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Integrated Traffic Management in Banani

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***Abstract*: -** *In its traditional sense, traffic management is the science of extracting maximum capacity from existing roads. Roads and streets, particularly in the urban areas, suffer from numerous inhibiting factors that constrain their efficiency as traffic routes. Hence, the imposition of measures such as stopping and parking restrictions, junction-signalization and prohibition of particular traffic movements can increase traffic capacity and improve efficiency. Faster and more fluid traffic movements also save the cost. The study provides a technical assessment of integrated traffic management in Banani area of Dhaka Ward no. 19 which expressed support for better traffic management across the city, to help alleviate traffic congestion, provide safer pedestrian condition and better vehicle parking so that inhabitants of Banani get special benefits as well as nearby adjacent area.*

***Keywords:* -** *Existing Scenario, Traffic Management, Parking, Pedestrian, Road width*

I. INTRODUCTION

Integrated traffic management comprises the application of various techniques to make the best use of any given network of roads and streets in terms of balancing the needs of traffic flow [1] pedestrian activity and the environmental needs people living, working or playing alongside streets-or otherwise exposed to traffic in them. But the concept of integrated traffic management should not be confined to vehicular and pedestrian movement. Recent decades have witnessed increasing recognition of traffic environment impact: just ass roads have a theoretical traffic capacity, so too do they have an environmental capacity. This may be quantified in terms of acceptable maximum levels of pedestrian delay, noise, traffic vibration and local pollution. Managing demand can be a cost effective alternative to increasing capacity [2]. Certainly, an integrated traffic management scheme can improve economic efficiency by eliminating or reducing time lost in traffic, but it can make urban places safer and more liveable, which are surely measures of efficiency in any civilized society. Despite their logic, these ideas may seem inapplicable in a city such as Dhaka- where many people resignedly accept that motor traffic must inevitably move noisily and incoherently from one snarl to the next. Whereas it is easy to criticize the pro-road in Dhaka, it is regrettably an opinion that is still widely held, even in advanced economics [3]. Usually traditional philosophy of predict (more traffic) and provide (more road space) is giving way to alternative methods of dealing without movement. A question that may be asked is whether it is actually possible to upgrade Banani into a well-ordered community. Whereas the precedents are not encouraging, there is one that can be found within a short walk of Banani itself. Dhaka Cantonment area is a model of well ordered community, sidewalks, road markings, traffic signs and other representative of the type of proposal made in this report.

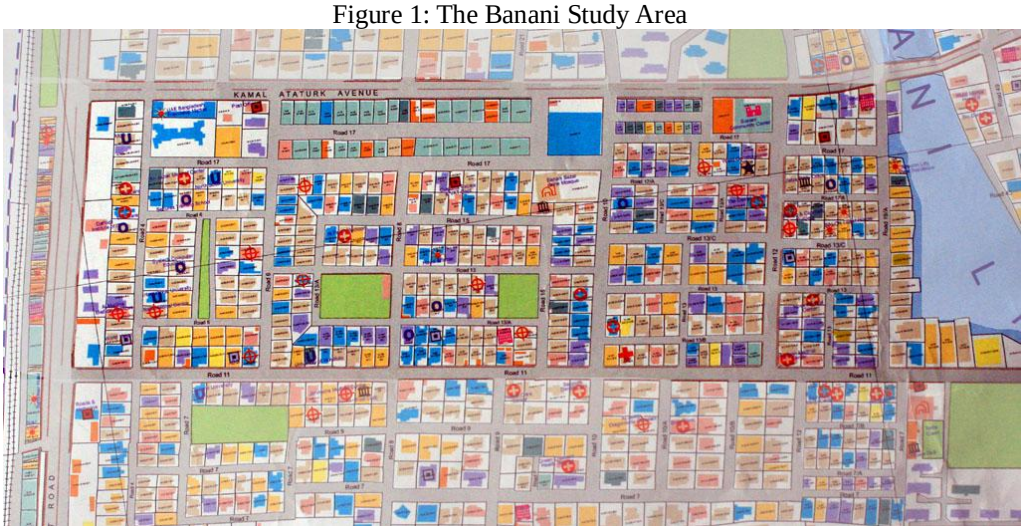
II. LITERATURE REVIEW AND BACKGROUND

Several researches had been conducted on the integrated traffic management system. The World Bank has conducted a range of traffic movement management improvements with Dhaka City Corporation (DCC), including strategic junction improvement and comprehensive traffic management at district level [4]. Intermodal surface Transportation Efficiency has conducted post modal transportation act in 1991[5]. International Integrated Systems, Inc has conducted Advanced Urban Traffic Management System (AUTMS) is traffic control platform that aims to improve comprehensive urban traffic network [6]. Gary Hui investigated on Urban

Traffic Management and Control strategies [7]. An integrated traffic management system will soon be introduced in Chennai city on a BOT (build, operate and transfer) basis under the annuity model [10]. A critical integration point of IBM Intelligent Transportation is the gathering of traffic and event data from other traffic center systems and field devices based on the increasingly popular Traffic Management Data Dictionary (TMDD) standard [11]. Integrated Traffic Management Systems (ITMS) need reliable, accurate, and real-time data [12].

2.1 Background: The Sub-Project is focused on central Banani, comprising streets within an area Defined by New Airport Road to the west, Banani Lake to the east, Kamal Ataturk Avenue to the north and Banani Road 11 to the south (Figure 1 refers).

Figure 1: The Banani Study Area



The Study Area is highlighted on this map, as a part of Dhaka's Ward19.

Selection of central Banani for a "pilot" District Traffic Management scheme (from the four areas listed above) responds to a number of factors/problems which can be ameliorated as a result of comprehensive and integrated planning and investment: They are:

• Serious and increasing levels of traffic congestion in a largely uncontrolled environment;
• Largely uncontrolled road junctions and cross roads, resulting in significant traffic delays and occasional grid-locking;
• Degraded road surfaces restricting road traffic flows;
• Uncontrolled and haphazard vehicular parking, adding to traffic congestion and pedestrian hazards;
• Arrogant and uncontrolled driver behavior adding to levels of traffic congestion and pedestrian hazards, particularly at road junctions;
• The lack of a pedestrian footpaths and facilities (eg pedestrian crossings) resulting in very uncomfortable and hazardous pedestrian environment;
• Largely uncontrolled use of the area by through traffic adding to the levels of traffic congestion and resulting in the deterioration of the predominantly residential environment;
• Increasing building densities and largely uncontrolled commercial uses are exacerbating unsustainable levels of traffic congestion in the area; and
• Significant deterioration of the landscaped residential environment

. The character of the land uses and the traffic in central Banani are representative of the rest of the Banani area, the whole of the Gulshan 1 and 2 areas and Dhanmondi. To this extent the pilot scheme proposals can be applied in a District Traffic Management scheme within central Banani will be readily transferable across all four areas and in other similar districts elsewhere in the Dhaka City Region, such as Uttara. In selecting central Banani, the close links between the area and the rest of Gulshan are such that the Banani scheme could be the first part of a Traffic Management Master Plan for whole Gulshan (1 and 2) and Banani. This would not only benefit residents and businesses over a wide area, it would also facilitate an approach to transport planning and traffic management, which would facilitate the wider application of the principles for multi-modal contained in the Dhaka Strategic Transport Plan. For instance the medium-long term potential to introduce mass-transit systems into the area will facilitate better local public transport feeding into mass transit hubs, and the opportunity to reduce the scale of private transport in residential streets, thus leading to a more sustainable environment. To this extent the adaptability and flexibility in the detailed design of the "pilot" scheme for central Banani is important. Many of the principles to be used in a District Traffic Management scheme for central Banani would

also be capable of being adapted in areas, which may have different land use and traffic characteristics, be they in the Dhaka City Region or elsewhere. For instance the need for transport planning measures to prevent unnecessary through traffic and the need to provide better pedestrian segregation will be constants in most districts. Of particular interest in the September 2005 *Urban Transport Policy* is the 'Pedestrians
First, policy that sought to construct properly designed and continuous footpaths and to launch a pedestrian awareness program within a road safety program [8]. In summary, every plan and policy for transport in Dhaka within the last decade has referred to the need to apply traffic management techniques, to improve the pedestrian environment and to manage travel demand.

2.2 Situation Analysis:

Banani is a mainly residential area of north Dhaka, clearly bounded to its west by the busy dual-four lane New Airport Road. Banani Lake defines its eastern border, whilst the area itself is bisected by two east-west roads that effectively split it into three 'character areas'. The most capacious of these roads is Kamal Ataturk Avenue, a divided highway that connects New Airport Road with the district centre of Gulshan 2 Circle. Banani Road 11 provides the other east-west route. Until quite recently this road terminated eastwards at the edge of Banani Lake, but the construction of the Gulshan-Banani Bridge and its link roads on the Gulshan side have transformed Banani Road 11 into a heavily-trafficked thoroughfare. The 'Study' comprises the centremost, busiest and densest of Banani's three character areas, situated between Kamal Ataturk Avenue and Road 11. On first acquaintance, this locality (the 'Study Area') gives a favourable impression of tree-lined avenues. The main development type is residential flats, typically rising to the maximum permitted six storeys (although this limit now appears to have been relaxed to eight storey). Commercial premises now dominate Road 11, whilst along the Study Area's northern edge several buildings reach as high as 20 storeys –, lining the southern side of Kamal Ataturk Avenue and two parallel streets, both known as Road 17. Of these, Road 17(2) is flanked by high-rise buildings to either side. These premises accommodate several universities, corporate offices and one substantial hotel. The overall width of Road 17(2) is generous, but much is lost to such functions as right angled car parking, construction material dumps and food stalls. Other roads in the north also serve commercial functions, including the whole southern side of Kamal Ataturk Avenue.

Thorough inspection reveals barely-concealed vices all over the Study Area. Everywhere, it is apparent that redevelopment is advancing vigorously. Flats have almost entirely replaced single-family houses, whilst apartment blocks are themselves being demolished to make way for alternatives with greater earning-potential (typically by making replacements taller, increasing their plot ratio or changing their use to commercial or mixed developments). Indeed, non-residential uses are scattered everywhere, with educational and medical premises being particularly commonplace. Shops, boutiques, and guest houses are also spread throughout the area.

In the south of the Study Area, Road 11 is largely commercialised, with shops, banks, restaurants and a hotel. Traffic is particular intense along this road, not only because it is used as a through-route but also because of numerous parking and 'un-parking' activities and a tendency for vehicles to make three-point turns in the road. The road must once have been a quiet local distributor, but it was transformed into a major through-route when the Gulshan-Banani Bridge was opened. The result of this (doubtlessly well-intentioned) innovation is an overwhelming traffic environment where pedestrians cross the road at great peril and where the cacophony of horns and rickshaw bells persists throughout day and late into the night. Impenetrable vehicular congestion often blights the road as through-traffic contests its right of passage with cars trying to reverse from angle-parked positions on shop and restaurant forecourts. The road is a source of stress to its users, signified by the eruption of unpleasant episodes amongst drivers, rickshaw pullers and pedestrians.

The Study Area is no haven for the urban poor, although there is a noteworthy slum on the west bank of Banani Lake, near the Gulshan-Banani Bridge. Even so, many poor people throng Banani's streets, and there is an undeniable fusion of private affluence and public squalor. The superficially-attractive tree-lined avenues are thronged with cars, vans and rickshaws, whilst their surfaces are often rutted. Every street was once *pucca* (metalled) but incessant traffic and erosion by monsoon rains have stripped several sections of their black-top layer. Hence some street-sections are *semi-pucca* (with crushed brick surfaces) and others are merely *katcha* (earth surfaced). There are few sidewalks, and where they survive, most are unusable because of uneven surfaces and such obstacles as hawker stalls, heaps of construction materials and discarded refuse and vegetation. At the time of writing Road 11 revealed the impact of sewer works, with open gullies and innumerable holes puncturing its residual sidewalks. Pedestrian conditions are very bad: most access roads within the Study Area lack any form of sidewalk. Indeed, the most common form of street comprises a narrow central strip of *pucca* road bordered to either side by *katcha* 'sidewalks' that suffer from numerous obstructions. Walking in the Study Area reveals that the pedestrian is regarded with contempt by every type of mechanised road user, leading at best to prolonged delays and at worst to an omnipresent risk of injury. Additional perils emerge after sunset: street lighting is variously inadequate, switched off, or absent altogether. Traffic conditions

vary by street and time of day. Some streets are thronged by rickshaws, both moving and congregated by the dozen in the hope of winning customers. Rickshaws are permitted on all streets except Kamal Ataturk Avenue, although this stricture does not necessarily mean that they cannot be found there. Motor vehicles are commonplace, and the Study Area's general income level indicates that car ownership may be several times greater than in Dhaka generally. The only road in the Study Area that carries recognizable public buses is Kamal Ataturk Avenue, although the service is infrequent compared with that on New Airport Road and some other bus corridors. There is a general absence of the traffic signs, road markings and street furniture that could otherwise guide, warn or control traffic. Apart from traffic signals at the junction of Kamal Ataturk Avenue and New Airport Road, there are no traffic signals within the Study Area. Likewise, there are no Give Way lines or lane-divider markings. One junction, namely at roads 10 and 11, regularly benefits from a traffic policeman, whilst elsewhere doormen (who are employed by hotels and businesses) venture into the traffic to assist pedestrians and customers trying to park or un park their cars. Other than a few businesses and apartment blocks that benefit from dedicated car parks, there is no formal parking provision within the Study Area. Cars may be parked randomly at the roadside, but the most common arrangement is right-angle parking, which both reduces the available road width for traffic and impedes pedestrian movement.

III. METHODOLOGY

The Study area covers the Central Banani area. Every road is listed in Table 1, which includes basic information on its characteristics. The traffic and pedestrian conditions in Central Banani are shown in Figure 2 The Study Area covers 32 ha and contains 8.76 km of roads (including the bordering roads of Kamal Ataturk Avenue and Road 11). Roads were originally set out in a hierarchical fashion. Kamal Ataturk Avenue is a district distributor, whilst Road 11 has assumed a similar role, despite being totally unsuited to such a function.8 Several north south roads serve as local distributors, even though the available carriageway widths are quite inadequate for the task. All east-west roads (other than Kamal Ataturk Avenue and Road 11) are local access roads: some are very narrow and several lack metal surfaces.

Traffic mainly comprises cycle-rickshaws, pedal-cycles, saloon cars and 4WD vehicles. Private vehicles are numerous because many local residents and visitors can afford to own and use them. Buses, personnel carriers and motor cycles are rare and lorries only appear at night (unless they are employed on construction projects). Pedestrian activity is quite intense, and comprises residents, workers, shoppers, students, pedlars, beggars and the homeless.

Figure 2: Traffic and Pedestrian Conditions in the Banani Study Area

Banani Road 11 in the early evening displays a typically anarchic mixture of vehicles and pedestrians jostling for supremacy.

Road Condition when the monsoon set in.

3.1: Data Collection

- Information on representative traffic flows
- Interview data on travel origins and destinations
- Inventories of vehicles based within the Study Area
- An appraisal of street lengths, widths and conditions,
- Surface and sub-surface drainage arrangements, and
- An assessment of utilities equipment (mains, sewers, gas supply and power cables and telecommunications wires);

The Table 1 is given below for the road information of Banani Area

Road	Length (m)	Width (m)	Remarks
KAA	933	2 x (12/14)	District distributor, dual carriageway, commercial frontages.
4	322	4.5/7.5	Narrow road used as N-S local distributor, commercial frontages. Some *katcha* surface.
6(0)	322	6/15	Relatively narrow road used as N-S local distributor. Some *katcha* surface.
6(1)	144	6/12	Residential E-W access road.
6(12)	122	5.5/7.5	Residential minor N-S access road, residential.
6(2)	144	5.5/8.5	Residential E-W access road.
6(21)	122	5.5/7.5	Residential minor N-S access road, residential. Some *katcha* surface.
8	233	7.5/15	N-S local distributor, commercial frontages.
10	322	6/15	N-S local distributor, mixed (shop house) frontages. *Katcha* surface at southern end
11	1172	9/21	E-W local distributor used as district distributor. Worst pedestrian and traffic conditions of any road in Banani.
12	322	6/18	N-S local distributor, commercial frontages.
13(0)	389	4.5/9	Residential E-W access road, narrow usable carriageway.
13(1)	194	4.5/7.5	Residential E-W access road, narrow usable carriageway.
13(2)	128	5.5/12	Residential E-W access road, narrow usable carriageway.
13(3)	161	5.5/14	Residential N-S access road, narrow usable carriageway
13(4)	100	5.5/14	Residential N-S access road, narrow usable carriageway
13/A(1)	266	4.5/10.5	Residential E-W access road, narrow usable carriageway. Some *katcha* surface.
13/A(2)	128	4.5/7.5	Residential N-S access road, narrow usable carriageway.
13/A(3)	67	7.5/10.5	Residential N-S access road, reasonably wide carriageway.
13/B	194	4.5/12	Residential E-W access road, narrow usable carriageway, *semi-pacca* and *katcha* surface.
13/C(1)	200	6/20	Residential E-W access road, reasonably wide carriageway.
13/C(2)	122	5.5/12	Residential E-W access road, reasonably wide carriageway.
13/C(3)	61	3.5/10.5	Residential N-S access road, very narrow usable carriageway.
15(1)	266	7.5/18	Residential E-W access road, reasonably wide carriageway.
15(2)	233	9/18	Residential N-S access road, wide carriageway.
17(1)	144	10.5/17	E-W access road, educational activity, many pedestrians, wide carriageway.
17(2)	305	12/24.5	E-W access road, canyon-like street between tall buildings (commercial, educational, hotel). Seriously degraded street.
17(3)	389	7.5/21	E-W access road, tall buildings to north (commercial, educational, hotel). Seriously degraded street: just over a third of its width is available for traffic.
17(4)	200	7.5/15	E-W access road, mainly commercial to north side.
17(5)	111	4.5/17	Residential E-W access road, narrow usable carriageway.
17/A(1)	194	7.5/18	Residential E-W access road, reasonably wide carriageway.
17/A(2)	117	3/7.5	Residential E-W access road, very narrow carriageway.
19/A	339	6/14	Residential N-S access road, narrow usable carriageway. Blockaded during site visit because of construction works.
UNR(1)	83	15/24.5	Short, relatively wide N-S commercial connector.
UNR(2)	111	12/17	Shopping street with tall frontages to both sides; heavily trafficked.
UNR(3)	56	12/17	Very wide N-S connector alongside open air car park.
UNR(4)	44	7.5/9	Short, relatively wide N-S residential connector.
Notes: KAA= Kamal Ataturk Avenue, UNR=Un-named road, N-S= North South, E-W= East-West			

3.2 Way of Traffic Management

1) Developing a *Traffic Management Master Plan*;
2) Designing requisite infrastructure to incorporate all relevant proposals for subsurface drainage and utility provisions, surface drainage, sidewalks, road reconstruction and surfacing, car parking provision, and any other appropriate requirements;
3) Devising suitable traffic management measures to improve traffic flow by the use of one-way streets, junction improvements, parking restrictions, road markings, traffic signs, traffic signals and other relevant techniques;
4) Giving particular consideration to the present incompatible 'vehicle mix' to identify dedicated routes for rickshaws and the best role that thelas might play in freight distribution within the traffic management task. This exercise should also review the contribution made by public buses and determine the scope for better services on Kamal Ataturk Avenue, plus a possible new service of small buses along Road 11 after its refurbishment;
5) Developing solutions that would give particular help to pedestrians, such as the provision of decent sidewalks, the identification of preferred pedestrian routes, pedestrian crossings along roads and at intersections, and pedestrian-only streets and shared surfaces;
6) Identifying the scope for travel demand management (TDM) to reduce vehicular travel within the Study Area, with special regard to discouraging the use of local roads as 'rat runs' and to reduce the traffic overload on Road 11;
7) Examining development controls within town planning practice to establish whether they are sufficiently robust or suitably applied to prevent the over development' of streets within the Study Area. Given the potential for a surfeit of traffic to be generated by 'overheated' development, developers in future should be required to submit traffic impact assessments (TIAs) from reputable and authorized traffic consultants;
8) Seeking the views of local residents and business people about the proposed integrated traffic management scheme, and incorporating their opinions as appropriate; and
9) Developing a participatory environment to enable local residents and business people to be active in the implementation and ongoing monitoring and enforcement of the proposed District Traffic Management scheme.

3.3 Upgrading the Public Realm

When the integrated traffic management scheme is implemented, the public realm will be primarily affected. Activities will necessarily include:

1) Preparing a *Landscape Master Plan* to support improvements to the public realm, including the provision of identity and visual quality, and specifying locations for hard and soft landscaping;
2) Designing a 'toolbox' of measures to assist pedestrians including: (i) discrete pedestrian footpaths and other areas, physically separated and protected from road vehicles; (ii) traffic calming in support of pedestrian comfort; and (iii) landscape and shade in the pedestrian environment;
3) Specifying that road openings for the reconstruction and relocation of utility services must include replacement (subsurface) drains and connections to properties, plus (ideally) the 'undergrounding' of telecom wires and power cables that currently sag into the public realm;
4) Fully rehabilitating the streets within the Study Area, using materials appropriate to the intended function of the street (black-top asphalt would not be appropriate– for example – in a pedestrian zone); and
5) Providing traffic signs, road markings and other traffic management aids, together with street lighting and other street furniture and landscaping, both hard and soft.

IV. RESULTS AND DISCUSSIONS

The Traffic Management scheme for central Banani is may be noted that all but two of the major and minor roads have been made into one-way streets. All but three of the local distributors have also been made one-way, the exceptions being Roads 8, 10 and11. However, Road 11 has a one-way eastbound section towards its western end to discourage through traffic, in combination with the prohibition of the right-turn northbound from New Airport Road. Vehicular access has been maintained in Road 11 for the benefit of frontage traders, but consideration could be given to pedestrianising the central section of Road 11 between its junctions with Roads 6(0) and 10. However, it is proposed to wholly pedestrianise one street (Road 17(1)), which serves university premises and which is heavily thronged with pedestrians at most times. The internal one-way system has been proposed because it will make the roads safer for vehicles and pedestrians and it will also lengthen journey times within the Study Area, thereby discouraging drivers seeking short-cuts and rat-runs. Consideration was given to converting some streets into *culs de sac*. However, this would require them to be wide enough to carry two-way traffic and to accommodate turning circles or hammer heads at their sealed ends. Whereas such possibilities could be considered if this Project Component is advanced to detailed design, they have not been

defined here. Careful attention has been given to road and footway widths. Reference was made to contemporary British standards for local distributors and major and minor access roads. However, whilst the British terminology has been retained in Tables 2 and 3, compromises have been made with the dimensions. It should be appreciated that the British standards are relatively generous, and apply to 'new build' roads in residential areas [9]. In the case of the Study Area, the roads already exist, and it was considered essential to accommodate the reconstruction works within the existing boundary lines set by building frontages. Bearing this stricture in mind, road widths were developed on the assumption that a one-way lane should be able to accommodate a lorry 2.8 meters wide (over rear-view mirrors) plus a rickshaw with a width of about 1.2 metres: thus the minimum width for a lane designed to cope with both lorries and rickshaws would be 4.0 metres, which is wider than the international standard of 3.5 meters (or 3.0 meters in constricted situations). However, the Consultant recognizes that in some situations there would not be space to accommodate 4.0-metre lanes, and that in any case the widest vehicles (lorries) are time-restricted, whilst few rickshaws would be running during lorry-operating hours. Bearing such considerations in mind, the width requirements shown in TABLE 2 were developed for guidance purposes.

Table 2: Proposed road footway widths

Road Classification	Width	Remarks
Local distributor (two-way)	8.5m	May be reduced to 7.0 m if wide vehicles or rickshaws are prohibited.
Local distributor (one-way)	4.5m	May be reduced to 4.0 m where frontage constraints apply.
Major access road (two-way)	7.0 m	Scope for reduction not recommended.
Major access road (one-way)	4.0 m	May be reduced to 3.5 m in extreme situations.
Minor access road (two-way)	7.0 m	Possible scope for reduction to 6.0 m in constrained situations.
Minor access road (one-way)	3.5 m	May be reduced to 3.0 m in extreme situations.
Sidewalk (commercial and other high-activity streets)	3.0 m each side	May be expanded to 4.0 m or more where activity levels are high or where frontage positions allow.
Sidewalk (other streets)	2.0 m each side	May be reduced to 1.5 m where necessary or a single 3.0 m sidewalk may be provided on one side of the road only.
Car parking bay (parallel to the carriageway)	3.0 m	May be reduced to 2.5 m in constrained situations.
Rickshaw 'station'	3.0 m	Depending on space available, may be considered on north-south local distributor or major access roads at junction approaches with KAA and Road11.

Table 3 shows that most local access roads in the Study Area would be narrower than they are now. However, much potential space is currently lost to side friction and unused space. A narrower, safer road with proper sidewalks, planned on-street parking would greatly improve the character and operations in the Study Area. Redundant space could be properly landscaped, rather than becoming a dump for refuse and construction materials. Obviously, it will be important to enlist the co-operation of residents and business tenants to ensure that standards are maintained.

Table 3: Banani Study Area Traffic Management Proposals:

Road	Length (m)	Width (m)	Remarks
KAA	933	2 x (12/14)	As now, but with rebuilt sidewalks
4	322	4.5/7.5	Minor access road, one-way northbound. Sidewalk to one side only.
6(0)	322	4.5/8.5	Local distributor, one-way southbound.
6(1)	144	4.0/7.5	Major access road, one-way westbound.
6(12)	122	3.0/7.5	Minor access road, one-way northbound.
6(2)	144	4.0/7.5	Major access road, one-way eastbound.
6(21)	122	3.0/7.5	Minor access road, one-way southbound.
8	233	8.5/14.5	Local distributor, two-way, signals at junction with Road 11. Parallel parking can be permitted in bays 2.5 m wide.

10	322	8.5/14.5	Local distributor, two-way, signals at junction with Road 11 and KAA. Parallel parking can be permitted in bays 2.5 m wide.
11	1172	8.5/14.5	Local distributor, two-way, signals at junctions with Roads 8 and 10 and New Airport Road. One-way eastbound between Roads 6 and 10.
12	322	4.5/10.5	Local distributor, one-way, signals at junction with KAA, no right turn from Road 11 westbound. Parallel parking can be permitted in bays 2.5 m wide.
13(0)	389	4.5/9	Major access road, one-way eastbound.
13(1)	194	3.5/7.5	Minor access road, one-way westbound.
13(2)	128	3.5/7.5	Minor access road, one-way westbound.
13(3)	161	3.5/7.5	Minor access road, one-way eastbound.
13(4)	100	3.5/7.5	Minor access road, one-way southbound.
13/A(1)	266	3.5/7.5	Minor access road, one-way westbound.
13/A(2)	128	3.5/7.5	Minor access road, one-way northbound.
13/A(3)	67	3.5/7.5	Minor access road, one-way southbound.
13/B	194	3.5/7.5	Minor access road, one-way eastbound.
13/C(1)	200	3.5/7.5	Minor access road, one-way westbound.
13/C(2)	122	3.5/7.5	Minor access road, one-way westbound.
13/C(3)	61	3.5/7.5	Minor access road, one-way northbound.
15(1)	266	3.5/7.5	Minor access road, one-way eastbound.
15(2)	233	3.5/7.5	Minor access road, one-way southbound.
17(1)	144	15/15	Pedestrian street, shared surface type with block or sett surface dressing, residents' access only.
17(2)	305	4.0/24	Major access road, one-way eastbound, parallel parking can be permitted in bays 2.5 m wide. Remaining width to be pedestrianised.
17(3)	389	4.0/20	Major access road, one-way westbound, parallel parking can be permitted in bays 2.5 m wide. Remaining width to be pedestrianised.
17(4)	200	4.0/8.0	Major access road, one-way westbound.
17(5)	111	4.5/17	Minor access road, one-way westbound.
17/A(1)	194	7.5/18	Minor access road, one-way eastbound.
17/A(2)	117	3.5/7.5	Minor access road, one-way eastbound
19/A	339	4.0/8.0	Major access road, one-way southbound, no right turn at Road 11.
UNR(1)	83	7.0/13.0	Major access road, two-way.
UNR(2)	111	4.0/7.5	Major access road, one-way eastbound.
UNR(3)	56	7.0/13.0	Major access road, two-way.
UNR(4)	44	3.5/7.5	Minor access road, one-way southbound.
Notes: KAA= Kamal Ataturk Avenue, UNR=Un-named road, N-S= North South, E-W= East-West			

Figure 3: Traffic Management Diagram for the Banani Study Area

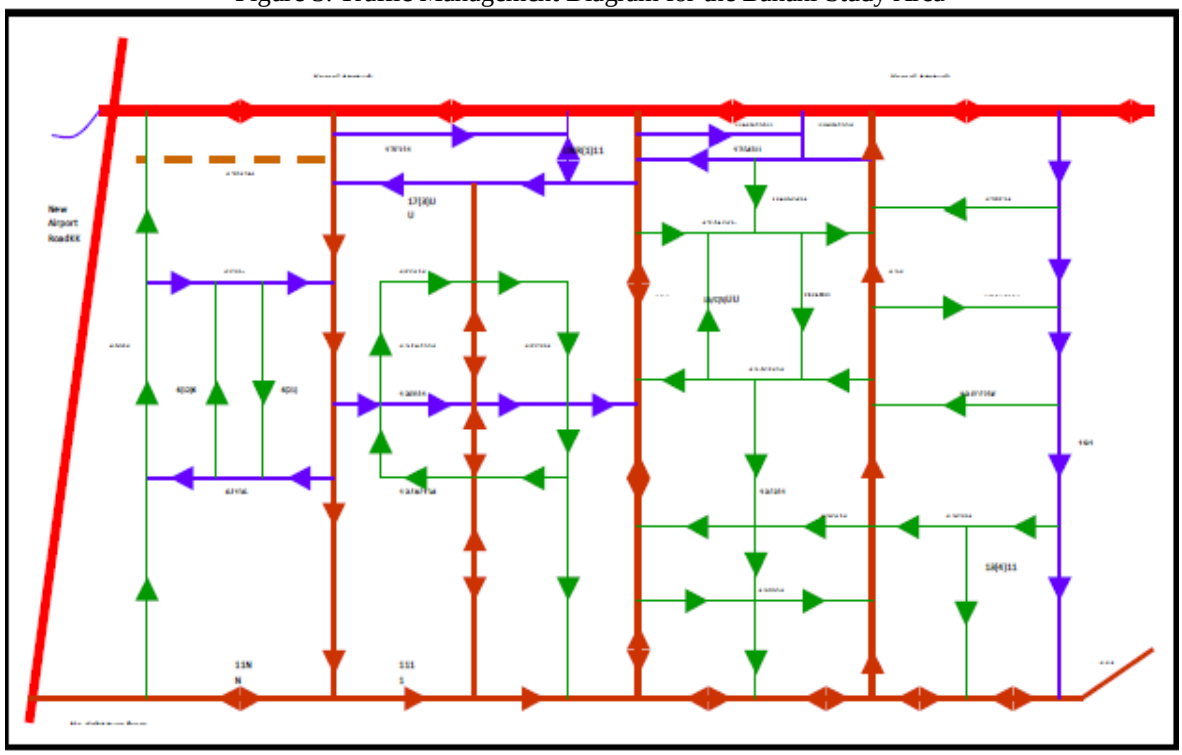
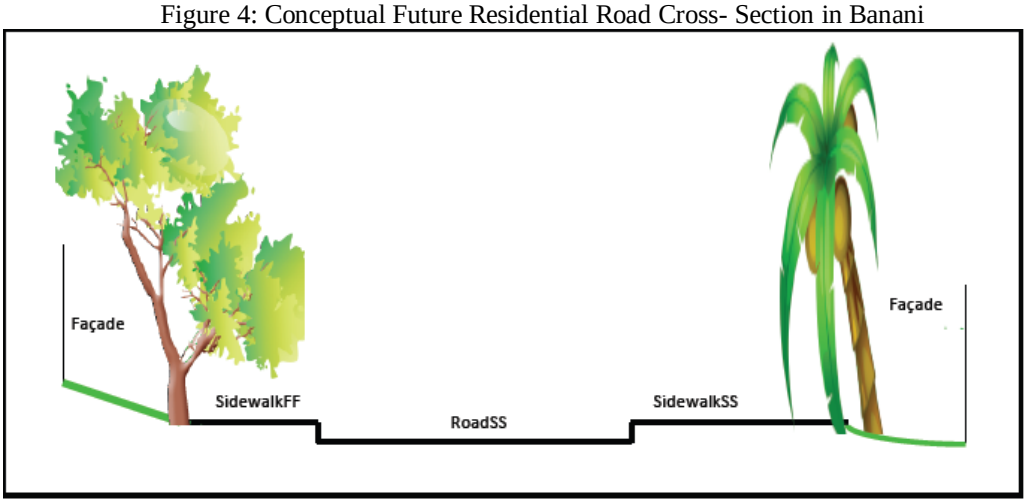


Figure 4: Conceptual Future Residential Road Cross- Section in Banani



A cross section of a typical residential street in Banani as it might appear after upgrading as part of the integrated traffic management component.

V. CONCLUSIONS

The findings of this research can be an effective tool for Banani integrated traffic management system. The inhabitants of Banani would get the highest facilities as well as it might reduce the traffic congestion of surrounding area. As a result of this study traffic conflicts in the area of Banani will resolved and random parking will come in disciplined area. People will drive smoothly without traffic congestion. As a result of proper management system people will be attractive in this area, so economic benefits will be in good phase. Of course there has some limitations and difficulties for this study. For example the data collection was difficult due to non co- operative attitude of the respondents and the response rate of the people was low. More modern techniques to attract respondents to the surveys can be explored in future research. Further, the model created in this project is based on the survey, and it can be improved by studying other kind of models which might have better options.

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