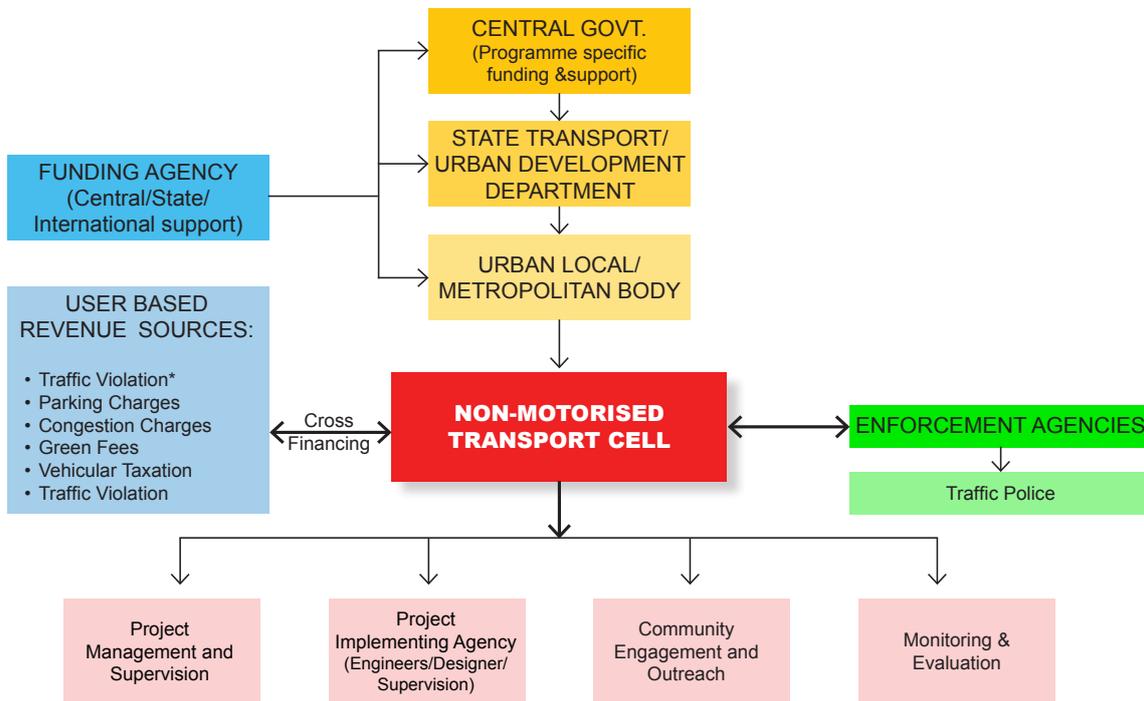


Figure 37: Minimum staffing resources needed depending on the scale of the NMT Program | Source: IBI Group

STAFF RESOURCE	QUALIFICATION AND EXPERIENCE	ROLES AND RESPONSIBILITIES
Team Leader <i>Minimum 10 Years</i>	Masters Degree in Transport Planning/Urban Design/Urban Planning	Non-Motorised Transportation Planning
Urban Designer/ Urban Planner <i>Minimum 5-10 Years</i>	Experience in NMT planning/ streetscape designing	Street Design Guidelines/ Urban Design Guidelines
Traffic Engineer/ Modeller <i>Minimum 5-10 Years</i>	Masters Degree in Traffic Engineering Experience in traffic engineering/ road safety auditing	Traffic Modelling/ Safety Auditing
Civil Engineer <i>Minimum 5-10 Years</i>	Masters Degree in Civil Engineering Experience in utility planning and roadway construction	Infrastructure/Underground Utility Planning
Support Team <i>Minimum 3 Years</i>	Degrees in Architecture/Finance/ Civil Engineering/GIS Experience to deliver the project	Financial Feasibility/GIS/ AutoCAD Database



TOOL 2: “HOW-TO” CREATE A DEDICATED NMT CELL?

1

Identify Type & Mandate of NMT Cell required (to be created) for the project

TYPES OF CELLS

Policy NMT Cell

- Provide all the Guidance and Strategic support for the preparation and implementation of the project including assigning budgets for the project(s)
- Support of all the city level institutions namely State Transport Department and inferenced Authorities.

Project Specific Technical NMT Cell

- Work under the overall guidance and advice of the Policy NMT Cell
- Coordinate with all other stakeholder groups (private stakeholders/citizen’s group) as necessary
- Identify Scale & Scope of the NMT project
- Develop ToR and appoint Consultants/Identify in-house project team.

2

Identify key Stakeholders and Chairperson for the NMT Cell

KEY STAKEHOLDERS (AT MINIMIUM)

Policy NMT Cell

- Chairman/Vice-Chairman/Commissioner/ Secretary of Transportation (Executive Chairperson)
- Head of the Urban Transportation Authority
- Head of the Urban Development Authority
- Head UMTA
- Head of Project Specific Technical NMT Cell
- Policy Experts from NGO’s academia and private sector

Project Specific Technical NMT Cell

- Chief/Deputy Chief Engineer (Head of Project Specific Technical NMT Cell)
- Head – UMTA
- HoD* – Road & Traffic Dept.
- HoD* – Public Transport
- HoD* – Infrastructure
- HoD* – Urban Development Authorities having jurisdiction over/within the study area
- Representatives from enforcement agencies
- Technical Experts from NGO’s, academia and private sector

3

Notify the appointment of the NMT Cells

- Follow the City’s existing protocol for notifying NMT cells appointment.
- Notify the mandate of the NMT Cells and the project specific Goals of the NMT Project

- Identify coordination and assistance required from various inter-governmental agencies to achieve the Goals of the Specific NMT Project



05 / PLAN + DESIGN



A wide, active, evenly paved, continuous, well-shaded sidewalk in Victoria, British Columbia provides equal access to pedestrians of all types and abilities
Source: Photo by Laurence Lui



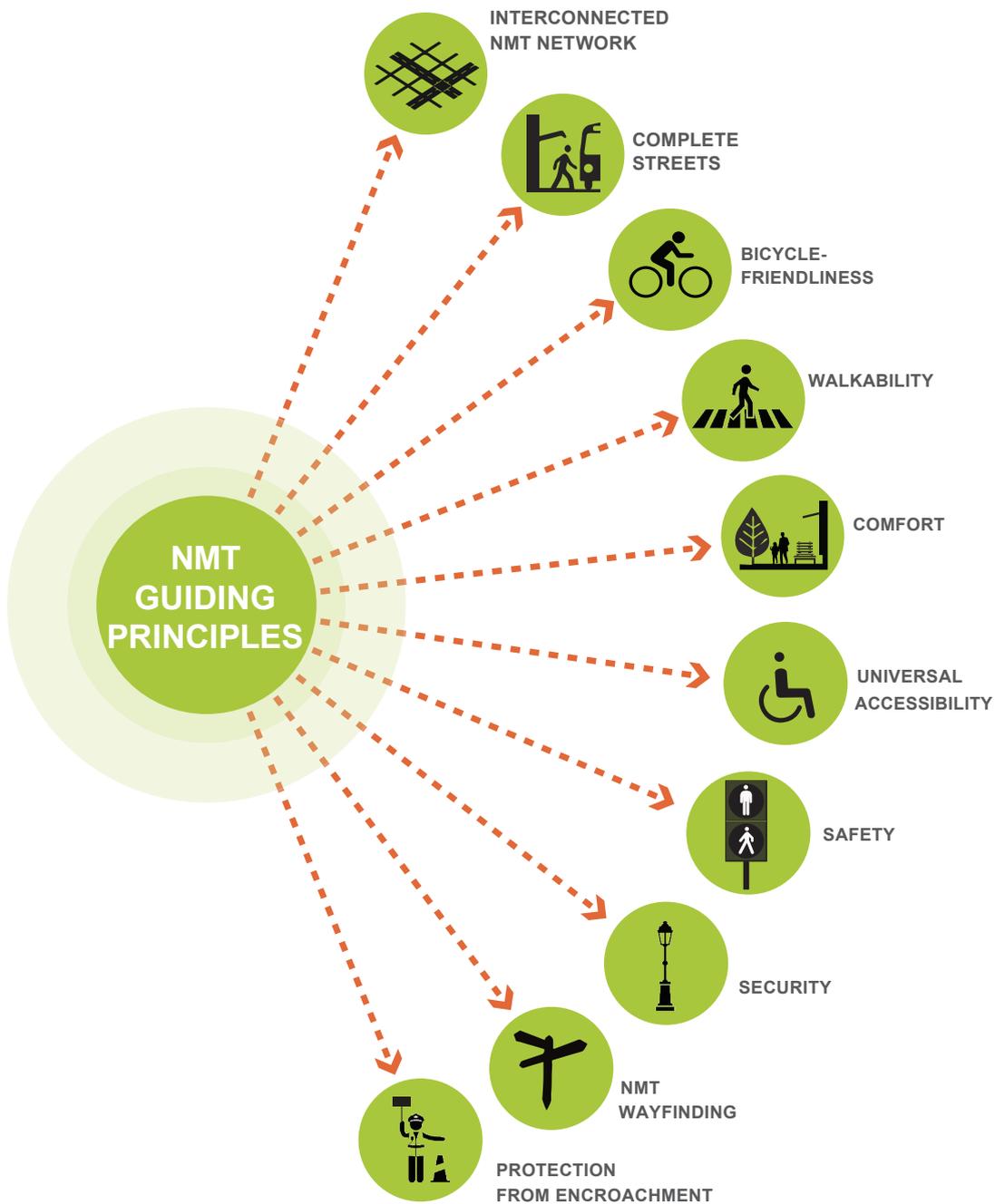
5.1 From Principles to Details

Designing or planning cities is not just about providing a well-designed product. Cities involve multiple stakeholders and it is impractical to assume that everyone in a city will behave the way the design assumes they will. Identification of design issues/problems is therefore essential. What is the design problem for NMT in India? In simple terms, there is a need to balance the specific needs and aspirations of society with larger economic and environmental concerns. In this respect, the need to innovate is critical to ensuring a larger good without harming the contextual elements. Design can be used as a tool that can completely alter the way we think about people, places and objects. Therefore it is essential to nurture a design sensitivity that respects the dichotomy between the individual and public and aims to use innovation to resolve this conflict. The following are some key design concepts:

1. Land use patterns significantly dictate mobility patterns. Compact mixed-use land use patterns where a majority of uses are within walking or cycling distance encourage shorter trips by NMT. Traditional city cores, which have been designed before the advent of the automobile, are amply illustrative of how compact land use patterns create a comfortable and safe environment for walking and cycling;
2. The potential for NMT use in India's expanding cities increases manifold when it is considered as part of an integrated multi-modal transport system. Multi-modal integration allows the flexibility of using different transport modes for different portions of a trip depending upon reach and availability. NMT is particularly suitable as a feeder mode for first/last mile connectivity. In general, the biggest hurdle to the use of public transport systems such as metro, rail and Bus Rapid Transit (BRT) is the difficulty in access. Many Indian cities currently provide services for access through intermediate public transport modes such as auto rickshaws and cycle rickshaws. Improving NMT infrastructure and integrating it with public transport could potentially make walking and cycling equally attractive feeder modes. This would help in increasing feeder choices to and from public transport and make public transport more attractive;
3. Complete Streets are visualised from the outside in, with a view towards its overall operational context. The access and functioning of each of the modes is assessed in relation to the other modes, sometimes resulting in shared space by multiple user types. Complete Streets design take into account a multitude of aspects: linear travel space for each mode; intersection treatments; block size and connectivity; user comfort and safety; parking; traffic calming devices; emergency and service vehicle access and storm water management (i.e., the street conceived as a single, integrated entity). Following are the common streets key guiding principles: Multi-modality, Inter-modality, Flexibility and Holistic design;
4. Universal design principles are not just meant for the physically disabled, they are also meant to improve the usability and appeal of places by all types of users. The application of these principles in street design should ensure barrier-free movement for all types of NMT users, including infant prams, children, physically or cognitively impaired pedestrians, wheelchairs, and luggage carts, in addition to the average pedestrian, cyclist and other non-motorised vehicles;
5. Network Planning: The importance of a comprehensive network approach as opposed to an opportunistic approach to developing NMT infrastructure cannot be underestimated. Even if beautifully constructed, an NMT corridor in isolation is unlikely to see much use unless it connects to a wider network. Well-connected networks facilitate more options, shorter trips and shorter travel times, all of which are key issues for supporting NMT. Several factors impact the success of a planned NMT network, principally: Directness, Coherence, Safety, Attractiveness and Comfort; and
6. NMT-inclusive Street Design Guidelines/Standards: It is now imperative to re-envision street design guidelines and standards to consider NMT as equal and important users of road space and allocate space and facilities accordingly. In addition, vulnerability needs to be considered, such that road geometries help in providing maximum protection to NMT users.



5.2 NMT Principles and Components

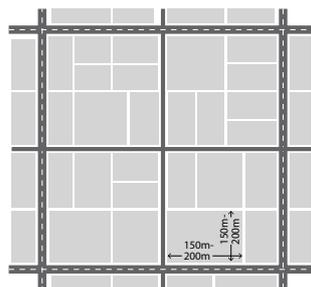




1. INTERCONNECTED NMT NETWORK

Components

Applicable at multiple levels, the principle of developing an interconnected NMT network system includes the following components:



1 STREET HIERARCHY

- Hierarchy as per Urban Road Code-cross Section:
 - o Arterial - 50m to 80m - 50km/hr
 - o Sub-Arterial - 30m to 50m - 50km/hr
 - o Distributor - 12m to 30m - 30km/hr
 - o Access - 6m to 15m - 15km/hr
- On streets with RoW of 18m or less, if pedestrian traffic is greater than 8000 per hour in both directions together, the entire RoW should be notified for pedestrianization. (NMSH Parameters, MoUD 2011)

2 BLOCK SIZES

- Recommended block size: 150-200m (ITDP TOD Standard)
- Area of blocks surrounded by public access pedestrian/cyclist streets or pathways not to exceed 2 ha. (NMSH Parameters, MoUD 2011)
- In existing built-up areas, statutory planning to be done for breaking up blocks with an area of more than 2 Ha, to provide publicly accessible pedestrian thoroughfare. (NMSH Parameters, MoUD 2011)

3 DIRECT NMT LINKS

- Mid-block crossings every 250m on average. Minimum 5 safe street-level crossings/km (NMSH Parameters, MoUD 2011).
- Standards for Mid-block Pedestrian Crossing: (IRC: 103:2012)
 - o Residential Areas: 80-250m
 - o Commercial/Mixed Use: 80-150m
 - o High Intensity Commercial Areas: Pedestrianization if possible
- Identify opportunities to provide 'cut-throughs' (i.e. across parking lots or through parks, where such cut-throughs shorten access routes.)

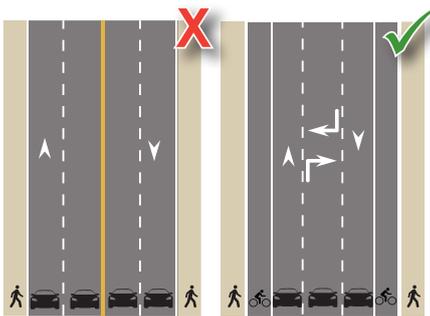
Indicators

- Total length of public pedestrian corridors (including walkways, footpaths, pedestrian bridges) as a percentage of total length of street network.
- Percentage of total length of streets with motor vehicle carriageway of 10m and more that have dedicated and segregated cycle tracks.
- Percentage of total length of streets with at least 5 safe street crossing (signalized or traffic calmed) opportunities per km for pedestrians and bicycles with spacing between two crossings not more than 250m. (NMSH Parameters, MoUD 2011)
- Number of intersections of public pedestrian and cyclist network per square kilometer.
- Existence of statutory provision for creating public access through large blocks.



Components

Create a network of complete streets which are designed to accommodate the most people, rather than vehicles. Complete Streets may consist of the following components:



1 APPROPRIATE ALLOCATION OF ROAD SPACE

- Width of footpath shall be determined based on pedestrian volume and have to be wider than 2m wherever required. (NMSH Parameters, MoUD 2011)
- Bus Rapid Transit System should be considered for demand greater than 2000 passengers per hour per direction. (NMSH Parameters, MoUD 2011)
- In a slow-speed local street (below 30 km/h), the optimum width for a carriageway is 3 m for one-way movement and 4.5 m for two-way movement (ITDP Better Street, Better Cities).
- Dedicated and physically segregated bicycle tracks with width of 2m or more, one in each direction, should be provided on all streets with total motor vehicle carriageway larger than 10m (not RoW) after providing adequately sized footpaths in each direction based on pedestrian traffic. (NMSH Parameters, MoUD 2011)



2 FLEXIBLE ZONES

- Vending zones shall be provided at regular intervals (approx. 10 minute walk from every home/workplace)
- Space for on-street parking should be clearly marked and enclosed by curbed bulb-outs

3 BUILDING EDGE-TO-EDGE DESIGN

- Building edges and building frontages should be incorporated in street design.
- Building frontages should be accessible to public as far as possible.
- Multi-Utility Zone (MUZ) of minimum 1.8 m width should be provided on all Collector and Arterial Roads, to accommodate bus stops, street utilities, trees, street furniture, planting for storm water management; IPT/NMT stands, paid idle parking, etc. (UTTIPEC, DDA, TOD Policy 2015)

Indicators

- Total length of public pedestrian corridors (including walkways, footpaths, pedestrian bridges) as a percentage of total length of street network.
- Percentage of total length of streets with motor vehicle carriageway of 10m and more that have dedicated and segregated cycle tracks.
- Percentage of streets within 500m of transit stations with minimum 3m footpaths.
- Percentage of building frontage along streets wider than 18m with no setback.
- Percentage of building frontages that are active. i.e. encourage human interaction and eyes-on-street.



3. BICYCLE-FRIENDLINESS

Components

Extensions to the pedestrian network by providing cycling facilities encourage the users of NMT to expand their reach. Some of the components to achieve this include:



1 CYCLE LANES

- Dedicated and physically segregated bicycle tracks with width of 2m or more, one in each direction, should be provided on all streets with total motor vehicle carriageway larger than 10m (not RoW) after providing adequately sized footpaths in each direction based on pedestrian traffic. (NMSH Parameters, MoUD 2011)
- Consider different kinds of bicycle lanes to serve different contexts, such as:
 - o Physically segregated one-way or two-way cycle tracks
 - o Coloured, partially protected one-way bicycle lane
 - o Median cycle track
 - o Off-street bicycle track - on sidewalks
 - o Contraflow bicycle lanes
 - o Recreational bicycle trail within greenway/linear park system



2 PUBLIC BICYCLE SHARING

- Strategically locate bike share/ bike stations along transit corridors, existing or proposed bikeways, popular destinations, and retail/job centres, to ensure that users can pick-up/drop-off bikes conveniently. (First Last Mile Strategic Plan, SCAG, 2013)
- Ridership of the system should be in excess of 1000 trips per bicycle per year. (NMSH Parameters, MoUD 2011)



3 CYCLE PARKING

- Provide cycle parking facilities near crowded locations and high cycling volume corridors.
- Develop arrangements with private companies/institutions to offer free cycle parking
- Provide dedicated space for cycle rickshaw parking

4 PUBLIC TRANSIT INTEGRATION

- Strategically locate cycle parking or bike sharing or rental facilities near public transit stations
- Cycle rickshaw parking bays of 1.5m width should be provided near the junctions. (Urban Road Code- Cross Section)
- Create opportunities for carrying bicycles on public transportation

Indicators

- Adoption of urban street design standards for the metropolitan area that include safe cycle infrastructure design standard (NMSH Parameters, MoUD 2011)
- Percentage of total length of streets with motor vehicle carriageway of 10m and more that have dedicated and segregated cycle tracks (NMSH Parameters, MoUD 2011)
- Percentage of total length of streets with motor-vehicle carriageway of 10m or more, equipped with cycle tracks to standards. (NMSH Parameters, MoUD 2011)
- Percentage of total length of streets with at least 5 safe street crossing per km for bicycles with spacing between two crossings not more than 250m. (NMSH Parameters, MoUD 2011)
- Presence of at least one functioning bicycle sharing system with more than 5000 bicycles with at least 1000 trips per bicycle per year if city population is larger than 5 lakhs. (NMSH Parameters, MoUD 2011)
- Percentage of built plots accessible through citywide cycle network of segregated lanes or traffic calmed streets. (NMSH Parameters, MoUD 2011)

Consolidated standards for designing facilities for cyclists (Planning and Design Guidelines for Non-Motorised Transport, 2014 and Urban road codes, 2012)

Parameter	Design Standard	Other Details
Width of cycle track	<ul style="list-style-type: none"> Arterial roads: 2.2 to 5.0m (including kerbs) Sub arterial roads: 2.2 to 5m (including kerbs) Distributory roads: 1.5 to 2.5m (including Kerbs) Access roads: mixed with MV traffic 	<p>Minimum width for two lane cycle track</p> <p>Arterial roads: 2.5 m</p> <p>Sub arterial: 2 m</p> <p>Distributory roads: 1.5m</p>
Height clearance for cycle track	2.4 m clear height	No obstructions like tree branches, ad panels, posts etc. should be present
Viewing clearance/field of view	<ul style="list-style-type: none"> Not less than 25 m (82 ft) In case of gradients 1 in 40 or steeper- not less than 60 m (197ft) 	
Track surface	<ul style="list-style-type: none"> Cement concrete has less maintenance cost, better illumination during nights but has higher initial cost Asphalt pavements give smoother riding surface for cyclists but have higher maintenance costs 	The surface of bicycle path should be in 100 mm thick cement concrete with 150 mm thick PCC base. M40 concrete is recommended to be used for the cycle tracks.
Shade of cycle track	<ul style="list-style-type: none"> On all streets above 6m in width at least 125 trees/km 	Spacing between trees should be less than 12m except at the intersections
Elevation of cycle tracks	<ul style="list-style-type: none"> Maximum height < 100mm (4") 	
Utility zones	<ul style="list-style-type: none"> Minimum width of 1.8 m Should include space for hawker zone Minimum width for a hawker to conduct business= 4 sq.m 	Utility list: tree planting; auto-rickshaw stands; hawker zones; car parking; street furniture; bus stops, street lights/ pedestrian lights.
Slope of ramp	<ul style="list-style-type: none"> Cycle track of 6-8 cm height: 30% gradient. Cycle track of 8-10 cm height: 20% gradient. Cycle track of 10-12 cm height: 15% gradient 	
Parking requirements	<ul style="list-style-type: none"> Needs to be provided near all metro stations Minimum width required is 1.5 m Cycle stand design: should accommodate at least the frame and ideally both wheels 	Parking for para-transport/feeder modes/ NMT is to be prioritized and subsidized and provided within multi utility zone



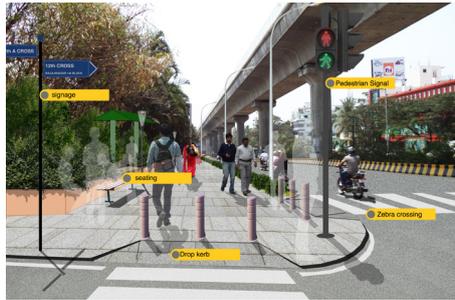
4. WALKABILITY

Components

Focusing on sidewalk networks at various scales is important in creating comfortable and attractive pedestrian linkages within the city in order to support walkability. Components of continuous sidewalks, at a minimum, include the following:

1 COMPACT DEVELOPMENT

- Recommended block size: 150-200m (ITDP TOD Standard)
- Area of blocks surrounded by public access pedestrian/cyclist streets or pathways not to exceed 2 ha. (NMSH Parameters, MoUD 2011)
- In existing built-up areas, statutory planning to be done for breaking up blocks with an area of more than 2 Ha, to provide publicly accessible pedestrian thoroughfare. (NMSH Parameters, MoUD 2011)
- In all integrated schemes, a minimum of 30% of overall FAR shall be mandatory for Residential use, a minimum 10% of FAR for commercial use and minimum 10% of FAR for community facilities. Mix of uses and FAR utilization for the remaining 50% FAR shall be as per the land use category designated in the Zonal Plan. (UTTIPEC, DDA, TOD Policy 2012).
- The residential zone with shop line (R-2 Zone) in which shopping will be permissible as indicated herein will comprise:
 - o Plots in a residential zone along roads on which the shop line is marked on the development plan.
 - o Plots in a residential zone along roads having existing or prescribed width of and between 18.3 m. and 31 m. (Source: Mumbai DP 1991).



2 PEDESTRIAN PRIORITY

- Recommended area of pedestrian space > 1.9 sqm/ped. (IRC code 103, 2012 Guidelines for Pedestrian Facilities)
- On streets with RoW of 18m or less, if pedestrian traffic is greater than 8000 per hour in both directions together, the entire RoW should be notified for pedestrianization. (NMSH Parameters, MoUD 2011)
- Desired average waiting time for a pedestrian at traffic signals is not more than 45 seconds (SLBs for Urban Transport- MoUD).
- Primary pedestrian access for buildings from the main street, with location as per shortest walking distance from nearest bus-stop (NMSH Parameters, MoUD 2011).



3 CONTINUOUS, APPROPRIATELY WIDE SIDEWALKS

- A continuous unobstructed footpath of 2m minimum on each side of all streets with RoW wider than 12m. (NMSH Parameters, MoUD 2011 and IRC: 103:2012).
- Sidewalks should be scaled to the amount of pedestrian traffic they can handle and based on adjacent land uses. (IRC: 103:2012)
 - o Commercial/Mixed Use- 2m
 - o Shopping frontages- 2.5m
 - o Bus Stops- 3m
 - o High Intensity Commercial Areas- 4m

Indicators

- Adoption of urban street design standards for the metropolitan area that include safe pedestrian infrastructure design standards
- Total length of public pedestrian corridors (including walkways, footpaths, pedestrian bridges) as a percentage of total length of street network.
- Total length of >12m streets with unobstructed footpaths as a percentage of the total length of streets in the city
- Percentage of streets with total carriageway >10m which have 5 or more traffic calmed or signalized crossing per km
- Percentage of intersections that have pedestrian crossing and refuges in all directions.

Standards for designing facilities for pedestrians (Planning and Design Guidelines for Non-Motorised Transport, 2014 and Urban road codes, 2012)

Parameter	Design Standard	Other Details
Width of footpath	<ul style="list-style-type: none"> Arterial roads: 1.7 to 5.5m (including kerbs) Sub arterial roads: 1.7 to 5m (including kerbs) Distributary roads: 1.5 to 3m (including kerbs) Access roads: 0- 2.5 m 	If secondary footpaths are available on arterial roads or along service lane, the minimum width of secondary paths can be 1.5m
Height clearance for footpath	2.4 m clear height	No obstructions like tree branches, ad panels, posts etc. should be present.
Elevation of footpaths	<ul style="list-style-type: none"> Maximum height < 150mm (6") 	Exception: for BRT corridors or segregated bus lanes- kerb height at stations should match height of first step or floor height depending on bus design
Shade of footpath	<ul style="list-style-type: none"> On all streets above 6m in width at least 125 trees/km 	Spacing between trees should be less than 12m except in intersections
Footpath surface	Footpath surface should be smooth, even and non-slippery, free from cracks. Large-sized pavers are preferred because they reduce maintenance burden.	
Utility zones	<ul style="list-style-type: none"> Minimum width of 1.8 m Should integrate space for hawker zone Minimum width for a hawker to conduct business= 4 sq.m 	Utility list: tree planting; auto-rickshaw stands; hawker zones; car parking; street furniture; bus stops, street lights/ pedestrian lights.
Dead width on footpath	<ul style="list-style-type: none"> Shopping area: 1m Next to buildings: 0.5 m Busy areas like bus stops: width dependent on pedestrian volume 	
Slope of ramp	<ul style="list-style-type: none"> Min. ramp slope 1:12 for wheel chair users 	
Disabled friendly infrastructure	<ul style="list-style-type: none"> Tactile paving on all walking surfaces Auditory features at all signals All signage should be graphic or symbol based 	



5. COMFORT

Components

Design of attractive and comfortable NMT realm increases the preference towards its usage. Some of the components to achieve these include:



1 SHADE

- Street Trees (NMSH Parameters, MoUD 2011):
 - At least 125 trees per km for streets with RoW smaller than 12m.
 - At least 125 trees per km per footpath on streets with RoW greater than 12m.
- Active frontages including arcades, awnings, other forms of shade shall be encouraged to maximize shade.



2 LIGHTING

- Lighting must be provided every 20-30m, focusing light on the pedestrian and bicycle lanes and not on the car lanes (IRC103-2012)
- Higher lighting levels (80 lux) using special light poles for pedestrian crossing is recommended, while lower level light poles are preferred to avoid shadow where there are high trees. (IRC103-2012)
- Appropriate lighting fixtures not exceeding a height of 4m from ground grade level should be provided. (IRC103-2012)



3 REST AREAS

- Elderly and disabled pedestrians need to rest frequently intervals. Provision of resting places or simple sitting areas with chairs, benches or steps where one can have a break-is an important element of pedestrian spaces.
- Seats should be 450mm and have a backrest 700mm high
- Seating should be provided at regular intervals, every 50m is recommended.
- Public Facilities: Provide Accessible Public Toilets at every 500-800m distance – preferably located close to bus stops for easy access by pedestrians and public transport users (UTTIPEC, DDA, TOD Policy 2015)

Indicators

- Percentage of walkway segments that incorporate adequate shade and shelter element (ITDP TOD Standard 2013)
- Adoption of urban street design standards for the metropolitan area that include safe pedestrian infrastructure design standards (NMSH Parameters, MoUD 2011)
- Percentage of length of streets smaller 12m RoW with at least 125 trees per km
- Percentage of length of streets wider than 12m RoW with at least 125 trees per km footpath for which they provide continuous shade (NMSH Parameters, MoUD 2011)
- Percentage of street lighting at regular intervals of 20-30 meters with lights focusing on pedestrians (derived from IRC103-2012)

6. UNIVERSAL ACCESSIBILITY



Components

A simplified and universally accessible pedestrian facility encourages the usage of NMT for all types of users. Some of the ways that this could be achieved include:



1 BARRIER-FREE DESIGN

- Standard kerb ramps are cut back into the footpath at a gradient not greater than 1:12 with flared sides providing transition in three directions (IRC103:2012)
- Tactile warning strips shall be provided on the kerb side edges of the slopes that persons with vision impairment do not accidentally walk into the road. (IRC103:2012)

2 UNIVERSAL SIGNAGE

- Audible crossing signals (pelican crossings) help everyone, as well as being essential for persons with vision impairments to not accidentally walk into the road. (IRC103:2012)

Indicators

- Percentage of intersections with complete, wheelchair-accessible crosswalks in all directions. (ITDP TOD Standard 2013)
- Percentage of block frontage with safe, wheelchair-accessible walkways (ITDP TOD Standard 2013)
- Presence of tactile paving warning strips at intersections (derived from IRC103:2012)



7. SAFETY

Components

Strengthening the preference towards non-motorised modes is aimed at overcoming physical access barriers through application of a number of design components, including:



1 PHYSICAL PROTECTION OF NMT ROUTES

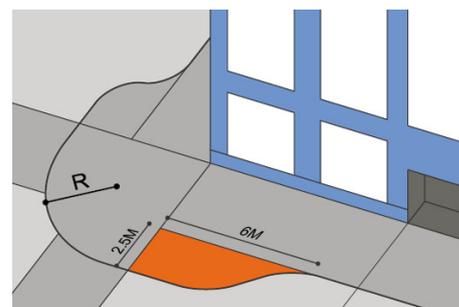
- Traffic calming of all streets with RoW of 12m or less through narrowing of driveway and meandering path with use of trees, islands and street furniture. (NMSH Parameters, MoUD 2011)
- Pedestrian refuge with a minimum width of 1m at each street crossing location after crossing 7m of one way motor vehicle carriageway or 10m of two way motor vehicle carriageway at non signalized mid-block crossings. (NMSH Parameters, MoUD 2011)
- Minimum buffer of 0.5m between cycle track and motor vehicle lanes (ITDP Better Street, Better Cities)

2 TRAFFIC CALMING

- Limit speed on urban arterial roads and sub-arterial streets to 50kmph and on collector and local streets to 30kmph. (NMSH Parameters, MoUD 2011)
- Streets meant primarily for NMT movement as well as all streets of RoW 12m or below, should be limited to maximum speed of 20km/hr by design. (NMSH Parameters, MoUD 2011)
- Tabletop crossings: Raise pedestrian crossings at intersections and mid-block to match the top of the kerb.

3 GRADE SEPARATED STRUCTURES

- Grade separated structures (foot-over-bridges and pedestrian-subways) should be avoided to prevent unnecessary detours to reach destinations. (NMSH Parameters, MoUD 2011)
- Grade separated structures must be provided with escalators or lifts to ensure universal accessibility, and appropriate structure for weather resilience.
- If grade-separated pedestrian crossings are unavoidable due to presence of highways, there must be at least 4 crossing opportunities per kilometre in areas with development at edges. (NMSH Parameters, MoUD 2011)
- Grade separated facilities must improve walking travel time in comparison to walking at-grade.



4 INTERSECTION DESIGN

- Reduce turning radii to slow turning traffic.
- Use kerb extensions to shorten pedestrian crossing distance and slow traffic by constricting street width.
- Treatments such as stop signs or rumble strips should be provided in advance of signalized intersections, to prevent cars from stopping too close to the crossings.
- Roundabout reduce vehicular speeds, ensuring adequate segregation and visibility for the slow moving users.
- Ensure bicycle lane protection across intersections
 - o Extend bicycle lane up to intersection and provide coloured markings indicating bicycle priority movement across intersection
 - o Bicycle Boxes or Stacking Spaces are required for waiting cyclists on the near side of junctions.

Indicators

- Percentage of streets with total carriageway >10m which have 5 or more traffic calmed or signalized crossings per km. (NMSH Parameters, MoUD 2011)
- Percentage of intersections that have pedestrian crossings and refuges in all directions. (NMSH Parameters, MoUD 2011)
- Percentage of intersections with complete, wheelchair-accessible crosswalks in all directions. (ITDP TOD Standard 2013)
- Ratio of pedestrian intersections to motor vehicle intersections (ITDP TOD Standard 2013)



Components

A populated public realm, with round the clock activities and eyes on the street will create a secure environment for vulnerable pedestrians and cyclists, particularly women and children. Key components include:

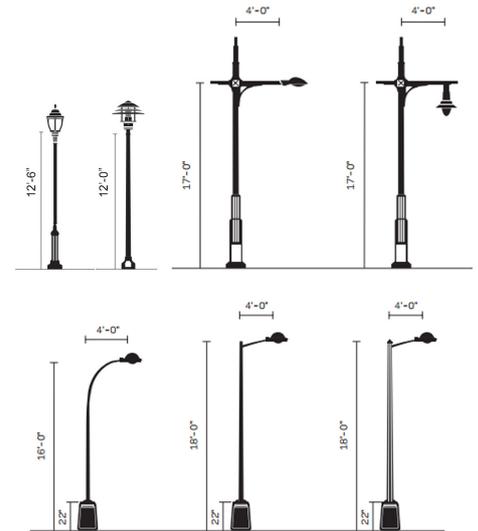


1 ACTIVE STREET EDGES

- Buildings should have active street facing components such as shops, balconies, windows, porches, etc to provide natural surveillance.
- Primary pedestrian access for buildings from the main street, with location as per shortest walking distance from nearest bus-stop (NMSH Parameters, MoUD 2011).
- Vehicular/service access should be from secondary street wherever access to building is possible from multiple streets.
- Compound walls, if present, should be transparent above a height of 100cm. High security government buildings may apply for exemption. (NMSH Parameters, MoUD 2011)

2 LIGHTING

- Pedestrian lighting should be specifically provided where there is:
 - o potential for conflicts such as at road crossings
 - o not enough natural light
 - o potential for pedestrians to congregate at night, such as at bus stops
 - o level changes, such as at steps, ramps, overbridges and underpasses/subways
 - o there is not enough natural surveillance (Pedestrian Planning and Design Guide - NZTA)
- Lighting must be provided every 20-30m intervals, focusing light on the pedestrian and bicycle lanes and not on the car lanes (IRC103-2012)
- Higher lighting levels (80 lux) using special light poles for pedestrian crossing is recommended, while lower level light poles are preferred to avoid shadow where there are high trees. (IRC103-2012)
- Appropriate lighting fixtures not exceeding a height of 4m from ground grade level should be provided. (IRC103-2012)



Pedestrian Lighting Types (NYC Street Design Manual - Lighting)



3 VENDING ZONE

- Vending zones shall be provided at regular intervals (approx. 10 minute walk from every home/workplace/transit stop)

Indicators

- Percentage of street lighting at regular intervals of 20-30 meters with lights focusing on pedestrians (derived from IRC103-2012)
- Percentage of street frontage that is active and can provide natural surveillance.
- Pedestrian lighting fixtures providing average luminance of 5–10 lux to plazas walkways, and cycle tracks, and with an illuminance uniformity of 6:1 (NYC Street Design Manual - Lighting)



9. NMT WAYFINDING

Components

A pedestrian focused, clear and navigable wayfinding system improves legibility and permeability of cities for NMT users. Key components include:



1 INFORMATIONAL SIGNAGE

- Place signs on/near corners and decision points, regularly-spaced along a route approximately 60m. - 90m. apart (First Last Mile Strategic Plan, SCAG, 2013)
- Ensure that signs are pedestrian-scaled and oriented (First Last Mile Strategic Plan, SCAG, 2013)
- Place medallion signs on existing and new infrastructure such as light poles at heights that are visible to both pedestrians and active transportation users (First Last Mile Strategic Plan, SCAG, 2013)

2 TECHNOLOGY INTEGRATION

- Encourage development of mobile applications showing:
 - Location of pedestrian and cycling lanes and cycle parking
 - Estimating travel time advantages for NMT users
 - Providing information about PBS or bicycle rental availability
- Provide real-time information and expected transit arrival times on mobile devices. (First Last Mile Strategic Plan, SCAG, 2013)

Indicators for measurement

- Percentage of signage provision at regular intervals of 200-300 ft (derived from First Last Mile Strategic Plan, SCAG, 2013)
- Percentage of signage that are pedestrian scaled and oriented (derived from First Last Mile Strategic Plan, SCAG, 2013)

10. PROTECTION FROM ENCROACHMENT



Components

An uninterrupted, continuous and delineated space for NMT users could be achieved by the following components:



1 BOLLARDS AND RAILINGS

- Bollards are often used to stop vehicles from entering the footpath and to keep pedestrian away from vehicular traffic. Unless positioned carefully, they can form barriers to wheelchair users and are a particular hazard for persons with visual impairments (IRC103-2012).
- Bollards $\geq 1000\text{mm}$ high should be identifiable by using contrasting colours with the provision of reflective tapes.
- To stop use by cars, bollards at suitable locations should be provided with clear gap of 1200mm between two bollards.



2 DESIGNATED SPACES FOR INFORMAL ACTIVITIES

- Designated space should be such that the spill over of activities or clientele does not start encroaching the pedestrian path.
- Adequate parking places shall be provided to discourage indiscriminate parking, as this can obstruct building access.
- Provision of Multi-Functional Zone is most critical otherwise the uses/components of street like, auto-rickshaw stand, cycle rickshaw stands, hawkker zones, car parking, street furniture etc. encroach upon pedestrian, cyclists or carriageway space.



3 ENFORCEMENT

- Facilitate enforcement by provision of clear instructions and road markings
- Conduct training workshops with enforcement agencies to sensitize them to NMT needs

Indicators for measurement

- Percentage of streets with total carriageway $>10\text{m}$ which have 5 or more traffic calmed or signalized crossings per km. (NMSH Parameters, MoUD 2011)
- Percentage of intersections that have pedestrian crossings and refuges in all directions. (NMSH Parameters, MoUD 2011)
- Percentage of intersections with complete, wheelchair-accessible crosswalks in all directions. (ITDP TOD Standard 2013)
- Ratio of pedestrian intersections to motor vehicle intersections (ITDP TOD Standard 2013)



5.3 Plan + Design Tasks, Key Outcomes and Tools

This Plan + Design section outlines a process that can be followed to develop an NMT Plan/Design for the applicable scale (as identified in the Assess step). This step builds on NMT Planning Principles, and should take into account what is financially feasible and responsive to citywide goals and overall vision.

	Tasks	Outcomes	Tools
1	Map Existing Infrastructure and develop NMT Demand Estimates	Existing Conditions Inventory/NMT Demand Analysis	
2	Conduct Stakeholder Workshop/Meeting(s) to Revalidate Vision, Issues and Opportunities.	Stakeholder Inputs	
3	Identify Gaps and Plan Rehabilitation/Expansion of NMT Network	NMT Network Plan with Street Hierarchy/Street Typologies	Tool 3: “How-to” Prepare Citywide NMT Plan? Tool 4: “How-to” Develop Corridor NMT Plan? Tool 5: “How-to” Develop Area-specific NMT Plans? Tool 6: “How-to” Retrofit Existing Streets with NMT?
4	Formulate context-specific NMT proposals	Master list of NMT proposals	
5	Identify pilot projects and signature projects	Project Plans	
6	Develop and compare current and horizon year alternative scenarios	Scenario Models	
7	Identify implementation and phasing strategy	Phasing Strategy and Preliminary Costing	



5.3.1. Map Existing Infrastructure and Develop NMT Demand Estimates

PURPOSE

To survey existing infrastructure and prepare a comprehensive database as a resource to help document baseline conditions and analyse constraints.

SUB-TASKS

- **Review of Existing Documents & Studies:** Compile and review, past and current planning efforts and proposed developments underway in the study area with the intent to identify gaps and inconsistencies in the plans and development projects when assessed against a backdrop of NMT Principles;
- **Undertake site visit(s) & prepare inventory of the planning & physical characteristics of the Study Area:** The existing conditions inventory will include the preparation of a detailed base map and a series of inventory maps and photographs;
- **Detailed Roadway Inventory:** Map detailed infrastructural conditions along priority corridors using AutoCAD and GIS mapping procedures. Inventory will include the following at a minimum:
 - o Topographical mapping including street alignment measured at 10 to 30m intervals.
 - o Sidewalk inventories including footpath width, condition and surface materials.
 - o Cycling facilities, if any, including cycle track width, condition and availability of cycle or cycle rickshaw parking.
 - o Mapping of streetscape elements including trees, utility boxes, bus stops, benches, ramps, bollards, trash bins, sign posts, etc.
- **Conduct Volume Count and Compute NMT Level of Service:** Conduct 16 hour pedestrian and cyclist volume counts at 15 minute intervals along important links and intersections and use them to analyse the NMT Level of Service (LOS). The IRC Codes describe the method for NMT LOS Calculations. The Multi Modal Level of Service (MMLOS) analysis framework developed by Richard Dowling and Associates is also a useful analysis tool;
- **Conduct User Surveys and Estimate Current NMT Demand:** User survey sample size should ideally be 2-5% of the population with a minimum sample size of 100 to be statistically valid. Conduct pilot user surveys to assess and revise user survey formats. **Use survey responses to analyze socio-economic profile and travel behaviour including: origin-destinations, travel modes, trip distance, and trip purpose;**
- Conduct Spot Speeds, Traffic Speed and Delay Surveys to assess level of traffic congestion on existing roads; and
- Conduct participatory mapping at local levels to identify physical obstructions, dangerous streets and crossings and other spots flagged by NMT users.

OUTCOMES

- Checklist of existing data sources, and identification of gaps in data.
- Site Inventory report including visual and photo surveys and physical conditions base map, CAD/GIS database.
- Existing pedestrian and cyclist counts and NMT Level of Service.
- User surveys and NMT demand estimates.

TOOLS AND RESOURCES

Secondary Data Sources including GIS or AutoCAD data files

Secondary data sources may be used only if the data is fairly recent and reflective of current conditions.

Primary Surveys (see Appendix B)

To survey conditions where secondary data sources are not available.

Literature Review of Existing Documents and Studies

Focus Group Meetings and Interviews

REFERENCES

- IRC code 103, 2012 Guidelines for Pedestrian Facilities
- Multimodal Level of Service Analysis for Urban Streets: User Guide (http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w128.pdf)
- Guidebook on Volume Data Collection (http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_797.pdf)



5.3.2. Conduct stakeholder workshops/meeting(s) to revalidate vision, issues and opportunities

PURPOSE

To engage stakeholders in the planning process and obtain buy-in and feedback at critical junctures during the planning process.

SUB-TASKS

- Identify workshop dates and venues early on in the NMT Planning process.
- Prepare project backgrounder and agenda for the workshop for circulation to all stakeholders and participants of the workshop.
- Prepare questionnaires and surveys for the workshop—In addition to the project backgrounder and agenda, questionnaires and surveys focusing on issues, opportunities, intended outcomes and preferences among other relevant issues should be identified.
- Invite and engage the following well in advance, with weekly reminders sent out:
 - Project stakeholders
 - Elected officials and bureaucrats are to be invited to deliver keynote speeches to ensure media participation.
 - Subject experts—who will present innovations; introduce planning subjects, techniques, solutions and lessons learned from different cities and projects.
- Prepare highly graphic and easy to understand workshop presentation materials in the form of PowerPoint presentations, and Display boards.
- Organize workshop to ensure active stakeholder participation—in three parts as follows:
 - **Part One (Project Background and Education):** focus on introductions, workshop initiation, keynote speeches, project background, project goals and vision, intended outcomes, analysis, base line conditions and SWOT.
 - **Part Two (Stakeholder engagement - Concept Development & Visual Preference Surveys)-** Divide stakeholders into different groups to focus on developing physical design concepts for Accessibility & Land use, public realm & urban design. Ensure that every group has a facilitator (ideally from consultant team), Rapporteur (Ideally a stakeholder), invited expert, and representation from the Planning/Development agency. This should be followed by a short reporting back session
 - **Part Three (Stakeholder engagement – Plan Implementation)** - Focus on Q/A sessions, review of boards and materials and opportunity for informal engagement.
- Summarize workshop results in the form of a report outlining the workshop process, key findings, innovative solutions identified, key concepts developed, feedback obtained, and survey/questionnaire results. Summary of recommendations, expert comments and next steps should also be identified.
- Generate project interest and solicit feedback by publishing workshop results through print media, social media and dedicated project websites.

OUTCOMES

- Identification of issues and opportunities
- Master list of preferences and ideas
- Discussion and approval on key decisions

TOOLS AND RESOURCES

Visual Preference Surveys/ Computer-generated Simulations

To help stakeholders visualize how the suggested improvements may look, and to create consensus on the desired visual identity.

Design Charrettes

To provide opportunities for participants to feel involved in the brainstorming and design evolution stages.

Online Community Engagement Applications

To share information and keep stakeholders engaged through social media platforms like Facebook and web applications like Mindmixer.

REFERENCES

- Good Practice Guide to Public Engagement in Development Schemes - RTPi UK
- The NCI Charrette System Guide for Transit Oriented Development http://www.fta.dot.gov/documents/NCI_Guide_8-14-13sm.pdf



5.3.3. Identify gaps and plan rehabilitation/expansion of NMT network

PURPOSE

To identify gaps and barriers for NMT users, which need to be closed to create a cohesive, direct, safe, attractive, and comfortable NMT network.

SUB-TASKS

- **Prepare a base map** of the current road network delineating the availability and condition of NMT facilities within each link and intersection of the road network;
- **Identify major NMT barriers and gaps** in the current road network, such as incomplete or narrow footpaths, cycle tracks that end abruptly, lack of safe crossings, etc. as critical issues marked for immediate improvement;
- **Prepare an overlay of the desired NMT network**, emphasizing the principles of continuity, interconnectivity, walkability, and universal accessibility. Recreation routes can also be identified as a part of the network planning exercise. But clearly, it should be in addition to the main street hierarchy and not as an alternative;
- **Define a street hierarchy matrix**, based on relevant IRC standards and existing conditions, including NMT allocations for each RoW;
- **Define street characters** based on their experiential and mobility functions, such as boulevard, esplanade, high street, pedestrian malls, woonerf, NMT trails etc.;
- **Identify priority corridors**, specifying where segregated cycle tracks and pedestrian footpaths are needed, the links for which traffic calming is needed and so on. These will be based on street functionality and NMT demand; and
- **Suggest typical designs** that may be used for different types of streets, intersections and areas.

OUTCOMES

- NMT Network Plan, including:
 - o Street Hierarchy Table with appropriate RoW allocations for NMT
 - o Street Typologies and typical designs
 - o Identification of priority corridors

TOOLS AND RESOURCES

Pedestrian Network Analysis

tools such as the ArcGIS Network Analyst utility may be used to assess completeness and quality of the NMT network.

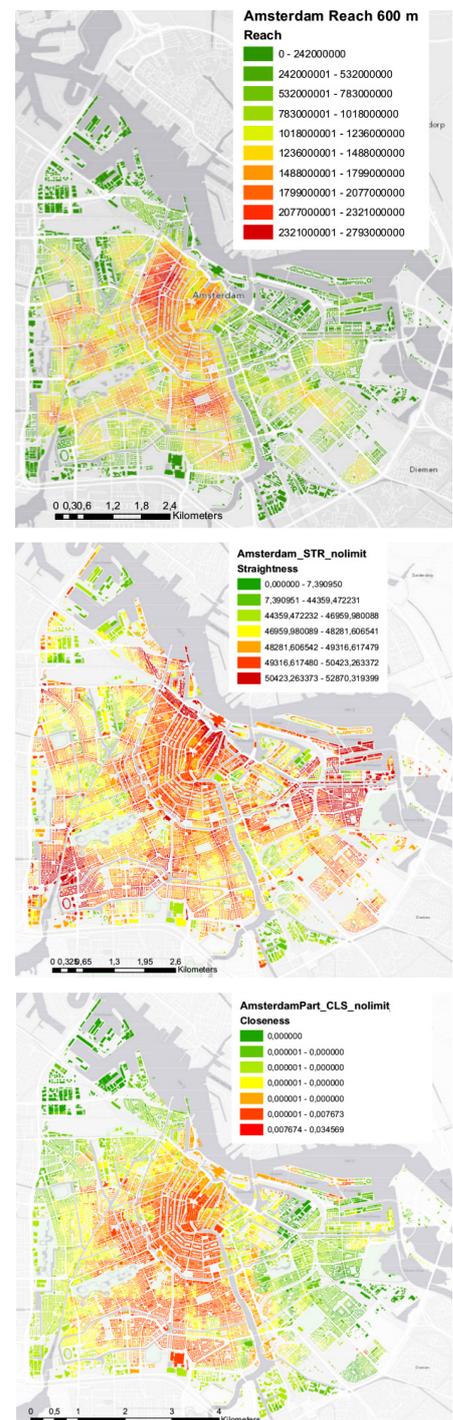


Figure 38: Network Analysis of Amsterdam.

The Urban Network Analysis Toolbox, developed by MIT, uses the Network Analyst utility and measures the performance of the network across 5 parameters: Reach; Gravity; Betweenness; Closeness; and Straightness. (Source: <http://www.urban-knowledge.nl/20/urban-network-analysis-toolbox>)



5.3.4. Formulate context-specific NMT proposals

PURPOSE

To convert NMT principles to implementable details through conceptualization and design of NMT interventions.

SUB-TASKS

- Create a list of all possible NMT interventions that can be considered for the relevant planning scale and context. NMT interventions may be of the following types:
 - Physical interventions such as design of streetscapes, sidewalks, cycle tracks, or grade-separated facilities.
 - Policy interventions such as parking management, congestion pricing for car users, user incentives or employment benefits for NMT users,
 - Traffic engineering interventions such as creating car-free zones, temporary road blocks, road diets, or traffic signal improvements
 - System based interventions such as public bike sharing, bike rental, etc.
 - Wayfinding and signage interventions
 - Building code modifications for better NMT interaction
 - Community oriented campaigns such as the Raahgiri Day in Gurgaon or Cycle Day in Bangalore
- Integrate NMT proposals with other ongoing efforts, such as public transportation plans, historic preservation and conservation plans waterfront developments, public open space designs, etc.
- Prepare the NMT Plan/Strategy in three phases
 - Concept Plan, including alternatives, if any
 - Draft NMT Plan, to be presented to stakeholders for review
 - Final NMT Plan, based on stakeholder feedback.

OUTCOMES

- Context-specific NMT Proposals

TOOLS AND RESOURCES

Tool 3: “How-To” Prepare Citywide NMT Plan?

Tool 4: “How-To” Prepare Corridor NMT Plan?

Tool 5 (A): “How-To” Prepare Station Accessibility Plan?

Tool 5 (B): “How-To” Develop NMT Plans for Hilly Areas?

Tool 5 (C): “How-To” Develop NMT Plans for Historic/Tourist Destinations?

Tool 6: “How-To” Retrofit Existing Streets?

REFERENCES

- IRC code 103, 2012 Guidelines for Pedestrian Facilities
- Better Streets, Better Cities: A guide to street design in Urban India (ITDP) <http://itdp.in/wp-content/uploads/2014/04/07.-Better-Streets-Better-Cities-EN.pdf>
- Footpath Design: A guide to creating footpaths



5.3.5. Identify pilot projects and signature projects

PURPOSE

To identify projects that can help garner positive feedback for NMT and contribute to the learnings regarding what works and what doesn't.

SUB-TASKS

- Develop a selection criteria matrix to identify pilot projects based on the following (but not limited to) quantitative and qualitative parameters:
 - o Low budget and quick implementation is possible
 - o Small area of influence, which can be monitored to study impact
 - o Stakeholder opposition is not anticipated.
 - o Demonstrate NMT benefits.
- Create a monitoring and evaluation framework for pilot projects for easy documentation of successes and failures
- Develop a selection criteria matrix to identify signature projects based on the following (but not limited to) quantitative and qualitative parameters:
 - o High visibility projects which have political support and can garner media attention.
 - o Large enough, in scope and target beneficiaries, to have a significant impact.
 - o Can demonstrate principles of good planning and design.
 - o Are replicable within the city and in other cities.
 - o Have significant stakeholder participation with high ownership of the city.
 - o Risk potential is low and is most likely to be successful.
- Create a long-term campaign ensuring sustained commitment for successful implementation of signature project.

OUTCOMES

- Framework of documenting successes and failures from pilot project that can be used in future projects
- Clear implementation plan for signature project

TOOLS AND RESOURCES

Evaluation Matrix

Develop an evaluation matrix for selection of pilot and signature projects to help maintain transparency and justify the selection to stakeholders.

REFERENCES

- NYCDOT Measuring the Street (<http://www.nyc.gov/html/dot/downloads/pdf/2012-10-measuring-the-street.pdf>)



5.3.6. Develop and compare current and horizon year alternative scenarios

PURPOSE

Scenario analysis may be helpful in the following situations:

- You want to demonstrate the long term impact of NMT-centric policies. Such evaluation is extremely helpful in altering public opinion.
- You want to plan cycling infrastructure in the city, in an area, or along a corridor.
- You want to assess the optimum scale of pedestrian infrastructure to be planned at locations that are expected to produce more than average pedestrian demand. **Minimum pedestrian infrastructure is mandatory** on all urban streets, irrespective of demand.

SUB-TASKS

The following steps are used in a typical scenario analysis:

1. **Define the Study Area Boundary.** To study long term city-wide impacts, the entire city may be considered as the study area. When planning within a smaller area or a corridor, create a 500m to 1km buffer around the area or corridor and define it by the study boundary. When planning optimum pedestrian infrastructure around “destinations”, define a continuous 10-15 minute walking catchment boundary around the destination or group of destinations.
1. **Create Traffic Analysis Zones (TAZ)** measuring 1.5 sq.km or less. TAZs in city cores must measure less than 1 sq.km. TAZ for pedestrian modeling
2. **Create a link network. Each link must have attributes describing NMT attractiveness**, such as physical safety (level of separation, speed and volume of motorized vehicles); security (land use mix and density, street vendors, lighting, other bicyclists and pedestrians); and barriers (parked vehicles, bus stop density, pavement quality, shade, gradient).
3. **Prepare a Peak Hour Production-Attraction (PA) Matrix for each Trip Purpose**, where household interview data is used to estimate trip productions for each zone; and land use mix is used to estimate trip attractions. Purpose-wise trips attracted to each zone from the household interviews is correlated with land use types in each TAZ using multiple linear regression technique to derive the relation between the trips attracted and the land uses of the TAZ. The peak hour PA table is derived from the hourly variation of the trips of each purpose observed through traffic counts.
4. **Estimate Current and Potential NMT users**, using information from stated preference surveys and trip length distribution. People are more likely to use NMT for shorter trips. Develop 2 scenarios: Maximum Shift Scenario (MSS) and Least Shift Scenario (LSS). (See example) Derive the NMT PA Matrix by applying the current NMT mode share percentage to peak hour purpose-wise productions and attractions.

TOOLS AND RESOURCES

Modelling Software such as:

- TransCAD
- CUBE
- VISUM
- EMME
- GIS - Network Analyst
- Omni Trans

It should be noted that these softwares are made primarily to model motorized modes like Cars, two-wheelers and buses. Omnitrans is the only software among these that has specific modelling capabilities relating to NMT users.

REFERENCES

- Non-Motorised Transport (NMT) Modelling in HDM-4 (http://www.lpcb.org/index.php/component/docman/doc_view/75-1996-padeco-nmt-modelling-in-hdm-4?Itemid=32)
- Multimodal Level of Service Analysis for Urban Streets: User Guide (http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w128.pdf)
- Guidebook on Volume Data Collection (http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_797.pdf)

DESCRIPTION	SCENARIO	SHARE OF TRIP SHORTER THAN 5 KM SHIFTING TO NMT
Improving only NMT infrastructure	MSS	30% from MTW, three-wheelers & Bus
	LSS	10% from MTW, three-wheelers & Bus

Example for developing scenarios to identify potential NMT users



5. **Develop Origin-Destination Matrix from PA Matrix using aggregated attraction and impedance values.** Using the Gravity Method, distribute NMT trips between zone i and zone j in proportion to the number of trips produced in i, number of trips produced in j and in the inverse proportion of the impedance between these zones i.e. travel time, travel cost, relative safety etc.
6. **Assign Trips from O-D Matrix to the Network** using All or Nothing (AON) method. This method uses the minimum BCI or travel distance between ODs of the cyclists as the determining factor for route choice.
7. **Calibrate the Network** by comparing the observed NMT volumes with modelled volumes.
8. **Develop Scenarios** for:
 - o Business-as Usual for horizon year if no NMT improvements are made. Illustrate the adverse impacts on congestion and quality of life in this scenario.
 - o NMT improvement alternatives to help evaluate and select best alternative.
 - o NMT improvements phase-wise for horizon years.

OUTCOMES

- Modelled scenarios will help stakeholders visualize and comprehend the impact of various interventions and will aid in consensus building.

The Bicycle Compatibility Index is a tool used to measure impedance. The table below illustrates the parameters and their weightages required to calculate the BCI for each link and zone

LEVEL 1	LEVEL 2	CYCLISTS SCORE*	% WEIGHT ATTACHED	CAPTIVE VALUE
Physical safety		812	29.74	
	Less frequency of buses in curb lane	812	29.74	8.84
	Low speed of motorized vehicles	790	28.94	8.61
	Lesser Volume of motorized vehicles	605	22.16	6.59
	Dedicated bicycle tracks	523	19.16	5.7
Social security		790	28.94	
	Formal Land use aspects (diversity/intensity of mix)	722	23.45	6.79
	Informal LU on roadside	716	29.23	8.46
	Lighting	718	22.3	6.45
	Other bicyclists/pedestrians	574	25.03	7.24
Barriers		523	19.16	
	Pedestrians on the road	698	23.56	4.51
	On street parked vehicles	688	25.19	4.83
	Poor Pavement quality	716	27.22	5.22
	Gradient	629	24.03	4.6
Intersections		605	22.16	
	Crossings signalized	710	26.01	5.76
	Crossings un-signalized	759	27.8	6.16
	Roundabouts	683	25.02	5.54
	Uncontrolled MV entry/exit	578	21.17	4.69

The Cyclists Score is given to various components of NMT infrastructure like width of NMT path, segregation tools, encroachments, visibility and other relevant information for each link. The aggregate score of each link is multiplied by the travel time or length of the link to derive the BCI of the particular link. The BCI derived for each link is aggregated for each zone to derive the cycling impedance between various OD pairs and is used in the Gravity function for trip distribution to derive the Origin-Destination (OD) matrix for current and potential cyclists in the city.



5.3.7. Identify implementation and phasing strategy

PURPOSE

Formulate preliminary strategies to ensure the successful implementation of NMT proposals in the form of quick wins, short, medium and long term interventions.

SUB-TASKS

- Develop a phasing strategy by evaluating the readiness of implementation of each NMT proposal. The evaluation may be based on criteria including but not limited to:
 - o The urgency of the need, derived from the social, environmental, and economic costs of “doing nothing”.
 - o Ease of implementation based on land availability, project scale and inter-agency coordination requirements.
 - o Estimated budget and availability of funding.
 - o Risk potential and possibility of opposition.
- In general, preference must be given to projects intended to improve safety and security and increase the efficiency of all sustainable modes.
- Prepare a compendium of NMT proposals which includes preliminary recommendations with relevant priorities to enable the planning agency to systematically implement the recommendations. In general, the implementation plan must contain:
 - o Proposal description
 - o Estimated capital investment and maintenance costs per proposal
 - o Agencies responsible for implementation of each proposal
 - o Proposed timeline and phasing - with summary costs for each phase
 - o Identified pilot and signature projects with criteria of selection

OUTCOMES

- NMT Implementation and Phasing Plan

TOOLS AND RESOURCES

Tool 3: “How-To” Prepare Citywide NMT Plan?

Tool 4: “How-To” Prepare Corridor NMT Plan?

Tool 5 (A): “How-To” Prepare Station Accessibility Plan?

Tool 5 (B): “How-To” Develop NMT Plans for Hilly Areas?

Tool 5 (C): “How-To” Develop NMT Plans for Historic/Tourist Destinations?

Tool 6: “How-To” Retrofit Existing Streets?

REFERENCES

- Better Streets, Better Cities: A guide to street design in Urban India (ITDP) <http://itdp.in/wp-content/uploads/2014/04/07.-Better-Streets-Better-Cities-EN.pdf>
- Footpath Design: A guide to creating footpaths

Figure 39: Suggested Basis to Assess Need of NMT Interventions

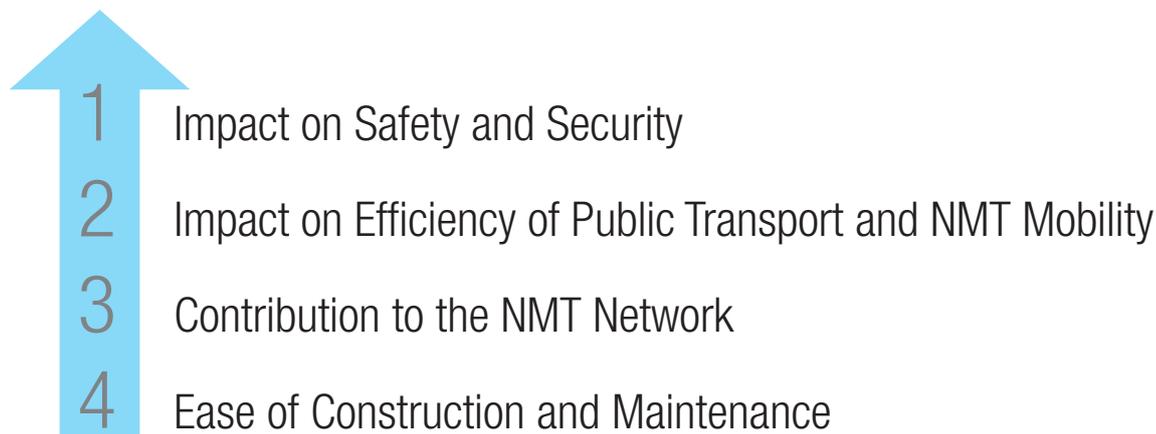




Figure 40: Suggested Format for Evaluation/ Prioritization of NMT Interventions

CRITERION	PROPOSALS				
	PROPOSAL 1	PROPOSAL 2	PROPOSAL 3	PROPOSAL 4	PROPOSAL 5
<p>Accidents (safety)</p> <p>(Rate on a scale of 1 to 20 for each proposal where 20 is highest priority for proposals with the highest possibility of reducing accidents and improving NMT safety and 1 is the lowest)</p>					
<p>Current and Potential NMT Volume (efficiency)</p> <p>(Rate on a scale of 1 to 15 for each proposal where 15 is highest priority for proposals that will serve large NMT volumes or improve the efficiency of sustainable modes such as bus or rail transit modes and 1 is the lowest)</p>					
<p>Contribution to the Network</p> <p>(Rate on a scale of 1 to 10, for each proposal; where relative points are awarded to links/intersections, such as 10 points to the link connecting directly between one or more existing or selected routes, 1 point for links which are isolated or at considerable distance from routes already developed or selected for development)</p>					
<p>Ease of Construction and Maintenance (cost)</p> <p>(Rate on a scale of 1 to 5 for each proposal, where 5 is highest priority for proposals with less obstructions/complications; or those within the same municipality limit as well under the same development body; or roads which are new developments or proposed to be re-developed with a sanctioned budget which includes provision for NMT infrastructure and 1 is the lowest for proposals with high independent costs and complications related to implementation)</p>					
Total Points					

Priorities for development may be based on the total points allotted to each route/corridor, with routes having higher points placed higher on the priority.



TOOL 3: “HOW-TO” PREPARE A CITYWIDE NMT PLAN?

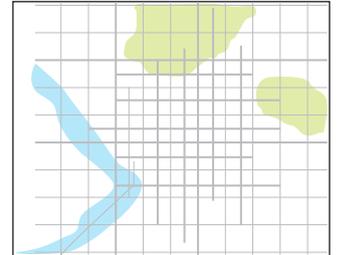
1

Map existing street network and identify gaps

To identify the interconnectedness of the existing Street network and identify opportunities for creating direct NMT links

DATA SOURCE :

- Satellite Image/Remote Sensing/ GIS Data
- Field Surveys along major transit corridors
- As per approved Master Plan/ Development Plan (DP)
- Comprehensive Mobility Plan (CMP)
- Right-of-way widths: Google earth/ satellite images/surveys



2

Develop NMT network plan with street hierarchy/ typologies

A cohesive and comprehensive network of NMT routes improves connectivity and optimizes street functionality

HIERARCHY

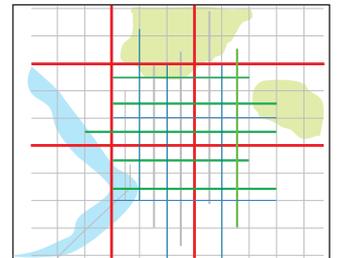
- Urban Arterials
- City Streets

TYOLOGIES

- Boulevard
- Esplanade
- Woonerf
- High Street
- Pedestrian Malls
- NMT Trails

REFERENCE :

- *ITDP -Better Streets Better Cities Manual*
- *Urban Road Congress Street Hierarchy*



3

Identify goals and targets for 5 to 10 year periods

To create long term commitment to NMT

TYPICAL COMPONENTS

- NMT Modal Share
- Parking Demand
- Emission Targets
- Safety

EXAMPLE: NMT GOALS

50% NMT Mode Share
15% Reduction in vehicular emissions to meet the national ambient air quality standard

Source: Draft TOD Policy, UTTIPEC, DDA, 2012

4

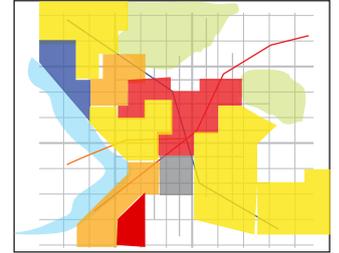
Identify priority commuter and recreational NMT corridors

To determine strategic priorities in the medium term, that can improve overall quality of NMT

BASED ON :

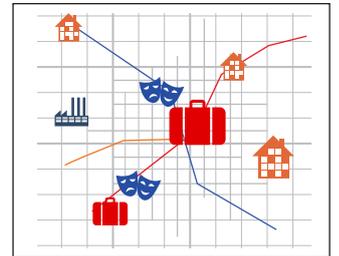
EXISTING AND PROPOSED LAND USES

- To understand the distribution of residential, employment and institutional uses in the city.



ACTIVITY GENERATORS SUCH AS HOUSING , EMPLOYMENT AND RECREATIONAL CENTRES

- To help identify routes of high commuter traffic and origin-destination travel patterns.



5

Establish statutory relevance

By including NMT concepts and principles into upcoming updates to the Mobility Plan or Street Codes.



Universal Accessibility



Walkability



Interconnected NMT Network



Safety



Complete Streets



Security



Bicycle-Friendliness



NMT Wayfinding



Comfort



Protection from Encroachment

OPTION 1: INCLUDE A NMT CHAPTER IN MASTER PLAN/MOBILITY PLAN AS AN AMENDMENT

OPTION 2: INCORPORATE NMT POLICIES IN RELEVANT SECTIONS OF TRANSPORT RELATED ACTS AND LEGISLATIONS

OPTION 3: ESTABLISH CITY SPECIFIC STREET DESIGN CODES

Typical NMT elements that could be included at this stage include:

- Road widths
- RoW allocation for footpath and cycling tracks
- Area for informal sector
- On-street parking
- Landscape and other street amenities



TOOL 4: “HOW-TO” PREPARE A CORRIDOR NMT PLAN?

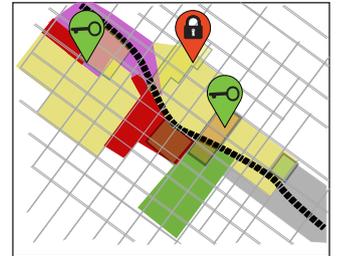
1

Identify origin-destination desire line

To determine high volume desired commuter connections or recreational corridors

ORIGINS/ DESTINATIONS

- Institutional
- Commercial
- Recreational
- Ceremonial



2

Identify shortest routes that connect most destinations

To determine the optimum path to make the desire connection

- Activity generators such as Institutional/Recreational/ Commercial uses
- Informal Markets
- Bicycle parking and maintenance facilities/PBS stations

DATA SOURCE:

- Land Use Map
- Activity Mapping



3

Maximise connections to existing assets

To increase route choices by integrating the corridor with other transport corridors and green corridors

TRANSIT CORRIDORS

- Metro/BRT corridor
- Bus Routes

GREEN SYSTEMS

- Greenway
- Rivers and lakes
- Forested areas

4

Minimize Conflicts

To increase the safety and comfort levels of the NMT corridors especially for vulnerable users.



INTERSECTIONS

- Avoid busy intersections
- Signalised intersections are better geometries
- Improve intersection geometry



DRIVEWAYS

- Avoid driveways
- Allow barrier free travel through driveways



MIXED TRAFFIC

- Provide segregated NMT facilities as far as possible
- Shared use may be considered where speeds are low

5

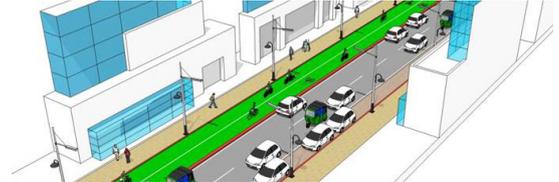
Define kind of NMT facilities

To determine the type of NMT facility that is most suitable for each link based on RoW availability and surrounding land uses.



PEDESTRIAN FACILITIES

- Footpath/Sidewalk/Crosswalk
- Subway/Foot Over Bridge preferably with escalators and lifts
- Multi-use trail
- Pedestrian street



CYCLIST FACILITIES

- Segregated cycle tracks
- Partially protected
- Cycle Lane Markings
- Sharrows (Shared Lane Markings)

6

Comfort

To identify opportunities to increase NMT comfort through provision of streetscape amenities.



SHADE

- Tree cover
- Arcades/Awning



SECURITY

- Lighting
- Eyes-on-the-street by planning street facing buildings and vendors



AMENITIES

- Benches
- Trash Bins
- Toilets

7

Draft Corridor NMT Plan

To create a phased implementation Plan for prioritizing key NMT improvements along corridor.



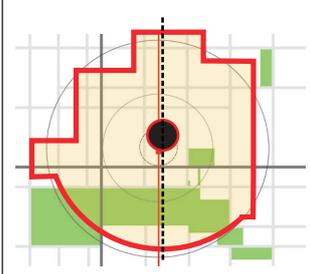


TOOL 5(A): "HOW-TO" PREPARE A STATION ACCESSIBILITY PLAN?

1 Identify Station Area Accessibility Boundary and Influence Zone

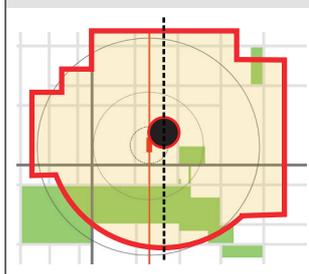
PED-SHED ANALYSIS FOR 15MINS WALKING

DISTANCE: Ped-shed is short for pedestrian shed. Ped-sheds map the actual walking distance on the existing street network.



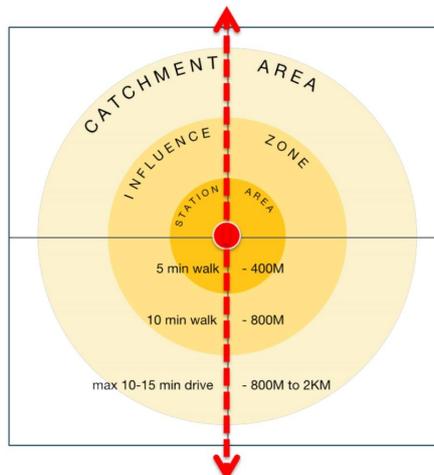
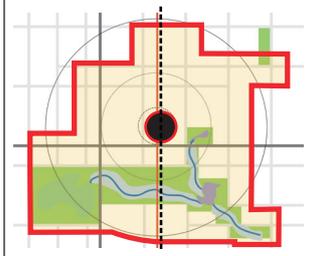
CYCLE/FEEDER CATCHMENT AREA FOR 15MINS CYCLING

DISTANCE: Cycle/Feeder catchment area map the actual walking distance on the existing street network.



NATURAL ENVIRONMENT BOUNDARIES:

Station area boundary is re-mapped to include natural systems, greenways, waterways and opens space.



Station area boundaries are defined by the distance people walk in a set duration of time.

An effective strategy will work to increase the size of station area planning boundaries for both BRTS and Metro Rail by providing alternative mobility choices.

Data Source:

- Satellite Imagery
- GIS Database for land parcels, road network
- Master Plan/DP
- Google Street View
- Field Survey

2 Map available Data for Station Accessibility Area

DEVELOPMENT

Land Attributes: Existing & Proposed (EUse + Ownership + Plot Sizes)

Development: Population Densities + FAR Utilization



ACCESSIBILITY

NMT Network | Street Grid | Intersections

Road Alignment | Traffic Volume Count

Multimodal Integration: Station Entry | IPT Stands | Bus Stops



INFRASTRUCTURE

Physical: Drainage | Sewer | Water | Waste

Social: Parks | Public Facilities | Street Vendors | Weekly Markets



ENVIRONMENTAL & HERITAGE FEATURES

Environment: Natural Drainage | Topography

Heritage: Tangible (Built) | Intangible (Culture/Arts)



3

Conduct SWOT Analysis

Strengths are favourable conditions that need to be built upon. **Weaknesses** are unfavourable conditions that need to be considered. **Opportunities** are potential improvements and favourable conditions that the project will seek to achieve. **Threats** are the potential barriers that may impede the realization of project goals.

COMPONENTS

- Urban Development Attributes
- Access to transit
- NMT Mobility
- Parking
- Context: Development/Redevelopment/Greenfield

4

Prepare Station Accessibility Concept Plan

For the two influence areas: Walking and Cycling, integrating policies and design interventions based on NMT Principles.

CORE COMPONENTS OF A STATION ACCESSIBILITY PLAN:

- Spatial Layout Plan illustrating street network including the circulation and Multimodal Integration
- Street Hierarchy & complete Street Design typologies
- Area- wide Parking Plan
- Capital Improvements Program
- Cycling Network Plan including Cycle Parking
- Phasing Strategy

ADDITIONAL COMPONENTS:

- Physical Infrastructure Plan
- Landscape and Open Space Plan
- Architectural and Urban Design Guidelines
- Real Estate Market Potential Strategy
- Catalyst Redevelopment Projects

NMT PRINCIPLES



Universal Accessibility



Walkability



Interconnected NMT Network



Safety



Complete Streets



Security



Bicycle-Friendliness



NMT Wayfinding



Comfort



Protection from Encroachment



TOOL 5(B): “HOW-TO” DEVELOP NMT PLANS FOR “HILLY AREAS”?

1

Assess current NMT conditions

To determine high volume desired commuter connections or recreational corridors

Including:

- Assess NMT Demand
- Compute NMT Level of Service on main streets
- Identify and assess capacity of NMT-only links



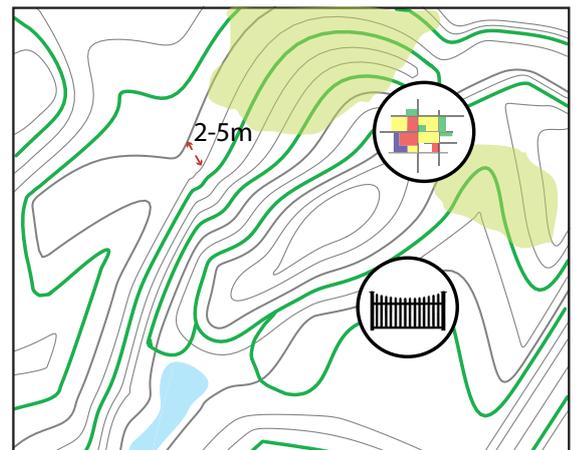
2

Develop Base Map on GIS

To determine land conditions and identify opportunities and constraints.

Including:

- Existing Street Infrastructure – street centerlines and kerbs
- Property Boundaries and ownership information
- Contours (preferable 2 – 5 meter contours)
- Existing Land Uses



3

Identify unique needs of the area and stakeholders

To determine specific land use and economic needs that are dependent on or influence transport planning priorities

Including:

- Recreational cycling
- Informal markets
- Flexible spaces
- Tourist destinations



4

Develop NMT Plan – 4 main components

IDENTIFY PEDESTRIAN PRIORITY STREETS (Pedestrian Malls)

Based on:

- pedestrian volumes; and
- retail activity

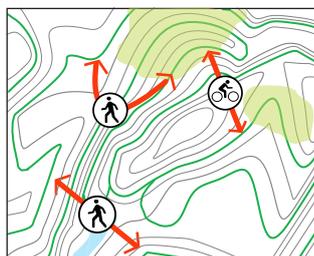


M.G Road Gangtok

IDENTIFY SHORTER AND DIRECT PEDESTRIAN LINKS (Such as stairs)-

Based on:

- Contour lines; and
- Property boundaries



DETERMINE MINIMUM FOOTPATH WIDTHS FOR DIFFERENT ROWS

Based on:

- traffic and pedestrian volumes; and
- surrounding land uses



IDENTIFY MULTI-USE/ RECREATIONAL TRAIL LINKS

- Integrate with existing link alignments
- Run along contour lines
- Minimize encroachment on private properties



M.G Road Gangtok



TOOL 5(C): “HOW-TO” DEVELOP NMT PLANS FOR “HISTORIC/TOURIST DESTINATIONS”?

1

Identify Key Activity Generators and Destinations

To determine high volume desired corridors.

Including:

- Heritage buildings;
- Tourist destinations; and
- Hotel and other tourist facilities



2

Identify Streets with Historic Significance

To identify the streets that contribute to the experience of destinations.

Including:

- Streets flanked by historic buildings
- Avenues leading to key destinations



3

Assess Current Transport Conditions

To evaluate multimodal priorities.

- Assess trip characteristics such as trip purpose and modal share
- Compute Multimodal Level of Service on main streets
- Assess safety and comfort for NMT users
- Assess parking needs



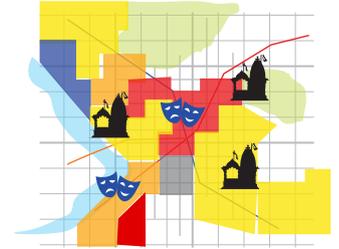
4

Develop Base Map on GIS

To determine land conditions and identify opportunities and constraints.

Including:

- Existing Street Infrastructure – street centrelines and kerbs
- Existing Land Uses including key destinations
- Heritage protected area, if any



5

Identify unique needs of the area and stakeholders

To determine cultural or economic needs that are dependent on or influence transport planning priorities

Including:

- Temporal/processional activities
- Recreational cycling
- Informal markets



6

Develop NMT Plan – 4 main components

IDENTIFY PRIORITY COMMUTING CORRIDORS

Based on:

- Traffic and pedestrian volumes; and
- Desired Lines for educational/work trips

IDENTIFY PRIORITY RECREATIONAL CORRIDORS

Based on:

- Connections to maximum destinations; and
- Integration with existing greenways/natural corridors

IDENTIFY SIGNATURE PROJECTS

Such as:

- Heritage trails;
- Pedestrian plazas; and
- Public Bike Sharing/ Bicycle Renting schemes

DEVELOP ANCILLARY PLANS THAT SUPPORT COMFORT AND SAFETY OF NMT USERS

Including:

- Parking Plan; and
- Freight Transport/Loading and Unloading Plans



TOOL 6: “HOW-TO” RETROFIT EXISTING STREETS WITH NMT?

1

Select Streets for Retrofit

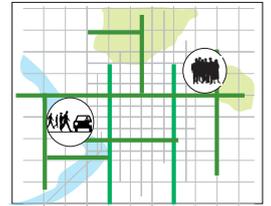
To identify existing streets that need to be retrofitted to solve problems of congestion and chaotic mobility.

BASED ON:

- NMT Volumes
- Stakeholder interests
- High risk of accidents

DATA SOURCES

- Traffic and Pedestrian Volume Counts
- Stakeholder Consultations
- Accident Data indicating high risk locations



2

Identify gaps in NMT network

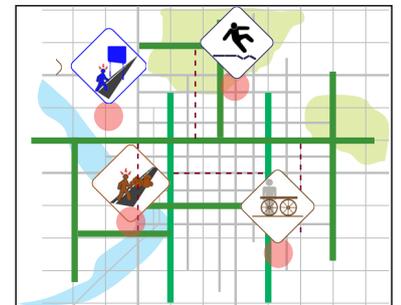
To identify impairments to NMT mobility such as:

- Incomplete / missing / narrow sidewalks
- Incomplete cycle tracks
- Lack of safe crossings
- Interruption and encroachments



DATA SOURCES

- Site Visits
- Topographical Surveys
- User Surveys



3

Identify unique needs of the area and stakeholders

To identify specific needs and locations for NMT oriented facilities such as:

- Cycle / Cycle rickshaw parking
- Informal markets
- Flexible spaces
- Spill-out spaces
- Utility provisions

DATA SOURCES

- Data Sources:
- User Surveys
- Stakeholder Consultations
- Site Visits
- Consultations with utility companies



4

Identify Constraints and Opportunities

To identify systemic and infrastructural challenges to overcome or opportunities to utilize to address NMT needs.

BASED ON

- Available ROWs
- Ongoing / proposed infrastructure projects
- Ongoing / proposed developments



5

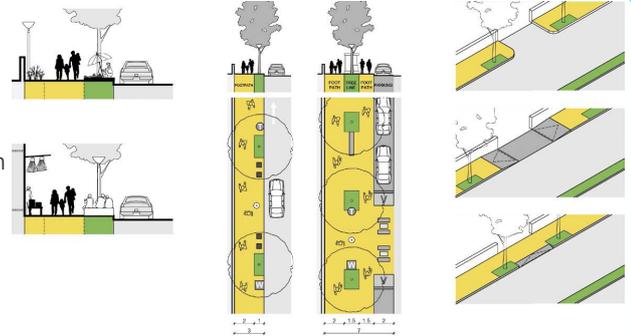
Develop Typical Street Templates

To envision the desired RoW allocation along streets and intersections as elements of continuity.



REFERENCES

- ITDP Better Streets, Better Cities Manual
- ITDP Footpath Design Manual
- EMBARQ Street Design Manual
- UTTIPEC Street Design Manual

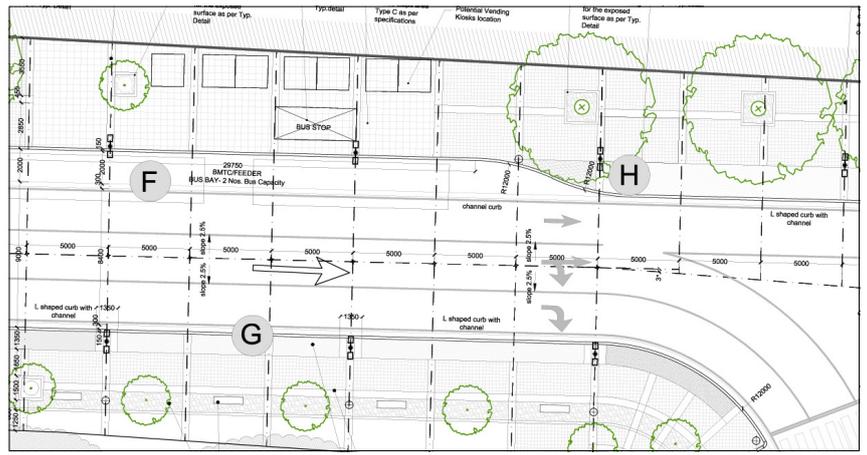


(Source :Better streets,Better Cities Manual)

6

Prepare Detailed Drawings and Material Specifications

To contextualize desired street layouts to existing conditions, ensuring conformance to typical layouts while addressing the unique needs of different locations and present a blueprint for execution.



(Source:IBI Group)



7

Prepare Action Plan

To break the work down into implementable components or tendering packages with detailed phasing, costing and financing plan for each package



Utilities Relocation Plan



Tree Planting Plan



Footpath and Cycle Lane Surfacing Plan



Road Surfacing Plan



Street Furniture



Street realignment plan

06 / INVEST



An Example of Mandi House in Delhi that integrates public realm around its transit stop that supports a walkable urban neighbourhood.
Source: IBI Group



6.1 Financing NMT – principles of prioritization

Why the current lack of NMT funding?

The financing of NMT projects, and the current lack of it, is an interesting conundrum in the transport investment processes of the city. There are several reasons why NMT investments are not prioritised in Indian cities:

1. The efficiency of roads, following the highway design principles, is still measured by speed and not by the accessibility provided;
2. The cost-benefit analysis methods to justify investments are primarily based on travel time savings. Since these methods, again, are derived from highway text books, only the travel time savings of motorised modes is counted. The time savings of pedestrians and cyclists are not counted in these models. To make matters worse, the value of travel time is based on income levels so the higher income groups (owning cars) have higher value of time and the economic model shows better benefits of investing in infrastructure for them;
3. Financial feasibility models for transport investments, such as highways and toll roads, are based on user charges and internal revenue returns. Sidewalks and cycle tracks cannot bring in user charges and other revenue. On the other hand, the financial and economic models put no value on avoided accidents, avoided emissions, avoided congestion and other socio-economic benefits that would accrue to the city authorities if they invest in NMT infrastructure;
4. The carriageway construction costs are easy to estimate (material X area) and hence easy to tender out for the city authorities; construction of sidewalks and cycle tracks, especially if they are retrofitting an existing city, can have over a dozen cost components (some of them being unpredictable). Examples of these could be:
 - a. Cost of shifting utilities like drainage, sewerage, water-supply lines, electricity lines, light poles and electric boxes, and others
 - b. Cost of removing/relocating encroachments like religious structures, boundary walls, shop spill outs etc.
 - c. Separate costs for localized interventions like property accesses and access roads, crossing facilities, et al.
5. Also the design input has to be accurate and meter by meter to propose micro-details of dealing with trees, bus stops, crossings, advertisements and signages, vendors, et al. This makes it complex to survey, design and then estimate the cost of the project; and
6. Often NMT based projects suffer from being too small in size to access the external project funding grants or loans which require larger volumes to justify the investment effort.

What are the consequences?

What would happen if we do not invest in NMT Infrastructure? If we do not invest in NMT facilities now, it will cost much more to retrofit these facilities in the future. The process for calculating this cost is explained as under:

- Provision and retrofitting various NMT infrastructure facilities like cost of pavement, signages, traffic signals, parking, and barriers for motor vehicles, etc. after construction of the carriageway is high. Added to this is the increment in cost due to inflation.
- Apart from the direct costs, there are various economic cost factors involved in case we do not provide NMT facilities. Some of these costs are listed as under:
 - o User savings cost - non-motorised improvements that allow people to reduce their transport costs like vehicle ownership and operation, parking costs, etc;
 - o Social cost savings - costs to government or businesses such as reduced road or parking facility costs;
 - o Cost of accidents and fatalities – cost to government for providing health service like hospital, ambulance, fuel, etc;
 - o Cost of pollution mitigation measures – a cost can be estimated based on prevention, control or mitigation of expenses;
 - o Health cost – cost to an individual and government for fighting against diseases that arise due to inadequate physical activities, high pollution, and noise level of private motorised modes. Some of these diseases are heart disease, hypertension, stroke, depression, diabetes, osteoporosis, cancer, dementia etc; and
 - o Cost of energy – direct cost saving of fuel to government by reduction in number of motor vehicles.

This section explores some investment strategies that the city could explore to finance NMT projects and prioritize them in their investment plans.



6.2 Invest Tasks, Key Outcomes and Tools

The Invest step explores possible financing options for NMT and discusses methods which could be used by the cities to make NMT financing attractive and viable. It also recommends measures to allocate finances appropriately for NMT projects

	Tasks	Outcomes	Tools
1	Prioritize NMT proposals for city budget allocations	Capital Improvement Program	
2	Identify alternative financing sources	Alternative financing sources	
3	Develop incentives for private stakeholders to invest in NMT infrastructure	Private stakeholder incentives/DCR modifications	
4	Establish budget allocations for NMT rehabilitation and maintenance	Rehabilitation and Maintenance Plan	



6.2.1. Prioritize NMT proposals for city budget allocations

PURPOSE

To understand budget priorities and expenditure trends in urban transport and where NMT infrastructure can fit in.

SUB-TASKS

- Analyse the estimated revenue receipt and expenditure pattern of at least the last five financial years to get the exact picture of expenditure on transport sections, include sub-sections such as construction or maintenance of footpaths and cycle tracks. Key components of this budget analysis exercise are as follows:
 - o City wide expenditure figures on transportation and details of NMT infrastructure spending.
 - o City wide revenue receipts and principles of allocation to various sections of municipal infrastructure services.
 - o Zone or ward wise details of NMT infrastructure spending and revenue receipt allocation,
 - o Review of key principles of budget allocation in light of the NMT infrastructure spending pattern and its cascading effect.
- Cross-check principles of allocation for compliance with the transport planning objectives of the master plan for the city.
- Examine the merits of introducing “Local Transport Plans” (LTP’s) as instruments to ensure that more NMT-friendly policies and strategies are developed at the local level.
- Develop a Capital Improvement Program, identifying budget amounts and sources to be diverted to NMT capital investments in the next 5-years.

OUTCOMES

- Local Transport Plans
- Capital Improvement Program

TOOLS AND RESOURCES

- **Municipal annual budget sheets and annual reports**
- **Cost Benefit Analysis**

REFERENCES

- Interim Report of the High Level Committee: Financing of Infrastructure, Government of India



6.2.2. Identify alternative financing sources

PURPOSE

To identify innovative financing mechanisms and potential partners

SUB-TASKS

- Develop an NMT fund or proactively encourage the state governments to establish the NMT fund to promote the implementation of NMT projects and assist municipalities in funding NMT related road infrastructure improvement. This could be a part of the Urban Transport Fund, if existing in the city.
- Evaluate opportunities to bundle NMT projects with other larger projects to make them financially attractive and implementable. Some of the projects they can be combined with are:
 - o Urban renewal projects
 - o Public transit projects
 - o Heritage and tourist area plans
 - o Other initiatives like decongesting cities, making green cities, making smart cities, etc. to easily incorporate NMT projects in their agenda.
- Consider creating green financing options in the city by taxing use of private vehicles under the “polluter pays” principle. These can be in the form of:
 - o Private vehicle taxation
 - o Reallocation of state transport duties revenue from imposing various transport duties like MV licencing, octroi, etc.; and
 - o Parking pricing – parking charges should represent the actual market value of the land.
- Tap on to international climate financing options to generate financing for NMT projects as they fit into the mitigation and adaptation proposals to reduce GHG emissions. These can be availed from a variety of funding institutions and under the Nationally Appropriate Mitigation Action (NAMA) plans that the country supports.

OUTCOMES

- Financing from alternative sources

TOOLS AND RESOURCES

- **Nationally Appropriate Mitigation Action (NAMA)**
 - CDMs
 - Taxation and Cess Models
 - Climate mitigation calculation tools
- **National Mission for Sustainable Habitats**
- **Smart City Funding**

REFERENCES

- Congestion Mitigation and Air Quality Improvement (CMAQ) Program, USA
- Interim Report of the High Level Committee: Financing of Infrastructure, Government of India

CASE STUDY

The **Congestion Mitigation and Air Quality (CMAQ) Improvement Program, USA**, assists areas designated as non-attainment or maintenance under the Clean Air Act Amendments of 1990 to achieve and maintain healthful levels of air quality by funding transportation projects and programs. The CMAQ program has funded numerous bicycle and pedestrian improvements including bikeway networks in cities such as Philadelphia, Houston, and New York City; pedestrian and bicycle spot improvement programs; bicycle parking; bicycle racks on buses, sidewalks, trails; and promotional programs such as bike-to-work events.



6.2.3. Develop incentives for private stakeholders to invest in NMT infrastructure

PURPOSE

To develop a sustained mechanism to induce private entities to invest in NMT infrastructure

SUB-TASKS

- Modify building bye-laws to contribute to the envisioned NMT experience. Some potential building bye-laws include:
 - Mandatory active frontage or shop line
 - Prohibition of compound walls
 - Mandatory provision of publicly accessible frontage zones.
- Provide developer incentives such as **density exchange or density bonus** as a tool for attracting private sector investment in NMT infrastructure.
- Implement density transfers through Bye-law amendments, sometimes referred to as **Transferable Development Rights (TDR)**, as a mechanism to attract development and investment for NMT facilities. TDRs are generally used as a mechanism to:
 - Conserve significant heritage buildings
 - Achieve built form and street character.
- Evaluate alternative mechanisms to raise funds from private financing sources:
 - Capital market funds - State government should support smaller ULBs to access the capital market through Pool Financing like in TamilNadu, the Tamil Nadu Urban Development Fund (TNUDF) was established to provide small and medium ULBs access to capital markets. While doing so the state government may specify the financial performance benchmarks for the ULBs like maintaining a 1.25 Debt Service Coverage Ratio. Access to capital market like TNUDF.
 - Land monetization – government should charge the owner a reasonable percentage of market value of land in lieu of the increase in the market value of land due to proposal and implementation of sustainable transport infrastructure projects in the vicinity.
 - Advertisement revenue – government should formulate a committee for integration of advertisement revenue, from different sources like bus shelters, buses, road space, etc. for funding parts of NMT infrastructure like guarded bicycle parking system, PBS system, etc.

OUTCOMES

- Recommendations for development incentives with estimate of resulting revenues and expenditure on public realm improvement projects.
- DCR modifications

TOOLS AND RESOURCES

- Multiple stakeholder investment model
- Allocating percentage of a large project like mass transit to access facilities

REFERENCES

- Capturing the Value of Transit (CTOD) <http://ctod.org/pdfs/2008ValueCapture.pdf>



6.2.4. Establish budget allocations for NMT rehabilitation and maintenance

PURPOSE

To preempt and plan for rehabilitation and maintenance of NMT infrastructure.

SUB-TASKS

- Develop a maintenance plan that will allocate maintenance responsibilities and account for material and labour costs for significant, minor and routine maintenance activities.
- Select special maintenance teams - in house or contracted for post-monsoon annual maintenance.
- Allocate an amount for yearly upgradation. Small chunks of upgradation work must be identified in the Action Plan based on the yearly allocated budget for upgradations.
- Prepare estimates of operation and maintenance expenditure in order to achieve longevity and smoother operations of system-oriented NMT projects like bike sharing schemes.

OUTCOMES

- Rehabilitation/Maintenance Plan

TOOLS AND RESOURCES

- **Municipal annual budget sheets and annual reports**

REFERENCES

- Interim Report of the High Level Committee: Financing of Infrastructure, Government of India

07 / IMPLEMENT



Promenades at Sabarmati River in Ahmedabad
Source: <http://www.prokerala.com/news/photos/preparations-going-on-at-sabarmati-river-front-224495.html>



7.1 Making it Happen

Implementing and executing an NMT project on the ground is a complex task not only because of issues faced during implementing street rehabilitation projects, but also because of the multiplicity of stakeholders involved. It becomes important then to clearly define the organizational roles and responsibilities during the construction process.

The implementation phase also requires intensified public participation, outreach and marketing campaigns to accompany the construction process so that it will answer the ongoing concerns of the citizens about the project as the construction activity begins.

Before beginning construction, the implementing agency needs to get a construction agency on board. The pre-site execution phase includes the following on the part of the implementing agency:

- Detailed cost estimates based on the implementation drawings are made by the agency. These estimates may require changes in the preliminary approved development budget;
- Following the approval of the estimate, the public notification or an expression of interest is placed and interested contractors/developers are invited to bid for the development of project;
- The successful bidder is selected based on the laid criterion in the invitation of bids;
- An independent project manager should also be appointed for the implementation phase to ensure proper quality and progress of work as per the schedule; and
- Subsequent changes/improvements in designs/drawings may be necessitated due to limitation of site, time, cost overruns, etc.

Safety of pedestrians and cycle users specifically, and other road users generally, need to be taken into consideration at the time of road construction and maintenance works. This also includes works done for road restorations. At times of construction, the cycle users will share the carriageway with construction going on within the road RoW. However, they need to be provided similar safety practices adopted for other users. Although IRC SP55 addresses safety standards during construction, cycle users have not been given due importance in the guidelines. The Work Zone Safety Manual (NHAI, 2010), addresses safety at work zones for all road users including vulnerable road users, however the document is specific for application on highways, and may not be entirely applicable in urban areas.

Enforcement of the built infrastructure is an important part of the implementation process. The design and planning approach for development of NMT infrastructure is not based on mandated or enforced use, but on attracting pedestrians and cyclists by choice. This is reflected in its signage design which employs the use of informative, rather than regulatory, signs for cyclists. Clearly, enforcement is not required to force cyclists within cycle infrastructure, but to prevent its misuse by other modes and functions. This is especially important in our conditions, where a high share of motorised two wheelers, always threaten encroachment of the cycle infrastructure. Enforcement to prevent this misuse is important to ensure and retain its use by cyclists.



7.2 Implement framework

Implementation of a cycle and pedestrian infrastructure plan or project involves the organizational framework for implementation, community engagement and outreach, project management, supervision, monitoring, and evaluation.

	Tasks	Outcomes	Tools
1	Define clear roles and responsibilities for NMT development and maintenance	Roles and responsibilities	
2	Conduct advocacy and awareness campaigns	NMT events/ educational campaigns	
3	Ensure high quality project delivery	Uniform tendering and contract management procedures	
4	Conduct NMT sensitization workshops with enforcement officials	Sensitization/ training workshops	
5	Develop monitoring and evaluation framework to measure success of NMT targets	Monitoring and evaluation framework	



7.2.1. Define clear roles and responsibilities for NMT development and maintenance

PURPOSE

To facilitate partnerships and delineate responsibilities to coordinate implementation activities in a structured manner.

SUB-TASKS

- Provision for NMT in mid to large cities is almost exclusively a municipal responsibility. There are many, however other government and non-government organizations involved in the planning and implementation process and need to be mapped. An indicative list and their roles could be as follows:
 - **Local Governments:** Master planning, local area planning, road network planning, NMT infrastructure planning, construction, upgradation and maintenance;
 - **Transit Agencies:** NMT infrastructure investment around transit stations and corridors;
 - **Regional Planning Agencies (UMTA/Metropolitan Authorities):** Long-Range Transportation Plan, Regional Low-Carbon Mobility Plan, Regional Growth Management Plan, technical assistance to local agencies, and monitoring of Urban Transport Fund;
 - **Citizens, NGOs and Advocacy Groups:** Advocacy for NMT improvements, community participation in planning and design, education, attend planning meetings and advocate high quality design;
 - **Elected officials:** Developer and citizen awareness about benefits of NMT, changing regulatory climate, advocate transportation demand management policies and local economic development incentives;
 - **Businesses/Real Estate Developers:** Joint development with transit agencies, Public Private Partnerships, affordable housing construction, private sector investment in real estate, and employee incentives;
 - **State Government:** Policy changes, funding assistance, capacity building, technical assistance, Land and Market Reforms; and
 - **Central Government:** Policy changes, guidelines formulation, funding assistance, and capacity building.

OUTCOMES

- Notified Roles and Responsibilities for Government Agencies
- Implementation team

TOOLS AND RESOURCES

State Planning Acts and Regulations

National/State Transportation Acts and Regulations

Stakeholder workshop involving regional partners

REFERENCES

- JnNURM CDP Toolkit (2013), Ministry of Urban Development
- Urban Capacity Building Programme, Janagraha Urban Space Foundation (<http://www.janaagraha.org/content/program/urban-capacity-building>)



7.2.2. Conduct advocacy and awareness campaigns

PURPOSE

- To ensure project is implemented smoothly
- To ensure project has ownership of the community and receives positive publicity

SUB-TASKS

- Engage the community through user/stakeholder participation. The benefits of their participation are as follows:
 - o It streamlines the execution of interventions since fewer objections/ court cases from citizens will occur and wider acceptance is secured;
 - o It improves the quality of the decisions since local know-how and experiences of users and professional expertise can be combined as the users are often in the best position to identify urgent priorities;
 - o Potential future problems might be identified earlier and solved quickly since there is wider support; and
 - o Involvement of the private sector in the sharing of responsibility and costs solves the financial and organisational burden of the government and they become more pro-active actors.
- Focus strategies to promote NMT should on the following groups:
 - o Tourists- Establish NMT friendly tourism routes, guest houses/ hotels to supply free bikes for the duration of the stay, establish a programme to train local guides that can run bicycle tours;
 - o Urban Scholars/Students- Promote cycling to school and initiate safety awareness training;
 - o Urban Commuters- provide information to them about shorter and safer paths for walking and cycling; and
 - o Promote cycle subsidization programmers with large employers (businesses/co-ops/factories, etc.) and encourage to provide showers, bicycle parking and storage facilities.

OUTCOMES

- Awareness about the importance and benefits of NMT
- Community support – both beneficiaries and other road users during infrastructure projects

TOOLS AND RESOURCES

- Conventional media
- Social media
- Dissemination material
- Events and exhibitions

CASE STUDY

Raahgiri Day, inspired by Ciclovía, is a weekly street event begun on 17 Nov 2013 by the founding members EMBARQ India, IAmGurgaon, Pedalyatri, Duplays, and Heritage School. The 11.3 km corridor was supported by the Gurgaon Police, Municipal Corporation of Gurgaon, and DLF (one of Gurgaon's largest private housing, commercial, office and retail developers) along with Schools, RWAs, NGOs, Industry Associations, Active Recreation groups and Active Citizens. MCG and Gurgaon Police have taken the lead organizing role for Raahgiri Day.

The involvement of the citizens and authorities in the program has not only led to awareness of both on the issues of NMT but has also created a platform for dialogue on the issue. Several infrastructure projects on NMT are now under discussion in Gurgaon



7.2.3. Ensure high quality project delivery

PURPOSE

To ensure timely delivery of project which is compliant with the original plan

SUB-TASKS

- **Produce a set of key guidelines** as instructions for the agency/team implementing and executing the design. Transfer of a well-conceived NMT infrastructure plan on site, demands good communication between design agency, project managers and the contractors in order to explain instruction on use and interpretation of drawings;
- **Prepare Construction/Working Drawings:** All drawings should be well referenced with detailed drawings including signage and marking designs. They can also be made to suit the various contractors employed like civil, electrical, drainage, etc.;
- **Assign Project Manager and Quality Surveyor:** Apart from assisting the employer in quality control and billing, the role of project manager (PM) is to ensure that there are no discrepancies during the process of transfer of drawings to site. PM ensures two way communications between the designer and the contractor; and
- **Conduct Regular Site Inspection:** At all stages of construction, there should be no compromise on the safety of the road users as well as the workers on site. There should be periodic inspections to maintain the quality of the project execution.

OUTCOMES

- NMT projects are completed as per design and time schedule.

TOOLS AND RESOURCES

- Project management softwares and applications
- CAD tools and softwares

REFERENCES

- Tender SURE, Bangalore City Connect Forum
- Urban Capacity Building Programme, Janaagraha (<http://www.janaagraha.org/content/program/urban-capacity-building>)



7.2.4. Conduct NMT sensitization workshops with enforcement officials

PURPOSE

To ensure that enforcement agencies understand and are sensitive to NMT needs and can prevent encroachments and misuse of sidewalks and cycling infrastructure.

SUB-TASKS

- Develop training material in the form of hand outs and videos to sensitize enforcement officials towards NMT needs and the importance of traffic signals in protecting pedestrians.
- Conduct on-site workshops with traffic police to explain how to facilitate traffic movement and simultaneously create safe space for pedestrian and cyclist movement.
- Prepare a manual of enforcement strategies that protect against violations of motorised vehicles entering sidewalks and cycle tracks, parking on them, over speeding, traffic signal violations, etc., including:
 - o Stationing of trained policemen or marshals near crossings and at each entry to cycle lane/track (far or after side of the junction), to direct unauthorized motor vehicles outside the infrastructure;
 - o Policing and citations at junctions, towards the end of cycle paths; and
 - o Recording of violations for secondary fines and citations using video cameras should be conducted in addition to manual enforcement.
- Incorporate encroachment of NMT infrastructure by vendors and slums in the list of duties of an enforcement official. Traffic Police would need to work in cooperation with municipal officials responsible for street vending enforcement to ensure that vendors do not obstruct NMT paths.
- Assign a nodal officer responsible for enforcement planning, actions and strategies on the road to ensure action as per pre-planned strategies in case of any eventuality on the corridor. This mechanism should include linking with a central command/control centre with an assigned coordinator.
- Develop design interventions that can assist in enforcement such as:
 - o Specifically designed, sign boards, pavement marking, reflector studs and light beacons to assist motorists in specific lanes at the beginning and end of segregations or change of segregation type; and
 - o Specifically designed sign boards and marking in line with listed violations such as those in the motor vehicles act. For example, speed limit signs and 'no entry signs' for specific modes at the entry exit of bus and cycle lanes.

OUTCOMES

- Higher safety and accountability for NMT users

TOOLS AND RESOURCES

- Traffic police workshops
- Signage
- Advertising the penalties



Figure 41: Centre for Green Mobility (CGM) staff with Traffic Police marking the refuge and demonstrating the turning of vehicles in Ahmedabad
Source: Centre for Green Mobility Facebook Page



Figure 42: Pedestrian Space created by markings created by Centre for Green Mobility (CGM) staff with Ahmedabad Traffic Police in a unique sensitization exercise
Source: Centre for Green Mobility Facebook Page



7.2.5. Develop monitoring and evaluation framework to measure success against NMT targets

PURPOSE

To ensure that project implementation is directed towards desired outcomes; and successes, failures and benefits are monitored and evaluated

SUB-TASKS

- Appoint an expert team (from the government system or third-party consultants) for the monitoring and evaluation of overall NMT policy performance and to ensure its effective implementation can be useful for the project. The strategies to be followed by the M & E team should be:
 - o Focus on direct outcomes of the projects that have been carried out. In that case it is important to pay attention to the development of knowledge, arguments and instruments;
 - o Focus on the internalization of the results of the projects in policy and plans of the target groups; and
 - o Assess the impacts achieved by the project as per pre-developed quantitative verifiable indicators.
- Develop a post-project audit format to monitor that the project is beneficial in the short and long terms and the targeted beneficiaries. The key objectives that evaluation of a NMT route or network is to assess:
 - o If the network/infrastructure has succeeded in sustaining existing and or attracting additional use along the route;
 - o If the type of infrastructure developed is appropriate to the environment, road or context in which it has been used;
 - o If the infrastructure developed manages to attract/serve existing users already on the road network; and
 - o If the infrastructure succeeded in improving the safety of bicyclists along the route by design.

OUTCOMES

- Lessons learned from monitoring can be used to improve that and other NMT facilities elsewhere.

REFERENCES

- IUT Toolkits: ADB Module 5 - Guidelines for NMT Measures - policy and options (<http://www.iutindia.org/capacityBuilding/Toolkits.aspx>)
- Ten Steps to a Results-Based Monitoring and Evaluation System - World Bank - a Handbook for Development Practitioners (<https://openknowledge.worldbank.org/bitstream/dle/10986/14926/296720PAPER0100steps.pdf?sequence=1>)



APPENDIX A:

CASE STUDIES



Bicycle Signals along 9th Avenue Bicycle Lane in New York, USA provide an additional sense of safety to cyclists and give the city added control over all traffic movement.
Source: IBI Group

NMT-related Regulations

San Francisco Pedicab Ordinance

Pedicabs in San Francisco are mainly used to ferry tourists to city sites. These form attractive tourist rides as they give an open ride to tourists. The pedicabs are tricycles and can seat 2 people per pedicab. Such pedicabs have become extremely popular all over the United States in recent years, especially in San Diego and New York, where excessive congestion and accidents have forced the authorities to enforce stricter regulations.

The registration of pedicabs in San Francisco follows a similar process as the registration for taxis. Like taxis, fleets of pedicabs are generally owned by a single owner, who leases the vehicle for operation to licensed pedicab operators. Due to the current regulatory requirements, pedicab fares are comparable to taxi fares. The San Francisco Pedicab Ordinance of 1986 (Article 39) regulates the operation of pedicabs operating in San Francisco.

The ordinance requires both the owners and operators of pedicabs operating on public streets to obtain a permit from the Police Department. To apply for a permit, the owner or lessee need to mainly provide information about the vehicle, including type and seating, route(s) and area(s) of operation, as well as verification that the owner has never been convicted of any crime. The operator is required to submit a separate permit application providing information about the driver's history with traffic offences, if any, as well as driver's physical abilities. The operator might also be required to pass an examination to prove his knowledge of traffic laws.

Other terms covered in the Pedicab ordinance include:

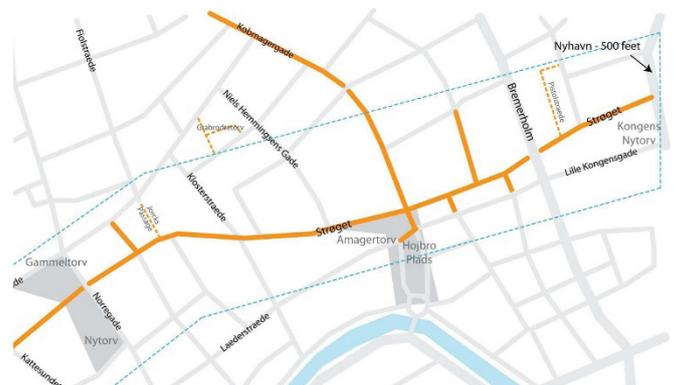
- Insurance Requirements;
- Pedicab License, Plate, ID card, and Operator's Badge;
- Pedicab Fares Regulations;
- Operating Regulations;
- Sanitary Regulations;
- Safety Requirements;
- Loading; and
- Penalty and Severability.



Stroget - Walking Street, Copenhagen

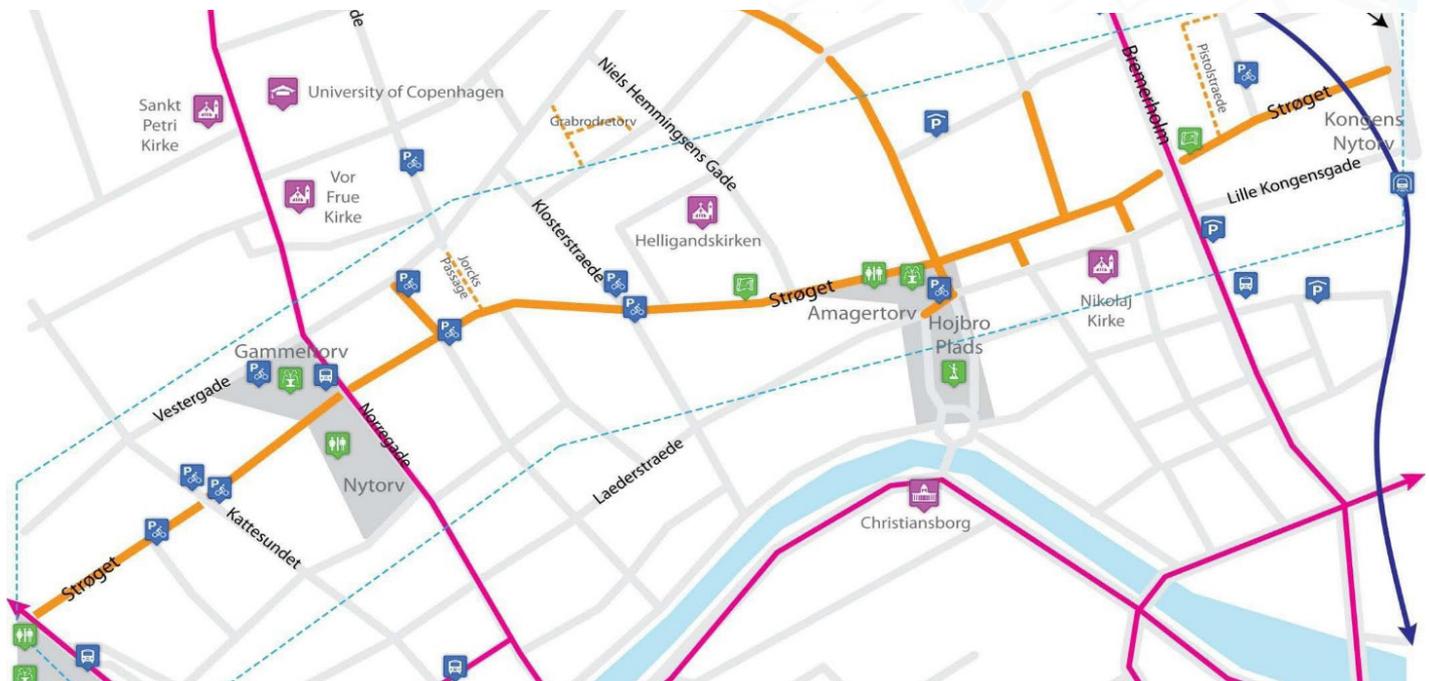
Since it became pedestrian in 1962, Stroget Street in Copenhagen, Denmark has become a major tourist attraction. It has been responsible in reviving the potential of a historic medieval city, by recreating the human scale of its past. It is now also the longest and most successful retail street in the region. In 2000, Stroget attracted over 80,000 visitors per day. The street is about 32 -39 feet wide and about 2/3 of a mile. A mixed-use street, Stroget is lined with buildings that have commercial uses on the ground floor and residences and offices above. In 2010, Colliers reported that the value of commercial rental rates along Stroget Street were at 29th position in the world.

The street is provided by access point from all modes. Bicycle and vehicular parking are provided at convenient locations to enable easy and convenient access. Transit access is provided by bus. Stroget Street also includes two historic cathedrals (Nikolaj Kirke and Helligandskirken).



Stroget and adjacent areas (Above) and Stroget amenities and attractions (Below)

Source: Bates K, 'Making pedestrian mall works', June 2013



South Korea

South Korea is a developed country in East Asia with a total population of 50 million people. It is also one of the first Asian countries to actively support NMT through a National Plan for Cycle Use. The impetus for NMT improvements was provided by urban issues of traffic congestion as well as the looming energy crisis and climate change threats.

The chronology of the Cycle Use National Plans is shown to the right. The first National Plan oversaw construction of 4,419 km of cycling paths and cycle parking for 190,000 cycles. It resulted in a 2.4% increase in bicycle mode share in 5 years. The second National Plan won a 500 billion south Korean won (0.46 billion USD (1 USD = 1093.19 south Korean won)) budget, which was to be used for construction of 4000 km of cycling paths, and cycle parking for 80,000 cycles. The 2nd National Plan also directed a portion of the budget for awareness and advocacy campaigns related to cycling.

The 3rd National Plan was influenced by the Lee Myung Bak administration’s National Green Growth initiative (2009). The 3rd National Plan called the ‘Comprehensive Bicycle Plan for Korea’ includes a **modal share target of 5%** for 2012. The 1.2 trillion south Korean won (1.1 billion USD (1 USD=1093.19 south Korean won)) budget will go towards the construction of up to 17,000 km of cycling paths. The Plan focuses on the following components of infrastructure development:

- Utility Bicycle Routes
- National Bicycle Network
- Bicycle Industries

The Comprehensive Bicycle Plan provides guidance on Legal and Institutional matters using the “5 E” framework: Encouragement, Education, Engineering, Evaluation and Enforcement. It identifies the following 5 strategies for infrastructure development:

- Contribute to low carbon, green transportation;
- Ensure safety through physical and regulatory means;
- Increase connectivity of various bicycle paths;
- Incorporate regional, historical and cultural traits;
- Framework for continuous implementation.

The Comprehensive Plan also suggests network link typologies and provides best practices for cycle-oriented transportation planning.

The chronology of the Cycle Use National Plans
Source: National Plan for Cycle Use, South Korea



Khayelitsha Township - Cape Town

The case study of Khayelitsha presents the relevance of investing in pedestrian infrastructure in poor neighbourhoods. Such investments enable high economic returns with respect to reducing crime, and creating health and education benefits – both key requirements for development.

Urban Upgrade Project

According to Khayelitsha Nodal Economic Development Profile some 50% of the residents in Khayelitsha reported that they do not feel safe to move around in their area during the day. This percentage rises to an alarming 94% when residents were asked whether they feel safe to move around at night. The City of Cape Town initiated the Violence Prevention through Urban Upgrading project (VPUU) in 2005 in cooperation with the German Federal Ministry for Economic Cooperation and Development (BMZ), the German Development Bank (KfW) and with the aid of several other stakeholders, aimed at social, situational, and institutional crime prevention while linking urban upgrading with a broad spectrum of social interventions. The total budget of the project is 400 million South African rand (\$55.6 million USD). One element of the program is to improve safety on the streets with simple measures.

The Active Box is a small three-storey security building that provides offices, caretakers flat and a room for patrollers. These Active Boxes, manned 24 hours a day, are found along the main pedestrian routes and are painted red. This ensures that if an individual is feeling threatened they can clearly see where they have to go to find help. Safer pedestrian passageways are made available through the use of street lighting and paved walkways;

Lights are strategically placed to light up the pedestrian route and are left on until late for kids to play. Citrus fruit trees - Harvestable fruit trees are planned in the courtyard and along the pedestrian walkways to provide shade and comfort state cool down the atmosphere in summer.

On a monthly basis, a Patrolling Initiative and Knowledge Management team maps the percentile rank of routes, according to how dangerous they are reported to be and to track changes in the pattern of perceived safety along pedestrian routes in a more accurate way. Red routes are prioritised in terms of patrol deployment. With all these initiatives VPUU measures **significant improvements in safety and security: the murder rate dropped by 33%**, the best in a low income area in Cape Town.



Organisation of the Bicycle Manufacturing Industry, Taiwan

Taiwan, once known as the “kingdom of the bicycle” was the largest manufacturer and exporter of bicycles until the 1990s. Even after facing stiff competition from cheaper bicycle manufacturing in China, Taiwan’s bicycle manufacturing industry managed to reinvent the industry and now specializes in the manufacturing and export of medium to high priced bicycles.

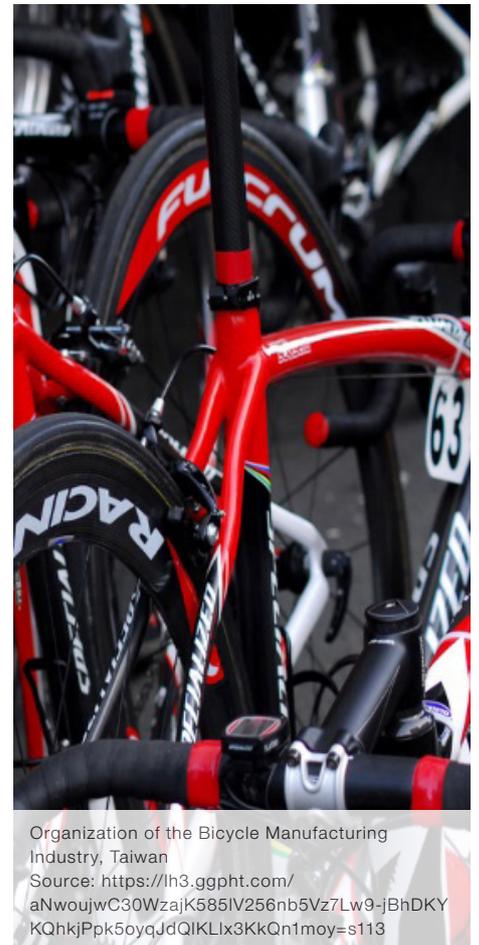
Interestingly, however, Taiwan’s domestic bicycle market is insignificant. In fact, bicycle usage in Taiwan is extremely low. Taiwan’s total population is 23 million, and there are 5.7 million cars, 12 million motorcycles and only 1.1 million bicycles in the country. In this scenario, the bicycle manufacturing industry can play an important role in cultivating a national cycling culture, leading to increased use of the mode for commuting and recreational travel. There are two episodes in this context that can serve as best practices for NMT-inclusive planning in India: Organisation of the Bicycle Manufacturing Industry and Bicycle Park:

Organisation of the Bicycle Manufacturing Industry

At the peak of its bicycle manufacturing days, Taiwan adopted the Original Equipment Manufacturing (OEM) model and maximised profits by increasing manufacturing quantities. However, in the 1990s, China began to surpass Taiwan in bicycle manufacturing, aided by lower labour costs. Taiwanese manufacturers, unable to compete with Chinese prices, started exploring a new strategic direction in bicycle manufacturing.

In 2003, two leading Taiwanese manufacturers, Giant and Merida, created a partnership with 11 bicycle part manufacturers, called the “A-Team”. The A-Team invested in strategic research and development to support innovation, enhance quality, and make the supply chain more efficient. This enabled Taiwanese manufacturers to counter the declining profit margins and deteriorating quality and instead created a new market for high quality, high end and specialized bicycles in the medium to high price range.

A well-organised bicycle industry can now also invest in promoting cycling within Taiwan.



Organization of the Bicycle Manufacturing Industry, Taiwan
Source: <https://lh3.ggpht.com/aNwoujwC30WzajK585IV256nb5Vz7Lw9-jBhDKYKQhkjPpk5oyqJdQIKLix3KkQn1moy=s113>

Shova Kalula (Ride Easy)

The very first national bicycle initiative launched by the South Africa National Department of Transportation (NDOT) was in the form of a user incentive program, called Shova Kalula (Ride Easy). The purpose of the program was to maximise the use of bicycles to enable communities to access social and economic opportunities at a lower cost. The longer term vision was to bring bicycle transport into the mainstream, as well as develop a network of micro-business enterprises that would manage Shova Kalula shops independently in the future.

The program was initially planned to target populations in the rural and peri-urban areas, providing subsidised bicycles to 350,000 secondary school students, 445,000 primary school students, 573,000 urban workers and 472,000 rural workers. The initial impetus for this program came from NGOs, mainly Afribike, who was appointed the service provider for Phase I. Since its launch in 2001, **stakeholder involvement among local and provincial governments, businesses, NGOs and foreign organisations has remained consistent.**

The initial demonstration projects planned for Shova Kaula had to follow the Action Plan shown below:

1. Road show to promote the concept among provincial departments and local authorities;
2. Recruiting interns to participate in different aspects of implementation;
3. Site selection and scoping to identify the communities where the scheme would be launched;
4. Site implementation to establish the bicycle shop and train the manager;
5. Mobile bicycle transport clinic/shop involved procuring a commercial vehicle for the mobile activities;
6. Evaluation of phase 1 and recommendations for phase 2.

The first phase of the project, which was the demonstration phase, was centrally operated. In the second phase, the implementation was to be transferred to provincial governments, financed by the central government. In its current form, provincial state governments need to submit a business plan to the NDOT outlining the business model they propose to use, to receive the funding for the program. The program has been quite popular, and this is evident from the number of provinces who receive funding under the Shova Kalula program. The total number of Shova Kalula shops set up by 2007 was 22 and 2,478 bicycles were distributed in the country.

The project resulted in benefits for people lacking mobility options. The subsidised rates for purchasing bicycles made them affordable for many people, providing them with improved access to jobs, education and essential amenities. However, the plan has been criticised for not being backed up by financial investments for infrastructure improvement. Due to this, the dangers in cycling in traffic in major areas have not been addressed.

Safety Training
Source: <http://benlowmik.wordpress.com/2010/09/23/shova-kalula/>



Benchmarking Active Transportation in North America

This research by the Clean Air Partnership reviewed a total of 78 NMT indicators, including everything that had ever been employed in a benchmarking study either in academia or by the government. Behan and Lea selected 39 indicators out of 78 to do the final benchmarking study of North American cities. The indicators were divided into the following 5 broad themes:

Infrastructure – The study notes a strong correlation between absence of bicycle facilities and mode choice at the respective origin or destination. The indicators under infrastructure primarily measure length of bicycle or pedestrian facilities and end of trip facilities;

Safety – Safety concerns are an important barrier to NMT (Active Transportation). Two kinds of safety were measured: personal safety and traffic safety;

Travel Behaviour – This was measured by mode shares and rates of car ownership. Another important measure was the NMT speed indicated by trip lengths over travel time. NMT speeds suggested the directness of NMT routes and influenced travel behaviour;

Demography – A number of demographic criteria were found to correlate with mode choice. Income was an important indicator for US cities, and would be for countries like India as well. Other demographics that influenced NMT use included population density, population size, and gender. Women were found to be less likely to use NMT by choice;

Geography and Weather – Comfort conditions for walking and cycling are considered to be in the temperature range of 20°C – 30°C, with low levels of humidity.

Because this study included cities in Canada and the US, there were limitations in terms of data consistency. For a more accurate evaluation, therefore, consistency of data inputs must be ensured. This is possible by providing a uniform data collection and monitoring protocol to all cities in advance of implementation.

Specific Indicator	Metric
1. Total length of on-street cycling facilities	km
2. On-Street Cycling Facilities (separated)	km
3. On-Street Cycling Facilities (not separated)	km
4. Signed bicycle routes	km
5. Multiuse paths	km
6. Policies regarding inclusion of bicycle lanes	yes/no
7. Shared lane markings	yes/no
8. Bike boulevards	yes/no
9. Woonerf/living streets	yes/no
10. Colored bicycle lanes	yes/no
11. Bicycle traffic lights	yes/no
12. Covered Bicycle Parking Facilities	capacity
13. Uncovered Bicycle Parking Facilities	capacity
14. Pedestrianized Zones	km
15. Pedestrian Sidewalks	km
16. Bicycles permitted on Streetcars?	Yes/no
17. Bicycles permitted on Subways?	Yes/no
18. Bicycles permitted on Buses?	Yes/no
19. Bicycles permitted on Commuter Rail?	Yes/no
20. Bikes permitted on these modes at all time	Yes/no
21. AT Injuries	%
22. AT Fatalities	%
23. Violent Crime Rates	Crimes/1,000 people
24. Cycling Mode Share (Work Trips)	%
25. Walking Mode Share (Work Trips)	%
26. Combined AT mode share (Work Trips)	%
27. Other Mode Shares (Work Trips)	%
28. Median Commuting Distance	Km
29. % work trips <5km in length	%
30. Level of taxation on new vehicles	%
31. Level of taxation on petrol	%
32. Population (total)	#
33. Population Density	Persons/km ²
34. Gender	%m/f
35. Annual precipitation	Mm/year
36. Hours of Sunshine per year	Hours/year
37. Mean Summer Temperature	°c
38. Mean Winter Temperature	°c
39. Mean Annual Temperature	°c

Indicators included in the Canada Benchmarking Study
Source: Benchmarking Active Transportation in Canadian Cities, Behan and Lea

National Biking and Walking Study 1994

In the early 1990s, US Congress tasked the Federal Highway Administration (FHWA) of the US DOT to look at ways to increase cycling and walking. With a 1 million USD budget and following two years of study, the FHWA produced a National Biking and Walking Study in 1994. In addition to the main study, 24 individual subject area reports were produced. Most of the work was contracted out to NGOs and private consultants, although there were also full-time internal resources dedicated to the project.

Through the study, the following two primary Federal transportation goals were developed:

1. Reduce pedestrian and cycling fatalities and serious injuries from traffic accidents by 10%; and
2. Double the percentage of trips taken by walking and cycling from around 7 % to around 15%.

While the first goal has been met (and exceeded), the second has been more elusive. Although the total number of trips taken by these modes has doubled, because of the growth in total number of trips, the percentages have not. Trip substitution was a key element in the US goal because it would help meet transportation-related objectives (reduced congestion, improved air quality, reduced emissions, more sustainable transportation, etc.) as well as health-related objectives.

A Federal Action Plan with 64 specific action items was developed including objectives at the National, State and Local levels, although the actions outside the national government had to be framed as suggestions as opposed to mandated directions. However, through this initiative, each state was mandated to hire an active transportation coordinator.

The study was primarily developed through collaboration within the US DOT (including the National Highway Transportation Safety Administration – NHTSA). The US Environmental Protection Agency (EPA) was also involved to an extent, as was the railroad administration, which was primarily interested in safety. Since this study, the health-related and environmental benefits of walking and cycling have become more widely recognized.

The 15 year status report for the National
Bicycling and Walking Study
Source: www.pedbikeinfo.org

The National Bicycling and Walking Study: 15-Year Status Report

May 2010



U.S. Department
of Transportation
Federal Highway
Administration

Pedestrian and Bicycle
Information Center

Bogota – Ciclo Ruta Network

Bogota came to be known in the planning world for its exceptional transformation from being an ill-governed and chaotic city to a model of visionary policies and progressive urban planning. Since 1995, Bogota has achieved notable success across various thematic areas which include public services, urban mobility and public space. While the city is primarily known for its model Bus Rapid Transit project under the leadership of Mr. Enrique Penalosa, Mayor, (1998-2001), interventions supporting non-motorised transport were initiated in the mid 90's and integrated with the Transit Planning. The flagship “CicloRutas” program is one such successful initiative which provided impetus to rebrand and inaugurate a modern form of Ciclovía . The CicloRutas, which in some ways traded off cycle path quality for network coverage in order to quickly implement a connected set of cycle ways, inspired similar NMT networks in many other big cities internationally.

CicloRutas refers to a network of now over 376 km of cycle ways, which were in large part built following construction of a few cycleway pilot projects in the late 1990s. Much of the design and construction work began in the wake of the city's approval of its CicloRutas Master Plan (PMC) in 1999 although the process was initiated in 1996. This design and construction happened quickly, from 1998 to 2003, initially as a key project of then mayor Enrique Peñalosa. The project's momentum then carried it through two subsequent election cycles with mayor Antanas Mockus Sivickas, and then mayor Luis Eduardo Garzón. Much of the success in Bogota can be attributed to the continuity of the chain of policies that supported an improved urban environment across multiple political administrations from the mid 90's onwards. Reported figures vary, but stats reveal that the city's cycling mode share during the early period of network construction was 0.6%, but it had peaked at 4.4% by 2003, which represents a dramatic increase seen in few other cities in the world. Further confirming the importance of proximity to a cycling network as a factor that encourages more cycling, a study by Cervero et al (2004) specifically conducted in Bogotá reports an association between proximity to a CicloRuta cycleway and use of the cycleway at least once per month, while also reporting that high traffic volumes in Bogotá are shown to impede utilitarian cycling.

The fact that the project was initiated in the absence of either a land use or mobility master plan is a clear indication of the level of influence a political administration has in building exemplary models to enhance liveability.



HUD-DOT-EPA Interagency Partnership for Liveable/Sustainable Communities

In 1994, the US Department of Transportation (DOT) established an Interagency Task Force on Bicycling and Walking, which included the departments of Health, Education, Defence, Interior, Agriculture and the Environmental Protection Agency. In a similar spirit of collaboration, in June of 2009, the federal government announced a three-way partnership between the US Environmental Protection Agency (EPA), the US Department of Housing and Urban Development (HUD) and the US DOT to coordinate planning and funding initiatives around several principles of liveability/sustainability, three of which relate strongly to non-motorised transport.

Value communities and neighbourhoods: Enhance the unique characteristics of all communities by investing in healthy, safe and walkable neighbourhoods—rural, urban, or suburban.

Broadly speaking, the actions that this partnership will involve:

- Enhance integrated planning and investment;
- Provide a vision for sustainable growth;
- Redefine housing affordability and make it transparent;
- Redevelop underutilized sites;
- Develop liveability measures and tools;
- Align HUD, DOT and EPA programs; and
- Undertake joint research, data collection and outreach.

The US Department of Transportation (DOT) recently announced a strongly-worded official policy statement on accommodating bicycles and pedestrians. The language of the policy statement underscores the DOT's growing interest in "liveable communities," with an emphasis on accommodating people of all ages and abilities, and all transportation modes.

Along with the policy statement, the DOT issued eight recommendations to all transportation agencies and "local communities":

1. Treat walking and bicycling as equals with other transportation modes;
2. Ensure convenient access for people of all ages and abilities, especially children;
3. Go beyond minimum design standards;
4. Accommodate cyclists and pedestrians on new, rehabilitated and limited-access bridges;
5. Collect data on walking and biking trips;
6. Set mode share targets for walking and bicycling, and track them over time;
7. Maintain sidewalks and shared-use paths to the same standard as other roadway assets;
8. Improve non-motorized facilities during maintenance projects (e.g. road resurfacing); and
9. The new policy was not accompanied with any specific funding.



New Zealand's National NMT Strategy: "Getting there – on Foot, by Cycle"

In 2005, the government released its first national walking and cycling strategy in a document titled *Getting There – On Foot, by Cycle*. It was released with the announcement of an 1.15 million USD in new funding to be invested in pedestrian and cycling programs in addition to increased NMT infrastructure funding and strategy development support for road controlling authorities through the National Land Transport Fund. The vision is supported by three goals which emphasize creating NMT-supportive communities and transportation systems, increasing walking and cycling and improving safety for pedestrians and cyclists. These goals are further informed by the following six key principles:

1. Walking and cycling face similar issues, but are different modes of transport with different needs;
2. Providing a transport system that works for pedestrians and cyclists means catering for diversity;
3. Walking and cycling are important for all communities, but critical in urban areas;
4. Increasing the use of walking and cycling requires a comprehensive approach;
5. Safety needs to be integrated with promotion; and
6. The needs of current users must be addressed alongside those of new users.

The strategy proposes that to achieve its three goals, action is required across ten priorities, under the following four focus areas:

1. **Strengthen foundations for action**
 - o Encourage action for walking and cycling within an integrated, sustainable approach to land transport;
 - o Expand our knowledge and skill base to address walking and cycling; and
 - o Encourage collaboration and co-ordination of efforts for walking and cycling.
2. **Provide supportive environments and systems**
 - o Encourage land use, planning and design that supports walking and cycling;
 - o Provide supportive environments for walking and cycling in existing communities; and
 - o Improve networks for long-distance cycling.
3. **Influence individual travel choices**
 - o Encourage positive attitudes towards and perceptions of walking and cycling as modes of transport; and
 - o Encourage and support individuals in changing their travel choices.
4. **Improve safety and security**
 - o Improve road safety for pedestrians and cyclists; and
 - o Address crime and personal security concerns around walking and cycling.



All vehicular signals on this intersection in Auckland turn red together for a single phase, when pedestrians' have complete freedom of rout choice and may cross straight or diagonally. Source: Pedestrian planning and design guide, New Zealand government.

NMT Grants in Australia

In Australia, grants for infrastructure projects that encourage walking and cycling and reduce car use, are available from the national and state/territory governments. Most of the Grants map their objectives to those of the National Cycling Strategy that is released every five years. The Grants available at the national level include the following:

- Liveable Cities Funding Program; and
- Jobs Fund – Bike Path Component.

Liveable Cities Funding Program

The Department of Infrastructure and Transport announced the Liveable Cities Program in October 2011. As stated on the Cycling Resource Centre website: The Program aims to fund projects that will improve the capacity of the 18 capital and major regional cities to undertake strategic planning in line with the Council of Australian Governments (COAG) agreed criteria and will support the development of demonstration projects that facilitate urban renewal and strategic urban development. The Program will provide 20 million USD over two years.

Funding will be provided in the following two streams:

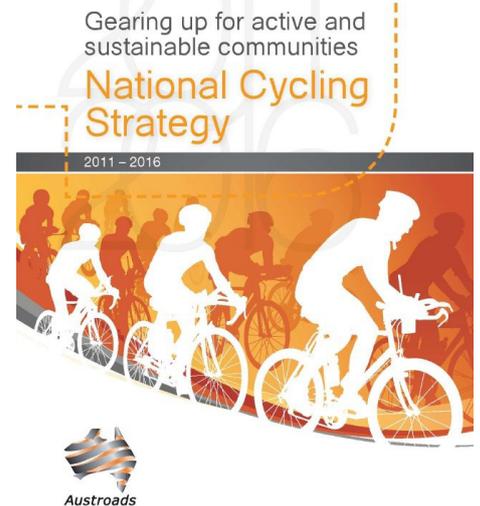
- Stream 1 - Planning and Design (projects seeking funding under this stream can apply for a maximum Australian Government funding contribution of up to 0.5 million USD);
- Stream 2 - Demonstration Projects (projects seeking funding under this stream can apply for a maximum Australian Government funding contribution of up to 4 million USD).

Funding in both streams will be provided up to a maximum of 50% of the project costs. Applications will be assessed under the criteria set out in the Program Guidelines.

Jobs Fund – Bike Path Component

The Australian Government implemented the Jobs Fund in 2009 to support employment and economic recovery in response to the global financial crisis. The fund provided 40 million USD for bike path projects that generated employment opportunities. 175 bike path projects have been approved till date using this fund.

The Australian Bicycle Council National Cycling Strategy sets objectives and strategies that build the framework for funding grants to follow
Source: Australian Bicycle Council website



Cycle to School Program and Bicycles for Peace – Katakwi, Uganda

The First African Bicycle Information Organisation (FABIO) partners with organizations to provide a variety of social programs. This includes distributing bicycle ambulances, providing bicycles to young and older people alike, and training youth to work on bicycles.

The provision of bicycle ambulances provides a critical increase in access to hospitals and health care for the injured and sick. In particular, FABIO targets lowering maternal mortality rates.

The effort to provide young people with bicycles helps students, particularly girls, who must walk long distances to a small number of schools and who are in danger of being attacked during this trip. The distance and security challenges have discouraged parents from allowing their daughters, in particular, to travel to school, and they are often kept at home instead to do housework. FABIO has seen an increase in school attendance for those students that were provided with bicycles.

FABIO also partnered with a Boston, Massachusetts, USA-based Two Wheeled Foundation to implement a capacity building program to teach un- or under-employed youth in Uganda how to work on bicycles. In addition, they are taught how to ride and use bicycles.

Cycle to Work Scheme - United Kingdom

The UK Government introduced a tax exemption scheme known as the Cycle to Work scheme in the Finance Act 1999. The purpose of the scheme was to promote healthier journeys to work and to reduce environmental pollution.

The scheme enables employers to loan cycles and bicycle safety equipment to employees as a tax-free benefit. The scheme was introduced under the Government's Green Transport Plan. The advantage of this scheme is that it does not require the employer to obtain prior approval of Her Majesty's Revenue and Customs (HMRC). The fine print guidelines stipulate that employees will be given the opportunity to buy back their cycles at the end of the scheme duration (12-18 months) for the full market value – a factor that is viewed as a deterrent to the scheme.



First African Bicycle Information Organisation
FABIO

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cycle
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10
IMATE CHANGE

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CYCLE TO SCHOOL
The Cycle to School Initiative focuses on the mobility constraints faced by young people living in Katakwi district providing bicycles. FABIO decreases the drop-out rate of secondary school students which is closely linked to be


cyclescheme.co.uk

CYCLE TO WORK SCHEME

Tax free bikes for commuting → → →
Save up to 42% of the cost of a bike and accessories for commuting and pay monthly through your salary. Then sign up online for the latest competitions, rates and cycling tips.

Cycle to School Program and Bicycles for Peace
Source: <http://malteinjinja.wordpress.com/fabio/>

Delft, The Netherlands - Cycle network

In the late 1970s, the first National Traffic and Transport Structure Scheme and the following Programme for Personal Transport (1980-84) gave high priority to the encouragement of bicycle use and the improvement of traffic safety by providing better facilities for cyclists. Within this policy strategy, the municipality of Delft was selected as a model city for pro-bicycle traffic planning.

Delft was the first Dutch city to have developed and implemented a bicycle (and pedestrian) network in accordance with an officially adopted Bicycle Plan. The Delft Bicycle Plan, launched in 1979, was aimed at developing a coherent bicycle network that would (1) incorporate existing bicycle routes, and (2) propose additional projects to close the gaps in the existing network.

The Plan defined a hierarchical network with three sub-networks: an urban network, a district network, and a neighbourhood network. Each network was envisioned with its own characteristics.

The urban network designed as a subset of the plan includes high capacity bicycle routes for inter-district travel, and connects important destinations such as the train station, library, and main shopping centre. The urban network would connect cyclists to the regional cycle network. The approximate distance between these routes would be 400 – 600 m. The Plan proposed high investment projects for this network, including bridges and tunnels, which would help in eliminating cycling barriers along the routes. The Plantageburg was one of the expensive projects carried out along a main urban network corridor.

The district network works as a distributor or collector network. Placed every 200–300 m, the bicycle routes in the network would enable intra-district travel providing connections between the local neighbourhood routes with the urban routes. The Plan proposed less intrusive treatments for the district network, including creation of bicycle lanes, smaller bridges and improved intersection design.

The neighbourhood network includes the fine grained network of local streets or paths which would provide access from residences to the district network.

Up to 95% of the three sub-networks already existed in Delft when the Bicycle Plan was launched. Main focus of the plan was on the articulated network to have greater impact than the sum of the effects from individual measures. The Plan was a useful exercise in identifying gaps in the network and closing them.

Another concept of woonerf originated in Delft in the 1960s and was made popular in the Netherlands in the 1970s. Woonerf is a Dutch word that means 'residential yard'. It refers to a residential street that is used cooperatively by all types of users without any segregation. The woonerf concept was used to de-emphasize the presence of vehicular traffic in the street system. The intent of this approach was not to make cars disappear, but rather to integrate them with other users of the street to create a shared space.



Bicycle lane in Netherlands well defined using pavers
Source: Photo credits: winmulder

Hammarby Sjöstad – Stockholm, Sweden

Hammarby Sjöstad is a brownfield development district within the city of Stockholm. It has been widely recognized for implementing an integrated and sustainable approach to city planning. The development includes mixed uses, good transit access, non-motorised transport considerations, public bicycle sharing and car sharing. Hammarby has a non-motorised mode share of 27% and public transport mode share of 52%. The number of cars per 1000 residents is 210, considerably lower than the city's average.

The 160 HA land was an industrial site to the south of Hammarby Lake, 3 km south of Stockholm city centre. The construction of the project began in 1999. The development of 130 HA is now complete, and 17,000 residents have moved in. After its scheduled completion in 2017, Hammarby Sjöstad will house 24,000 inhabitants in 11,000 residential units, at a density of 150 p/HA.

Urban Design

Hammarby Sjöstad's urban design plan proposed a dense settlement structure, concentrated along the main transit corridors. In order to discourage car use, parking in the area is limited and expensive. Cycling and walking were given importance, not only for their transport functions but also for their health and liveability benefits.

Bicycle paths, pedestrian paths, and scenic walkways along the canals were provided for commuting and recreational uses. Many of the thoroughfares were designed as multimodal streets, inclusive of bicycle lanes.

The layout of Hammarby Sjöstad integrates transportation, amenities and public spaces. The district spine is a 37.5 m wide multi-modal boulevard and transit corridor, which connects key transport nodes and public amenities, and creates a natural spine of activity and commerce.

Lugnets Alle and Hammarby Alle are the other multimodal thoroughfares that include tram lines in the central median with side-boarding platforms. Beyond the boarding platforms there is one car lane in each direction and outside the car lanes are bicycle lanes followed by parking spaces and then pedestrian walkways. Pedestrian priority is given on the main streets, complemented by traffic calming and frequent pedestrian crossings.

Land Use Integration

The importance of mixed use design was recognized in creating a walk able city. The city offered rent subsidies to commercial operators for two years to attract maximum retail and commercial establishments. As an outcome, the area already has a thriving commercial presence with 100 retail units and restaurants, and offices employing over 5000 people. Other amenities like food stores are also within easily walk able distances. The mix of uses in Hammarby Sjöstad also includes institutions such as schools, a library, a cultural centre, a chapel, an environmental centre and childcare and healthcare facilities.



Western Cape Provincial – NMT Master Plans

The Western Cape has been ahead of the curve, in that it has addressed NMT in the Provincial Spatial Development Framework. These require that **individual municipalities develop NMT master plans incorporating pedestrian and cycle path networks**. In 2007, Western Cape also published the Provincial Strategy on Non-Motorised Transport. The key objective of this strategy is to streamline the local efforts and provide a framework to guide future NMT planning efforts in the province.

The Western Cape Provincial Strategy on Non-Motorised Transport is based on the following vision from the White Paper on Transport Policy in 1997: “An integrated, accessible, well managed and maintained transport system throughout the Western Cape, which is recognised as making efficient use of resources and being socially just, in a way that advocates broader developmental aims and objectives.”

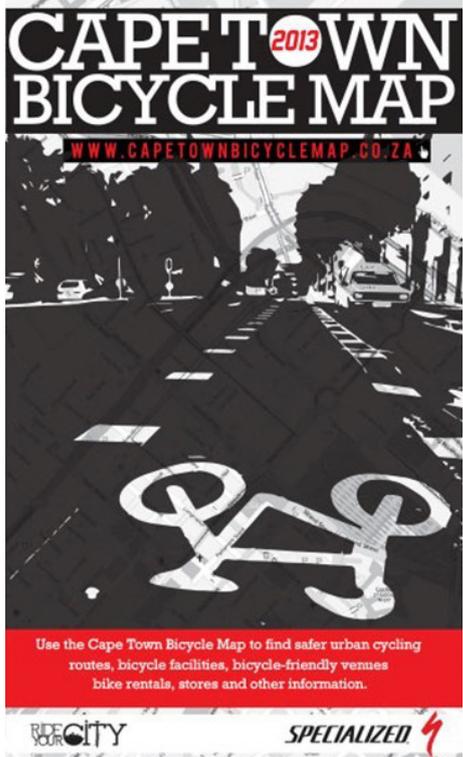
The Western Cape NMT strategy draws from experiences of ongoing NMT policy initiatives in the province and in the urban metropolis of Cape Town. The City of Cape Town has its own traffic calming policy, a pedestrian plan, and its own mobility strategy where public transportation and NMT have been identified as priority modes.

The Western Cape NMT strategy covers the following broad subjects:

- Institutional Framework – including the role of the Government and other stakeholders;
- Project Development Process – including guidance on identifying needs, planning NMT strategies, identifying and prioritizing projects, securing funding, construction and NMT promotion;
- Guiding Principles – including NMT design concepts and philosophies.

The strategy is primarily a guidance document for local municipalities meant to create an enabling environment for NMT. It does not cover specifics such as design guidelines.

The Cape Town Bicycle Map developed to encourage more people to ride a bicycle
Source: <http://capetownbicyclemap.co.za/about/>



Singapore - first/last mile connectivity

Singapore, a sovereign city-state, gained independence in 1965. Today, it is not only one of the largest economies of Asia, but is also setting standards in the management of urban land and transportation in a land-starved island city. In 2012, Singapore's population stood at 5.3 million at an average density of 7421 pp/sq. km.

Transportation in Singapore is planned and managed by the Land Transport Authority (LTA), a statutory board under the Government Ministry of Transport. The LTA has not only developed a state of the art Mass Rapid Transit System (MRT), but has also pioneered the Congestion Pricing system, whereby private vehicles are made to pay higher tolls for entering the congested city centre during peak hours. Other public transport modes in Singapore include the Automated People Mover systems, buses and taxis. These combined efforts in providing a high quality public transport system and discouraging car travel within the city have enabled Singapore's public transport system to make up more than 50% of the modal share of all work trips.

The LTA has been quick to realise the importance of NMT in providing first/last mile connectivity to public transport. Accordingly, it is constantly upgrading the pedestrian and cycling infrastructure around transit stations. Through a recent effort, LTA has incorporated barrier-free measures along all public streets and pedestrian link ways accessing transit stations. By March 2011, almost 95% of the access routes within 400 m of transit stations were barrier-free. The LTA is also working to decrease pedestrian crossing times at almost 500 traffic signals, especially those leading to public transit stations.

Recognising the growing popularity of cycling the world over, LTA has also introduced several bicycle facilities at MRT and LRT stations and on buses. Bicycle racks and bicycle stations are now provided at almost all key transport nodes. By 2013, the LTA was also expected to install almost 2,500 additional bicycle racks, single and double tier racks to 20 additional MRT stations. Foldable cycles are also allowed on-board buses and trains.

The National Cycling Plan established in 2012 envisions a cycling network that consists of dedicated cycle paths to enhance connectivity from residential nodes to local MRT stations. 6.4 km of cycling paths were completed in 2011, and 38.9 km of cycling paths are currently under construction. These cycling paths will connect residents of seven Housing Development Board (HDB) towns to their nearest MRT station.

Bicycle Parking at MRT Station in Singapore
Source: Karl Fjellstrom, ITDP, China



Cycling Superhighways - Denmark

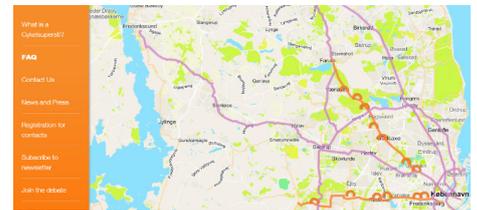
In Denmark, investments in cycle superhighways are aimed at commuters who travel by trains and cars. It is believed that with superior facilities, several train and car commuters will switch to cycling regularly or occasionally. Traffic lights are coordinated for cars, but with the provision of cycle superhighways, cyclists travelling at 20 km/h will benefit from the traffic lights coordinated in their favour at arterial routes thus surfing a wave of green lights through the city at rush hour.

The capital region of Copenhagen and twenty two other municipalities have joined forces to create a network of bicycle superhighways, known as **Cykelsuperstier**, which will help make Copenhagen the bicycle capital of the world. From the current trips by bike standing at 35%, the government of Denmark plans to raise the number to 50% in the coming couple of years. The aim of building the bicycle superhighways is to encourage more people to use bicycles over longer distances of travel instead of preferring to use cars, busses or trains. Distant suburbs will benefit very much once the bicycle superhighways are completed.

A common secretariat for ensuring proper flow of work is planned with the help of the municipalities. The funding for the planning of cycle superhighways and the secretariat comes from the Danish Road Directorate with additions from the region and municipalities. The idea behind the creation of cycle superhighways is to promote a 'brand' which is recognized by all.

A governmental body called Capital Region Denmark, responsible for public hospitals and regional development, provided funds for the superhighway project to the tune of 1.6 million USD. The budget allocated to the cycle superhighways is €55 million which is expected to reduce annual CO2 emissions by 7000 tonnes. The planned network which when completed will have 26 bike-bahns (cycle highways) spanning over 300 km in length, 48 km of which have been completed by the end of 2012. The 17.5 km Copenhagen – Albertslund route is the first route to be constructed. It opened in April 2012. It was estimated that the route will result in a 20% increase in cycling, and a decline of one million vehicle km travelled per year.

Even though implementation has faced difficulties in the form of coordination between multiple stakeholders, the plan has taken shape. To put the benefits of this investment into perspective, an annual savings of €40 million has accrued yearly due to the health benefits of cycling – benefits realized on an investment of €389,000 per km of cycle superhighway, in comparison to an investment of €13 million per km of roadway construction.



The map of Copenhagen and surrounding regions showing existing cycle superhighways in orange and planned cycle superhighways in purple.

Source: <http://www.cykelsuperstier.dk/>



Cycling Superhighway designed for intercity travel using cycling

Source: Bram van oojen, itdp.org

Medellin, Colombia

In 2012 Medellin was named one of the top transport systems in the world by ITDP. This is commendable when considering that, until a couple of decades ago, the city was a hub of drug and gang activity. Medellin's transportation system has not just improved environmental sustainability, but by increasing accessibility, has also brought about social change.

The *Metro de Medellín*, the backbone of the transport network, carries almost half a million passengers every day. The metro cable was connected to the metro to provide better connectivity to the poorer part of the city which were geographical inaccessible. When the first Metrocable line was built in 2004, the station pylons became new centres of activity. These new centres were enhanced with the provision of improved streetscapes, plazas, bridges and promenades that offered higher quality access for pedestrians and cyclists. Pedestrian enhancements were not limited to Metrocable station areas. NMT was used to further the Metrocable's agenda – which was to improve accessibility and quality of life by creating well-designed pedestrian spaces.

The project that integrated NMT access routes with the **local planning** for different areas in the barrios are called **Proyecto Urbano Integral (PUI) or local area plans**. The PUIs are a result of a **participatory planning process** involving the municipal Urban Development Wing (EDU) and the resident communities.

The PUIs -- 5 in total -- envisioned a network of interconnected public spaces that would not only improve access but also **improve residents' quality of life**. This network consists of pedestrian links that connect Metrocable stations, public plazas, terraces and amphitheatres with bridges, ramps and stairways. Polluted waterways were remediated and promenades were constructed alongside the renewed streams. People from unstable housing blocks were relocated, but largely minimum alteration was made to the informal fabric of the barrios, and no resident was displaced.

One example that particularly stands out is of Communa 13, a community that regularly suffered from regional conflicts and gang activity. The PUI for Communa 13 seeks to improve mobility and create safe public places for its residents. A new Metrocable line goes through Communa 13 and within its station area a new Library Park activates the public realm and acts as a gateway to the community. In one of the most unsafe areas of the barrio along steep hillsides, a series of six escalators have been built to improve accessibility for residents as well as security. The escalators, ascending nearly 384 m, link open spaces and public terraces. Such investment in infrastructure (nearly 7 million USD), it is believed, will not only vastly reduce pedestrian commute time but also **bring peace to the area. Several awareness and advocacy tools have also been used to create ownership among the residents for the infrastructure** and ensure that it is not abused.



AASHTO Bicycle and Pedestrian Design Guides

The American Association of State Highway and Transportation Officials (AASHTO) is the United States' primary body for setting standards in roadway design. The AASHTO has released the following guides for bicycle and pedestrian road design:

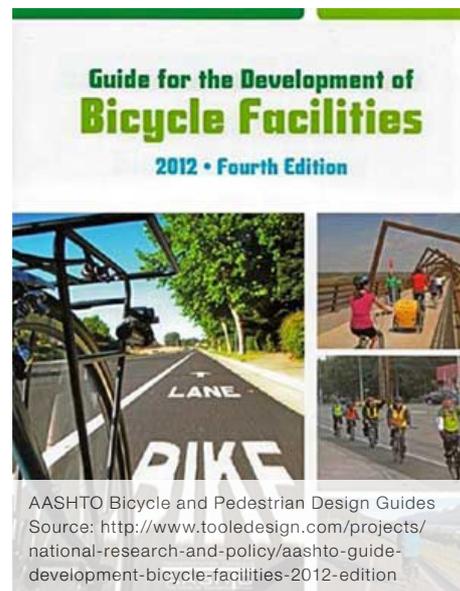
Guide for the Planning, Design and Operation of Pedestrian Facilities – released in 2004 – includes guidelines for street facilities for pedestrians, and discusses land use planning and site design concepts that affect pedestrian mobility.

Guide for the Development of Bicycle Facilities – a fourth edition was launched in 2012 – includes guidelines and standards for on-road bicycle facilities, shared use paths and parking facilities. The design guidelines incorporate flexibility to encourage design innovation and context sensitive solutions.

The Urban Bikeway Design Guide prepared by National Association of City Transportation Officials (NACTO) in 2011, is based on the AASHTO Bicycle Guide. It is based on a best practices approach. It incorporates best practices from cities that want to share their experiences and makes them available to cities that can implement innovative solutions. To create the guide, the authors have conducted an extensive worldwide literature search from various design guidelines and real life experiences.

The guide offers categorical guidance for cities to improve bicycle transportation, which faces challenges in terms of right of way. It covers all the obligatory treatments required to develop safe bicycle tracks together with distinctive categories for each treatment. The guide offers design guidance on the following subjects:

- Bike lanes: conventional, buffered, contra flow and left-side lanes;
- Cycle tracks: one-way protected, raised and two-way;
- Intersections: bike boxes, intersection crossing markings, two-stage turn queue boxes, through bike lanes, combine bike lane/turn lane and cycle track intersection approach;
- Bicycle signals: bicycle signal heads, signal detection and actuation, active warning beacon for bike route at non-signalled intersection and hybrid signal for bike route crossings of major street; and
- Bikeway signing and marking -- coloured bike facilities, shared lane markings and bike route way finding signage and marking system.



Abu Dhabi Street Design Manual

The Abu Dhabi Urban Street Design Manual (USDM) was commissioned in 2009 by the Abu Dhabi urban planning council to address the needs of a growing population and a need to improve pedestrian facilities and create more walk able and liveable communities. The USDM was adopted in January 2010 to design all urban streets. The USDM complements the Urban Planning Council's 2030 Development Plan with sustainable land use and transport planning. The USDM is a balanced approach to designing Abu Dhabi's urban streets ensuring the safety of pedestrians, cyclists, transit riders and motor vehicle drivers. The manual directs a transition towards a more multi modal, walk able and low carbon future.

The manual for developing new streets and **retrofitting the existing** ones is organized in the following three parts:

Part I: Context and Process

This section highlights the manual's goals and objectives to achieve complete street design. The design process starts with gathering information, developing and evaluating concept design, concept review and approval and developing a detailed design.

Part II: Design

This chapter establishes street composition for Abu Dhabi, based on various users and always keeping pedestrians as a priority. Land use and climate are also considered. Street design incorporates street composition, junction design and streetscape design such as materials, landscape, furniture, lighting etc. It also provides a set of standards and guidelines for street design elements, including traffic calming measures. Typical cross sections and dimension tables are followed by flexible ranges for situations with restricted right-of-way.

Part III: Supporting Materials

This chapter demonstrates a sample project, illustrating the street design with reference to the site. It includes two performance measures, first the Level of Service (LOS) to describe their contribution toward the efficiency of the transport network, and second the Quality of Service (QOS) to describe the effectiveness of each mode from the user's perspective. It contains a toolbox to assess the connectivity of urban (and rural) areas. This section also includes various examples of street configuration, good street design elements and standard details.

The manual is supported with definitions, graphical illustrations showing the standard details of street designs.

Abu Dhabi's new urban design guidelines call for greater connectivity and accessibility, especially for pedestrians.
Source: <http://thecityfix.com/blog/abu-dhabi-showcases-sustainable-urban-design/>



Broadway – New York

Broadway is a boulevard in New York, running diagonally through Manhattan's street grid, creating both irregular **intersections and public spaces**. The street is the pedestrian and vehicular spine of Lower Manhattan and is the major north-south arterial within the core. The 'Green light for Midtown' project area, located on Broadway along Times Square and Herald Square focused on converting 47th to 42nd Streets in Times Square and 35th to 33rd Streets in Herald Square to pedestrian streets. Prior to the implementation of this project, Broadway was congested with vehicles and too many pedestrians, forced onto narrow sidewalks on congested avenues, resulting in an unpleasant working and shopping environment and unsafe conditions for pedestrians. The project's completion brought safety enhancements to one of the city's busiest and most popular destinations, making it **more accessible** for residents and visitors. The project is a success not only in its much-lauded efforts to give **pedestrians safety**, but is also beneficial for traffic.

The NYC Department of Transportation (NYC DOT) determined that reconfiguring the boulevard to focus on the needs of its **pedestrians would result in safety, liveability, and mobility benefits**.

Green Light for Midtown is the pilot project implemented by the New York City Department of Transportation in 2009 addressing problem and opportunity on Broadway diagonal path across the midtown grid. The project was completed in two major phases. Broadway north of 23rd Street was reconfigured in 2009, while Broadway between 14th Street (Union Square) and 23rd Street was remade in 2010. New York City's Transportation Department provides the following statistics:

- 356,000 people walk through Times Square each day on overflowing sidewalks;
- Traffic on Broadway moves on average only 4.2 miles per hour; and
- Broadway has 137% more traffic accidents than the nearby Avenues.

Broadway creates a **complex multi-legged intersection** causing congestion resulting in higher crash rates. The project involved changes to Broadway itself, and to nearby streets so that it is compatible to both pedestrians as well as traffic. Area-wide transportation network, adjusting turning lanes, parking regulations, and signal timing was a part of the project. Broadway was completely closed to vehicle traffic at Times Square and Herald Square, which created room for new pedestrian plazas and space in 2009. Temporary low-cost pedestrian plazas with street furniture were created at Times Square, Herald Square, and Madison Square Park. NYC DOT carefully tracked before-and-after data on the project, and found that the changes to Broadway have successfully improved traffic flow and increased safety, while creating new space for pedestrians and bicyclists. In 2010 it was replaced with permanent designs once the benefits of the changes had been confirmed after the evaluation.



Pedestrian Streets - Hong Kong

With a population of over 7 million in an area of 1,104 sq. km with large green reserves, Hong Kong is one of the most densely populated cities in the world. Hong Kong has an odd geography. It is located on a hilly island with central peaks. Development is only along the edges, and the central hilly regions have been preserved as natural forests.

Being a compact city, most of the essential services and facilities are located in proximity to residential areas or public transport networks, and are highly accessible. In retrospect, Hong Kong has always placed strong emphasis on pedestrian planning by providing infrastructure like its famous footbridges. However, recent efforts are focused on creating “Pedestrian Streets” that are at-grade. Following are some of the types of pedestrian streets:

1. **Full-time Pedestrian Street:** In full-time pedestrian streets, pedestrians have absolute priority. Vehicular access is restricted to emergency services only. Service vehicles may also be allowed in at specific periods for selected locations;
2. **Part-time Pedestrian Street:** In part-time pedestrian streets, vehicular access is only allowed during specific periods. In order to minimize vehicular access to the area, there is no on-street parking space. However, loading bays are provided for loading and unloading purposes; and
3. **Traffic Calmed Street:** In traffic calmed streets, footpaths are normally widened and on-street parking spaces are reduced as far as possible. Taxi stands and green minibus stands are only provided if relocation is not practical. There is no restriction to vehicular access. However, vehicles are slowed down through the use of traffic calming measures, such as speed tables, curb build-outs, sharpened corners, road narrowing, gateways, etc.

The Transport Department (TD) has laid down detailed guidelines in the Transport Planning and Design Manual (TPDM) for the planning of pedestrian crossing facilities. Crossing facilities include footbridges and subways but are mostly at grade (i.e. at the same level as the road), including the following:

- **Zebra crossings** (where pedestrians have the priority to cross the road);
- **Signal-controlled crossings** (commonly known as “Green Man” crossings);
- **Cautionary crossings** at signal-controlled junctions (with signals for drivers only but not for pedestrians);
- Uncontrolled cautionary crossings (no signals for either pedestrians or drivers).



Segregated cycle tracks in Hong Kong (Above)
and Pedestrian street with no vehicular access
(Below)



Source: ltdp.org.cn

Singapore Universal Design

Universal Design in Singapore is promoted by the Building and Construction Authority (BCA). The BCA developed the Code on **Barrier-free Accessibility** in Buildings in 1990, after which significant improvement was made in making buildings barrier-free. The codes are applicable to all sorts of public and private buildings as well as open spaces and parks. In support of these codes, the BCA has also developed the **Universal Design Guide** which includes design recommendations referenced with applicable codes and guidelines from the **accessibility building codes**.

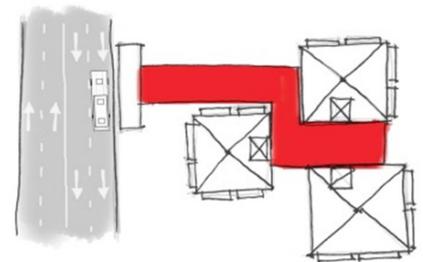
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Accessible Footpaths

In the design of accessible footpaths, it is important to consider the physical dimensions and the safety of users.

- ❖ Accessible routes should be provided between a development and the nearest public facilities.
- ❖ All main footpaths connecting to facilities within a development should be accessible to all users.
- ❖ Floor surfaces of the main accessible footpaths should be stable, firm, slip-resistant and durable.

Plan view of a development with sheltered accessible routes leading to a bus stop



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Gratings

Where gratings are provided, care should be taken to ensure the safety of all users at all times.

- ❖ Gratings should be flushed and be level with the finished floor level to prevent tripping hazards.
- ❖ Gratings located on walking surfaces should be located outside accessible routes. If this cannot be avoided, the long dimension should be placed across the dominant direction of travel and the grating gap should be less than 12 mm wide and in one direction.

Code on Accessibility 2007, Clause 3.6.2.1c

Code on Accessibility 2007, Clauses 3.6.2.1a and 3.6.2.1b



Example of gratings

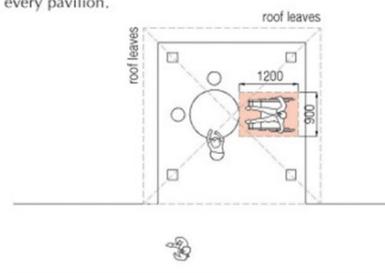


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Pavilions

In the design of park and communal areas, pavilions should be provided for users to pause and rest, or to seek shelter from the weather.

- ❖ It is recommended to locate Pavilions should be strategically located along accessible routes.
- ❖ Pavilions should be flushed and be level with the main accessible footpath.
- ❖ A space of at least 900 mm by 1200 mm for wheelchair users is recommended at every pavilion.



Plan view of a pavilion with space for wheelchair users

Pedestrian and Bicycle Information Centre – USA

The FHWA's Office of Human and Natural Environment offers a **Bicycle and Pedestrian Program that promotes bicycle and pedestrian transportation use, safety and accessibility.** The program issues guidance and is responsible for ensuring that requirements in legislation are understood and met by states and other implementing agencies, and is available at <http://www.fhwa.dot.gov/environment/bikeped/index.htm>.

FHWA also sponsors resources such as the **Pedestrian and Bicycle Information Centre** (<http://www.pedbikeinfo.org>) to provide information on a variety of engineering, education and enforcement topics. The following are examples of three types of curriculum guidance in the US for cycling: nationally both by the public and non-governmental sectors, and state-wide. These curricula are then customized and implemented at individual schools.

At a national level, the US Department of Transportation Federal Highway Administration provides overviews and guidelines on good practices in **Bicycle Safety Education.** (<http://www.bicyclinginfo.org/education/resource/bestguidedoc.html>)

The League of American Bicyclists, a non-governmental organization has provided a Ride Smart curriculum and certifies instructors nationally. (<http://www.bikeleague.org/ridesmart>)

The Bicycle Transportation Alliance Walk+Bike Education program focuses on providing curriculum in the state of Oregon, US (<http://btaoregon.org/get-involved/walkbike-education/#studenteducation>)

Pedestrian way finding – New York

Walk NYC is New York City's standard for pedestrian way finding. Walk NYC provides a clear visual language and graphic standards that can be universally understood by providing quality multi-modal information, and provides consistent information across a broad range of environments in the city.



A new pedestrian way finding system known as WalkNYC has been introduced in the city of New York
 Source: <http://t-kartorblog.com/2013/07/>



NMT investment - USA

Under the umbrella of the Federal-Aid Highway Program, the US Federal government is increasingly investing in non-motorised transport facilities. According to the Federal Highway Administration (FHWA), with the introduction of American Recovery and Reinvestment Act, the total non-motorised transport obligations for the 2009 fiscal year almost reached 1.2 billion USD. This program includes the following programs:

- The American Recovery and Reinvestment Act (ARRA) (started in FY 2009);
- Congestion Mitigation and Air Quality Improvement Program (CMAQ) (started in FY 1993);
- Surface Transportation Program (STP);
- Highway Safety Improvement Programs (HSIP) (started in FY 2006);
- Safe Routes to School (SRTS) (started in FY 2006);
- Non-motorised Transport Pilot Programs (NTPP) (started in FY 2006);
- Recreational Trails Program (RTP); and
- Numerous other smaller programs that amounted to 13% of overall obligations.

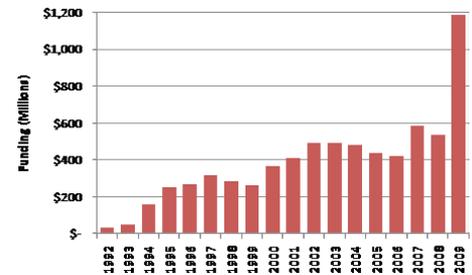
Until the creation of the ARRA in 2009, the largest contributor to pedestrian and bike projects was by far the STP (contributing between 45% and 85% of total NMT obligations). Matching funds requirements are generally 80% federal versus 20% state, and this applies to cycling and walking projects as well. There are a few exceptions, where the federal portion would increase up to 100%.

TIGER (ARRA): In May 2009, the US DOT announced a 1.5 billion USD grant fund, Transportation Investment Generating Economic Recovery (TIGER), which defined the terms of discretionary funds made available through the American Recovery and Reinvestment Act (ARRA) of 2009.

The projects that received grants with a strong non-motorised transport component include the following:

- Philadelphia Area Pedestrian & Bicycle Network, 23 million USD (Philadelphia, PA & Camden, NJ);
- Millwork District Multimodal Improvements, 5.6 million USD (Dubuque, IA);
- Indianapolis Bicycle & Pedestrian Network , 20.5 million USD (Indianapolis, IN);
- Revere Transit Facility & Streetscape, 20 million USD (Revere, MA); and
- US-93/2nd Street Improvements, 3.5 million USD (Whitefish, MT).

Federal-Aid Highway Program Funding for Pedestrian and Bicycle Facilities and Programs
Source: accessed online March, 2009, www.fhwa.dot.gov/environment/bikeped/bipedfund.html



Buenos Aires Pedestrian Priority Program

Buenos Aires, the capital of Argentina is one of the largest cities in the South American continent. Faced with increasing traffic chaos in the city and declining space and safety for pedestrians, the Mayor of Buenos Aires introduced the Pedestrian Priority Program as part of the Healthy Mobility Initiative of the Sustainable Development Policy. The program is aimed at improving pedestrian conditions in the city through strategic street improvement projects. Following are its objectives:

- Improve environmental quality (reduce noise annoyance, air pollution);
- Increase accessibility and connectivity;
- Progressive displacement of public transport to the avenues;
- Enlarge pedestrian space;
- Implement a public bike system;
- Reduce parking areas on roadways;
- Regulation of good loading and unloading;
- Increase and renewal of street furniture;
- Preservation of cultural heritage and identity; and
- Revitalization of commercial and service areas.

A number of components have been identified to be part of this program, including the following:

- Street renewal – widening sidewalks, installing lighting and pedestrian traffic signs;
- Dock regulation – consolidating dock loading and unloading positions with the Waste Collection Basin;
- Trees – planting trees to provide shade and add character to public promenades;
- Crosswalks – pedestrians priority;
- Equipment - installing street signs to regulate traffic flow and pedestrian circulation; and
- Waste – streamline waste collection by use of centralized waste receptacles on street corners to facilitate the movement of garbage collection vehicles.

The overall **cost of the program has been estimated at 5.6 million USD**. Construction on the street renewals began in 2008 and is still ongoing. Three streets have been completely transformed.

Before-and-after images of Carabelas Street in Buenos Aires demonstrating the complete transformation in the appeal of the street to pedestrians
Source: "To put pedestrian first in the heart of Buenos Aires" – Ministry of Urban Development - Buenos Aires



Bicycle Superhighways - Northwest Europe

A cycle superhighway is a big ticket investment aimed at creating bicycle-only facilities for commuters over long intercity distances. A cycle superhighway is basically a dedicated bicycle track where a high standard of service provision is maintained all the way, across municipal boundaries. They connect residential areas, jobs and educational facilities. Designed to cover the most direct route, they are planned so that they contain the least number of stops possible, allowing people to maintain a constant speed for faster travel. Footrests, green waves, smooth pavements, bicycle pumps and countdown signals are provided to ensure comfort.

Investments on creating a network of cycle superhighways in The Netherlands are aimed at attracting bicycle commuters who travel less than 15 km a day for work or educational purposes. Smooth 4 m wide lanes, charging facilities for e-bikes, intermediate cycle maintenance facilities, wind barriers and covered stretches are some of the reasons why these highways are attractive options. The entire network is being financed partly by the regions and communities (€60 million) and partly by The Netherlands Ministry of Infrastructure (€20 million).

The bicycle superhighway between the city of Breda and Etten-Leur boasts of at least 3.5 metre tracks all along the 7 km. The city of Breda announced the highway as a successful project in 2009 with 1300 commuters using the highway on a daily basis. 20% of the funding was given by the city of Breda for the construction of the highway at a cost of €0.5 million per km and the rest was funded by the provincial government.



Cyclist icon at a junction in the Breda – Etten-Leur cycle highway, Netherlands

Source: <http://bicycledutch.wordpress.com/2011/11/11/first-cycle-superhighway-revisited/>

Nanjing Street – Shanghai

Nanjing Street is a 5 km premier pedestrian retail street with footfalls of over 1 million people per day. It is named after the city of Nanjing, capital of Jiangsu province, neighbouring Shanghai. Nanjing Road, located in the city centre, comprises two sections, Nanjing Road East and Nanjing Road West. The road runs in a west-east direction with Huangpu District in the east and People's Square to the west.

Nanjing Road, which was always a retail street, was practically destroyed in the 1930s, when 2 bombs fell on two department stores on the street. In 2000, the local government released funds to renovate Nanjing Road to be a characteristic pedestrian-only street. The width is about 28 meters and the total length is 1,200 meters, which extends from Middle He'nan Road to Middle Xizang Road.

There are more than 600 shops on both sides of the walkway. East Nanjing Road is a dedicated commercial zone. At its eastern end is the central section of the Bund. Immediately west of the Bund precinct was traditionally the hub of European-style restaurants and cafes, although in recent years these have become less of a feature as the demographics of visitors to Nanjing Road have shifted from affluent local residents to visitors from around the country. Close by is the Central Market, a century-old outdoor market today specialising in electronic components and digital media. Further west is the Nanjing Road pedestrian mall. Located here are most of Shanghai's oldest and largest department stores, as well as a variety of domestic retail outlets, and some traditional eateries with a long history. The pedestrian mall and East Nanjing Road end at People's Park, formerly the Shanghai Race Course. Opposite the park are some of Shanghai's prestigious historic hotels, including the Park Hotel. West Nanjing Road begins here, and features a number of upmarket malls, office buildings, the Shanghai Exhibition Centre, and shops. This area also previously featured a number of large mansions and estates, most of which are today either demolished or used by the government.



The pedestrian shopping street named after the city, Nanjing
Source: Shopping district Nan Jing Lu Bu Xing Jie, Huang Pu Qu, near People's Park and Radisson Blu Hotel in Shanghai, People's Republic of China, Lars Curfs, 2009

Congestion Mitigation and Air Quality Improvement Program

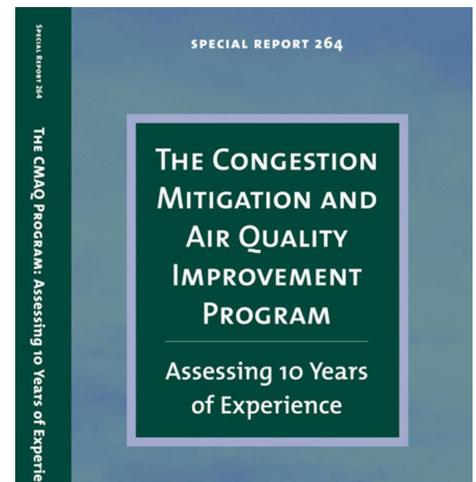
The Congestion Mitigation and Air Quality Improvement (CMAQ) Program assists areas designated as non-attainment or maintenance under the Clean Air Act Amendments of 1990 to achieve and maintain healthful levels of air quality by funding transportation projects and programs. The CMAQ program was implemented to support surface transportation projects and other related efforts that contribute air quality improvements and provide congestion relief.

Program Requirements: Projects funded under the CMAQ program must be located in areas that were designated as a non-attainment area Section 107(d) of the Clean Air Act and classified pursuant to Sections 181(a), 186(a), or 188(a) or (b) of the Clean Air Act. Projects must be likely to contribute to the attainment of National Ambient Air Quality Standards (or the maintenance of such standards where this status has been reached) based on an emissions analysis.

Eligibility: The Federal Highway Administration's 1996 Guidance on the CMAQ program identifies the following as some eligible projects: Construction of bicycle and pedestrian facilities; non-construction projects related to safe bicycle use; and the establishment and funding of state bicycle/pedestrian coordinator positions, as established by ISTEA, for promoting and facilitating the increased use of non-motorised modes of transportation.

Matching funds: The federal share for most eligible activities and projects is 80%, or 90% if used on certain activities on the interstate system, or up to 100% for certain identified activities such as traffic control signalization and carpooling projects.

Considerations: The CMAQ program has funded numerous bicycle and pedestrian improvements including bikeway networks in cities such as Philadelphia, Houston, and New York City; pedestrian and bicycle spot improvement programs; bicycle parking; bicycle racks on buses, sidewalks, trails; and promotional programs such as bike-to-work events. CMAQ funds have also been used to fund bicycle and pedestrian coordinator positions at the state and local level including the Park Hotel.



CMAQ Funding Availability	
2014	\$20.2 million
2015	\$12.4 million
2016	\$17.8 million
2017	\$18.8 million
2018	\$27.8 million
2019	\$28.6 million

*Funding estimate as of 12/2013; dollar amount may change

“Getting there – on Foot, by Cycle” - NMT Strategy, New Zealand

To accomplish the goals established in Getting There, the government released a 2006-2009 Strategic Implementation Plan. It outlines the national approach and specific initiatives that were critical for the first three years of the strategy. This plan prioritizes visible actions as a way to demonstrate a strong commitment to the strategy and to create early momentum to carry through the ten-year timeframe. The importance of supporting promising initiatives on the ground and nationally was also identified as a way of encouraging innovation and “learning by doing”. Its goals include raising awareness, building local government partnerships, enabling coordination and expanding technical capacity, while learning how to better carry out effective action through research, evaluation and monitoring of efforts. The specific initiatives, which were intended to be coordinated to complement each other, were:

- Initiative 1: Getting There Research, Monitoring and Evaluation Action Plan;
- Initiative 2: Getting There Transport Sector Alignment Review;
- Initiative 3: Getting There Decision Maker Communication Action Plan;
- Initiative 4: Getting There Information Centre;
- Initiative 5: Getting There Workforce Development Action Plan;
- Initiative 6: Walking and Cycling Model Communities Programme;
- Initiative 7: Road Controlling Authority Benchmarking Programme;
- Initiative 8: Strengthening User Group Networks Programme;
- Initiative 9: Long-distance Cycle Networks Investigation Project; and
- Initiative 10: Expansion of road user training and education related to pedestrians and cyclists.

The delivery plan was to be reviewed annually to inform the initiatives of each coming year. No annual reviews have been sourced.

A pedestrian and cyclists road safety framework was published in 2006 to address the stated priority of the New Zealand government to improve pedestrian and cyclist safety - one of the ten priorities identified in the national strategy. The framework outlines a comprehensive approach for effectively reducing risks to and improving safety for, pedestrians and cyclists in the following ways:

- Guiding the work of government agencies, ensuring a co-ordinated national approach;
- Supporting alignment of national, regional and local efforts;
- Providing guidance for support for road controlling authorities; and
- Supporting the effective integration of safety into walking and cycling promotion efforts.



A traffic calmed road at Palmerston North is provided with humps to calm traffic at non-signalized midblock

Source: Pedestrian planning and design guide, New Zealand Government

Raahgiri Day – EMBARQ

Raahgiri Day, inspired by Ciclovía, is a weekly street event begun on 17 Nov 2013 by the founding members EMBARQ India, IAmGurgaon, Pedalyatri, Duplays, and Heritage School. The 11.3 km corridor was supported by the Gurgaon Police, Municipal Corporation of Gurgaon, and DLF (one of Gurgaon's largest private housing, commercial, office and retail developers) along with Schools, RWAs, NGOs, Industry Associations, Active Recreation groups and Active Citizens. MCG and Gurgaon Police have taken the lead organizing role for Raahgiri Day.

Raahgiri day was conceptualized and planned from a school project. Heritage school approached EMBARQ India and Pedal Yatri, a recreational cycling group in Gurgaon, to assist students with a research project- "Making Gurgaon a Bike Friendly City – 2013." The research project culminated with a 12 kilometre (7.5 miles) cycle rally in Gurgaon, held on April 2013. Almost 300 cyclists participated, including students, parents, and teachers from Heritage School; senior government officials from Gurgaon and members from Pedal Yatri and EMBARQ India. The generous public support to decongest the roads from private vehicles instigated the idea of Raahgiri Day.

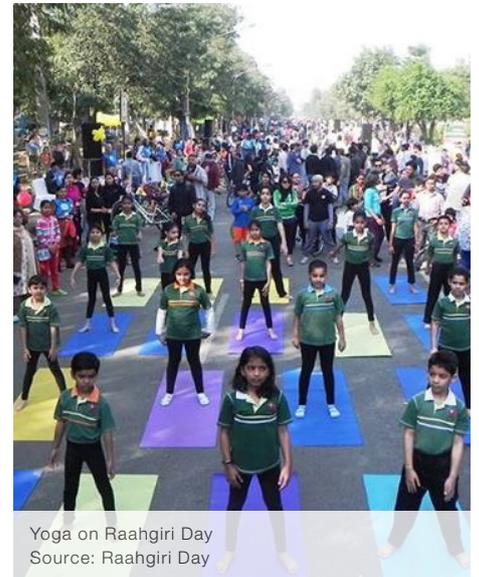
Key Objectives of Raahgiri Day are:

- Promote cycling, walking and use of public transport as envisaged in the national urban transport policy and integrated mobility plan for Gurgaon;
- Re-state and remind its citizens that the streets belong to the people;
- Promote healthy living by encouraging an active lifestyle; and
- Create an inclusive community and promote and facilitate social integration; and

Promote and highlight the environmental issues/concerns

Four roads in Gurgaon stay shut to traffic every Sunday between specific times in the morning. In addition to being open to pedestrians and cyclists during these times, Raahgiri Day organises community leisure activities such as street games, street dancing; yoga, aerobics and Zumba.

Raahgiri Day is a cause driven movement and does not aim at earning profits. The events in the Raahgiri day are organized and supported by various sponsors such as Delhi Dance Academy, Times of India, Radio Mirchi, Suburb, Coca Cola, Reebok and many more. From the date of commencement till April 2014, Raahgiri Gurgaon has spent INR 41.65 lac (66,884 USD (1 USD = 62.27 INR)) collected from the funds and sponsorships and still have INR 8 lac (12,846 USD (1 USD = 62.27 INR)) as a balance amount.



Yoga on Raahgiri Day
Source: Raahgiri Day

Boston, Massachusetts, US Mayoral Cup

Boston, Massachusetts, in conjunction with its annual Hub on Wheels event, holds a bicycle race. Hub on Wheels is an annual ciclovia-style event, where a busy arterial, Storrow Drive, is closed to motorised vehicle traffic. However, it is a more formal event than most cicloviás, with a registration fee to support rides of various lengths that are organised for participants. The Mayoral Cup is an additional draw after the organized ride, where the public can see a professional race in downtown. The prize money is significant: \$40,000 in 2014. The race is preceded by a free children's race.

Commuter Tax Benefit

In January, 2009 the US included bicycles in a pre-tax benefit provided for commuting expenses. If an employer elects to participate, up to \$20 in tax free or pre-tax benefit can be provided to employees.

US League of American Bicyclists Awards

Nationally-recognized rewards can provide further legitimization for supporting NMT. Awards can provide incentives, assistance and recognition for businesses and communities. The application process helps to raise awareness for the various activities that support NMT. Winning the award provides some press and publicity for the businesses and communities.

The US League of American Bicyclists issues a Bicycle Friendly Business as well as a Bicycle Friendly Community award. The awards are based on rankings ranging from Bronze to Platinum. For example, Facebook ranks Gold.

Employers and communities applying for these awards must facilitate cycling in numerous ways. Businesses applying for the award are asked if they provided tax benefits, cash incentives, free and secure bicycle parking, host workshops or educational events, whether the business is located in a bicycle accessible area, have a paid or volunteer bike coordinator, guaranteed rides home and participate in national activities such as National Bike Month. An annual report describes the highlights and accomplishments of each of the businesses and communities that receive awards.

Bikes Not Bombs – Boston, USA

Bikes Not Bombs is a US organization that reclaims thousands of used bicycles and redistributes them to those in economic need internationally in Africa, Latin America, and the Caribbean. At the same time, the organization carries out local and international programs in skill development and training related to sustainable transportation.

Bikes Not Bombs uses the bicycles that are not shipped overseas in youth training programs including safety and mechanical skills. Bikes Not Bombs also has a retail location whether they sell rebuilt bikes for money which goes to their organizations.

Children's Race before the Boston Mayoral Cup
Source: <http://www.bostonbikes.org/wp-content/gallery/mayorscup/tdbmc2010-kids-007.jpg?dbdb3c>



National Cycling Policy of Ireland

The NCPF gives great importance to coordination and cooperation for smoother implementation. It also encourages **capacity building in government departments, government agencies, interdepartmental committees, local authorities, NGOs.** Also, implementation involves changing perceptions and deepening knowledge of cycling planning in universities and professional organisations.

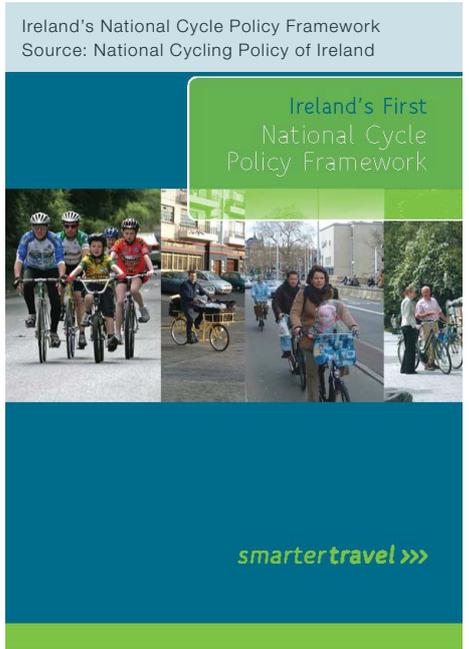
The policy identifies two alternative models that would be responsible for implementation at the National Level: a new National Agency with a singular mandate of overseeing implementation of the NCPF; or a Cycle Office within an existing national department. A third model is also identified: that of modifying the remit of an existing government agency to also include implementation of the NCPF.

At the local level, the policy suggests creation of local policies and action plans that are consistent with the national policy. These should be entrenched within the Development and Local Area Plans, as well as other plans such as the Integrated Framework Plans, Strategic Development Zones and master plans. It is advised that every local authority have a Cycling Forum led by a Cycling Officer – similar to the one created by the Dublin City Council. At the local level, the policy strongly subscribes to the need to involve users and cycling advocacy groups in policy formulation. The policy also goes on to make suggestions of the activities of the Cycling Forum, identifying one of the most important activity being that of building and disseminating knowledge within organisations to promote cycling.

Academics are also encouraged to be included in the functioning of organisations at the national and local levels.

Universal Design

To encourage the concepts of Universal Design, the Government of Ireland created a National Disability Authority (NDA) under the Disability Act 2005. The NDA constituted the Centre for Excellence in Universal Design as a research institution in charge of developing policies and guidelines, capacity building, and raising awareness. The Centre has developed a series of booklets called Building for Everyone – a Universal Design Approach containing “practical guidance on the universal design of buildings, places and facilities”.



Delft – The Netherlands

The Delft Bicycle Master Plan was the first master plan of its kind in the Netherlands, and possibly in the world. As a planned effort, it was imperative for the Transport Department to study the benefits of developing such a master plan. That was the main purpose behind the benchmarking and evaluation study in 1987.

The implementation of the Delft Bicycle Master Plan began in 1982, and was estimated to conclude in 1992. All projects identified by the Master Plan were not implemented. Hence the Evaluation of the Delft Bicycle Master Plan, which compared cycling conditions in Delft in 1982 to conditions in 1988, undertook evaluation of only the three sub areas of the city where most of the major projects had been implemented. The evaluation of the Delft Bicycle Master Plan aimed at studying the impact of the investments on the following:

- The effects on the observed numbers of cyclists;
- Changes in the origin and destination pattern of bicycle trips;
- Changes in the cyclists' route choice and use of the network;
- Effects on road safety;
- Effects on the willingness to use the bicycle.

The evaluation study included the following analyses:

- a. Analysis of changes in mobility of Delft inhabitants with emphasis on mode choice and the mode-choice situation. This investigation was based on home interviews and in-depth interviews;
- b. Analysis of changes in the origin-destination pattern of bicycle trips. This investigation was based on mail back roadside surveys among cyclists;
- c. Analysis of changes in cyclists' route choice and network use. This analysis is based on observations of routes followed by cyclists in the Delft network;
- d. Analysis of changes in car and bicycle traffic volumes. This investigation compares counts held during the before and after study;
- e. Analysis of changes in traffic safety. This analysis uses traffic accident data of the period 1980-1988 as recorded in a centralized manner by the Dutch Government;
- f. Analysis of the effects of the newly built Plantage Bridge. Two separate evaluations of this project have been made. The first one deals with the effects on the travel pattern of inhabitants of an adjacent residential district. The second investigation determines the effects on bicycle traffic crossing the canal;
- g. Analysis of the effects of the Station Tunnel on bicycle traffic and train use;
- h. Comparison of the Delft travel pattern with that of other Dutch medium-sized towns. The objective of this study is to determine whether the findings of the evaluation study are transferable to other towns.



Cycle tracks designed along the public transport to encourage mobility choices.

Source: IBI Group

Car-Free movement and Ecocabs in Fazilka and Vizag

Cycle rickshaws have always been the primary mode of transport in Fazilka but service levels were poor: rickshaw drivers frequently overcharged, maintenance was variable, availability was uneven through the city and the Municipal Council did not enforce service quality norms. In June 2008, social activist Navdeep Asija introduced Ecocabs as a social enterprise dedicated to improve their service levels by organizing rickshaw drivers in a self-regulated scheme. An additional rationale was to promote non-motorised transport to reduce growth in pollution. Within three years, Eco Cabs won the Indian government's Rs 500,000-award for the Best Urban Non-Motorised Transport model in the country.

Concept of Ecocabs is now working successfully in 22 cities of Punjab.

Car free movement

Fazilka implemented a pilot project in 2006, through one week long "Fazilka Heritage Festival". The initiative was a part of case study conducted by Graduates Welfare Association Fazilka (GWAF) by pedestrianizing a stretch of 300 meters, not far from the current car free zone. The study revealed that, this experiment had not just improved the quality of social life but also improved the law and order, environment through less air pollution emitted, economy and road safety of the residents.

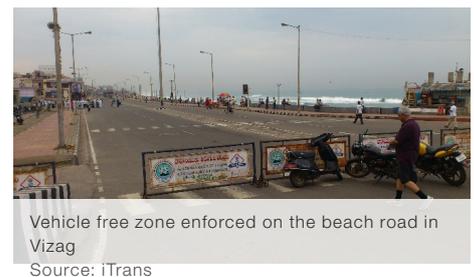
Influenced the pilot project, many activities were planned to promote non-motorised transport within the city. The main market area around the Ghanta Ghar or clock tower was closed for cars between 10 am when most of the shops are open to 7 pm till shops close. Entry is restricted for two-wheelers but the town plans to ban them gradually. The City constructed the car free areas by placing special emphasis on traffic calming devices, installing permanent barriers and positioning police for enforcing the car free zones at few locations. In addition to the alternative ways like Eco cabs enforcing and helping the city to be more sustainable, pedestrian and cycle friendly.

Similarly, at the Beach Road in Vizag, a 3.50 km stretch has been declared as Vehicle free zone since 1st November, 2011 from 5.30 to 7.30 a.m. Only pedestrian and cyclists were allowed in this space. Police officials play a very important role in enforcing the car free zone.



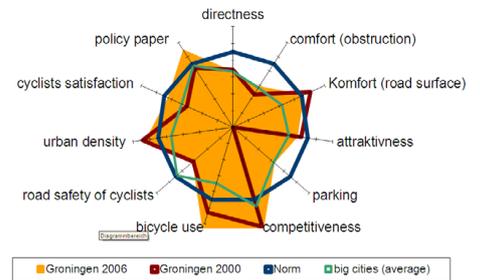
WEB PORTAL
www.ecocabs.org

- Database Management
- Mobile Site
- Ecocab centre Locator
- Resources and Literature
- Online Registration



The Cycle Balance – The Netherlands

The Netherlands uses a system called a Cycle Balance to assess the quality and performance of the cycling infrastructure. It does not include any measure for modal shares. The Cycle Balance is essentially a measure of comparative strengths and weaknesses. It relies heavily on first hand qualitative observations and secondary data sources for statistics. In the first project period between 2000 and 2004, cycle balances were developed for 125 cities and municipalities.



Copenhagen Bicycle Account

Copenhagen released the first Bicycle Account in 1994. There are two parts to this monitoring report: the first presents the results of information collected through telephone surveys, and the second presents a summary of traffic data, such as vehicle counts, mode split statistics, accident rates etc. The surveys are conducted annually and the Bicycle Account is published once every 2 years. The results of the survey are published in attractive illustrative brochures to maintain interest among the general public.



Street Design projects – New York

While the street-redesign projects implemented by NYCDOT have received a great deal of attention, it is the process by which they have been implemented that may be most noteworthy. NYCDOT Commissioner Janette Sadik-Khan, however, has implemented projects on a trial basis, often using inexpensive materials that can be upgraded at a later date.

To monitor implementation, performance measures or indicators are also used to link DOT actions to their overall mission and goals. Sustainability performance measures can help DOTs monitor environmental, economic, and social performance – and can help communicate that performance to stakeholders (that is, elected officials and the public). NYSDOT developed the GreenLites certification program to better integrate these principles into practice.

GreenLites is a self-certification program that distinguishes transportation projects and operations based on the extent to which they incorporate sustainable choices. This is primarily an internal management program for NYSDOT to measure our performance, recognize good practices, and identify where we need to improve. It also provides the Department with a way to demonstrate to the public how we are advancing sustainable practices. NYSDOT project designs and operations are evaluated for sustainable practices and based on the total credits received; an appropriate certification level is assigned. The rating system recognizes varying certification levels, with the highest level going to designs and operational groups that clearly advance the state of sustainable transportation solutions.

APPENDIX B:

SURVEY TEMPLATES

USER SURVEY

Socio-demographic characteristics, activity patterns and travel behaviour are inter-related. In order to effectively understand transport demand and supply, personal as well as socio-demographic characteristics such as age, gender, employment status, caste, religion, family size, income levels, etc. must be taken into consideration. The sample size should be atleast 1 % of the population (universe of users).

1. **Trip Purpose :** Employment 1 Home 2 Education 3 Recreation 4 Other 5
2. **Gender :** Male 1 Female 2
3. **Age group :** 10-20 yrs 1 20-35 yrs 2 35- 50 yrs 3 >50 yrs 4
4. **Make the trip :** Daily 1 Weekly 2 Monthly 3 Occasionally 4
5. **Which mode did you use to reach for the trip ?** Metro 1 Bus 2 Auto 3 Shared Auto 4
2- Wheeler 5 Car 6 Cycle 7
 - A. If Metro /Bus : Time from home to metro or bus stop Upto 10min 1 10-15min 2 15-30min 3 >30min 4
 - B. If Metro/Bus : Time from metro or bus stop to destination Upto 10min 1 10-15min 2 15-30min 3 >30min 4
 - C. Total trip time Upto 10min 1 10-15min 2 15-30min 3 >30min 4
6. **Origin of Trip**
7. **Destination** _____ Distance between the Origin and Destination _____ (in Km)
8. **Quality of walking facilities** Excellent 1 Very Good 2 Good 3 Bad 4 Very Bad 5
9. **Quality of Traffic (Speed discipline)** Comfortable 1 Moderate 2 Risky 3 Dangerous 4
10. **Are you using/buying any facilities/products,provided by hawkers?** Yes 1 NO 2
11. **House hold income of visitor** <10,000 1 10,000-25,000 2 25,000-50,000 3 Dangerous 4
12. **Please give the order of priority (rank) of facilities that might be useful to you-**

1. More Parking space
2. Resting/seating
3. Drinking Water
4. Better Walkways/space
5. Additional Signage/information kiosks
6. Toilets
7. Any Other(Please specify) _____

STATED PREFERENCE SURVEY FOR CURRENT CARS AND 2-WHEELERS USERS ONLY -**Parking location and pricing**

1. How much distance are you willing to walk from the parking place to your site
Upto 500m 1 upto 1Km 2 upto 1.5 Km 3
2. How much can you pay for a better parking service (4 hours charge) ?
Rs. 20 1 Rs. 20-25 2 Rs. 50-100 3 >Rs. 100 4

Shuttle service from parking

3. If there is a better facility for parking at a distance and bicycle /cycle rickshaw shuttle service is provided for movement to Nehru Place, are you willing to use them?

1. Bicycle----- Yes 1 NO 2
2. Cycle Rikshaws----- Yes 1 NO 2
3. Wheel Chair----- Yes 1 NO 2

If yes, how much are you willing to pay for the shuttle service?

- <Rs. 10 1 Rs. 10-20 2 Rs. 20-30 3 >Rs. 30 4

4. At what parking charge (4 hour charge) will you shift from Car/2-Wheeler to other options?

- <Rs. 50 1 Rs. 50-70 2 Rs. 70-90 3 >Rs. 90 4

Which mode are you likely to shift to?

- Metro 1 Bus 2 Auto 3 Taxi 4 2-Wheeler 5

TRAFFIC VOLUME COUNTS

Traffic and Pedestrian counts are done to assess as well as validate actual demand on roads. They are essentially done for 16 hours interval which is then extrapolated to 24 hours. The count is also done for 15 minute interval for every hour.

Name of Intersection/Junction: _____													Date :		
Location_ID: _____															
Time Period	Motorised Traffic										Non Motorised Traffic			Others (pl. specify)	
	Passenger Vehicles					Goods Vehicles					Cycle	Cycle Rickshaw	Animal Drawn		
	Two wheelers	Autorickshaw (3w)	Grameen Seva	Car/Jeep/Van/Taxi (Other than Taxi)	Bus	Goods Autorickshaw (3w)	LCV	2-Axle Truck	3-Axle Truck	MAV				Tractor / Trolley	
:00 :10															
:10 :20															
:20 :30															
Total															
Name of Enumerator: _____															

PEDESTRIAN COUNT SURVEY

Direction: _____		Date: _____	Road Name: _____
Location: _____		Junction Name: _____	
Time	No. of People		
:00 - :15			
:15 - :30			
:30 - :45			
:45 - :00			
Grand Total:			
Enumerator Name : _____			
Enumerator Signature : _____			

APPENDIX C:

SAMPLE TERMS OF REFERENCE (TOR)

Sample Terms of Reference for preparing a city-wide NMT Plan

Task 1: Establishing a baseline of NMT in the city

Task 1.1: Prepare Study Area Profile

Prepare a profile of the study area from available documents and compare with the city level statistics. The parameters include location in the city, history and evolution of the area, demographic data, socio-economic data and transportation network.

Task 1.2: Review of Existing Documents & Studies

Compile and review of the previously completed and current planning efforts underway in the city with the intent to identify gaps and consistencies of the various policies, strategies and development projects when assessed against a backdrop of NMT Principles (Refer Guidance Document) under the following broad categories:

- Planning & regulatory context
- City-wide context
- Mobility & access
- Land use, public realm & urban design

Task 1.3: Undertake site visits(s) & prepare inventory of the planning & physical characteristics of the Study Area: The existing conditions inventory will include the preparation of a detailed base map and a series of inventory maps and photographs.

Task 1.4: Collect Data, Undertake Documentation of the Study Area

The consultant is expected to document the land use, urban form, mobility network and street environment that determines / affects non-motorized travel within the city. These include but are not limited to:

- **Land Use, Urban form and Activity:** Map the existing data using AutoCAD and GIS mapping procedures. Inventory will include the following at a minimum:
 - Existing land uses
 - Proposed land uses
 - Major nodes & activity centres
 - Major roads & infrastructure (Parking)
 - Existing natural features
 - Proposed key developments
- **Mobility Networks:** The consultant will document different modes or combination of modes used by people for commuting i.e. walking, bicycling, intermediate public transport, public transport and private motor vehicles. This will be supported by the following documentation.
 - Mobility Networks
 - Road networks and safety
 - Non-motorized transport networks
 - Public transport
 - Intermediate public transport
- **Street Environment:** The consultant will document the existing non-motorized infrastructure and environment. Physical characteristics of the streets in the city should be studied under the broad categories:

- Existing right of way including: carriageway, lane widths, footpaths;
- Street amenities including: signage, trees, street lights, vendors, public toilets;
- Infrastructural elements: electric and telephone junction boxes, manholes, storm water drains;
- Transit facilities such as: IPT stands, bus stops, parking.
- **Conduct Vehicular, Pedestrian and Non-motorized vehicles (NMV) Counts:** Vehicular and pedestrian counts will be undertaken at major intersections to understand peak hour traffic and movement.

Task 1.5: Develop Case Studies and Best Practices in Non-Motorised Transport Initiatives: Select best practices that demonstrate successful NMT projects nationally and internationally. The case studies will highlight successes, failures and lessons learnt.

Task 1.6: Undertake focus group meetings & key interviews with stakeholders to help generate buy-in, identify major issues confronting the project, and the social, economic, and political goals for the project.

Task 2: Study Area Analysis

Task 2.1: Analysis, Baseline Conditions Assessment and SWOT analysis: Undertake an analysis of baseline conditions and prepare issues and opportunities maps - utilize the existing conditions inventory to evaluate the physical characteristics of the study area.

Task 2.2: Identify priority NMT zones: Prioritize the “pedestrian first” zones to define the nature of NMT initiatives based on the following parameters:

- Map existing land uses, proposed land uses and key developments to understand the distribution of residential, employment and institutional uses in the city.
- Identify activity generators: map housing, employment and recreational centres to determine the desired lines and identify routes of high NMV traffic.
- Delineate influence zone of existing or proposed transit to determine the area around transit routes or stations, where accessibility proposals needs to be prioritized

Task 2.3: Identify preliminary goals and targets with respect to the institutional support, plans, policies and development market.

Task 3: Visioning and Stakeholder Engagement – NMT Workshops

Invite and engage key stakeholders including elected officials and staff from various agencies to the visioning workshop, to achieve the following objectives:

- Discuss integration of NMT principles into the land use and transportation plans of the city
- Solicit implementation strategies from workshop participants
- Share and revalidate identifies NMT first goals and targets
- Prioritize goals into short term, midterm and long term opportunities
- Identify the market, generate project interest and solicit feedback

Task 4: Draft NMT Master plan Recommendations

Task 4.1: Recommend modifications to existing NMT initiatives, suggest regulatory changes to integrate NMT principles, policy changes and catalyst/signature projects to trigger the desired intent of NMT plan within the city. Draft NMT Plan should include the following, at the least.

- Prepare an overlay of the desired NMT network, emphasizing the principles of continuity, interconnectivity, walkability, and universal accessibility. Recreation routes can also be identified as a part of the network planning exercise.
- Define a street hierarchy matrix, based on relevant IRC standards and existing conditions, including NMT allocations for each ROW.
- Define street characters based on their experiential and mobility functions, such as boulevard, esplanade, high street, pedestrian malls, NMT trails etc.
- Suggest typical designs that may be used for different types of streets, intersections and areas highlighting:
 - Physical interventions such as design of streetscapes, sidewalks, cycle tracks, or grade-separated facilities.
 - Wayfinding and signage interventions
 - Traffic engineering interventions such as creating car-free zones, temporary road blocks, road diets, or traffic signal improvements
 - Addressing sustainability features like rainwater harvesting, solar lighting etc.
 - Integrating with other modes – Metro and Bus stops, IPT stands and others
 - Parking design and integration of bicycle and cycle rickshaw parking
 - Integration of vending spaces and active public space interventions by design

Task 4.2: Identify pilot projects and signature projects

Based on the outcomes from task 3, develop priority projects that will impact the short term goals, ensures visibility and triggers the need for later stages based on the following (but not limited to) quantitative and qualitative parameters:

- Low budget and quick implementation is possible
- Small area of influence, which can be monitored to study impact
- Stakeholder opposition is not anticipated.
- Can generate debate on the benefits of investing in NMT infrastructure

Task 5: Identify a Financing strategy

Task 5.1: Develop an understanding of the city's financing system impacting implementation of NMT related transportation projects like construction or maintenance of footpaths and cycle tracks.

Task 5.2: Develop a Capital Investment Strategy for NMT projects- Develop a Capital Improvement Program, identifying budget amounts and sources to be diverted to NMT capital investments in the next 5-years.

Task 5.3: Identify innovative financing mechanisms and potential partners

- Develop incentives for private stakeholders to invest in NMT infrastructure
- Consider creating green financing options
- Evaluate opportunities to bundle NMT projects with other larger projects to make them financially attractive

Task 6: Identify a phasing and implementation strategy

Task 6.1: Identify implementation and phasing strategy

Prepare a compendium of NMT proposals which includes preliminary recommendations with relevant priorities to enable the planning agency to systematically implement the recommendations.

Task 6.2: Technical Capacity Building Recommendations

Assessment of existing capacity of the planning teams and to identify gaps and to recommend measures of augmentation of technical capacity. Also, define clear roles and responsibilities for NMT development and maintenance

Task 6.3: Develop monitoring and evaluation framework to measure success of NMT targets

Develop a post -project audit format to monitor that the project is beneficial in the short and long terms and the targeted beneficiaries.

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