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Prepared by:
Padeco Co. Ltd. in association with Metcon Consultants, Nepal
Tokyo, Japan

For Department of Urban Development and Building Construction

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Volume 4: ROADS AND LANES
FINAL REPORT
Volume 4: ROADS AND LANES

June 2010

Prepared for the Asian Development Bank and the Government of Nepal
# Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
</tr>
<tr>
<td>DDC</td>
<td>District Development Committee</td>
</tr>
<tr>
<td>DoLIDAR</td>
<td>Department of Land Infrastructure Development and Agriculture Road</td>
</tr>
<tr>
<td>DoR</td>
<td>Department of Road</td>
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<tr>
<td>DUDBC</td>
<td>Department of Urban Development and Building Construction</td>
</tr>
<tr>
<td>GoN</td>
<td>Government of Nepal</td>
</tr>
<tr>
<td>ICD</td>
<td>Inland Container Depot</td>
</tr>
<tr>
<td>LSGA</td>
<td>Local Self Governance Act</td>
</tr>
<tr>
<td>MPPW</td>
<td>Ministry of Physical Planning and Works</td>
</tr>
<tr>
<td>MSUD</td>
<td>Municipality Services and Urban Development Project</td>
</tr>
<tr>
<td>NRS</td>
<td>Nepal Roads Standard</td>
</tr>
<tr>
<td>PCC</td>
<td>Plain Cement Concrete</td>
</tr>
<tr>
<td>PPTA</td>
<td>Project Preparatory Technical Assistance</td>
</tr>
<tr>
<td>RBN</td>
<td>Roads Board Nepal</td>
</tr>
<tr>
<td>SRN</td>
<td>Strategic Road Network</td>
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<tr>
<td>STIUEIP</td>
<td>Secondary Town Integrated Urban Environmental Improvement</td>
</tr>
<tr>
<td>TDF</td>
<td>Town Development Fund</td>
</tr>
<tr>
<td>TU</td>
<td>Transport Unit</td>
</tr>
<tr>
<td>UEIP</td>
<td>Urban Environmental Improvement Project</td>
</tr>
<tr>
<td>VDC</td>
<td>Village Development Committee</td>
</tr>
</tbody>
</table>
## Contents

1. Introduction .................................................................................................................. 1

2. Review of the urban roads sector in Nepal ................................................................. 2
   2.1 Governing regulations .............................................................................................. 2
   2.2 Responsibilities and policies .................................................................................. 2
   2.3 Design standards ..................................................................................................... 1
   2.4 Impediments to improvements ............................................................................... 2

3. Rationale for STUEIP .................................................................................................... 6
   3.1 Key problems and opportunities ........................................................................... 6
   3.2 Related projects ....................................................................................................... 9
   3.3 Selection of priority investments .......................................................................... 11
   3.4 Basis of design ........................................................................................................ 13

4. Outputs .......................................................................................................................... 19
   4.1 Road and footpath improvement in Biratnagar ...................................................... 19
   4.2 Road and footpath improvement in Birgunj ........................................................... 20
   4.3 Road and footpath improvement in Butwal ............................................................ 22
   4.4 Land acquisition ..................................................................................................... 24
   4.5 Traffic management ............................................................................................... 24
   4.6 Community awareness program .......................................................................... 25
   4.7 Reduced scope program ....................................................................................... 25

5. Operations and maintenance ....................................................................................... 27
   5.1 Existing arrangements for operations and maintenance ...................................... 27
   5.2 General approach to operations and maintenance .............................................. 27
   5.3 Specific arrangements for the project .................................................................. 27

6. Cost Estimates ............................................................................................................... 29
   6.1 Full scope component ........................................................................................... 29
   6.2 Priority works ......................................................................................................... 30

7. Implementation arrangements ......................................................................................... 31
Appendices

A  Biratnagar: drawings
B  Birgunj: drawings
C  Butwal: drawings
D  Photos
E  Biratnagar details
F  Birgunj details
G  Butwal details
1 Introduction

1 This is Volume 4 of the Final Report for a Project Preparatory Technical Assistance (PPTA) of the Asian Development Bank (ADB) to the Government of Nepal (GoN) for the Secondary Towns Integrated Urban Environmental Improvement Project (hereafter “the project” or “STIUEIP”). It describes the Roads and Lanes component of the project.

2 The PPTA commenced on 1 May 2009. The Ministry of Physical Planning and Works (MPPW) acting through the Department of Urban Development and Building Construction (DUDBC) is the executing agency for the project preparation.

3 On 17 August 2009, the Steering Committee approved the selection of the municipalities of Biratnagar, Birgunj, and Butwal for the project. Since then the consultant has carried out surveys, held meetings with stakeholders, and undertaken analyses of the engineering, institutional, social, financial, economic and environmental aspects of the proposed project.

4 The Draft Final Report comprises nineteen volumes as follows:

1. Project Rationale
2. Drainage and Sanitation
3. Solid Waste Management
4. Roads and Lanes
5. Public-Private Partnerships
6. Poverty Reduction and Social Strategy
7. Major Environmental Issues
8. Economic Analysis
9. Institutional Analysis
10. Butwal Water Supply
11. Biratnagar Survey Data
12. Birgunj Survey Data
13. Butwal Survey Data
14. Financial Assessments
15. Biratnagar Social Safeguards
16. Birgunj Social Safeguards
17. Biratnagar Initial Environmental Assessment
18. Birgunj Initial Environmental Assessment
19. Butwal Initial Environmental Assessment
2 Review of the urban roads sector in Nepal

2.1 Governing regulations

2.1.1 Public Road Act 1979

The Public Road Act (1979) is the principal legal document that makes provision for road construction, maintenance and extension. The Act defines the public road, road limit (right-of-way), classifies roads into four categories, and prohibits the construction of any type of structure within the right-of-way. The Act authorizes the Department of Roads (DoR) to keep the road free from any obstacle that may hamper safe vehicle movement. DoR is also responsible to manage and control encroachment in Right of Way. Any works within the defined right of way such as installation of service line or opening of access road needs prior approval from the DoR. The DoR is also empowered to fix the limitation of vehicle weight and control the movement of overloaded vehicle in roads. The Act also has provision for realizing betterment tax from beneficiaries.

2.1.2 Motor Vehicles and Transport Management Act 1993

The Motor Vehicles and Transport Management Act 1993 governs the registration of vehicles, driving licenses, insurance, control of public transport, and traffic control. Article 122 of the Act requires that before any excavation takes place in a public place, permission from the nearest police station must be obtained.

2.1.3 Construction Contractors Act 1999

The Construction Contractors Act (1999) relates to the registration of construction contractors and bars undertaking public construction contracts without obtaining a license for that purpose. However, the Act allows the implementation of public construction work through users committees or through public participation. The Act classifies construction contractors into four groups and fixes financial ceilings and other qualifications for each category.

2.1.4 Local Self-Governance Act 1999

The Local Self-Governance Act in 1999 replaced the Municipality Act 1992 devolving more responsibilities to municipalities. Guided by decentralization principles, this act delegated several responsibilities to the municipalities which had hitherto been a central business, roads and bridges being one.

2.1.5 Roads Board Act 2002

The purpose of the Roads Board Act (2002) was to make necessary provisions on repair and maintenance of roads, minimizing the expenditures to be incurred in repairing and maintaining the roads and making transparent and effective the repairing and maintaining works of the roads. This act considers all the roads in the country including urban roads. As provisioned in the act, vehicle tax and road use tax are collected centrally. Some of this revenue is later distributed to maintenance works of roads as per requirement. The act has formed an autonomous body to manage the fund called Roads Board Nepal (RBN).

2.2 Responsibilities and policies

2.2.1 Three Year Interim Plan

The Three Years Interim Plan (2008-2010) set out the following policies relevant to the project:

1. Legal provisions will be drafted and enacted for the proper management of road construction activities in the urban areas.
2. Separate space will be provisioned, preferably within and along the boundary lines of the right-of-way, for laying out sewerage, drinking water, telephone and electricity infrastructures. Provision of a bicycle lane will also be made on the feasible roads.

3. In the terai, different north-south roads connecting the commercial centers and major border crossing points with the East-West Highway will be constructed and upgraded along with upgrading the east-west Postal (Hulaki) road.

4. Road projects will be formulated and constructed based on methods that optimally utilize local skills and resources and generate employment opportunities.

5. The Roads Board Nepal will be strengthened. The maintenance activities will be managed according to priorities as well as assurances of funds and assembling the requisite resources.

6. The responsibility for the maintenance of local level and urban roads will be transferred to the local bodies. Along with roads, the existing manpower as well as machinery, equipment, office and residential buildings etc., will also be transferred, temporarily or permanently, to the concerned local body on the basis of road density.

7. Institutional strengthening and capacity enhancement measures will be adopted in the Department of Roads (DoR) and its subordinate offices following the conceptual framework of decentralization, and to ensure the management of timely and transparent service delivery.

11 In terms of quantitative targets, the TYIP shows a slight shift in emphasis towards maintenance and upgrading in comparison with the Tenth Plan (Table 1 Quantitative targets for the road sector).

Table 1 Quantitative targets for the road sector

<table>
<thead>
<tr>
<th>Category</th>
<th>Units</th>
<th>Tenth Plan target</th>
<th>Tenth Plan actual</th>
<th>TYIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>New roads (all types)</td>
<td>km</td>
<td>1,025</td>
<td>805</td>
<td>780</td>
</tr>
<tr>
<td>Road upgrades</td>
<td>km</td>
<td>1,764</td>
<td>1,161</td>
<td>2,500</td>
</tr>
<tr>
<td>Periodic maintenance</td>
<td>km</td>
<td>1,216</td>
<td>1,324</td>
<td>1,450</td>
</tr>
<tr>
<td>Construction of bridges</td>
<td>no,</td>
<td>220</td>
<td>112</td>
<td>104</td>
</tr>
</tbody>
</table>

Source: Tenth Plan and TYIP.

12 However, the TYIP periodic maintenance figure of 1,450 km compares with a total of 17.782 km under DoR management (TYIP figure). One of the objectives of the TYIP roads program is to reduce regional imbalance and social inequality as well as to promote broad based economic growth and help alleviate poverty. It follows from this objective and the data in Table 1 that national plans allow very little scope indeed for constructing new roads in the 58 municipalities.

2.2.2 Department of Transport Management

13 The Department of Transport Management, functioning under the Ministry of Labour and Transport Management, is responsible for the registration of vehicles, driving licenses, insurance, control of public transport, traffic signs and traffic control. Responsibility for road safety is split between the Department of Transport Management, which is responsible for the design of road signs and the regulation of traffic, drivers and vehicles, and the Department of Roads, which is responsible for engineering design standards.
2.2.3 Department of Roads

The DoR, functioning under MPPW, is responsible for the construction and maintenance of the Strategic Road Network. The Strategic Road Network roads are the main national arteries that provide inter-region connections and links to district headquarters, international border crossings, and key economic centers.

2.2.4 Roads Board Nepal

RBN communicates with GoN through the MPPW. Under the Act, the functions, duties, and powers of the Board are as follows:

(a) To cause to carry out repair and maintenance of roads,
(b) To collect additional toll charges leviable for the use of roads and to recover penalties under this Act.
(c) To make recommendations to GoN on the matters of fixation of the road tolls or fuel levies to be collected under the Roads Board Act, additional charges and fines to be collected for plying the motor vehicle contravening to the specified standards.
(d) To make recommendations to GoN on fixation of toll.
(e) To formulate integrated annual plans for repair and maintenance of the roads.
(f) To provide funds to road authorities for the repair and maintenance of the roads.
(g) To disburse the toll amount at the prescribed rate to repair and maintenance of such a road from where such amount was collected as toll under this Act.
(h) To cause to reconstruct, rehabilitate, and upgrade the road as prescribed.
(i) To prepare, in order to minimize the expenditures on repair and maintenance of roads, an action plan related thereto.
(j) To cause to safeguard the road having selected it on a prescribed basis.
(k) To bear the expenditure required pursuant to any agreement between GoN and an agency or organization with a provision that such an agency or organization and GoN would bear the funds required for the repair and maintenance of the road.
(l) To make effective the repair and maintenance works of the roads.
(m) To approve annual budget and program of the Board.
(n) To do or cause to do such other works as may be prescribed.

The Board derives its revenue from tolls, fuel levies, vehicle registration fee, and grants or loans from the Government and international agencies. The fund meets about one third of the total maintenance requirements. About 70 per cent of Board revenues are allocated to maintenance of the strategic road network and 30 per cent to the maintenance of the local and rural road network.

The Board can set quality standards, monitor implementation by road agencies, undertake financial and technical audits of road agencies, and has the power to sanction penalties in the case of violations. However, the Board has not been so efficient in decision making and resolving issues. The private sector participation has also been ineffective, in spite of private sector representatives being on the Board. In addition, the Board has no autonomy over the flow of funds: revenues (except tolls) are collected by other agencies and is handled by the treasury. So, the Board is yet to improve its performance for efficient operation by ensuring adequate maintenance resources.

Under the Roads Board Rules 2003, each roads authority must prepare an annual road maintenance plan according to the Board’s standard format. The roads authorities must define the maintenance works to be done within their jurisdiction in the following maintenance categories:
a. Routine maintenance  
b. Recurrent maintenance  
c. Periodic maintenance  
d. Rehabilitation works  
e. Reconstruction  
f. Upgrading

19 The Rules define each of these categories.

20 As part of the Road Sector Development Project (World Bank, 2008 to 2012), RBN is receiving technical assistance and training to improve its organizational capacity to manage the Road Fund efficiently, to allocate resources effectively, to monitor Road Fund disbursements and to maintain an objective advocacy for the maintenance resource needs of the road sector.

2.2.5 Department of Local Infrastructure Development and Agricultural Roads

21 Municipalities are responsible (as roads authorities) for the construction and maintenance of urban roads, with the support of the Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR), functioning under the Ministry of Local Development (MLD).

2.2.6 Municipalities

22 Municipalities are road authorities in their own right. The *Local Self-Governance Act*, 1999, requires municipalities to:

- Prepare plans of unpitched and pitched roads, bridges and culverts as needed within the municipality, except those roads which are under the responsibility and control of GoN, and construct, maintain and repair or cause to be constructed, maintained and repaired.
- Arrange or cause to be arranged for bus parks and parking places of rickshaws (three-wheelers), horse-carts, trucks etc. within the municipality.
- Supervise, repair, maintain and manage such properties.

23 Although bus parks and truck parks are a municipal responsibility, the *Motor Vehicles and Transport Management Act* 1993 provides for the location of these facilities to be a matter for the District Transport Committee. Traffic control is the responsibility of the Department of Transport Management under the Ministry of Labor and Transport Management, which has no zonal offices,

2.3 Design standards

24 The *Nepal Road Standard* (NRS, 1950) with First Revision (1989) is the authoritative document for roads standards in Nepal. However, the document focuses on highways. Very little has been suggested in the case of urban roads. NRS divides roads into four categories:

- National highways
- Feeder roads
- District roads
- City roads/streets

25 Category (d) may be considered as urban roads. These include roads within urban limits passing through the city except for the roads classified in first three classifications. These provide abutting residential, business or industrial properties.

26 Based on terrain, NRS has categorized roads as plain terrain, rolling terrain, mountainous terrain and steep terrain. In the context of STIUEIP, the areas are mostly plain terrain. Butwal municipality may have some areas with rolling terrain. As per the number of lanes, carriageway need to be designed according to the design capacity suggested in the NRS. To determine the required capacity of roads, traffic calculations should use the NRS 'transport units' (normally termed “passenger car units” or “passenger car equivalent” in traffic engineering). NRS has provided traffic coefficients for this purpose. Gradient of the road is not that critical compared to mountainous or
steep terrains. However, drainage is a major limiting factor of the roads in the STIUEIP towns. A minimum of 1 percent slope may be suggested as per NRS.

27 The right-of-way of the roads will be guided by established norms. Municipalities will have the maps which will guide the design of the roads. In case of footpaths, NRS has suggested to provide width of footpath (the NRS uses the term “sidewalk”) based on the pedestrians estimated for the designed future. Usually clear 60 cm width should be provided for every 30 pedestrians/minute, subject to a minimum sidewalk width of 2.5 m on each side of the carriageway.

28 Apart from the NRS, road norms are absent in Nepal. Urban Road Standard was also suggested to Municipal Services and Urban Development Projects (MSUDP) in 1989. This standard is, however limited to some prototype designs. These standards remain as a good reference, yet they lacks formal approval from concerned government agencies.

29 The MSUDP categorized urban roads into three groups: i) Category I Arterial roads, ii) Category II Connector roads and Category III Access roads (Table 2).

### Table 2 Urban Road Standard

<table>
<thead>
<tr>
<th>Category</th>
<th>Type</th>
<th>Function</th>
<th>RoW (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>A1</td>
<td>Arterial Road</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>Arterial Road</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>A3</td>
<td>Arterial Road</td>
<td>28</td>
</tr>
<tr>
<td>II</td>
<td>C1</td>
<td>Connector Road</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>C2</td>
<td>Connector Road</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>C3</td>
<td>Connector Road</td>
<td>14</td>
</tr>
<tr>
<td>III</td>
<td>R1</td>
<td>Access Road</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>R2</td>
<td>Access Road</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>R3</td>
<td>Access Road</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>R4</td>
<td>Access Road</td>
<td>8</td>
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<tr>
<td></td>
<td>R5</td>
<td>Access Road</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>R6</td>
<td>Access Road</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: Derived from MSUDP 1989

2.4 Impediments to improvements

2.4.1 Financial constraints

30 The road sector is heavily dependent on foreign sources for funds (Table 3).

### Table 3 Road sector financial allocations in financial year 2007/2008

<table>
<thead>
<tr>
<th>Category</th>
<th>Allocation</th>
<th>Source of funds</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>($m) (%)</td>
<td>GoN ($m)</td>
<td>Foreign ($m)</td>
</tr>
<tr>
<td>Highways</td>
<td>20.6</td>
<td>10</td>
<td>5.2</td>
</tr>
<tr>
<td>Feeder roads</td>
<td>41.3</td>
<td>21</td>
<td>18.5</td>
</tr>
<tr>
<td>Rehabilitation and maintenance</td>
<td>46.1</td>
<td>23</td>
<td>18.8</td>
</tr>
<tr>
<td>Recurrent expenditure</td>
<td>4.6</td>
<td>6</td>
<td>4.6</td>
</tr>
<tr>
<td>Urban roads</td>
<td>5.7</td>
<td>3</td>
<td>5.7</td>
</tr>
<tr>
<td>Bridges</td>
<td>11.7</td>
<td>6</td>
<td>11.7</td>
</tr>
<tr>
<td>Miscellaneous projects</td>
<td>1.7</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td>Rural roads and infrastructure</td>
<td>66.5</td>
<td>34</td>
<td>27.0</td>
</tr>
<tr>
<td><strong>Total road sector expenditure</strong></td>
<td><strong>198.4</strong></td>
<td><strong>100</strong></td>
<td><strong>93.2</strong></td>
</tr>
</tbody>
</table>

Source: World Bank, 2007, Project Appraisal Document on a Proposed Grant in the Amount of SDR27.8m (US$42.6 million equivalent) to Nepal for a Road Sector Development Project.

31 RBN is the sole agency to allocate revenue for road maintenance and carry out routine, recurrent, periodic maintenance of roads and emergency repairs. The major revenue sources of RBN
are (i) highway toll tax, (ii) vehicle registration tax, and (iii) road tax levied on fuel. However, the GoN does not pass on all the revenues received from these sources to RBN.

32 The collection of fees and taxes is fairly sufficient for regular maintenance and three quarters of recurrent maintenance. However, there is a lack of necessary funds for periodic maintenance and emergency repair. Out of the total funds available in RBN, 70 per cent is spent through DoR for maintenance of the Strategic Road Network and 30 per cent is sent to local bodies. Of this, 15 per cent goes to municipalities and the remaining 15 per cent to DDCs. The budget allocated for the fiscal year 2008/09 to 51 municipalities by RBN is NRs109.8m.

33 As per this provision the budget allocated for Biratnagar, Birgunj and Butwal this year is NRs4m, NRs4m and NRs2.4m respectively. These amounts, however, are merely sufficient for routine maintenance and recurrent maintenance.

34 Most municipalities share the cost of constructing local or neighborhood roads with local communities. The municipalities’ support in the construction of neighborhood roads ranges from 50 to 80 per cent of the cost and technical assistance. It is important that any future project should take on this modality. Cost sharing has become a common practice for construction or upgrading of neighborhood roads. For example, Hetauda and Butwal are constructing all neighborhood roads on 40:60 cost sharing basis. Lately, Kathmandu has also adopted this approach. This is in line with the government policy to encourage community investment and a key motivation has been to increase property (land) values. Exceptionally, Birgunj municipality has not yet introduced this practice. Biratnagar has attracted local contribution, although only nominal. Now, the municipalities have to consider the community partnership model as a solution to upgrading and rehabilitating neighborhood roads.

2.4.2 Institutional constraints

Municipal capacity

35 Before the enactment of Local Self-Governance Act in 1999 all roads including urban roads were under the jurisdiction of DoR. Municipalities only maintained the lanes, which were mostly brick paved. With the enactment of LSGA, municipalities suddenly had to assume excessive new responsibilities for service delivery, which also included urban roads. Without capacity building initiatives and financial support, municipalities are still unable to deliver these services. The technical staffs in the three project municipalities are already fully occupied in dealing with petty infrastructure activities required for local roads. Among the three municipalities, Birgunj was the least equipped, with no designated section responsible for looking after roads and footpaths. In Butwal and Biratnagar all though there is a provision, the sections are not developed to cater to the services required. In the absence of larger road projects, the municipalities lack the knowledge and skills in designing and constructing urban roads.

Responsibilities

36 There are several overlapping and grey areas in the responsibilities of municipalities with other institutions including line agencies in Nepal. In case of road and access, there are some grey areas within DoR. Although it is clearly mentioned that the strategic road network is the responsibility of DoR, footpaths and crossings associated with these roads are normally not maintained by that department. Therefore, in the case of Kathmandu and Lalitpur, footpaths and pedestrian overhead bridges are taken care of by respective municipalities. The ambiguity in responsibilities has left Biratnagar, Birgunj and Butwal without any clear arrangement for the construction of pedestrian facilities. In Birgunj the chaotic situation of bypass Road is an example of this. Therefore, while improving the Strategic Road Network roads by adding footpaths and service lanes is necessary, coordination with concerned Divisions of DoR is also required.

37 While DoLIDAR is nominally responsible for policy and technical standards for urban roads, as the organization chart for DoLIDAR (see Volume 9) suggests, there is still no single organization that is performing this function. With the extension of the urban road network and
increasing traffic, this lacuna in institutional responsibility is beginning to have serious consequences.

**Lack of standards**

38 The major issues for which policies and standards are necessary are as follows:

1. What are the limits of DoR’s responsibilities in respect of sections of the strategic Road Network lying within municipal boundaries? Does it extend to the whole of the right-of-way? Part of the right-of-way? Which part?
2. Pavement and sub-pavement design
3. Geometric design
4. Roadside drainage
5. Location of utilities
6. Road hierarchy
7. Longitudinal gradients
8. Cross-falls
9. Footpaths

39 Historically, all roads belonged to the DoR of the Government. But after promulgation of the *Local Self-governance Act* (1999), there are grey areas where the responsibilities of the DoR and municipalities overlap. However, in recent years DoR has limited itself to the SRN. The issue of the stretches of SRN that pass through cities is yet to be resolved. These stretches have strong urban characteristics. With no real expertise on urban roads within the concerned divisions of the DoR, is resulting in the inferior management of roads in these stretches, which is also leading to traffic hazards including accidents. The chaotic management of the bypass road in Birgunj and the large number of accidents on the Butwal stretch of the Siddharthanagar Highway are some convincing examples of the need to address the management issues timely. In the case of the bypass road of Birgunj, MSUDP has been suggesting that these roads be developed as urban roads based on the *Urban Road Standard* of 1990, which still requires follow up.

40 Many towns in Nepal developed as market centres at highway intersections and later expanded to become municipalities. Therefore, there is a conflicting use of the highway that is passing through the city centre. As these roads are not under the jurisdiction of municipalities, the most urbanized part of the city is not (if not poorly) served due to the lack of clarity in responsibilities. In the case of Butwal, the DoR is designing a bypass while in the case of Birgunj, the bypass did not materialize. In the case of Biratnagar, there have been no developments as of yet. From these experiences it may be concluded that these roads need not be (and cannot be) isolated from urban functions. Therefore a meaningful study is required based on which urban roads standards need to be established.

41 Most of the cities in Nepal are unplanned. In the absence of norms for developing access to infrastructure, the regulations like building by-laws and right of way of roads has made it really difficult to improve the road management and safety. Apart from addressing the issue of highways that cut across urban areas, there is an urgent need to develop guidelines to assist municipal managers’ deal with the technical issues surrounding the urban road standards. If these issues are left unaddressed, encroachments could become the mainstay, where there are already several examples when footpaths were encroached upon to widen roads.

**Technical data**

42 The Passenger Car Units (PCU) given in *Nepal Roads Standard* (1971 with revision in 1989) may have been appropriate for roads at that time, as there is anyway no justification for those values to become the standard in the first place. Even if they were derived by measurement, there have been substantial changes in traffic patterns and road conditions since 1989. For example,
motorcycles now account for 70 per cent of motorized vehicles. The sizes and performances of the various types of vehicle have changed. Therefore, there is a need to recalculate the PCU values based on traffic surveys.

Construction standards

43 Construction standards are also lacking. In their absence, municipalities are constructing roads of inferior quality, being reported more often in the press. Without developing standards, many of the surface improvement works carried out by municipalities and communities’ compromise on quality; apart from wasting taxpayers’ money, as these roads demand frequent repair and maintenance. Moreover, in most cases pedestrians take the lowest priority requiring further consideration while developing new standards.

44 The national urban roads standard would also need to consider the geographic differences in the hills and terai, supporting the settlement pattern, mobility requirements and land use. The standards suitable for the sloppy terrain of hills and mountains may not be valid for terai and vice versa. In such contexts pedestrian safety and comfort should become a part of the design, especially at crossings.

Regulations

45 Complaints about digging and filling of roads for one or another utility are a common site on the streets of Nepal. There is evidently a lack of coordination between different departments. Moreover, there is also no provision, as to how deep and how wide particular utility lines can be located. In the absence of such guidelines, maintaining urban roads becomes chaotic; a costly affair with a lot of time losses. There are ample cases when after one utility is laid down and the road covered, another department soon digs up to fix another utility that is broken. Moreover, there is no standard on the installation of electric poles, street furniture, or street signs and hoardings. The lack of coordination has left urban roads in a total mess; this could become even worse in the wake of disasters like earthquakes, excessive rains and floods. Therefore the proposed urban road standards need to standardize location of utilities and the coordination of the department that are responsible as well.

Role of MPPW and DUDBC

46 All though the DoR has expertise on road design, there is a long way to acquire expertise in urban road design. Moreover the existing practices suggest that DoR attaches a low priority to urban roads. On the other hand, DUDBC is supporting municipalities in several aspects of their development including preparation of periodic plans. Therefore, it is proposed that the team preparing the standard may be headed by DUDBC in close coordination with DoR. The lack of standards for urban roads is related to the lack of standards and manuals for urban storm water drainage. If DUDBC were to take a more active role in relation to urban drainage and roads, it ought to be possible to get better outcomes from even small investments in new infrastructure.
3 Rationale for STIUEIP

3.1 Key problems and opportunities

3.1.1 Slow expansion of road networks

In recent years, the annual growth of the urban road network has been 3.2 percent compared to 4.8 percent for the remainder of the country’s roads (Table 4).

<table>
<thead>
<tr>
<th>Year</th>
<th>Strategic Road Network</th>
<th>Urban roads</th>
<th>District roads</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Highways</td>
<td>Feeder roads</td>
<td>243</td>
<td>322</td>
</tr>
<tr>
<td>1970</td>
<td>1,487</td>
<td>679</td>
<td></td>
<td>282</td>
</tr>
<tr>
<td>1975</td>
<td>1,728</td>
<td>789</td>
<td></td>
<td>374</td>
</tr>
<tr>
<td>1980</td>
<td>1,967</td>
<td>1,603</td>
<td></td>
<td>546</td>
</tr>
<tr>
<td>1985</td>
<td>1,960</td>
<td>1,875</td>
<td></td>
<td>1,224</td>
</tr>
<tr>
<td>1990</td>
<td>2,111</td>
<td>1,822</td>
<td>1,098</td>
<td>2,299</td>
</tr>
<tr>
<td>1994</td>
<td>2,734</td>
<td>1,520</td>
<td>1,339</td>
<td>3,941</td>
</tr>
<tr>
<td>1998</td>
<td>2,905</td>
<td>1,835</td>
<td>1,868</td>
<td>6,615</td>
</tr>
<tr>
<td>2002</td>
<td>3,029</td>
<td>1,832</td>
<td>2,198</td>
<td>9,775</td>
</tr>
<tr>
<td>2004*</td>
<td>3,339</td>
<td>4,196</td>
<td>2,260</td>
<td>7,486</td>
</tr>
</tbody>
</table>

Note: *2004 data include the re-designation of some District Roads as part of SRN (as highways or feeder roads)

The 3.2 per cent growth rate also compares with the annual rate of growth in the urban population of 5.8 percent over the same period. Urban roads account for 13 per cent of the total road length (Table 4) but only 3 per cent of the total expenditure on roads (Table 3).

One of the consequences of the slow development of urban road networks is poor access to services. In the municipalities outside the Kathmandu Valley, more than ten per cent of the population is more than 30 minutes from the nearest health post, commercial bank, and market (Table 5).

<table>
<thead>
<tr>
<th>Towns</th>
<th>Nearest health post (%)</th>
<th>Nearest bank (%)</th>
<th>Nearest primary school (%)</th>
<th>Nearest market (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kathmandu Valley municipalities</td>
<td>6.9</td>
<td>0.2</td>
<td>0.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Other municipalities</td>
<td>13.8</td>
<td>21.9</td>
<td>1.6</td>
<td>18.2</td>
</tr>
</tbody>
</table>


The social surveys for STIUEIP confirmed the need to expand the road networks in the project municipalities. Outer neighbourhoods have the worst existing conditions, and most neighborhoods highlight the need for bitumen paved roads (see Appendix B).

3.1.2 Poor road surfaces

Outside the Kathmandu valley, only a small proportion of municipal roads are sealed (Table 6).
Table 6  Road coverage in selected towns

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Population 2001</th>
<th>Total road (km)</th>
<th>Annual growth of the motorized vehicles</th>
<th>% of BT road against total road</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amargadhi</td>
<td>18,390</td>
<td>54.0</td>
<td>Mini, dozer/trunk</td>
<td>185.0</td>
</tr>
<tr>
<td>Baglung</td>
<td>20,852</td>
<td>65.8</td>
<td>Car, jeep/van</td>
<td>34.0</td>
</tr>
<tr>
<td>Bharatpur</td>
<td>89,323</td>
<td>458.7</td>
<td>Pick up</td>
<td>51.0</td>
</tr>
<tr>
<td>Biratnagar*</td>
<td>166,674</td>
<td>720</td>
<td>Micro bus</td>
<td>185.0</td>
</tr>
<tr>
<td>Birendranagar</td>
<td>31,381</td>
<td>76.1</td>
<td>Tempo</td>
<td>51.0</td>
</tr>
<tr>
<td>Birgunj</td>
<td>112,484</td>
<td>280.8</td>
<td>Motor bike</td>
<td>185.0</td>
</tr>
<tr>
<td>Butwal</td>
<td>75,384</td>
<td>250.0</td>
<td>Tractor</td>
<td>51.0</td>
</tr>
<tr>
<td>Dhangadi</td>
<td>67,447</td>
<td>334.0</td>
<td>Others</td>
<td>185.0</td>
</tr>
<tr>
<td>Dhankuta</td>
<td>20,668</td>
<td>57.5</td>
<td></td>
<td>51.0</td>
</tr>
<tr>
<td>Dharan</td>
<td>95,332</td>
<td>192.0</td>
<td></td>
<td>51.0</td>
</tr>
<tr>
<td>Dhulikhel</td>
<td>11,521</td>
<td>36.0</td>
<td></td>
<td>51.0</td>
</tr>
<tr>
<td>Hetauda</td>
<td>68,482</td>
<td>181.2</td>
<td></td>
<td>51.0</td>
</tr>
<tr>
<td>Nepalganj</td>
<td>57,535</td>
<td>83.2</td>
<td></td>
<td>51.0</td>
</tr>
<tr>
<td>Siddarthnagar</td>
<td>52,569</td>
<td>107.0</td>
<td></td>
<td>51.0</td>
</tr>
</tbody>
</table>

Source: Municipality Profile of Nepal, 2008  
*Source: Periodic Plan of Biratnagar

### 3.1.3 Rapid growth of the vehicle population

The numbers of vehicles in Nepal are increasing much faster than the population. Towns in Nepal are particularly congested with vehicles operating over a very limited road networks. The growth rate of vehicles in Nepal is presented in the table below. With the given mode of vehicle registration on zonal basis it was not possible to come up with the vehicle registration in each municipality. The data showed that the compound annual growth rate of vehicles is over 13 per cent (Table 7).

Table 7  Annual growth of the motorized vehicles

<table>
<thead>
<tr>
<th>Year</th>
<th>Bus</th>
<th>Minibus</th>
<th>Crane/ dozer</th>
<th>Car/ jeep/ van</th>
<th>Pick up</th>
<th>Microbus</th>
<th>Tempo</th>
<th>Motor bike</th>
<th>Tractor</th>
<th>Others</th>
<th>Total vehicles registered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989/90</td>
<td>2,489</td>
<td>1,464</td>
<td>7,969</td>
<td>23,050</td>
<td>2,359</td>
<td>32,776</td>
<td>6,169</td>
<td>102</td>
<td>76,375</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990/91</td>
<td>458</td>
<td>226</td>
<td>800</td>
<td>1,893</td>
<td>856</td>
<td>4,954</td>
<td>788</td>
<td>1,549</td>
<td>87,902</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991/92</td>
<td>413</td>
<td>148</td>
<td>1,524</td>
<td>2,115</td>
<td>1,207</td>
<td>8,154</td>
<td>548</td>
<td>358</td>
<td>102,369</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992/93</td>
<td>606</td>
<td>185</td>
<td>1,491</td>
<td>2,266</td>
<td>62</td>
<td>7,608</td>
<td>262</td>
<td>381</td>
<td>115,230</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993/94</td>
<td>1,168</td>
<td>77</td>
<td>1,740</td>
<td>3,049</td>
<td>154</td>
<td>8,653</td>
<td>1,396</td>
<td>372</td>
<td>131,839</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994/95</td>
<td>850</td>
<td>83</td>
<td>1,629</td>
<td>3,043</td>
<td>241</td>
<td>9,401</td>
<td>1,814</td>
<td>353</td>
<td>149,253</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995/96</td>
<td>486</td>
<td>82</td>
<td>1,151</td>
<td>5,261</td>
<td>117</td>
<td>13,855</td>
<td>2,183</td>
<td>58</td>
<td>172,446</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996/97</td>
<td>608</td>
<td>175</td>
<td>907</td>
<td>2,993</td>
<td>185</td>
<td>12,633</td>
<td>1,257</td>
<td>352</td>
<td>191,556</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997/98</td>
<td>899</td>
<td>130</td>
<td>1,291</td>
<td>4,139</td>
<td>344</td>
<td>12,306</td>
<td>1,265</td>
<td>51</td>
<td>211,981</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998/99</td>
<td>872</td>
<td>19</td>
<td>978</td>
<td>2,507</td>
<td>388</td>
<td>17,090</td>
<td>2,248</td>
<td>37</td>
<td>236,120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999/00</td>
<td>494</td>
<td>122</td>
<td>829</td>
<td>3,647</td>
<td>789</td>
<td>19,755</td>
<td>2,542</td>
<td>102</td>
<td>264,400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000/01</td>
<td>1,203</td>
<td>250</td>
<td>1,271</td>
<td>5,152</td>
<td>232</td>
<td>29,291</td>
<td>3,519</td>
<td>77</td>
<td>305,395</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001/02</td>
<td>868</td>
<td>475</td>
<td>1,798</td>
<td>4,374</td>
<td>248</td>
<td>38,522</td>
<td>3,189</td>
<td>86</td>
<td>354,955</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002/03</td>
<td>432</td>
<td>298</td>
<td>1,212</td>
<td>2,906</td>
<td>581</td>
<td>232</td>
<td>17</td>
<td>29,404</td>
<td>2,485</td>
<td>43</td>
<td>392,565</td>
</tr>
<tr>
<td>2003/04</td>
<td>732</td>
<td>237</td>
<td>1,477</td>
<td>7,079</td>
<td>478</td>
<td>884</td>
<td>16</td>
<td>26,547</td>
<td>2,191</td>
<td>58</td>
<td>432,264</td>
</tr>
<tr>
<td>2004/05</td>
<td>752</td>
<td>285</td>
<td>1,592</td>
<td>4,781</td>
<td>584</td>
<td>48</td>
<td>31,093</td>
<td>1,374</td>
<td>21</td>
<td>472,795</td>
<td></td>
</tr>
<tr>
<td>2005/06</td>
<td>1,528</td>
<td>663</td>
<td>2,263</td>
<td>45,114</td>
<td>36</td>
<td>66</td>
<td>60</td>
<td>45,410</td>
<td>635</td>
<td>0</td>
<td>528,570</td>
</tr>
</tbody>
</table>
Vehicles registered at year end

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Two-Seat</th>
<th>3-Wheel</th>
<th>4-Wheel</th>
<th>Motorbikes</th>
<th>5-Wheel</th>
<th>6-Wheel</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007/08</td>
<td>17,842</td>
<td>6,904</td>
<td>36,794</td>
<td>93,266</td>
<td>3,419</td>
<td>1,935</td>
<td>7,353</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.5%</td>
<td>1.0%</td>
<td>5.2%</td>
</tr>
<tr>
<td>2006/07</td>
<td>982</td>
<td>477</td>
<td>1,730</td>
<td>3,015</td>
<td>390</td>
<td>111</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>48,704</td>
<td>1,558</td>
<td>1,515</td>
</tr>
</tbody>
</table>


53 About 70 per cent of the vehicles are now motorcycles. Most of the vehicles operate in urban areas.

54 In addition to motorized vehicles, there are many non-motorised vehicles on urban roads, especially outside the Kathmandu Valley.

3.1.4 Inadequate maintenance

55 Road operation and maintenance is another area that needs to be considered while implementing urban road improvement. Of all the 58 municipalities, only larger municipalities have road maintenance section. However they are not equipped with necessary equipments nor are there trained human resources. Though both construction and maintenance works can be done by hiring private contractors, municipalities need to raise their capacity in comprehension and supervision of construction of roads and routine maintenance requirements.

3.1.5 Roads hierarchy in the three selected towns

56 Along with the development of roads, hierarchy of roads is becoming important from an urban management point of view. Among the three municipalities, only Biratnagar has a road map with a hierarchy. Even then, there is still no justification for the basis of this hierarchy. Moreover none of the municipalities have developed any road management policies based on the hierarchy of roads. The only use of this hierarchy may be seen in charging property tax. Therefore, it is suggested that the concerned authority in Nepal should establish urban road standards along with their hierarchy.

57 For the use of this project, following hierarchy of urban roads may be suggested:

I. National Strategic Road: Roads categorized under Strategic Roads Network by the Government of Nepal.

II. Urban Link Road: Major urban roads other than national strategic road that links major urban centres within as well as beyond the city. This road should have RoW 12 m or more so that the road will include at least two-lanes with footpaths on both sides.

III. Urban Secondary Road: Roads linking various settlements serving urban residential road may be categorized into Urban Secondary Roads. These roads will have at least 8 m RoW and are mostly blacktopped roads.

IV. Other roads: Roads other than above with lower hierarchy are considered in this category. It is mostly dominated by Urban Residential Roads. Roads linking minor centres in the hinterland may also be included in this category.

58 In the absence of detailed survey of existing roads, secondary information has been used to develop road hierarchy map of the three towns which are presented in the appendices.

3.1.6 Environmental impacts

The growth of urban traffic has had significant environmental impacts. The main impacts are:

- Air pollution
- Noise
- Community severance
- Safety
Between 1993 and 2005, the contribution of road dust re-suspension to TSP in Nepal increased eight fold as compared with a five-fold increase in the number of registered vehicles.\(^1\) In 2005, vehicle emissions were responsible for 37 per cent of the total PM\(_{10}\) and the main source of air pollution in the valley.\(^2\) Resuspended dust from vehicles accounted for 25 per cent of the PM\(_{10}\).

Traffic noise has significant health impacts close to main roads in Nepal.\(^3\) Busy highways pass through the middle of each of the STIUEIP towns. These highways also cause a degree of community severance because of the difficulty of crossing them at some locations.

Road accidents are increasing in Nepal due to increased vehicle fleet and speed. In 2005/2006 they killed 617 people and injured more than 3,000 people.\(^4\)

### 3.2 Related projects

There are several road projects either under construction or planned for consideration that have a bearing on STIUEIP.

#### 3.2.1 Birgunj: Sub-regional Transport Facilitation Project

The ADB-sponsored South Asia Sub-regional Economic Cooperation (SASEC) program comprising Bangladesh, Bhutan, India and Nepal developed action programs for sub-regional economic cooperation in six priority sectors: transport, energy, tourism, environment, trade, investment and private sector cooperation and information and communication technology. The Transport Working Group under the SASEC program identified six major sub-regional transport corridors, two involving Nepal, that need to remove institutional and physical impediments (choke points) to enhance sub-regional transport connectivity and economic integration. Birgunj lies on one of these transport corridors, Kathmandu– Birgunj–Raxaul–Kolkata/Haldia.

The Birgunj Inland Clearance Depot (ICD)\(^5\) access road sub-project includes improvement and construction of about 12.4 km of road involving acquisition of 54.65 ha of land. The sub-project has two types of road cross-section. The new alignment of the bypass section of the road passes from Parwanipur to Padam road to join the ICD on the west side of Birgunj will have 50 m right-of-way to allow for future expansion. However, the construction activity is being carried out on within 18 m to 20 m. In the case of the Padam Road section (about 600 m) and Jeetpur section (about 1,727 m) it is designed to be of a 30 m width.

The proposed alignment covers a major marketing and industrial area in Jeetpur bazaar and Parwanipur (from where the bypass starts for the ICD). Between Jeetpur and Parwanipur there is a portion of Tribhuvan highway and both are part of the industrial area. Similarly, there is also an emerging scope of market area development along Padam Road near the ICD. In this sense, the existing market facility, access to the market and future scope of market development in the area is obvious in the sub-project area after the implementation of the project.

The MPPW is the Executing Agency and DoR the Implementing Agency for the Project.

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\(^5\) The United Nations Economic Commission for Europe defines an Inland Clearance Depot as follows: A common user facility, other than a port or an airport, approved by a competent body, equipped with fixed installations and offering services for handling and temporary storage of any kind of goods (including containers) carried under Customs transit by any applicable mode of transport, placed under Customs control and with Customs and other agencies competent to clear goods for home use, warehousing, temporary admission, re-export, temporary storage for onward transit and outright export. The definition applies also to synonyms like Dry Port.
3.2.2 Biratnagar: construction of bypass or ring road,

67 The Tenth Plan included NRs 44.2m for construction of a bypass for Biratnagar. However, it was not built and the TYIP did not include it, Biratnagar municipality has since adopted a far more ambitious proposal for a ring road in its Periodic Plan (see Appendix A, p. A-3). The periodic plan envisaged that the DoR would support construction of this road. Recently, this responsibility is given to the Morang Divisional Office of DUDBC. DUDBC is planning a 30 to 40 km ring road encircling Biratnagar. Project office is established and staff recruitment is underway. It envisages a 4-lane road, at least 20 m wide with footpaths on both sides. It hopes that the land will be made available through land pooling approach where there will be a 90 m width of developed land on both sides followed by a 11 m service lane and an additional 30 m wide plot next to the service lane. The detailing of the design will be finalized after consultation with local people which will determine the scope of work. The ring road will pass through the municipality in the south and west while the rest of the alignment will lie in adjoining VDCs. Consulting firm Cemeca has been hired for detail feasibility study of upper 15 km stretch. As per the project office information, the division is going to invest NRs 12.5m for earth filling in selected 15 km length this fiscal year. In previous years the division has already invested in gravelling 3.8 km length in Tankesunwari VDC which will enter Biratnagar at Khahi when they complete an additional 3 km of gravelling.

3.2.3 Upgrading of Siddhartha Highway from Butwal Chauraha to Gol Park

69 Rupandehi Division of DoR has considered two important projects related to urban part of Siddhartha Highway and Mahendra Highway. The Department is planning a bypass of Mahendra Highway from Butwal Chauraha towards west crossing Tinau and rejoining at Belbas in the north. This bypass road would help to divert some of the vehicles plying the Mahendra Highway from Butwal centre, although there have been no traffic studies. This year the same division is going to upgrade the Pushpalal Chowk – Butwal Chauraha stretch by adding lanes. The present two-lane road will be widened to a four lane road with a median in between. This fast track will be separated by a curb stone from non-motorized vehicles like rickshaw and bicycles. There is a proposal for a 1.5 m footpath on both sides of the road. It is expected that these improvements will reduce traffic accidents in the stretch and give greater security to pedestrians.

3.2.4 Footpath construction in Amarpath, Butwal

71 Butwal municipality is getting a grant from the Town Development Fund (TDF) for footpath construction piggy-backed with its loan for an environmental project. The municipality is preparing to construct a 500 m footpath on both sides of Amarpath, one of the major market streets. The municipality is investing NRs 7.5m, of which it will receive NRs 6m from TDF. The right-of-way of Amarpath is 12.5 m. The municipality is proposing to construct 1.5 m footpath on each side. Since this is one of the crowded streets of Butwal, the size of the footpath needs to be based on some traffic study, and land use. This is a challenging task as the street already experiences indiscriminate movement of vehicles and parking.

3.2.5 Proposed bypass of Mahendra Highway in Butwal

73 Considering the congestions created due to urbanization, in the road stretch from Butwal Chauraha to Tinau Bridge and beyond, DoR has planned a bypass for the Mahendra Highway. According to DoR, a road has been proposed which will move west from Butwal Chauraha and crosses the Tinau and Danab rivers and follows the northern direction to meet existing Mahendra Highway at Belbas. This bypass will be a great relief to Butwal municipality as well as DoR as the bypass will encourage a smooth flow of vehicles.

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3.2.6 Bus terminals in the three towns

All the three towns have bus terminals located near to the city centre. Birgunj has moved the terminal from the city core to the bypass road. The terminal pavement is damaged and requires rehabilitation. With the poor drainage in the area, the bus terminal becomes a water pool during the monsoon, compelling the buses to operate from outside. Biratnagar Bus Terminal has fewer problems. However, the terminal lacks passenger facilities. Butwal Bus Terminal is relatively new and well-maintained. This terminal also lacks facilities other than terminal platform. All three municipalities have approached TDF for assistance. TDF has already finalized the detail design of Butwal and Biratnagar whereas the Birgunj study is in its final stages. The estimated cost of investments are NRs66.7m (as of Jan 2008) and NRs257.6m (as of June 2009) for Butwal and Biratnagar, respectively.

3.3 Selection of priority investments

3.3.1 General approach to identifying priority investments

The investment needs for municipal roads in Nepal are huge. Normally, a traffic and transport master plan would be a prerequisite for major investment in new or improved roads in a large municipality. None of the three STIUEIP towns have such a plan. The lack of data is such that preparation of a master plan would require extensive traffic surveys and engineering surveys. Even with this data, though, preparation of a plan would be difficult because each of the three towns is subject to major uncertainties regarding the SRN. Surveys would not remove these uncertainties. Given the low level of funding available for investment in the urban road networks, preparation of a master plan is unlikely to be a worthwhile exercise.

Therefore, three major approaches have been taken in selecting roads and footpath projects:
- Reinstating and selectively upgrading roads that are excavated for laying drains and sewers;
- Upgrading roads necessary to provide access to solid waste processing sites or wastewater treatment plants to be constructed under STIUEIP; and
- Mainstreaming the poor by upgrading lanes in their neighbourhoods.

Responsibility for SRN rests with DoR. Therefore investment on such roads is limited to traffic control and pedestrian facilities. It is expected that management and further improvements on these roads will come from the respective divisional offices of DoR.

The three selected towns for STIUEIP are major towns at strategic locations. This has attracted not only economic activities in the town but also large number of poor population that are in search of livelihood. Therefore these towns have relatively large number of slum and squatter population. The largest slum population share is in Butwal followed by Biratnagar and Birgunj.

Inclusion of the poor and deprived is one of the major political issues in the changed context of Nepal. Therefore, this project has considered one of the important selection criteria that address the requirements of the poor and vulnerable. Most of the projects proposed in this TA have direct as well as indirect benefits to the poor. However, some specific projects are allocated for the improvement of their neighbourhoods and their improved access. Under neighbourhood area improvement surface improvement of the neighbourhood and proper drainage are considered. Other soft activities like solid waste management, waste water management and access to water have been considered in respective chapters.

3.3.2 Road conditions in Biratnagar

Biratnagar municipality has a relatively good internal road network. It is served by two parallel north south roads which criss-cross at Road Sesh Chowk. The Rani Path followed after the Main Road in the south was the major road of Biratnagar of this link. The construction of the Koshi Highway (also known locally as the “Dharan Road”) is the main trunk highway which now serves...
as the India link for heavy vehicles. Rangeli Road followed by Kesaliya Road form the strategic east-west linkage. All other roads in Biratnagar may be categorized as secondary urban roads.

81. Recently, the DoR has upgraded the Rangeli Road up to the border of the municipality. This strategic road is linking eastern transport vehicles from Jhapa District and beyond and is a parallel southern road to the Mahendra (East-West) Highway. Passing to/from this road from/to the centre of the town, compel heavy vehicles to ply through narrow urban roads which creates significant problems such as congestion, pollution, safety, and break-up of the road surfaces which were not originally designed to carry such heavy traffic.

82. The Biratnagar municipality has developed a strategic approach for diverting these vehicles through a proposed ring road. To overcome the problem, the Periodic Plan of Biratnagar has followed the DoR proposal to have a Ring Road in Greater Biratnagar. The Ring Road starts from the Rangeli Road in neighbouring Katahari VDC, links southern VDCs and rejoins Biratnagar from the south to provide a new north south arterial road on the western part of the city. This ring road is expected to connect proposed Special Economic Zone with the ICD. As one of the major gateways for India, there is a plan to construct an 18 km Jogbani to Biratnagar rail link that is expected to terminate at the proposed dry port. After the construction of these strategic infrastructures, it is likely that there will be huge pressure created on existing infrastructure. Therefore, the proposed ring road is essential for the further expansion of the activities in Biratnagar. Since these are national level infrastructure initiatives, DUDBC Divisional Office Morang is considering these needs in its investment plan.

83. Roads in the city core are better maintained, although many of the secondary and tertiary roads are gravel. In the absence of proper drainage, however, these roads become periodically inundated in monsoon season which causes substantial road surface damage. Many of these urban connecting roads demand frequent maintenance due to the over-loading by heavy trucks which are often plying with loads beyond the design capacity of these roads. From this aspect it follows that urban roads are generally in need of upgrade, particularly if the ring road is not soon constructed. Roads like Sahid Marg, Redcross Chowk, and the Pokhariya part of the Main Road, therefore require upgrading to absorb these vehicles. The Main Road (Pokhariya) is damaged in most parts and demands immediate improvement, particularly as this road serves as major link to the north.

3.3.3 Road conditions in Birgunj

84. Birgunj municipality has a relatively good road network in its built up area. The city is primarily served by two parallel north south roads: Main Road and Bypass Road, linking Raxaul (India) to the rest of the country in the north via Tribhuvan Highway. As the Birgunj core is a planned settlement, there is a good network of urban roads. However, as the city is growing towards east, there is a need of better road links, in the absence of which there is a good chance of creating slum. The Road Master Plan of Birgunj (1990) rightly suggested that there will be need of at least four lanes additional north south roads in next 15 years to cater future population growth. After the master plan study the major improvement done in Birgunj is upgrading of the bypass road with two-lane black topping and improvement of Kalaiya Road. Therefore, there is a tremendous pressure on the existing roads.

85. Full utilization of the ICD would reduce the movement of heavy vehicles in Birgunj. A road connecting ICD to the national highway is under construction with the support of ADB (section 3.2.1). Moreover the ADB road link from the ICD will not only relieve traffic in the northern part of Birgunj but will also bring relief to the by the transfer of trade from the road to rail. While the ICD has been in operation since 2004, it is still operating at only 25 per cent of its capacity because of various shortcomings in the implementation of the transit treaty with India.

86. The bypass road is not constructed to its full width. The shoulder and the remaining space have attracted activities that are disturbing the thoroughfare in the bypass road. The road connecting to the bypass in the south is in chaos because of the poor management of traffic. Raxaul has a population of 41,347 (as of 2001). The increasing population on both sides of the border will trigger
more traffic. Moreover, the Tribhuvan Highway is part of the Asian Highway network. These conditions will trigger more traffic in this stretch especially in heavy through vehicles. Since these developments are of national interest and Tribhuvan Highway (including bypass road) is under central government authority, the government needs to widen the bypass road as per the requirements of the fast track link, for which there is adequate space available. Notwithstanding, ownership and management of all strategic roads including the highways and feeder roads are under the authority of DoR.

87 The busiest road in Birgunj is the main road. This is part of Tribhuvan Highway, which is now completely urbanized and has become the main street of the town. Most of the inner roads in Birgunj are paved and have side drains. These are in relatively good in condition. The city is expanding towards the east. This area however lacks road infrastructure. Recently, the municipality has upgraded a few kilometers of the road along a former rail track in the central area. No other roads are under consideration for development. Moreover, there is a need to upgrade radial roads linking the municipality to hinterland settlements that are supporting the economy of Birgunj through human resources, agricultural products and raw materials for the industries.

3.3.4 Road conditions in Butwal

88 Lying on the Chure range, Butwal is the gateway of western Nepal. The strategic importance prevails as the two major highways (viz. Mahendra Highway and Siddartha Highway) intersect the city. Having a relatively cooler climate compared southern towns like Siddartha Nagar and others, there is an attraction to this city due to its strategic location. The merger of Siddhartha Highway and Mahendra Highway for 1.4 km brings all commuters through this city. Thus, the highway has become main urban road catering to other urban streets ending on this road. Moreover, the visitors to Lumbini (the birth place of Buddha) are also attracted to this foothill town for their night halt. The settlements of Butwal are residing on the either sides of the highway. Therefore, there is a challenge to tackle the confronting interest of highway road with city streets. This is more pronounced compared to Biratnagar and Birgunj where the cities enjoy bypass roads to a greater extent.

89 The inner roads in the core city of Butwal are relatively well managed. The municipality reported that most of these roads are constructed under community participation, which is unique compared to the other two municipalities. Up to half of the total cost is shared. Utilising natural drainage, side drains are constructed in the core city of Butwal. However, there is an absence of such drains in the newly expanding areas like Sukkha Nagar, Deepnagar and beyond. Monsoon downpours often flood these streets, damaging the pavement. Frequent inundation of a section of the Siddhartha Highway surrounding Milan Chowk is notorious as it disrupts the traffic flow on the highway. Most of the roads in the urbanized area of Butwal are blacktopped. In many roads, the central 4 m to 6 m is paved and the shoulders are left without side drains. This situation also attracts land encroachers to invade the unused road space in some places. Therefore, there is a need to clearly demarcate the right of way of the roads. The road survey showed that most of the surface of these roads is already in poor condition, expecting that during the implementation time of this project, they will warrant resurfacing.

3.4 Basis of design

90 Design of roads and footpaths has considered Urban Roads Standards developed by then DHUD under MSUD Project (1989). In most of the cases where reinstating of roads is required

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8 Established in 2005 under the Intergovernmental Agreement on the Asian Highway Network, the Asian Highway Network consists of highways of international importance within Asia, including highway routes substantially crossing more than one sub-region, highways within sub-regions including those connecting to neighboring sub-regions, and highways that provide access to: (a) capitals, (b) main industrial and agricultural centers, (c) major air, sea and river ports, (d) major container terminals and depots, and (e) major tourist attractions. The Agreement established standards for roads that are part of the network, but these standards do not apply to urban sections of the roads such as those within Birgunj and Butwal municipalities.
existing road geometry is followed. In other cases the width of roads are followed as per the Urban Road Standard. On the sectors of highways that are passing through urban areas and have urban traffic characteristics, segregating pedestrians from highway vehicular movement is considered.

### 3.4.1 Road pavement

Considering the busy service road, roads are proposed with the capacity of 10 ton axial loading. Black topped road surface is proposed to be finished by asphalt concrete layer. The cross section of the road is given below.

![Typical Pavement Formation](image)

### 3.4.2 Footpath design

For the footpaths, the surface is prepared by compacting the earth, 150 mm compacted sand (or stone dust) and laying of M20 PCC interlocking tiles of 65 mm thickness. The width of the footpaths depends on road category as shown in the respective drawings. The consultants attempted to locate storm water drain (or sewer lines) below the footpaths wherever applicable. This will reduce the overhead load on cover slab of the drain, brings ease in maintenance works, there will be less disruption of traffic during maintenance, and a possible reduction in the cost of footpath construction if the covering slab of the drain serves as the footpath. However, there will be need for parallel side drains on each side of the footpath.

![Footpath Design](image)

### 3.4.3 Road safety measures

The GoN has established a Traffic Engineering and Safety Unit (TESU) in the DoR. Among other initiatives, TESU has prepared a Traffic Signs Manual and a Road Safety Audit Manual. The design of the STIUEIP roads should be consistent with these manuals. The Road Safety Audit Manual lists the following safety requirements for urban roads:

- Side drains must be covered.

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Shoulders may need to be widened on sections where there are many pedestrians and non-motorised vehicles.

Footpaths, parking areas and service roads must be provided in the larger towns.

Layout and control of intersections is to be simple and obvious.

Essential signs are to be provided,

A centre line is to be marked on all roads wider than 5.5 m.

The existing SRN roads passing through the project municipalities generally do not fully conform to these requirements.

The Road Safety Audit Manual identifies a range of safety features that the design should consider, including lighting, guard rails, pedestrian refuges and so on. Highways are particularly accident prone in cities because of mixing of several types of traffic including pedestrians. Other measures for traffic management may not be appropriate as highway traffic needs uninterrupted flow. Traffic lights and other same level management may not solve the problem. It may be necessary to have several overhead bridges to segregate pedestrians from other traffic. The detailed design stage should consider the priority safety features to incorporate the design.

3.4.4 Road side greenery

For greenery on roads, particularly on highways like Siddhartha Highway and Dharan Road, greenery is provided next to the service road and footpath segregating the traffics. The width of the green belt is kept flexible as per the width available, which however should not be less than 2 m.

3.4.5 Rain inlets

Rain inlets are normally provided at every 20m interval or on each side of the road crossings. These inlets will collect storm water from road surface and footpaths and feed into storm water drain laid parallel. In case of storm water drain laid at the centre of the road, the inlets will be connected to the drain using RCC pipes.
3.4.6 Road cross sections

As per the *Urban Roads Standards*, the following road cross sections are adopted and roads that are planned for reinstating after drainage installation are followed as per the existing geometry of the road.
3.4.7 Reinstatement of road surface

98 Learning from the experience of UEIP, reinstating part of the width of the road that is excavated for drainage laying did not work properly due to technical reasons as well as social expectations. Technically, when narrow lanes are excavated for drains, there will be little width left on both sides making the road surface undulate. This will start breaking reinstated layers from sides due to poor surface in remaining part. Furthermore, the road surfaces in the cities of Nepal are built with thin finishing layers which are likely to wear out quickly. In the case of gravel or earthen surfaces, the main culprit for the failure of the drains is the washing of material from the road surface into the drains. Therefore, in such cases, it is proposed that the surfaces are upgraded to blacktop.

99 For the practical purpose, reinstating excavated part of road is costed in drainage construction. The incremental road surfacing is only costed under roads and footpaths heading.

3.4.8 Neighbourhood area improvement in poor settlements

100 The design basis for the neighbourhood area improvement is to provide appropriate access to poor communities. Surface improvement of their lanes and side drains for storm water release are considered. Heavy vehicular movement is not considered in their neighbourhoods. Therefore, instead of designing roads for heavy vehicles, surface improvement are proposed with appropriate compaction of earth, laying of sand course and surface finishing by standard M20 PCC interlocking tiles. Necessary slopes will be maintained for drainage.
PROPOSED NEIGHBOURHOOD ACCESS IMPROVEMENT IN POOR SETTLEMENTS

WIDTH VARIES

300 DIA NP3 HUME PIPE

INTERMITTENT RAIN INLETS AT A
4 Outputs

4.1 Road and footpath improvement in Biratnagar

4.1.1 Reinstatement of road surface

The major STIUEIP component for Biratnagar is the Drainage and Sanitation one. There will be considerable works on roads that are associated with the drainage and sewerage. Footpaths will be reinstated wherever necessary. Necessary rain inlets will be constructed to arrest surface runoff as quickly as possible. Total length of road surface improvement work will be 53.2 km. Of the total length, black topped road reinstating works covers 30.66 km whereas upgrading the gravel road to black topped includes 22.54 km.

4.1.2 Construction of footpath and greenery in Dharan Road

The urban section of the Koshi Highway (Dharan Road) has a 30 m right-of-way. The road has two traffic lanes at the centre separated by a median of 1 m width, and a service lane on each side. Some 5 m space is available next to the property line which however is uneven from place to place, due to encroachment. It is proposed to improve the urban section of the road by adding footpaths and urban greenery. A typical plan and cross section is presented below. It is proposed under this project to construct the footpath and greenery on both sides of the road, in conjunction with areas that will be excavated for the drains and sewer lines. The length from Bus terminal to Bargachi Chowk (2 km) is proposed for this improvement.

Considering the high rate of accidents in highways passing through urban areas, overhead pedestrian bridges are proposed in Dharan Road. Two overhead bridges are proposed on this road which may be increased as per need in the future. The two locations proposed for the bridges are south of the crossing of Kesaliya Road and at the bus terminal, which however needs further detailing.
4.1.3 Neighbourhood Area Improvement in poor settlements of Biratnagar

In Biratnager, the main settlement is surrounded by clusters of poor settlements like Basta, Thani, Darai, Dom settlements, etc. These areas will be enhanced by upgrading the lanes and drainage in the area.

4.2 Road and footpath improvement in Birgunj

4.2.1 Improvement of Access Road (next to the bypass road)

Two major roads are in need of consideration for the future expansion of the city: the Access Road and the Canal Road (refer to Appendix B). The access road is the inner road designated for local access during the land development next to the Bypass Road with the RoW of 12 m. The Town Development Committee allocated this space for the access to the developed plots on both sides, but could not complete the road. This width is encroached in some places which need to be cleared. The road, except for few hundred meters, remains unfinished. During the rainy season these road space works as drainage canal. The drainage Div 12 and Div 13 is planned for the evacuation of the storm water in this area underneath this road. Therefore a two-lane road is proposed under this project with the Category III Access Road R1 as per the MSUD Urban Road Standard. The total length of this road will be 4.42 km linking Pratima Chowk in the north to Inarwa Road in the south. It is proposed that a parallel storm water drain will follow in each footpath proposed.
### 4.2.2 Construction of the Canal Road

Considering the other two drains in priority in the municipality i.e. Div 12 A and Div 13A, a 4-lane road is proposed along the disused irrigation canal. It is expected that this road will further attract new development in Birgunj and reduce sprawl in other parts of the city. The canal has an easement of at least 12 m on average. To accommodate a 4-lane road (i.e. 20 m wide), adjoining landowners would need to contribute additional land. 5 m depth of land is expected from the land owners of either side of the road, which will boost the value of land compensating the contribution. It is proposed that this road will be of Category II Connector Road C2 as per the MSUD Urban Road Standard. With the funding limitations, it will not be possible to construct the entire length of the road. Therefore it is proposed to construct a central part of the road starting parallel to Pratima Chowk and ending at Inarwa and bypass road junction. Total length proposed for construction is 6.34 km. For the remaining length it is proposed to establish road alignment for future expansion provision. To keep the roads linked properly, Pratima Chowk and Inarwa Road will be linked by the road of same width (i.e. 20 m). Furthermore, a network of road may be planned and laid in the field so that the pressure of the urban land need can be guided. The 1990 Road Master Plan may be considered as a base for these expansions.

There will be four east-west links proposed to feed the Canal Road and Access Road from the hinterland and the bypass road. These are existing roads upgrading to black topped. The total length of these roads is 4.18 km.

### 4.2.3 Reinstating existing roads

Apart from these two major roads, five linking roads connecting the bypass road to eastern part of the city will be reinstated after laying Div 12 and 13 on it. The total length of these roads will be 4.18 km.

In the inner city of Birgunj, only some existing drains are laid from the centre of roads. Therefore, it is estimated that improving the drain will demand about 30 per cent of roads reinstatement. Total length considered for reinstating is 5.7 km.

### 4.2.4 Access to treatment plant and solid waste processing site

It is important that there be good road access to the wastewater treatment plant and to the solid waste processing site. In the case of the solid waste processing site, trucks carrying waste should not have to pass through narrow or congested streets. To the extent possible, trucks should only travel on sealed roads. The project includes the essential road works to achieve these objectives.

### 4.2.5 Neighbourhood area improvement in poor settlements of Birgunj

In Birgunj, the main settlement is surrounded by clusters of poor settlements like Chhapkaiya, Inarwa, Musruwa, Dom settlements, etc. These areas will be enhanced by upgrading
the access roads and drainage in the area as per the requirements. This work will facilitate solid waste collection.

4.3 Road and footpath improvement in Butwal

4.3.1 Proposed upgrading of Siddhartha Highway

The stretch of Siddhartha Highway from Butwal Chauraha to Golchowk has the characteristics of an urban road. Accidents are frequent due to the mixing of various traffic: from highway vehicles to pedestrians. Consideration of the traffic need segregation of different modes of traffic is required in this stretch. Therefore, the divisional office of DoR has considered an upgrading project from the Fiscal Year 2009/10. Under this initiative, the highway will be separated by a 2 m wide median followed by two high speed lanes on each side. Curbs will separate these lanes from the rickshaw lane on each side, and 1.5 m footpaths are proposed for each side of the road. The total width on each side of the road proposed for these facilities in 12.7 m on each side. It is expected that these guided flow of traffic will reduce the accident rates and increase the flow of traffic. Such recommendation can also be seen in the Integrated Action Plan that Butwal prepared in 1997. However, the design has not considered service lanes that are bound to the neighbouring streets on both sides of the road. Moreover, there is absence of storm water drains and its safe discharge to natural drains in the proposed design. Therefore STIUEIP may consider the following improvements over what the DoR has proposed.

![Diagram of proposed road layout](image-url)
This stretch of Siddhartha Highway has poor drainage. Therefore, STIUEIP has considered storm water drainage on both sides of the road from Pushpalal Chowk to Butwal Chauraha (refer drainage chapter). It is proposed to have drainage below the 3 m footpaths on each side followed by a green belt or parking lot of 4 m width. A rickshaw lane and service lane is provided next to it followed by a divider with greenery (refer drawing). Only restricted movement will be allowed to cross the highway by vehicles. For pedestrians, at least three overhead pedestrian crossings are proposed at Butwal Chauraha, Milan Chowk, and next to the bus terminal. This needs further detailing. The total length of footpath and greenery proposed for this road is 1.33 km on both sides.

In case of Mahendra Highway before Butwal Chauraha (Drain D) one side footpath (3 m wide) will be constructed above the drain. The length of footpath along with side drain will be 967 m.

4.3.2 Reinstating existing roads/footpaths

Considering relatively wider urban roads in Butwal, it is proposed to lay drains on one or both sides of the road leaving existing carriage way. Most roads in Butwal however are not constructed to the full width of the pavement and lack side drains. Therefore, it is proposed to complete the remaining surface by black topping after footpath space (average 1.5 m on both sides, total 3m). Considering the footpaths and side drains on both sides, the total length of reinstatement work will be 7.323 km.

As incremental work the central 5m (average) width of the same 7.323 km road will be resurfaced by asphalt concrete on newly laid base course.
4.3.3 Neighbourhood Area Improvement in poor settlements of Butwal

In Butwal, there are a large number of squatter settlements spread all over the city. Near to the main centre, the settlements are more compact and do not have environmentally favorable conditions. Therefore, area improvement works will be implemented in these areas as per the requirements.

4.4 Land acquisition

The project aims to work on roads and footpaths primarily in existing ones. Therefore land for roads is available. In the case of Birgunj for the Canal Road which is proposed for four lanes, the neighbouring land owners should be contributing 5 m on each side. There is a general practice in many cities of Nepal that land is contributed voluntarily as the adjacent land to the road gets the direct benefit. This however demands vigorous interaction with the community before the start of the project. It is expected that the municipality will negotiate with the community. If it fails, the road will be reduced to 12 m wide, Category III, Access Road as per the Urban Road Standard. Therefore, compulsory land acquisition is not required. In all other cases land acquisition is not required.

4.5 Traffic management

All three towns have mixed traffic on their roads. This includes pedestrians to heavy vehicles plying on the same road. In all these three towns, non-motorized vehicles, especially rickshaws, are dominant. In Birgunj particularly, push carts are popular. Birgunj and Biratnagar are the gateway towns of Nepal where as Butwal lies at the cross road of two major highways. Therefore, these towns are crowded with heavy vehicles. Since the town is residing on both sides of the highways, the situation is even more challenging. Godowns inside the city, particularly in Birgunj are yet another difficulty in evacuating the heavy vehicles from the city centre.

Municipalities are collecting traffic fee with the vehicle owners from the municipal area. Rickshaws are registered in their respective municipalities. Biratnagar has stopped registering new
rickshaw considering the number in the town. However, neighbouring village development committees (VDCs) are registering as new rickshaws which are running in the streets of Biratnagar. There is an absence of updated records for the amount of traffic in these towns.

Considering the traffic load, some roads in Biratnagar and Birgunj have introduced a one-way flow. In Butwal physical obstructions were installed to control heavy vehicles entering into the core. In part of highways in the core area of Butwal and Biratnagar separate lanes for rickshaws and bicycles were introduced, which however is not followed in general. Traffic police are the sole agency for managing the roads in these towns, and it is important to note that these policemen are not adequately trained on the management of traffic. Therefore, there is a need to support the traffic police in managing the traffic through a well thought out traffic plan. The municipalities need to be supported to build their capacity in designing and implementing traffic management plans at municipal level. Each municipality should establish a traffic management unit for this purpose.

4.6 Community awareness program

One of the culprits of road damage in Nepal is the digging of roads for maintaining underground services such as drains, cables, and water lines. In the case of the SRN, the DoR is rather strict on controlling such activities, and coordination with the Department will be important during project implementation. However, in the case of municipalities it is relatively loose. Moreover, from the experience of UEIP, roads are not owned by local people, leaving it as the responsibility of municipality. In the case of Butwal, where the municipality collaborates with local community for road surface improvement, there is some sort of co-ownership. Therefore, the project will promote awareness of the community and bring them to agreement with the governing regulations of road management before the initiation of road (and footpath) construction. Necessary regulations may be designed at the beginning of such activities. The project has allocated funds for community mobilization for this purpose.

The awareness programs will have the following objectives:

- Prevention of encroachments
- Prevention of construction of pavement crossings or other structures that block side drainage
- Encourage reporting
- Promote road safety

4.7 Reduced scope program

With the given financial limitations, some of the activities are proposed to be dropped. Caution was taken to reduce the impact to the extent possible so that the objectives are not affected. As road improvement is primarily based on corresponding drainage improvement, the roads that are dropped are associated with the dropped drains. In the case of Roads and Lanes, the following components are proposed to be reduced.

Biratnagar

Considering the wider distribution of proposed drainage system in Biratnagar, it is assumed that laying of primary drain will pave way to secondary drains in the future. Therefore most of the secondary storm water drains are proposed to be dropped from this project. The list of roads that are going to be dropped and their respective costs are presented below:
Table 8 Road List and Respective Cost

<table>
<thead>
<tr>
<th>Roads</th>
<th>Cost (NRs m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Resurfacing of existing roads after drainage laying</td>
<td>121.22</td>
</tr>
<tr>
<td>2 Upgrade Gravel Road</td>
<td>64.22</td>
</tr>
<tr>
<td>3 Footpath and side drain on one side of storm water drain</td>
<td>34.34</td>
</tr>
<tr>
<td>4 Pedestrian overhead bridge</td>
<td>15.00</td>
</tr>
</tbody>
</table>

Birgunj

Drainage 12, 13 and 12A, 13A are under the priority of local people. The roads over these drains are strategically important for the expansion of the city. However, in the given financial constraint, roads over storm water drain 12A and 12B are suggested to be postponed. In such a case, Canal Road and associated link roads are removed from this project.

Table 9 Birgunj Roads and Cost

<table>
<thead>
<tr>
<th>Roads</th>
<th>Cost (NRs m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Canal Road</td>
<td>169.10</td>
</tr>
<tr>
<td>2 Footpaths on Canal Road</td>
<td>51.05</td>
</tr>
<tr>
<td>3 Connection roads</td>
<td>18.40</td>
</tr>
</tbody>
</table>

Butwal

In December 2009, the GoN and Butwal municipality decided that there should be a water supply component in Butwal instead of the Drainage and Sanitation and Roads and Lanes components.
5 Operations and maintenance

5.1 Existing arrangements for operations and maintenance

Municipalities in Nepal have not historically dealt with road construction and management. Their responsibilities were limited to paving and management of narrow lanes and walkways. It is only in recent times that the municipalities have started investing on roads. However, within each of the project municipalities there is an absence of a separate section that directly takes the responsibility of municipal roads. At present, the unit responsible for roads is the Planning and Construction Section. Although there are civil engineers within this section, there are no persons that are specialized on roads, and those that are available are pre-occupied with several other kinds of municipal infrastructures. For the construction of major roads, municipalities hire consultants while for local roads and maintenance works the municipal engineers will do the job.

There is no method to record the condition of roads and lanes, the frequency of maintenance, etc; in other words the municipality does not maintain an inventory of its road status. In most of the cases, roads are constructed or maintained as per the request of local community. There is no maintenance plan, and nor are there specific regulatory provisions for the routine management of road in any of the three municipalities. It is observed that Butwal municipality is more progressive in raising community participation for the construction or maintenance of roads. Notably none of the three municipalities own any kind of road maintenance equipments and rely on contractors to do the work, which is generally in accordance with international practices.

5.2 General approach to operations and maintenance

Therefore, it is proposed to establish a separate section within each municipality to take specific responsibilities for roads and traffic control. This section is expected to identify and undertake:

- the civil works concerning roads and pavements;
- keep the routine records of such infrastructure;
- introduce and update traffic management plan;
- prepare regular maintenance plans for road and access; and
- monitor existing roads.

Moreover, this section will liaise with RBN for the fund management and with traffic police for the smooth operation of traffic. There is also a need of a separate software package for strengthening this section in each of the participating municipalities. This will include human resource development, development of roads and pavement management plan, and monitoring system of these infrastructures. Based on the plan, some maintenance equipments may be provisioned.

5.3 Specific arrangements for the project

At the Draft Final Report stage, the ADB and GoN through the Steering Committee requested PADECO to reduce the size of the project. Following final consultations with the municipalities, the road works under the project will include no road works in Butwal and only cover a small fraction of the total road length in the other two municipalities, 3.9 per cent in Biratnagar and 6.0 per cent in Birgunj. As these works are improvements rather than new roads, they will not increase the total maintenance burden. On the contrary, the reduction in flooding during the monsoon as a consequence of the drainage works should reduce the burden of road maintenance. This reduction in flooding should benefit in some degree most of the road network.
The municipal accounts classify most expenditure on roads as capital investment rather than maintenance. It is difficult to derive a figure for current annual maintenance expenditure. However, it is probably of the order of NRs8m in Birgunj and NRs11m in Biratnagar. Considering the total road length, the financial analysis assumes that the savings in maintenance costs from reduced flooding amounts to NRs0.6m in Biratnagar and NRs0.3m in Birgunj.
6 Cost Estimates

PADECO initially prepared cost estimates for the Roads and Lanes components that reflected discussions with the municipal engineers and members of the all-party committees, the “full scope” component. However, the ADB and Steering Committee determined that the resulting total cost of STIUUEIP far exceeded the funds available, and instructed PADECO to make drastic reductions in the scope of the project. PADECO therefore prepared revised cost estimates for “priority works”. ADB practice requires the overall project cost estimates to include substantial contingencies; it follows that the “full scope” proposals and cost estimates still have value in that the Steering Committee could decide to apply any contingency amounts that the project does not utilise to the completion of some of the “full scope” works.

6.1 Full scope component

Table 10, Table 11, and Table 12 give the summary cost estimates for the full scope component.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate (NRs)</th>
<th>Amount (NRs)</th>
</tr>
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<tbody>
<tr>
<td>1 Resurfacing of existing roads after drainage laying</td>
<td>Sqm</td>
<td>207608</td>
<td>1,266</td>
<td>262.83</td>
</tr>
<tr>
<td>2 Upgrade gravel road</td>
<td>Sqm</td>
<td>118973</td>
<td>1,565</td>
<td>186.19</td>
</tr>
<tr>
<td>3 Footpath and greenery in the highway</td>
<td>M</td>
<td>4,000</td>
<td>5,210</td>
<td>20.84</td>
</tr>
<tr>
<td>4 Footpath and side drain on one side of storm water drain</td>
<td>M</td>
<td>21496</td>
<td>2,865</td>
<td>61.59</td>
</tr>
<tr>
<td>5 Pedestrian bridge over Highway</td>
<td>Nos</td>
<td>2</td>
<td>7,500,000</td>
<td>15.00</td>
</tr>
<tr>
<td>6 Poor Neighborhood lanes Improvement</td>
<td>Sqm</td>
<td>30000</td>
<td>1,221</td>
<td>36.63</td>
</tr>
<tr>
<td>7 Provision for consultation and awareness raising</td>
<td>LS</td>
<td>1</td>
<td>2,500,000</td>
<td>2.50</td>
</tr>
<tr>
<td>8 Environmental Impact Assessment</td>
<td>LS</td>
<td>1</td>
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</table>

Biratnagar Roads and Lanes, total 588.58

<table>
<thead>
<tr>
<th>Activities</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate (NRs)</th>
<th>Amount (NRs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Resurfacing blacktopped road after drainage laying</td>
<td>Sqm</td>
<td>39968</td>
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<td>50.60</td>
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<td>2 Access Road adjacent to Bypass Road</td>
<td>Sqm</td>
<td>35360</td>
<td>1,905</td>
<td>67.36</td>
</tr>
<tr>
<td>3 Footpaths on Access Road</td>
<td>M</td>
<td>8840</td>
<td>3,535</td>
<td>31.25</td>
</tr>
<tr>
<td>4 Canal Road</td>
<td>Sqm</td>
<td>88760</td>
<td>1,905</td>
<td>169.09</td>
</tr>
<tr>
<td>5 Footpaths on Canal Road</td>
<td>Sqm</td>
<td>12680</td>
<td>4,026</td>
<td>51.05</td>
</tr>
<tr>
<td>6 Connection roads</td>
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<td>29260</td>
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<td>45.79</td>
</tr>
<tr>
<td>7 Poor Neighborhood Access Improvement</td>
<td>Sqm</td>
<td>30000</td>
<td>1,221</td>
<td>36.63</td>
</tr>
<tr>
<td>8 Provision for consultation and awareness raising</td>
<td>LS</td>
<td>1</td>
<td>2,500,000</td>
<td>2.50</td>
</tr>
<tr>
<td>9 Environmental Impact Assessment for Stormwater Diversions and Associated Roads</td>
<td>LS</td>
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Birgunj Road and Lanes, total 457.3
Table 12: Summary of Butwal Proposed Road and Access Activities Costs

<table>
<thead>
<tr>
<th>Activities</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate (NRs)</th>
<th>Amount (NRs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Resurfacing of road surface along the drain improvement</td>
<td>Sqm</td>
<td>37,765</td>
<td>1,266</td>
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<td>2 Pedestrian bridge over main Highway</td>
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<tr>
<td>3 Poor Neighborhood Access Improvement (10km, width varies av 3m) – Provisional</td>
<td>Sqm</td>
<td>30,000</td>
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<td>36.63</td>
</tr>
<tr>
<td>4 Initial Environmental Evaluation (IEE)</td>
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Butwal Road and Access Total 106.94

6.2 Priority works

Table 13 and Table 14 are summaries of the costs of the Roads and Lanes component, priority works.

Table 13: Biratnagar: summary of cost for Road and Lanes component, priority works

<table>
<thead>
<tr>
<th>Activities</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate (NRs)</th>
<th>Amount (NRs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Resurfacing of existing roads after drainage laying</td>
<td>Sqm</td>
<td>111,858</td>
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<tr>
<td>2 Upgrade gravel roads</td>
<td>Sqm</td>
<td>77,936</td>
<td>1,565</td>
<td>121.97</td>
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<tr>
<td>3 Footpath and greenery in the highway</td>
<td>m</td>
<td>4,000</td>
<td>5,210</td>
<td>20.84</td>
</tr>
<tr>
<td>4 Footpath and side drain on one side of storm water drain</td>
<td>m</td>
<td>9,511</td>
<td>2,865</td>
<td>27.25</td>
</tr>
<tr>
<td>5 Poor Neighborhood Access Improvement</td>
<td>Sqm</td>
<td>30,000</td>
<td>1,221</td>
<td>36.63</td>
</tr>
<tr>
<td>6 Provision for consultation and awareness raising</td>
<td>LS</td>
<td>1</td>
<td>2,500,000</td>
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<td>7 Design and construction supervision</td>
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<td>17,410,000</td>
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</table>

Birgunj Roads and Lanes, total 353.80

Table 14: Birgunj: summary of cost for Road and Lanes component, priority works

<table>
<thead>
<tr>
<th>Activities</th>
<th>Unit</th>
<th>Quantity</th>
<th>Rate (NRs)</th>
<th>Amount (NRs)</th>
</tr>
</thead>
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<tr>
<td>1 Resurfacing blacktopped road after drain laying</td>
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<td>39,968</td>
<td>1,266</td>
<td>50.60</td>
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<td>2 Access Road adjacent to Bypass Road</td>
<td>Sqm</td>
<td>42,360</td>
<td>1,905</td>
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<tr>
<td>3 Footpaths on Access Road</td>
<td>m</td>
<td>8,840</td>
<td>3,535</td>
<td>31.25</td>
</tr>
<tr>
<td>4 Connection roads</td>
<td>Sqm</td>
<td>17,500</td>
<td>1,565</td>
<td>27.39</td>
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<tr>
<td>5 Access road to solid waste processing site (Diversion 13A)</td>
<td>Sqm</td>
<td>15,946</td>
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<tr>
<td>6 Access road to Chapkaiya treatment plant</td>
<td>Sqm</td>
<td>7,000</td>
<td>1,565</td>
<td>10.96</td>
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<tr>
<td>7 Poor neighborhood lanes Improvement</td>
<td>Sqm</td>
<td>30,000</td>
<td>1,221</td>
<td>30.38</td>
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<td>8 Provision for consultation and awareness raising</td>
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<tr>
<td>9 Design and construction supervision</td>
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Birgunj Roads and Lanes, total 283.80
Table 15 is the implementation schedule. The Drainage and Sanitation component dictates the schedule for the Roads and Lanes component (see Volume 2).

<table>
<thead>
<tr>
<th>Town/contract</th>
<th>Advance actions (duration to be determined)</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
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<tr>
<td>Form Steering Committee and PCO</td>
<td></td>
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<tr>
<td>Complete capacity building (under proposed TA)</td>
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<tr>
<td>Establish municipal project management committees</td>
<td></td>
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<tr>
<td>Prepare and issue tenders for consultants</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Appoint consultants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carry out survey and design work</td>
<td></td>
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</tr>
<tr>
<td>Obtain environmental clearance</td>
<td></td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>Conduct awareness programs</td>
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<tr>
<td>Prepare tender documents</td>
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<tr>
<td>Prequalify contractors</td>
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<tr>
<td>Call for bids</td>
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<tr>
<td>Appoint civil contractor</td>
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<tr>
<td>Contractor mobilization</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Undertake works</td>
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<td></td>
</tr>
</tbody>
</table>
Appendix A

Biratnagar Drawings

A.1. Biratnagar: existing and needed road
A.2. Biratnagar: road hierarchy
A.3. Biratnagar: major link roads requiring surface improvement
A.4. Biratnagar: road surveyed under drainage network
A.5. Biratnagar: road and access improvement, proposed complete project
A.6. Biratnagar: road and access improvement, priority works
BIRATNAGAR
EXISTING AND NEEDED ROAD
Source: Community Survey
BIRATNAGAR
ROAD SURVEYED
UNDER DRAINAGE NETWORK
Source: Municipality
Appendix B

Birgunj Drawings

B.1. Birgunj: existing and needed road

B.2. Birgunj: road hierarchy

B.3. Birgunj: road surveyed for improvement

B.4. Birgunj: road and access improvements, proposed complete project

B.5. Birgunj: road and access improvement, priority works
BIRGUNJ
EXISTING AND NEEDED ROAD

Source: Community survey

Legend
Road need
✓ Black topped
□ Rural link road
○ Footpath management
□ Other
Existing road
粉 Black topped
格 Gravel
土 Earthen
■ Brick paved

Scale: 1 - 2 Kilometers
BIRGUNJ

ROAD AND ACCESS IMPROVEMENTS
PROPOSED COMPLETE PROJECT

Source: Municipality

Legend

Proposed road
- Proposed 4-lane new road
- Proposed 2-lane new road
- Surface improvement from total length (20% concreted)
- Link road
- Lanes

Existing road
- Highway
- Metal road
- Gravel road
- Earthen road
- Other road
- Track

TA 7182-NEP  B - 4  Final Report, Vol. 4
Appendix C

Butwal Drawings

C.1. Butwal: existing and needed road
C.2. Butwal: road hierarchy
C.3. Butwal: road surveyed for improvement
C.4. Butwal: road and access improvement, proposed complete project
C.5. Butwal: road and access improvement, priority works
Appendix D

Photos

Figure 1, Busy Street in Biratnagar

Figure 2, Biratnagar, Crossing at commercial centre with traffic regulation sign
Figure 3, Biratnagar, Dharan Road with side drain broken and full of solid waste

Figure 4, Biratnagar, Dharan Road with central and service lanes separated
Figure 5, Birgunj, Bus terminal waiting for TDF funding for improvement

Figure 6, Birgunj, By-pass Road misused for parking and vehicle maintenance
Figure 7, Birgunj, By-pass road with poor use of Row

Figure 8, Birgunj, Confused policeman in traffic management
Figure 9, Inner lane in Birgunj with its open sewer lines

Figure 10, Birgunj, Proposed Access Road next to the By-pass Road
Figure 11, Birgunj, Proposed Canal Road

Figure 12, Birgunj, Proposed Canal Road in Birgunj for future expansion
Figure 13, Brigunj, Proposed road with drain in the Access Road

Figure 14, Rickshaws are the most popular means of local transport in the three towns
Figure 15, Birgunj, Traffic management is a challenge

Figure 16, Birgunj,
Figure 17, Butwal, Highway without footpath near Bust Terminal

Figure 18, Butwal, Road proposed for footpath by the municipality
Figure 19, Butwal, Siddhartha Highway with rickshaw lane

Figure 20, Butwal, Sukhanagar area road proposed for drainage and reinstatement of road
## Appendix E

### Biratnagar Details

#### A Existing urban road condition following drainage network under consideration

<table>
<thead>
<tr>
<th>Road code</th>
<th>Name of the road</th>
<th>Stretch of the road</th>
<th>Length (m)</th>
<th>Width (m)</th>
<th>Right of way (total width)</th>
<th>Type of road</th>
<th>Type of road surface</th>
<th>Condition of road</th>
<th>Condition of footpath</th>
<th>Footpath surface</th>
<th>Condition of footpath</th>
<th>No. of the crossing</th>
<th># drainage crossing required No. of the crossing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kanchan Keshaliya Marga</td>
<td>0+000 to 0+500</td>
<td>500.00</td>
<td>3.80</td>
<td>16.00</td>
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<td>B</td>
<td>P</td>
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</tr>
<tr>
<td></td>
<td>Kanchan Keshaliya Marga</td>
<td>0+500 to 1+200</td>
<td>700.00</td>
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<td>16.00</td>
<td>UL</td>
<td>G</td>
<td>P</td>
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<td>Kanchan Marg</td>
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<td>12.00</td>
<td>UL</td>
<td>B</td>
<td>P</td>
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<td>E</td>
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<td>Main Road</td>
<td>1+700 to 1+970</td>
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<td>15.00</td>
<td>D</td>
<td>B</td>
<td>VP</td>
<td>E</td>
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<td>4</td>
<td>Namuna Marga</td>
<td>0+000 to 0+640</td>
<td>640.00</td>
<td>4.20</td>
<td>8.00</td>
<td>UR</td>
<td>G</td>
<td>P</td>
<td>E</td>
<td>E</td>
<td>2</td>
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<td></td>
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<tr>
<td>3</td>
<td>Main Road,</td>
<td>1+970 to 2+240</td>
<td>270.00</td>
<td>5.00</td>
<td>15.00</td>
<td>D</td>
<td>B</td>
<td>VP</td>
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<td>3</td>
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<tr>
<td>5</td>
<td>Main Road-School-Ghogha</td>
<td>0+000 to 0+135</td>
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<td>B</td>
<td>VP</td>
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<td>UR</td>
<td>B</td>
<td>M</td>
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<td>0+000 to 0+450</td>
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<td>7.00</td>
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<td>B</td>
<td>VP</td>
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<td>175.00</td>
<td>5.80</td>
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<td>UL</td>
<td>B</td>
<td>P</td>
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<td>Ghauri Shankar Marg</td>
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<td>4.50</td>
<td>16.00</td>
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<td>G</td>
<td>P</td>
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<td>P</td>
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<td>E</td>
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<td>VP</td>
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<td>E, Oneside - B</td>
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Refer Appendix A-4 for map
### Existing urban road condition following drainage network under consideration

<table>
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<tr>
<th>Road code</th>
<th>Name of the road</th>
<th>Stretch of the road</th>
<th>Origin</th>
<th>Destination</th>
<th>Length (m)</th>
<th>Width (m)</th>
<th>Right of way (total width)</th>
<th>Type of road (UR, UC, UL, D, F, N)</th>
<th>Type of road surface (E, G, B)</th>
<th>Condition of road (VP, P, M, G)</th>
<th>If there is footpath width of FP on each side</th>
<th>Footpath surface (B, C, O)</th>
<th>Condition of footpath (VP, P, M, G)</th>
<th>If there is side drain, type of side drain (E, B, C)</th>
<th>If drainage crossing is required No. of the crossing</th>
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<td>G</td>
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### Existing urban road condition following drainage network under consideration

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<th>Road code</th>
<th>Name of the road</th>
<th>Stretch of the road</th>
<th>Length</th>
<th>Width</th>
<th>Right of way (total width)</th>
<th>Type of road</th>
<th>Type of road surface (E, G, B)</th>
<th>Condition of road (VP, P, M, G)</th>
<th>If there is footpath width of FP on each side</th>
<th>Footpath surface (B, C, O)</th>
<th>Condition of footpath (VP, P, M, G)</th>
<th>If there is side drain, type of side drain (E, B, C)</th>
<th>If drainage crossing is required No. of the crossing</th>
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<td>B</td>
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<td>P</td>
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<td>VP</td>
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<td>P</td>
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<td>UL</td>
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<td>P</td>
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<td>B</td>
<td>P</td>
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<td>VP</td>
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### Existing urban road condition following Major by-pass roads under consideration

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<th>Stretch of the road</th>
<th>Length (m)</th>
<th>Width (m)</th>
<th>Right of way (total width) (m)</th>
<th>Type of road (UR, UC, UL, D, F, N)</th>
<th>Type of road surface (E, G, B)</th>
<th>Condition of road (VP, P, M, G)</th>
<th>If there is footpath width of FP on each side</th>
<th>Condition of footpath (VP, P, M, G)</th>
<th>If there is side drain, type of side drain (E, B, C)</th>
<th>If drainage crossing is required No. of the crossing</th>
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<tbody>
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<td>0+000</td>
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<td>VP</td>
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<td>A</td>
<td>Jamuneshwar Marga</td>
<td>*Ganeshchowk to End of BT</td>
<td>0+800</td>
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<td>P</td>
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</tr>
<tr>
<td>G</td>
<td>Purano College Road.</td>
<td>*Parakar chowk- Himali Path</td>
<td>1+200</td>
<td>2+700</td>
<td>1500.00</td>
<td>UL B</td>
<td>VP</td>
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<td>Dharambad Road.</td>
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<td>1+200</td>
<td>2+700</td>
<td>1500.00</td>
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<tr>
<td>H</td>
<td>Dharambad Road.</td>
<td>*End of Btroad to Kesaliya R.</td>
<td>1+100</td>
<td>3+500</td>
<td>2400.00</td>
<td>UL G</td>
<td>P</td>
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<tr>
<td>I</td>
<td>21 / 22 Simana sadak.</td>
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<td>1+100</td>
<td>3+500</td>
<td>2400.00</td>
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<td>J</td>
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<td>1+100</td>
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<td>L</td>
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Refer Appendix A-5 for Map

### Type of road
- **UR**: Urban residential
- **UC**: Urban commercial
- **UL**: Urban link
- **D**: District
- **F**: Feeder
- **N**: National

### Type of road surface
- **E**: Earthen
- **G**: Gravelled
- **B**: Blacktopped

### Condition of road

---

**TA 7182-NEP**

---

*Final Report, Vol. 4*
<table>
<thead>
<tr>
<th>Footpath condition</th>
<th>B</th>
<th>C</th>
<th>O</th>
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<td>Concrete</td>
<td>Others (pls specify)</td>
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<table>
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<th>E</th>
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<tr>
<td></td>
<td>Earthen</td>
<td>Brick lined</td>
<td>Concrete</td>
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## Appendix F

### Birgunj Details

**Existing urban road condition**

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<tr>
<th>Road code</th>
<th>Name of the road</th>
<th>Stretch of the road</th>
<th>Length</th>
<th>Width</th>
<th>Right of way (total width)</th>
<th>Type of road</th>
<th>Type of road surface</th>
<th>Condition of road</th>
<th>Footpath width of FP on each side</th>
<th>Footpath surface</th>
<th>Condition of footpath</th>
<th>If drainage crossing is required</th>
<th>No. of the crossing</th>
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<tr>
<td>R1</td>
<td>Canal Road (A1)</td>
<td>V/shuwa pond</td>
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<td>E</td>
<td>VP</td>
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<td>--</td>
<td>--</td>
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<td>--</td>
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<td>R2</td>
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<td>Singha</td>
<td>1760</td>
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<td>E/G</td>
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<td>--</td>
<td>--</td>
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<td>--</td>
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<td>--</td>
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<td>B</td>
<td>M</td>
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<td>C</td>
<td>M</td>
<td>B</td>
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<td>--</td>
<td>--</td>
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<td>--</td>
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<td>JP Chapal Factory</td>
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</table>

**Note:**

**Type of road**
- UR: Urban residential
- UC: Urban commercial
- UL: Urban link
- D: District
- F: Feeder
- N: National

**Type of road surface**
- E: Earthen
- G: Gravelled
- B: Blacktopped

**Condition of road**
- VP: Very poor (more than 50% of the length is not in good condition)
- P: Poor (more than 25% of the length is not in good condition)
- M: Minor damages (10% of the area has pot holes / breakages)
- G: Good

**Footpath condition**
- B: Brick paved
- C: Concrete
- O: Others (pls specify)

**Type of side drain**
- E: Earthen
- B: Brick lined
- C: Concrete
## Appendix G

### Butwal Details

**Existing urban road condition**

<table>
<thead>
<tr>
<th>Road code</th>
<th>Name of the road</th>
<th>Stretch of the road</th>
<th>Length</th>
<th>Width</th>
<th>Right of way (total width)</th>
<th>Type of road</th>
<th>Type of road surface</th>
<th>Condition of road</th>
<th>Footpath condition</th>
<th>Condition of footpath</th>
<th>If there is side drain, type of side drain</th>
<th>If drainage crossing is required</th>
<th>No.s</th>
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</tbody>
</table>

**Notes:**

**Type of road**

- **UR**: Urban Residential
- **UC**: Urban Commercial
- **UL**: Urban Link
- **D**: District
- **F**: Feeder
- **N**: National

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- **G**: Gravelled
- **B**: Blacktopped

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- **VP**: Very Poor (more than 50% of the length is not in good condition)
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- **G**: Good

**Footpath condition**

- **B**: Brick paved
- **C**: Concrete
- **O**: Others (please specify)

**Type of side drain**

- **E**: Earthen
- **B**: Brick lined
- **C**: Concrete

Refer Appendix C for map.