The National Transport Master Plan of Liberia

0 Executive summary
Executive summary

0.1 Project Background

The Government of Liberia (GoL) “Poverty Reduction Strategy” (PRS), 2008, has four pillars, the fourth of which is “Rehabilitating Infrastructure and Delivering Basic Services”. Within this pillar are a number of components. Two of the most important centre on:

- “roads and bridges”; and
- “transportation”.

In 2009, in an attempt to set a framework for implementing a programme of rehabilitation, the first “National Transport Policy and Strategy” (NTPS) was produced. Its focus was on a number of strategic objectives, namely to:

- rehabilitate, reconstruct and construct primary/secondary, feeder and neighbourhood roads;
- improve the transport sector through effective systems and infrastructure for quality service provision;
- improve urban and rural transport; and
- build human resource capacity.

The NTPS noted that in order to accomplish these objectives, Liberia needed:

- a “National Transport Master Plan”, and
- an effective “Road Maintenance Management System”.

The Programme “Capacity Development for the Transport Sector”, financed by the German Government through the German Federal Ministry for Economic Co-operation and Development (BMZ) and implemented by GIZ, has been applied to support the GoL’s efforts in these objectives and has been focusing on:

- the implementation and further development of Transport Policy; and
- the preparation of the above-noted “National Transport Master Plan” has put particular emphasis on roads: one of the most important features of this Plan has been the prioritisation of infrastructure rehabilitation with options have set out depending on the availability of funds – it is believed that funding limitations, not forecast economic returns, would be the major constraint on project implementation;
- the development and implementation of a modern “Road Maintenance Management System”; and
- capacity development and training - with focus on the Ministry of Transport (MoT) and Ministry of Public Works (MoPW).

This executive summary highlights the major findings of the Master Plan. Prominence is given to those findings that impact the domestic transport sector. The international gateways (Monrovia Free Port and Robertsfield International Airport) are, of course, also important and there is much in the Main Text that concerns these facilities. They have, however, been the subject of other studies and the data and findings reported herein are frequently from secondary sources that have already concluded a course of action. It has, nonetheless, been important to take into account the impact of developments at these gateways on domestic transport and to make recommendations that go beyond the findings of the first studies.
0.2 Existing infrastructure

Existing infrastructure is shown in chapter 4, Figure 4-1.

Roads

The priority of the Government in the first 5-year, PRS period is the Construction, Rehabilitation and Maintenance of roads and bridges in Liberia. The Table below contains a summary of the status of PRS-I deliverables (2008 – 2011) according to MPW data.

Table 0-1: STATUS OF PRS-I DELIVERABLES: 2008 – 2011

<table>
<thead>
<tr>
<th>ROADS</th>
<th>PRS OUTPUTS (2008 – 2011)</th>
<th>TOTAL COMPLETED</th>
<th>TOTAL ON-GOING</th>
<th>TOTAL OUTSTANDING (By end of Dec. 2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Paved Roads</td>
<td>100 miles</td>
<td>38 miles</td>
<td>6 miles</td>
<td>56 miles</td>
</tr>
<tr>
<td>Primary Laterite Roads</td>
<td>1,187 miles</td>
<td>991 miles</td>
<td>196 miles</td>
<td>0 miles</td>
</tr>
<tr>
<td>Secondary Laterite Roads</td>
<td>300 miles</td>
<td>219 miles</td>
<td>84 miles</td>
<td>0 miles</td>
</tr>
<tr>
<td>Urban Laterite Roads</td>
<td>150 miles</td>
<td>150 miles</td>
<td>0 miles</td>
<td>0 miles</td>
</tr>
<tr>
<td>Urban Paved Roads</td>
<td>69 miles</td>
<td>14 miles</td>
<td>33.85 miles</td>
<td>21.15 miles</td>
</tr>
<tr>
<td>Feeder Roads</td>
<td>400 miles</td>
<td>164 miles</td>
<td>428 miles</td>
<td>0 miles</td>
</tr>
</tbody>
</table>


The Goal of government’s intervention in the roads sub-sector in the post-PRS (PRS-II) period is to ensure that all roads are pliable year round to enhance accessibility and connectivity for the socio-economic growth and development of Liberia. The Table below contains a projection of PRS-II deliverables (2012 – 2017) according to MPW data.

Table 0-2: PRS-II DELIVERABLES: 2012 – 2017

<table>
<thead>
<tr>
<th>ROADS &amp; BRIDGES</th>
<th>PRS-II OUTPUTS (2012 – 2017)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction, rehabilitation &amp; maintenance of Primary, Secondary and Urban Roads</td>
<td>8,174.79 mi (13156.04 km)</td>
</tr>
<tr>
<td>Construction and rehabilitation of Feeder Roads</td>
<td>2,092.38 mi (3,367.36 km)</td>
</tr>
<tr>
<td>Construction and maintenance of Bridges</td>
<td>165 bridges</td>
</tr>
</tbody>
</table>

Many roads, particularly in the East have been found to be located far from where indicated on the “Liberia Institute for Statistics and Geographic Information Systems” (LISGIS) maps. Three estimates of the extent of the road network are shown below.
Table 0-3: Estimated extent of road network

<table>
<thead>
<tr>
<th>Source</th>
<th>Km in class/surface type</th>
<th>Primary</th>
<th>Secondary</th>
<th>Feeder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Paved</td>
<td>Gravel</td>
<td>Paved</td>
</tr>
<tr>
<td>LISGIS</td>
<td>579</td>
<td>1,884</td>
<td>n.a.</td>
<td>2,190</td>
</tr>
<tr>
<td>GIZ/MoPW</td>
<td>574</td>
<td>1,752</td>
<td>n.a.</td>
<td>2,636</td>
</tr>
<tr>
<td>MoPW</td>
<td>734</td>
<td>1,130</td>
<td>n.a.</td>
<td>2,350</td>
</tr>
</tbody>
</table>

The majority of roads are unpaved and unable to provide all-year access to either county or district headquarters. Vehicle operating costs, fares and tariffs are, consequently, very high.

**Rail**

There is no connected rail network. The Nimba Railway is under rehabilitation, and the Bong Railway is operational but has restricted operations, and renovation is proposed within five years. The Mano River Railway was dismantled during the war. A fourth railway may be built to the Putu Range, where the explorations of iron-ore resources are now in a pre-feasibility stage.

**Seaports and coastal shipping**

The port of Monrovia currently accounts for almost all of Liberia’s seaborne trade. Since the end of the war, some progress has been made with rehabilitation but much remains to be done. The port of Buchanan is being used to a very small extent for exports of logs and woodchips and imports of cement. The port of Greenville is presently not operational, whilst the port of Harper is being used on a small scale for coastal shipments of equipment and supplies to United Nation Mission in Liberia (UNMIL) troops.

**Aviation**

The nucleus of civil aviation is Roberts International Airport (ROB) a Code 4E airport with a 3,300 metre instrument runway. It is the only airport in Liberia capable of offering Cat II Instrument Landing System (ILS) based approaches. ROB also has apron space totalling about 85,000 m2. It faces no operational constraints with respect to runway and apron capacities and has a substantial land bank of about 2,084 ha.

Monrovia’s James Spriggs Payne Airport (MLW) is in a very different situation, constrained by its urban surroundings. The nature of installations and fixtures, and standards are all substantially lower than one would expect in a well-run viable facility.

There are about 30 other domestic or rural airports with unpaved runways ranging between about 900m to 1,800m and cleared for Visual Flight Rules (VFR) only operations.

**Public transport**

Public transport infrastructure basically consists of a number of bus stops in Monrovia and major county capitals and the MTA bus depot and workshops in Monrovia. There are no terminal buildings at any of the major transfer points, particularly at Douala Market and Red Light.

Public transport services are considered to be inefficient and are almost entirely provided by the informal sector through taxis and mini buses. They concentrate on Monrovia and its surroundings,
but also provide on-demand services to county capitals. The basic public transport network in Monrovia comprises eleven routes operating along main roads, most of which are served by conventional buses (albeit at very low frequencies), minibuses and taxis. Vehicles are generally in unsafe and uneconomic conditions.

0.3 Data sources and availability

Road traffic surveys

Two road traffic surveys were conducted - during the dry season in November/December 2009 and during the Wet Season in April/May 2010. Both surveys consisted of classified counts of all vehicles (06:00 to 18:00) and random road-side driver interviews. Three night surveys supplemented the data and allowed the estimation of Annual Average Daily Traffic (AADT).

Matrices of inter- and intra-county movements by (i) vehicle categories, (ii) passenger numbers and (iii) freight tonnages were also established and information on average vehicle occupancies and trip purposes determined.

The derived present pattern of movements is shown on Figure 5-1 in chapter 5.

Road inventory

A road inventory to describe the assets of the highway network is being developed. The inventory for the primary network is substantially complete but will need to be updated on a regular basis as assets are upgraded, removed or changed. The inventory for the secondary network is underway. Responsibility for the maintenance of the inventory should be clearly vested in the management structure at the government entity in charge of the national road network (MoPW). The data was collected by observers equipped with Global Positioning System (GPS) receivers.

Road Condition Survey

The Road Condition Survey (RCS) has populated a database related to the road inventory with information that has been used to determine the volume and cost of works to rehabilitate and then maintain the road network at a satisfactory level of serviceability.
Other modes

Data for the rail, shipping and air transport sectors and for the public transport investigations relied on material provided during discussions with stakeholders and information in previous reports. There was no primary data collection and no modeling.

Other sources

There is a general lack of secondary data sources.

IMF forecasts of Gross Domestic Product (GDP) were used to establish short-term growth trends – these were extrapolated to provide longer-term forecasts. Forecasts of population growth came from the “Final National Population and Housing Census - Consolidated”, LISGIS, 2008.

Elasticities of demand for travel against growth in income have been derived from a limited amount of data on vehicle registrations held by the MoT and comparisons with developments in other West African countries have been made.

0.4 Methodology

General

The methodology adopted is summarised in Figure 0-1. It has centred on the rehabilitation of infrastructure and the development of transport policy (taking due account of practicalities relating to implementation).

A flexible approach was necessary as from time-to-time, it was necessary to adjust the approach to take account of: (i) findings to date; (ii) data availability; and (iii) constraints in the timely achievement of planned deliverables and results. The areas most affected by these problems have been highlighted.

In its approach to infrastructure, the methodology focused on forecasts of transport demand and, then, on:

- the practicalities of providing increasing capacity – this was not difficult to achieve in the roads, shipping and aviation sectors, but was a particular constraint on the rail sector;
- the lack of finance for capital and recurrent expenditure – a constraint relevant to all sectors. As a consequence most recommendations concerning the rail, coastal shipping and aviation sectors centre on private finance/private sector initiatives. Funding constraints will have a significant effect on road rehabilitation and maintenance as well;
- economic returns that are clearly needed to prioritise rehabilitation (as well as rehabilitation needed prior to the introduction of maintenance management), particularly in the roads sectors; and
- the limited amounts of data available and data processing constraints.

1 The figure summarises the finally adopted approach after these modifications.
The Economic Internal Rate of Return (EIRR) was the measure intended, and wherever possible applied, for initial prioritising of projects both within, and between, sub-sectors. When constrained budgets were being examined, the approach was to maximise Net Present Value (NPV).

Central to the analysis of the road transport mode was the World Bank’s "Roads Economic Decision Model (RED)" which was used to prioritise road rehabilitation investments within the limits of anticipated budgetary constraints.

In order to ensure planned maintenance, Roughton International’s Maintenance Planning System (ROMAPS) has been recommended. Once the roads have been returned to a maintainable condition this second level of modelling, for the important “Road Maintenance Management System” shall be applied.

A Geographic Information System (GIS) to relate different information in a spatial context and to reach conclusions about and demonstrate these relationships has also been developed.

After the assessment of the primary road network an agricultural surplus-deficit-analysis has been done for the area with the most unbalanced production areas, i.e. areas which “export” or “import” agricultural products from other regions of Liberia. The purpose was to identify secondary roads with potentially high traffic growth rates. These roads have then been surveyed (inventory and condition) and included into the GIS.

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2 EIRRs were used in the initial examination of expenditure in an unconstrained budgetary situation. A paucity of data and difficulties with meeting people outside the road sector led to difficulties in generating EIRRs for projects outside the roads sector – the Master Plan conclusions for the rail and coastal shipping sectors nonetheless remain clear.
Executive summary

Roads
- Existing Base Traffic
  - Origin and Destination Survey
  - Classified Count
    - Comfortable Driving Speed
    - Unit Rehabilitation Costs
      - Growth in GDP/Per Capita Incomes
      - Spatial/Sectoral Development Plans
    - Traffic Growth
      - Data Coding
      - Classification
      - Divisions
      - Traffic Survey
      - Traffic Volumes
      - Traffic Forecasts
      - Traffic Assessments
      - Traffic Capacity
      - Traffic Costs and Benefits
      - Traffic Recommendations
      - Traffic Expenditures
      - Traffic Impacts

Rail
- Existing Base Traffic
- Potential Road to Rail Transfer
  - Potential Road to Coastal
    - Potential Road to Air
      - Potential Road to Air Transfer
      - Traffic Forecasts
      - Traffic Assessments
      - Traffic Costs and Benefits
      - Traffic Impacts
      - Traffic Expenditures
      - Traffic Impacts

Coastal Shipping
- Existing Base Traffic
- Traffic Forecasts
- Traffic Assessments
- Traffic Costs and Benefits
- Traffic Impacts
- Traffic Expenditures
- Traffic Impacts

Ports/Shipping International
- Existing Base Traffic
- Traffic Forecasts
- Traffic Assessments
- Traffic Costs and Benefits
- Traffic Impacts
- Traffic Expenditures
- Traffic Impacts

Domestic Air
- Existing Base Traffic
- Traffic Forecasts
- Traffic Assessments
- Traffic Costs and Benefits
- Traffic Impacts
- Traffic Expenditures
- Traffic Impacts

Urban Transport
- Existing Base Traffic
- Traffic Forecasts
- Traffic Assessments
- Traffic Costs and Benefits
- Traffic Impacts
- Traffic Expenditures
- Traffic Impacts

Note: the flow of activities was generally intended to be downwards along the thick black lines.

Tasks shown thus were intended but could not be performed to the extent originally conceived because of lack of data/difficulties in meeting with counterparts or organisations or non-mobilisation of specialist staff.
0.5 Recommendations: Infrastructure Rehabilitation and Maintenance

General
Traffic was forecasted following a review of the macro-economic context and trade policies. By 2030 it was forecast that:
- passenger-vehicle movements in and around Monrovia: could be 6.64 times present values;
- passenger-vehicle movements in more rural areas: could be 4.43 times present values; and
- base freight-vehicle movements: could be 2.17 times present values – on certain routes where there is substantial growth in the production of produce that has a low value per unit weight, the growth could be much higher.

Roads rehabilitation
The Master Plan has concluded that roads must continue to be the dominant domestic mode – only roads can provide access to all parts of the country and many trips made by other modes will inevitably use roads for their initial and final stages. The Master Plan has consequently concluded that the GoL should:
- rehabilitate the all-weather strategic primary network that links Monrovia to the county capitals and to its main border points with Sierra Leone, Guinea and the Ivory Coast including pavement if funds are available; And
- construct two new links that could save substantial travel costs’ reduction: these are Buchanan to Tappita and Buchanan to Harper, on condition that these new development will not negatively impact resources to maintain existing infrastructure assets in maintainable condition
- Addition links may be identified, provided that sufficient funding is provided to keep existing infrastructure in maintainable condition and these links can be justified on the basis of technical survey studying the financial, economic, social and environmental impacts.
Given the high costs of current travel and the level of frustrated demand that is believed to exist, the Master Plan proposes to have this rehabilitated network completed as rapidly as possible and a five-year timetable is proposed for re-establishing basic functionality.

To speedily restoring the living conditions in Liberia as soon as possible, the National Transport Master Plan aims at providing access to all sections of the population and facilitating safe, comfortable transport at a design standard of 60 miles per hour or lower depending on the classification of road on the primary, secondary and feeder road network. The National Transport Master Plan adopts a flexible approach.

With the focus of transport policy centred on the need for speedy improvements, the Government of Liberia chooses to take optimum use of its limited resources. Provided funding is available, the National Transport Master Plan proposes to apply design standards at an economic optimum. In case of budget constraints, the National Transport Master Plan suggests to select design standards at the least life-cycle costs.

The RED analyses have indicated that a substantial rehabilitation programme and the construction of two missing links would have substantial economic benefits. A five-year "unconstrained emergency rehabilitation" investment programme is recommended by RED as shown on Figure 0-2. The required total expenditure over the emergency rehabilitation programme's projected five-year life would be about USD 172 million. Additionally, about USD 18 million per year would have to be spent on recurrent maintenance to ensure that the network does not return to its present unacceptable condition. The construction of the two missing links would add another about USD 10 million.

These are very large sums, believed to be beyond the capacity of the GoL, even if heavily supported by donors. Where budgetary constraints exist RED recommends "compromises" in regard to standards and scope of programme which should be adopted. Five "compromises", which remain aimed at investing in the standards and projects that will maximise economic returns, given immediately-available money, are presented in terms of the possible availability of funds.

Five-year rehabilitation programmes based on total 5-year "emergency rehabilitation" reduced budgets of USD 100 million, USD 75 million, USD 50 million, USD 17 million, USD 10 million and, in the last case, just USD 5 million are shown on Figure 0-3, Figure 0-4, Figure 0-5, Figure 0-6 and Figure 0-7.

An examination of these figures shows that as the available budgets fall:

- increasing proportions of the roads are recommended to be initially rehabilitated at reduced standards; and
- the rehabilitation of some other roads, where only basic standards are proposed: fall out of the initial programme.

Additional investments to bring the network to full, economically-justified, standards must, of course, be applied in a "post-emergency rehabilitation" follow-on period.
A summary of the general 5 years Road Rehabilitation Plan and the 10 years Maintenance Program is shown in the table below:

### Table 0-4: NTMP: Primary Roads 5 Years Rehabilitation and 10 Years MAINTENANCE Program

<table>
<thead>
<tr>
<th>No.</th>
<th>Road Number</th>
<th>Name</th>
<th>Length (km)</th>
<th>Rehabilitation Costs (MS) 5 Years</th>
<th>Totals Maintenance (MS) Year 1 to 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RL100</td>
<td>Monrovia St Paul Riv-Klay-Lofa Bridge-Mano River</td>
<td>131.3</td>
<td>2,716</td>
<td>10,047</td>
</tr>
<tr>
<td>2</td>
<td>RL01</td>
<td>Red Light - 15th Gate-Ganta-Guinea Border</td>
<td>241.1</td>
<td>31,316</td>
<td>25,471</td>
</tr>
<tr>
<td>3</td>
<td>RL101</td>
<td>Ganta-Saniquelle-Zorgorwee-Lougatuo (Border to Ivory Coast)</td>
<td>81.4</td>
<td>0,627</td>
<td>2,377</td>
</tr>
<tr>
<td>4</td>
<td>RL114</td>
<td>Kakata-Bong Mines</td>
<td>29</td>
<td>0,223</td>
<td>2,001</td>
</tr>
<tr>
<td>5</td>
<td>RL123</td>
<td>Robertsfield-Gate 15</td>
<td>30.2</td>
<td>3,624</td>
<td>3,165</td>
</tr>
<tr>
<td>6</td>
<td>RL104</td>
<td>Madina-Bomi-Robertsport</td>
<td>41.4</td>
<td>0,224</td>
<td>1,477</td>
</tr>
<tr>
<td>7</td>
<td>RL102</td>
<td>Klay-Sinje-Bo Waterside-Mano River Bridge (Sierra Leone Bord.)</td>
<td>79.3</td>
<td>0</td>
<td>10,389</td>
</tr>
<tr>
<td>8</td>
<td>RL112</td>
<td>Gbargnu-Belefanai-Voinjama-Foyaa-Mendikoma (Sierra Leone Border)</td>
<td>281.1</td>
<td>2,166</td>
<td>13,649</td>
</tr>
<tr>
<td>9</td>
<td>RL125</td>
<td>Voinjama - Bolongadi (Guinea Border)</td>
<td>16.4</td>
<td>0,126</td>
<td>0,262</td>
</tr>
<tr>
<td>10</td>
<td>RL106</td>
<td>Ganta-Saclepea-Tappita-Pouh Town-Zwedru</td>
<td>215.1</td>
<td>1,352</td>
<td>9,404</td>
</tr>
<tr>
<td>11</td>
<td>RL119</td>
<td>Tobli-Ivory Coast border</td>
<td>10.3</td>
<td>0,079</td>
<td>0,395</td>
</tr>
<tr>
<td>12</td>
<td>RL103</td>
<td>Zwedru-Kalowia-Kanweaken-Gbaebo-Sweken-Fishtown-Harper</td>
<td>264.4</td>
<td>2,036</td>
<td>8,689</td>
</tr>
<tr>
<td>13</td>
<td>RL226</td>
<td>Harper-Fish Town</td>
<td>32.2</td>
<td>0,223</td>
<td>1,329</td>
</tr>
<tr>
<td>14</td>
<td>RL116</td>
<td>Plebe - Blebo - Barclayville</td>
<td>76</td>
<td>0,584</td>
<td>4,937</td>
</tr>
<tr>
<td>15</td>
<td>RL110</td>
<td>Buchanan-Gio Town, Yarkpa Town, Cestos River, Greenville</td>
<td>202.7</td>
<td>1,091</td>
<td>7,623</td>
</tr>
<tr>
<td>16</td>
<td>RL105</td>
<td>Mile 20 - Juuarzon-Sapo - Pyne Town-Bambli</td>
<td>140.6</td>
<td>1,083</td>
<td>5,347</td>
</tr>
<tr>
<td>17</td>
<td>RL113</td>
<td>Yarkpa Junction - Cestos City</td>
<td>31</td>
<td>0</td>
<td>0,341</td>
</tr>
<tr>
<td>18</td>
<td>RL107</td>
<td>Kanweaken - Geeken-Norkwia Junction-Norkwia-Sasstown</td>
<td>86.3</td>
<td>0,665</td>
<td>1,382</td>
</tr>
<tr>
<td>19</td>
<td>RL129</td>
<td>Kanweaken - Glofaken</td>
<td>35.8</td>
<td>0,276</td>
<td>0,831</td>
</tr>
<tr>
<td>20</td>
<td>RL108</td>
<td>Monrovia-Schefflin-Harbel - Farmington River-Buchanan</td>
<td>122.3</td>
<td>0</td>
<td>16,022</td>
</tr>
<tr>
<td>21</td>
<td>RL109</td>
<td>Kanyan-Barclayville-Grandezz</td>
<td>46.4</td>
<td>0,357</td>
<td>0,742</td>
</tr>
<tr>
<td>22</td>
<td>RL115</td>
<td>Big Swen - Grand Cess</td>
<td>13.9</td>
<td>0</td>
<td>0,153</td>
</tr>
<tr>
<td>23</td>
<td>RL111</td>
<td>Seikempa-Yekepa</td>
<td>29.5</td>
<td>0</td>
<td>0,325</td>
</tr>
<tr>
<td>24</td>
<td>RL117</td>
<td>Zorgowee - Duolay</td>
<td>28.7</td>
<td>0</td>
<td>0,316</td>
</tr>
<tr>
<td>25</td>
<td>RL120</td>
<td>Harper-Cavalla</td>
<td>16.6</td>
<td>0</td>
<td>0,183</td>
</tr>
<tr>
<td>26</td>
<td>RL122</td>
<td>Uni. Farm - Bensonville</td>
<td>14.9</td>
<td>0,114</td>
<td>0,346</td>
</tr>
<tr>
<td>27</td>
<td>RL124</td>
<td>Wanda - Fendell</td>
<td>3.2</td>
<td>0,025</td>
<td>0,123</td>
</tr>
<tr>
<td>28</td>
<td>RL127</td>
<td>Barclayville - Picnicces</td>
<td>10.3</td>
<td>0,079</td>
<td>0,239</td>
</tr>
<tr>
<td>29</td>
<td>RL129</td>
<td>Glofaken - Karloken</td>
<td>28.9</td>
<td>0,222</td>
<td>0,67</td>
</tr>
<tr>
<td><strong>TOTAL =</strong></td>
<td></td>
<td></td>
<td><strong>2340.3</strong></td>
<td><strong>49,208</strong></td>
<td><strong>128,235</strong></td>
</tr>
</tbody>
</table>
Road Development and Road Upgrading

The National Transport Master Plan recommends a flexible approach to the pavement of the primary road network that links Monrovia to the county capitals and the main border crossings with neighboring countries. This approach suggests the pavement of the 1,513 km of primary roads if funds are available within 5 years, to an unconstrained budget of approximately US$1.5B, according to the following investment plan:

Table 0-5: 5 Year Primary and Secondary Roads Unconstrained Investment Plan

<table>
<thead>
<tr>
<th>Road Network</th>
<th>km</th>
<th>Proposed Investment (US$ M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Paved roads in good condition</td>
<td>104,3</td>
<td>$0</td>
</tr>
<tr>
<td>2. Paved roads which need rehabilitation works</td>
<td>59,7</td>
<td>$5,930,000</td>
</tr>
<tr>
<td>3. Gravel roads to be upgraded to pavement</td>
<td>1,288,1</td>
<td>$1,031,575,010</td>
</tr>
<tr>
<td>4. Liberian Infrastructure Trust Fund:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monrovia (Redlight) - Ganta - Guinea border</td>
<td>241,1</td>
<td>$149,038,258</td>
</tr>
<tr>
<td>Cotton Tree to Buchanan</td>
<td>81,5</td>
<td>$45,800,000</td>
</tr>
<tr>
<td>5. Mineral Development Agreements:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kakata - Hendi Road</td>
<td>40,2</td>
<td>$24,850,012</td>
</tr>
<tr>
<td>Zwedru - Greenville</td>
<td>191,5</td>
<td>$118,377,546</td>
</tr>
<tr>
<td>Ganta - Sanniquellie</td>
<td>35,8</td>
<td>$22,130,110</td>
</tr>
<tr>
<td>6. New Roads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buchanan - Harper</td>
<td>586</td>
<td>$349,909,097</td>
</tr>
<tr>
<td>Buchanan - Tappita</td>
<td>180,8</td>
<td>$107,958,302</td>
</tr>
<tr>
<td>7. Bridges and culverts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More specific studies are required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Culverts are included in the cost-estimates for roads.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>$1,855,568.335</td>
</tr>
</tbody>
</table>

To pave all primary roads will require the mobilization and investment of massive external resources including the use of PPPs to compliment GOL’s annual budgetary allocations for road works.

The National Transport Master Plan provides the current counts of the Average Annual Daily Traffic on the different roads and road-sections, the expected traffic demand based on calibrated development factors, the communication links in and in-between counties determined through origin and destination studies (O&d), the actual condition of the road network and the economical return of road investments on each primary road section, as a guidance or prioritization scheme, on where to invest the resources that can be made available in the future.
Already, a steady flow of contributions is being recorded. So, through the Liberian Infrastructure Trust Fund US$311M and US$50M are earmarked respectively to upgrade the primary road segments of the Monrovia (Redlight) to Ganta (Liberia-Guinea border) and of the Cotton Tree to Buchanan (Grand Bassah County).

Road infrastructure provided by Mineral Development Agreements

Of the five (5) MDAs signed by GOL with Concessionaires, only two (2) Agreements – China Union (Hong Kong) Mining Co. Ltd./China Union Investment (Liberia) Bong Mines Co., Ltd. and Putu Iron Ore Mining Inc./Mano River Iron Ore Mining Ltd., - make specific commitment to provide road infrastructure. Mittal Steel Holding A. G. and Mittal Steel (Liberia) Holding’s commitment to provide road infrastructure is said to be contained in a separate MOU with GOL.

The MDA requires China Union to rehabilitate, extend and build the Kakata to Hyendi Road 40.23 km, (25 miles). Although this is a secondary road, it has great economic importance. Additionally, Putu Ore Mining is required to pave the 191.5 km (119 miles) Zwedru – Greenville primary road link. According to the GOL-Mittal Steel MOU, Mittal Steel is obligated to pave the primary road link between Ganta and Sanniquellie of 35.8 km (22.24 miles). No explicit obligation(s) for the provision of road infrastructure is mentioned in the respective MDAs with BHP Billion and AmLib.

The various Mineral Development Agreements obligate Concessionaires to pave a total of 227.30 km (141.24 miles) of primary roads and 40.23 km (25 miles) of secondary road over the next five (5) years.

With respect to Mineral Development Agreements, the Transport Master Plan also recommends the introduction of a new Transport Concessions Law which will set out a basic form and conditions for the agreement on infrastructure between a concessionaire and the Government. The recommendations include a detailed checklist of some of the important issues to be considered when negotiating a concession agreement.
Figure 0-2: RED - Scenario unconstrained budget
Figure 0-3: RED – Scenario budget A
Figure 0-4: RED – Scenario budget B
Figure 0-5: RED – Scenario budget C
Figure 0-6: RED – Scenario budget D
Figure 0-7: RED – Scenario budget E
**Roads maintenance**

The programme is based on the proposal to rehabilitate 1,513 km of primary roads in the forthcoming five years. It is assumed that approximately one fifth of the total will be improved in each of the years of this programme allowing them, then, to enter into the planned maintenance programme. The cumulative network being maintained after twenty years will be 2,332 km.

The plan goes on to provide details for:
- the establishment of a maintenance management administrative capacity;
  - among others through transforming the sector, creating a Road Fund and Road Authority
- a pilot demonstration and training schema; and
- required technical assistance.

**Public transport**

It is recommended that road-based public transport services should be provided by the private sector. Government may, however, regulate for price, quantity and route in its efforts to seek changes to the structure of the industry and particularly in order to encourage the greater use of larger vehicles and the adoption of a network of routes that penetrate off the main urban and inter-urban routes.

Where the GoL requires operators to provide services on routes that are not profitable (through regulation) it will have to pay a subsidy to the operator for its service through a Public Service Obligation agreement (PSO) in order to foster private sector participation.

This form of subsidy should be used where government recognizes that it is in the national interest to provide otherwise unprofitable public transport services. In any case GoL should resist the temptation to become an operator of services.

**Rail**

The number of ore trains and resulting excess capacity on each line are summarised below. There is likely to be some spare capacity on all except the Nimba Railway.

**Table 0-6: Estimated line capacities**

<table>
<thead>
<tr>
<th>Railway</th>
<th>Section</th>
<th>Ore traffic</th>
<th>Non-ore traffic capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Payload per wagon [tonnes]</td>
<td>Wagons per train</td>
</tr>
<tr>
<td>Nimba</td>
<td>Tokadeh – Buchanan</td>
<td>95</td>
<td>70</td>
</tr>
<tr>
<td>Bong</td>
<td>Bong Town – Monrovia</td>
<td>65</td>
<td>60</td>
</tr>
<tr>
<td>Mano River</td>
<td>Mano River – Tubmanburg</td>
<td>65</td>
<td>60</td>
</tr>
<tr>
<td>(1435 mm)</td>
<td>Tubmanburg – Monrovia</td>
<td>65</td>
<td>60</td>
</tr>
<tr>
<td>Mano River</td>
<td>Mano River – Tubmanburg</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>(1067 mm)</td>
<td>Tubmanburg – Monrovia</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>
Shown below is the minimum amount of additional traffic and the implied approximate investments that would be required to achieve financial viability – and assuming a Financial Internal Rate of Return (FIRR) of about 10% is sufficient for this purpose.

<table>
<thead>
<tr>
<th>Railway</th>
<th>Minimum annual traffic</th>
<th>Investment (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Passengers</td>
<td>Freight</td>
</tr>
<tr>
<td>Nimba</td>
<td>120,400</td>
<td>505,680</td>
</tr>
<tr>
<td>Bong</td>
<td>301,000</td>
<td>480,095</td>
</tr>
<tr>
<td>Mano River (1435 mm)</td>
<td>120,400</td>
<td>529,760</td>
</tr>
<tr>
<td>Mano River (1067 mm)</td>
<td>120,400</td>
<td>556,248</td>
</tr>
<tr>
<td>Monrovia Network (Bong Line)</td>
<td>301,000</td>
<td>430,430</td>
</tr>
<tr>
<td>Monrovia Network (Mano River Line)</td>
<td>120,400</td>
<td>430,430</td>
</tr>
</tbody>
</table>

There is presently no evidence that this traffic would be available, it is recommended that Government does not rely on the rail sector for carrying non-mineral traffic and that it continues its hands-off development policies in this sector.

**Coastal shipping**

The potential market for coastal shipping, will determine the sizes and types of ship that can be used, and the service frequency. There is a “virtuous circle” in which more traffic results in lower fares producing in turn more traffic.

In order to estimate generated traffic it has been necessary to break into the “virtuous circle” and make some assumptions about the scale of the changes that can reasonably be expected in Liberia.
In this situation the role of GoL should amongst other things be to:

- **create an enabling environment for the development of private shipping services:** by providing information about potential demand, encouraging potential service users to coordinate their shipments, and – if necessary – providing time-limited revenue guarantees during the initial start-up period (3-5 years). The need for revenue guarantees should be carefully checked before they are offered, by carrying out a detailed study of the commercial viability of the proposed services.

- **In the event that more than one potential service provider comes forward, revenue guarantees should be offered to either a single company providing a mixed passenger/freight service, or a maximum of two companies providing separate services for passengers (high speed) and freight (low cost):** The revenue guarantees should be assigned through competitive tendering for route franchises, although other companies would be permitted to operate on the same routes without government support.

## Air transport

It is recommended that:

- **Government should undertake a feasibility study to determine the viability of investing in the upgrading of Spriggs Payne to international standards, taking account of the potential for growth and the investments that will be needed at Spriggs Payne and Roberts International. Consideration should be given to security and strategic issues in the study. In the event that this study confirms that the development will not be economic (and strategically a good choice) the domestic aviation activities now occurring at Spriggs Payne should be relocated to Roberts International:** Roberts International should be redeveloped and any revenues raised should be used to improve it;

- **Government should seek to maintain only the core of domestic airports:** other domestic airports should either be sold or closed;

- **Government should encourage private sector domestic operators:** in the same manner as is proposed for rail there should, however, be no long-term subsidy; and

- **Enabling policies should be mandated to facilitate the safe and secure operation of aircraft and airlines:** they are the focus and the raison d’être for the existence of Liberia’s aviation sector.

## 0.6 Policy Refinement and Implementation

### Framework

The Master Plan development process has raised a number of issues concerning the refinement, and strategy for implementation, of Government’s transport policy. The plan sets out recommendations in the following areas:

- **intermodal policy:** which is clarified in order to take account of findings regarding the practical roles that road, rail and air transport can together, and separately, play in the regeneration of the economy;

- **Government’s wider development plans which should take into account “risk”:** in this regard it is noted that it is important to recognise that development strategies that centre around spare capacity on rail corridors, the development of which are themselves highly dependent on developments in mining and in the wider world economy, will be inherently “riskier” than alternative road-transport based development options.
In the Liberian development context, the most important additional rail-associated risks are those associated with presumed spare capacity for non-mineral ore traffic and the uncertainty that the world demand for minerals will, from time-to-time, impose on the extent of that spare rail capacity.

As long as there is no wider connecting international rail network, it will, clearly, be more important that development nodes and corridors have good road access to Monrovia and the sea than it is that they have good rail access. The Transport Master Plan’s findings are important and should inform other planning initiatives – particularly those now involving internal development corridors.

Regulation will be used to promote economic efficiency: regulations and plans that could lead to economic inefficiency, unless they have mitigating social benefits, will be revoked and/or adjusted.

In order to facilitate the private sector concessions that are envisaged as major drivers within the transport sector a new "Transport Concessions Law" is also proposed.

**Intermodal policy road, rail, coastal shipping and domestic aviation**

The Master Plan has concluded that:

- **Roads must continue to be the dominant domestic mode** – only roads can provide access to all parts of the country - many trips made by other modes will inevitably use roads for their initial and final legs;
- Coastal shipping could play an important role prior to the completion of a south coast road; and
- Domestic aviation could play an important role as long as travel times by road remain long

**Funds for the rehabilitation and the maintenance of rehabilitated road sections: Initial strategy**

Analyses were based on the assumption that Government adopts an “emergency roads rehabilitation program” with a budget of USD 50 million and which is drawn down over the next five years at an average rate of USD 10 million per year. Consequent upon the adoption of this programme and the maintenance strategy described earlier, a further USD 15 million will (approximately) have to be made available annually – this additional expenditure is essential if the rehabilitation works are to be preserved and the access required for economic regeneration is to be maintained.

Over the next five years, an annual total roads sector budget of about USD 25 million is, therefore, required. It is believed this is also the minimum commitment from Government necessary to show foreign donors that they are serious in their intent to restore road transport infrastructure. It is, however, a large sum within the context of present overall Government spending and it is unlikely that Government will for next five years be able to fund these sums from its own resources.

The Master Plan solutions, therefore, rely on finding:

- external sources: for the capital sums required for rehabilitation; and
- local sources: for the recurrent maintenance budget – these begin with:
  - a base levy on road fuel consumption; and
  - a base levy derived from the fees for annual licences imposed on trucks.

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3 Nearly 8% of the 2010/11, USD 330 million, projected total annual Government revenue – source IMF.
4 This is in line with the recommendations of the NTPS.
Sustainable development of the transport sector is often very difficult to achieve under constrained financial conditions. A long-term financing solution requires that all transport costs should be covered in advance by a predictable source of revenues. It is estimated that one (1) US Dollar spent for road maintenance saves three (3) US Dollar on costs of abrasion to both the road surface and vehicles.

The NTMP recommends that road maintenance should be financed through earmarked levy. Funding for road maintenance should be provided by those who use available infrastructure and transport services. A fuel levy refers to the polluter liability (abrasion of roads, road accidents, emissions). Those who use the roads more, pay more. This holds true for roads damaged by overloaded heavy goods vehicles. Regulations reducing axle load and their strict enforcement are critical to the preservation of road assets.

The fuel levy is the most important charge and usually accounts for over 80 percent of road fund revenues. It bears a close relationship to the costs of road use. The levy is usually added to the existing excise and sales taxes. Since it tends to be collected alongside, or as part of, sales and excise taxes on fuel, it is important to administer the levy independently to ensure that the revenue is not intermingled with the regular taxes applied to transport fuels. It appears best to specify the fuel levy as a discrete charge added to the price of fuel and to emphasize that it is a road user tariff, that should go directly to a national road authority, a public entity that must be specifically created to manage funds derived from this road user tariff.

The NTMP suggests an initial fuel levy of $0.10 cents on each litre of fuel, an annual heavy truck license fee and penalty charges. These charges should reflect the level of use and damage caused to the roads. Transit charges are actually not in place. In order to encourage transit traffic, the international conventions that govern the movements of cargo which was signed by Liberia in 2005, should be implemented.

The following benefits of a fuel levy are anticipated to accrue to both road users and the government:

- Reduced vehicle operating costs for all road users,
- More predictable operating conditions for contractors providing infrastructure services,
- More predictable level of service for road users including safer driving conditions, and reduced travel times.
- More predictable operating conditions for road transport providers and their customers,
- Reduced financial, operational and legal risks for government, service providers and road users.
- More predictable policy and planning environment for government
- Improved understanding and valuation of road assets leading to improved accounting and reporting of public assets,
- More transparent decision-making and improved performance monitoring, and
- Reduced life-cycle costs of maintaining road assets
- Wearing color intensive and differentiated equipment make the action of the maintenance crews more visible on the road and it motivates the user paying the tariff.

Although the above mentioned fuel levy as local source is likely to still be insufficient, the shortfalls would probably incur only in the earlier years and, as traffic grows (and revenue leakages become smaller), these will turn into surpluses. In the early years the shortfall can, therefore, be met via a combination of:

- a small Government subvention: which will serve the double purpose of providing finance and reassuring donors that Government is serious in its intents to the road sector; and
- debt financing.

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5 A very rapid rise in road traffic volumes is predicted.
Estimates of present and likely future revenue from a USD 0.10/litre “Road Fuel Levy” and average annual licences on trucks of USD 1,000 per year are provided. Also indicated are the effects of an annual USD 1.0 million subvention from Government combined with a loan at 5% interest to bridge any funding shortfall. The report shows that, in order to provide for the required expenditure, the loan could be drawn down in stages. It would have a maximum value of about USD 13.9 million in about 2014 and, by 2019, could be repayable from projected revenue surpluses.

An alternative would be tolls. Toll is considered a possible source of revenue, but it has its limitations within the current Liberian setting. The present traffic volume along major trunk roads in Liberia is not sufficient for the introduction of a toll system in the near future. However, the construction of roads in the country has shown significant improvement with construction of major highways that will require funding for maintenance in the short and long term which will eventually necessitate a toll system. It is anticipated that the Government will invite and encourage private sector participation in a toll system in the future.

A toll system may be economically viable on regional routes that interconnect ECOWAS countries. It is estimated that traffic flows on some of these routes may equal or surpass the threshold required for the viable operation of a toll system in the future. Toll roads are possible under Public Private Partnerships arrangements as BOT projects if traffic volumes and potential revenues are high and if Government wishes to capitalize on greater efficiency. Projects that could qualify for PPPs include those related to seaports and airports, costal shipping besides the main inter-state high traffic trunk roads.

**Adjustment to Government Policy Statement**

Consequent upon the adoption of these proposals for raising revenue for the roads sector it is, recommended that three clauses are added to the NTPS, viz:

- “Government will seek to instigate an equitable system for recovering the costs of the routine road maintenance of rehabilitated roads from road users. In order to recover costs, a levy will be imposed on all motor fuel sales. Initially this levy will be USD 0.10 per litre. Monies raised will be deposited into a ring-fenced fund dedicated to the sole purpose of road maintenance. The levy will be revised as appropriate, initially by the Ministers of Transport and Finance and later by the Board of the “Road Fund”;

- “Government will seek to instigate an equitable system for recovering, from road users, the costs of repairing the structural damage to rehabilitated roads. Heavy vehicles will be charged according to their Gross Vehicle Weight (GVW) and axle configuration and according to a schedule approved initially by the Ministers of Transport and Finance and later by the Board of a “Road Fund”. The minimum initial charge for a truck with a 6-tonne steering axle and single 11-tonne rear axle will be USD 1,000 per year. All revenue that is collected will be deposited into a ring-fenced fund dedicated to the sole purpose of road maintenance.”

- “Government will at some later date seek to recover the costs for mitigating environmental damage and air pollution from road users”

A dedicated ring-fenced “Road Fund” for protecting the money raised and ensuring that is spent on road projects is detailed. The Fund would be managed by a Board, reporting to the Minister of Finance, and comprised of representatives from the Ministries of Transport and Public Works, as well as road users.
Other policy measures

Other policy measures elaborated concern:

- **investment programmes (annual, rolling, long-term etc.):** which should be prioritised according to rules that are clear and transparent;
- **international transit charges:** which should be set in line with the likely damage and/or social costs imposed on other road users - they should not be penalistic;
- **the role for public-private-partnerships:** the areas where these may be appropriate and the areas where these would not be elaborated;
- **axle load control:** important because heavy axles damage roads in a manner that is disproportionate to the actual increase in load;
- **strategic planning:** a unit dedicated to this purpose should be set up within the Ministry of Transport;
- **urban transport services:** fares are high and the use of taxis is leading to unnecessary congestion - the NTPS views the solution as investment in, and the promotion of, the National Transit Authority - other complementary solutions involving the private sector and linked to fare and route controls are, however, also recommended.
- **road safety:** there is presently neither data on accidents, nor information on the costs of road accidents to the economy - it is therefore noted that transport policy should, incorporate appropriate road safety goals and should elaborate the types of measures needed for:
  - the effective collection and analysis of road safety data; and
  - estimating present costs to the economy - “with” and “without” mitigating measures - and hence leading to an effective programme for accident reduction.

0.7 Implementation

Successful implementation of the NTPS and of the refinements and strategies proposed in this Master Plan will require, besides funds and technical expertise, leadership and effective coordination.

The recommended organizational and operational framework for implementation centres on:

- a “Steering Committee”, chaired by the Minister of Transport and composed of Government Ministers and other important stakeholders; and
- an “Implementation Coordination Committee” chaired by a MoPW coordinator and composed of technical personnel from important line ministries and the agencies they control.

The above committees should now be formally constituted and be given responsibility for all implementation.

This National Transport Master Plan is valid for a period of ten years. There shall be a periodic revision of the National Transport Master Plan, every five years. The MoT and MPW will start the process at the beginning of the fourth year, involving all relevant stakeholders.