Republic of Yemen
Road Sector
Strategy Note

August 2010

Middle East and North Africa Region
Energy and Transport Unit
CURRENCY EQUIVALENTS
(Exchange rate effective on March 8, 2010)

Currency Unit = Yemeni Rial (YER)
1 YER = 0.0049 USD
1 USD = 205 YER

Fiscal Year: January 1 – December 31

ABBREVIATIONS AND ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
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<tr>
<td>AADT</td>
<td>Average Annual Daily Traffic</td>
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<tr>
<td>FFPMU</td>
<td>Foreign Financed Project Management Unit</td>
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<td>GCRB</td>
<td>General Corporation for Roads and Bridges</td>
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<td>GVW</td>
<td>Gross Vehicle Weight</td>
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<td>MOF</td>
<td>Ministry of Finance</td>
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<td>MOT</td>
<td>Ministry of Transport</td>
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<td>MPWH</td>
<td>Ministry of Public Works and Highways</td>
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<tr>
<td>PMMR</td>
<td>Performance-based Management and Maintenance of Roads</td>
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<td>RAPCMO</td>
<td>Rural Access Program Central Management Office</td>
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<td>RMF</td>
<td>Road Maintenance Fund</td>
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<td>RS</td>
<td>Road Sector Department of MPWH</td>
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FOREWORD

This report was prepared by Mr. Jean-Charles Crochet (Senior Transport Economist and Task Team Leader), Mr. Terje Wolden (Senior Highway Engineer), and Ms. Lamis Aljounaidi (Infrastructure Economist), following missions in Yemen in 2008 and 2009.

The authors wish to thank all those in the Ministry of Public Works and Highways and other Government organizations who generously provided information and assistance and kindly commented on the Bank team’s preliminary findings and recommendations. The authors would like to extend special thanks to Engineer Omar Al-Kurshumi, Minister of Public Works and Highways for his openness and constant support to the Bank team.
EXECUTIVE SUMMARY

Background

The transport sector is fundamental to the future development of Yemen and the well being of its population. Yet, the country’s inhabitable deserts, mountainous terrain, and population location patterns give rise to high transport costs and leave many small communities isolated on mountain ridges or in remote valleys. The poor access to markets, employment, and services in many areas poses a serious challenge to economic and social development.

Yemen should be credited for an ambitious road building program over the last 25 years, establishing a large primary road network given its level of GDP and population size. With the condition of 60 percent of the paved network rated good or very good, Yemen’s road network appears better than in most comparator countries. This positive feature allows the country to satisfy economically its relatively high demand for road transport evidenced by its substantial vehicle fleet and traffic volumes on the arterial network.

The leadership of the Ministry of Public Works and Highways (MPWH) is very mindful of the shortcomings in the sector and with World Bank and other donors’ financial assistance has over the last 2-3 years been addressing forcefully the constraints to sector efficiency, focusing on institutional strengthening of road management, improving resource allocation and use, expanding rural accessibility, and improving road maintenance management and finance.

This Road Sector Strategy Note takes stock of recent developments in the sector and focuses on performance. It takes into account studies prepared for the Government and the rich dialogue between Government officials and Bank missions over the past few years. Based on this, key issues are identified and recommendations are made on a sector wide, short to medium term, Agenda for Reform which, if implemented, would further strengthen the performance of the road sector, thereby increasing its contribution to the national economy and the alleviation of poverty.

Main Sector Challenges

- The current balance of expenditures among various types of roads and categories of expenditures is not economically optimal. The annual allocation of funds for road maintenance is insufficient and far below what most other countries similar to Yemen spend on such maintenance. By deferring maintenance over many years a back log of works develops that will eventually be much more costly to address the longer it is postponed. Also, expenditures are probably too high on urban roads but could usefully be increased for secondary and rural roads. In addition, certain types of “high payback” expenditures, such as climbing lanes on high traffic roads are not included in road budgets while some low returns projects are contemplated. Finally, too many projects are being implemented at the same time, compared to the availability of funding for roads and to staff limitations. There are more than 750 projects being executed by MPWH, more than half of which are urban road projects.

- Although MPWH is fully in charge of the sector, with impressive institutional progress in the past few years, there is still a high fragmentation of roles and responsibilities in the sector and some units key for the sector such as those in charge of planning, laboratory, and research, are outside the responsibility of the Road Sector. The role of the Road Maintenance Fund (RMF) is also too broad while the capabilities of the Rural Access Program Central Management Office (RAPCMO) could be used more extensively.
• Although there has been progress in the past few years, **road planning, programming and budgeting is still weak and budget processes undeveloped.** There are multiple, often fragmented, plans and programs but not yet a single well accepted strategy document for the sector, although MPWH is keen to produce one. A medium term expenditure framework is not yet in place. Until recently, there was no road planning unit in the Road Sector Department. The sector data base, although greatly improved, still needs development. Finally the lack of a functional road classification makes planning and monitoring difficult.

• **Weaknesses in road design** have negatively affected in the past the economy of projects as well as project implementation and quality assurance. This is compounded by insufficient capacity in MPWH for design review and guidance to consultants and contractors on desirable design changes and by inadequate monitoring and evaluation of the projects’ technical aspects. There has also been a reluctance to vary the technical standards of roads depending on the type and location of the road, its function and traffic volume. Road standards on urban road projects are often excessive. Better methods and construction practices are also slow to be adopted.

• **Despite great progress recently regarding procurement, contracts, and supervision, some key weaknesses remain.** First, there is the legacy of past contracts with inadequate contract forms and technical requirements. Inadequate follow-up of contractors in the past is still affecting quality of works and implementation progress on locally funded projects. There is also too much reliance on variation orders, which lack transparency and make program management and monitoring difficult. Lack of predictable price adjustments, advance payments, and other weaknesses in past local forms of contract as well as slow payments have also increased costs and inhibited the development of contractors. Finally, for many years, there have been difficulties in bringing contracts to closure as well as terminating non-performing contracts.

• **The Yemeni road construction and maintenance industry is young and fragile.** It includes many small contractors each with limited capacity and capabilities and only very few large private contractors with adequate capacity. Public road construction corporations have played a dominant role in the sector for a long time and their future may need to be clarified. Weaknesses in contracts and contract management, as highlighted above, as well as issues with the price and availability of key materials such as bitumen, have constrained the development of the industry.

• **The local road consulting industry is at an early stage of development.** Its growth has been hampered by reliance on in-house services by Government for design and supervision. The lack of a steady and substantial stream of work, and, perhaps, insufficient opportunities for partnership between foreign and local firms, have also prevented a faster development.

• Despite recent efforts, **monitoring and evaluation of road sector performance is still weak.** The availability and reliability of data needs improvement. Consultation mechanisms also need to be developed with all sector stakeholders.

• **There is a serious shortage of capacity and skills in all institutions and firms involved in the sector** (including MPWH as well as contractors and consultants), and there are staffing imbalances among Government units.

• With almost 3,000 persons killed every year in traffic accidents, **road safety is exceptionally poor in Yemen.** There is, however, a sound set-up for traffic safety enforcement but
no national road safety strategy and no national unit clearly in charge and capable of carrying out the monitoring/evaluation of traffic safety activities.

- **Current policies and lack of enforcement of axle load limits for trucks cause excessive wear and tear** with a high long term cost for the road network.

- **The road sector has been highly subsidized in Yemen for many years.** Because of the very low price of gasoline and diesel and insufficient specific taxation of road use, as of the end of 2009 road users were not paying for the marginal cost of road infrastructure use, as they should, and their operations were subsidized.

- **There is a clear link between roads infrastructure and enhancement of women’s lives.** Wherever a good road is available, basic goods (drinkable water, food) are more available and cheaper, which gives time to women for commercial activities. The existence of a road also makes it easier for women to access markets where they can find basic materials and inputs as well as shops to sell their products to. Moreover, when a girls’ school served by a safe road exists, daughters are encouraged to attend school.

This report recognizes that strong political commitment and good leadership is critical in addressing such issues and gives the Ministry of Public Works and Highways credit for recent changes in policies and improvements in sector performance.

**An Agenda for Reform**

There is much that can be done in the short to medium term to improve the performance of the road sector in Yemen. Below, the main recommendations have been summarized under three main directions for Government action:

**Improve the quality of public expenditure programs for the road sector**

- Overall sector funding should remain substantial, at least above 1% to 1.5% of GNP.

- Funding for routine and periodic maintenance should be increased substantially and, in particular, periodic maintenance should be promoted vigorously. The RMF budget should increase from YR 4 billion to at least YR 10 billion over the next three years and reach about YR 15 billion over the medium term.

- Funding for road rehabilitation and low cost/high returns upgrading should be increased as already recommended in the National Highway Master Plan.

- The funding for urban main roads through MPWH should be reduced substantially.

- The focus should be on projects with high economic and social rates of return and the start of premature projects, such as the proposed new Amran – Aden motorway, should be postponed.

- The road budget should be rationalized by cancelling non-performing projects and concentrating funding for MPWH’s locally funded projects on economic and well performing contracts.
• An integrated road sector strategy should be prepared taking full account of financial constraints. This work would include in particular: (i) updating the National Highway Master Plan, and (ii) preparing a national strategy for secondary and rural roads based on realistic estimates of available funding under a medium term expenditure framework.

• The existing feasibility studies of large projects should be updated.

• Multimodal urban transport master plans should be prepared for the larger cities as a basis, among other goals, for the justification of new urban road construction projects by MPWH

**Develop the institutional framework and capability for road sector management**

• The sector’s overall organization should evolve gradually from the current one to one more in line with international best practices. For the time being, however, the sector should remain organized around the four main existing units (the Road Sector Department, RMF, RAPCMO, and the Foreign Funded Project Management Unit). Each of them would be developed and improved as recommended below. The clarity of each unit’s mission and accountability, the adequacy of resources, and the need to optimize the use of heavily constrained manpower should be the main institutional objectives. In this context, the Government should proceed cautiously with decentralization. Whenever feasible, however, project implementation should be managed by units that are located in the field and cover several governorates, in order to facilitate supervision as well as consultations and coordination with local authorities.

• The organization principles and the rights and duties of all stakeholders in the road sector should be clarified by a new road law and its implementing regulations, both to be drafted urgently. This law should include a classification of all roads and, for each category of roads, designate ownership, management responsibilities, financing arrangements and responsibilities for maintenance management and financing.

• The Road Sector Department (RS) should assume full responsibility under the Minister’s oversight for road sector policy and planning and for defining expenditure priorities including annual budgets for the sector. Procedures and technical and operational manuals should be prepared for design, procurement, and supervision reflecting international best practices. The Quality Control Unit’s role should be defined more precisely. A road planning unit as well as other small units to deal with road standards, technology and research, and the road construction and consulting industries should be established within the RS. An assessment of work load and staff needs and organizational structure with job descriptions is needed. The management information system should be well developed.

• The mission of the RMF should be clarified: it should focus on preventive routine and periodic maintenance and not be involved in road upgrading/rehabilitation. Performance based maintenance contracts should be generalized when current pilots have made progress and a good approach has been identified. Hybrid “term maintenance” contracts should also be considered. Knowledge of the road network conditions and assessment of maintenance needs should be improved. The use of consultants for design and supervision should be maximized, and manuals for routine and periodic maintenance should be established. An assessment of work load and staff needs is desirable.

• The FFPMU should clearly be in charge of all aspects of foreign funded projects from design to contract management and be organized, staffed and resourced accordingly.
• RAPCMO’s organizational structure should be revised and staff needs reassessed to take account of its much larger workload and implementation challenges. The need for de-concentration of RAPCMO should be assessed in this respect. A sustainable system should be established to provide uninterrupted adequate funding for RAPCMO’s operations independent of donors.

• A strategy for strengthening Yemen’s road construction and maintenance industry should be put in place as a matter of priority, based on the assessment of the industry planned under the Second Rural Access Project. As shown by the experience of other countries, most progress in the industry will come from the establishment of rules, procedures, and practices for selection and supervision of contractors and for contract management, which are fair, steady, predictable, and well understood by all parties. Current problems regarding the price and availability of key materials such as bitumen and cement should be addressed. The creation of a Yemeni association of road contractors should be promoted and effective communication channels should also be put in place between the Government and the construction industry. The contractor classification system should be used to weed out poorly performing and non professional contractors. Finally, the commercialization of Government corporations should be considered (setting them up as business units independent of the Government) as a first step before privatization.

• A strategy should also be put in place for strengthening Yemen’s consulting profession in the field of road studies and road engineering. This would include outsourcing Government work to local consultants whenever feasible, ensuring that there is in the long term a regular and predictable demand for consultants’ services in the road sector, using partnerships between foreign specialists and local consultants to develop the industry (with training and mentoring obligations to benefit Yemeni consultants), ensuring fair treatment of consultants, and including local consultants in Government training programs.

• The Information Technology Directorate of MPWH should be the leading unit for sector monitoring. It should be strengthened and provided with adequate staff, resources and equipment to carry out its functions fully. Measures should also be taken to systematically produce and disseminate information on the sector and its performance, and consult stakeholders. This includes in particular road user satisfaction surveys.

• An assessment of skills needed and a human resources development strategy should be prepared as soon as possible for the entire sector. The strategy would include, in particular, a medium term training plan, the improvement of existing engineering programs in Yemeni universities, and a continuous education program for high level government staff, and a plan for improving in a sustainable way the salary level and other benefits for Government staff in the sector.

Correct present inefficiencies in the use of the road network.

• A road safety management capacity assessment should be carried out as a first step in addressing the poor traffic safety situation. On this basis, a comprehensive national road safety strategy should be prepared including in particular the designation and strengthening of a central coordination and management road safety unit to spearhead and monitor the implementation of the strategy. There is also a need to start using traffic safety inspection/audits on existing road corridors as a way of identifying key safety improvement measures.

• Enforcing the current axle load limits is overdue. Several actions would have to be taken in concert to introduce effective axle load controls: implementation of an awareness campaign in
cooperation with traffic police, the truckers’ association, and MPWH; purchase of mobile equipment for random controls of axle loads; and expansion of the number of permanent axle load stations on the key road corridors.

- Public costs generated by road use should be paid by the users. The main way to achieve this objective is through steady increases in the price of gasoline and diesel, which eventually should cover not only the full cost of providing fuel at the pump but also the cost of providing the road infrastructure as well as the cost of externalities generated by road use.

- The positive impact which roads have on women’s economic activities and on girls’ access to education is a major argument for expanding rapidly the all weather rural roads network. Since women, as well as children, mainly use the roads for walking, often in groups, rural roads’ design should take into account the special needs of pedestrians. To enhance mobility for both men and women, the Government should also ensure that public transport services are available that link villages to the major services centers and markets, with reliable schedules and adequate information provided to the population.
I. INTRODUCTION

1. The Republic of Yemen has experienced steady development in the recent past and its GDP per capita is approaching US$1,000. By many aspects, Yemen is unique. It is still a rural country (with more than 70% of the population living in the countryside). It has about 140,000 villages and small settlements spread out all over the territory, many of which still need road access and harbor most of the country’s poor (40% of the total population). Given the uneven distribution of population, transport demand varies enormously between different parts of the country. It is highest by far in the densely populated mountainous northwest part of the country and generally very small in the vast low density eastern part. Transport is essential to ensure that the rural areas participate in the main stream of economic and social life. Transport is also essential for trade, which is key to the future of the economy. This is reinforced by the fact that most of the population is located away from the coastal areas, including the capital city, Sana’a, in some of the most difficult terrain one could find in any country of the world.

2. Yemen’s road sector has gone through a radical transformation in the past three decades. The most striking element of this has been the creation of a network of modern paved roads linking most of the main cities and Governorates, particularly in the populated mountainous west part of the country. This network has indeed grown from only about 3,500 km in 1980 to about 14,000 km in 2009, a 300% increase over 28 years, a magnitude of change that few countries have been able to achieve. Major progress has also taken place in the urban areas where most large cities now have an extended paved network and in rural areas where about 5,500 km of paved roads have been constructed in the past twenty years. These changes have had a major impact on the population and the economy of Yemen, making communications much easier and cheaper between centers of activity, promoting internal and external trade, and enabling a growing share of the population to have access to public services and markets.

3. The organization of the road sector and its main institutions have also radically changed in the past decades. The Ministry of Public Works and Highways (MPWH) has gradually taken firm control of the sector and the strategies and expenditure programs necessary for its development. Institutions in the public sector have also developed, adapting in a pragmatic way to changing needs and circumstances. In addition, a very diversified set of private road construction and maintenance companies and engineering firms has emerged. Last but not least, a cadre of qualified road specialists has developed with keen understanding of the very special physical and human constraints of Yemen and a sound appreciation of the experience of other countries in the road sector.

4. Despite these achievements, and in some cases because of them, Yemen’s road sector is confronted with a myriad of questions and challenges. Should for example the very rapid pace of development of the road network continue abated? What should be done to maximize the benefits of public expenditures? Is there a need to shift expenditures to different types of road works (especially to road maintenance) and different types of roads (mainly secondary and rural access roads)? How to better plan and budget public expenditures? Should the organization of the road sector be adjusted to improve project implementation? How to address some of the current major
inefficiencies in the use of roads such as road accidents? It is the purpose of this strategy note to review these questions and suggest pragmatic answers for the few coming years.

5. This report comprises three main parts: (i) a broad assessment of the situation of the Yemeni road sector and a comparison with countries similar to Yemen; (ii) an analysis of the sector’s main issues; and (iii) an agenda for reform.
II. YEMEN ROAD SECTOR: CURRENT CONDITION AND COMPARISON WITH OTHER COUNTRIES

A. Road network

Yemen has an extensive road network, but only a small part of it is paved

6. As of 2009, Yemen had about 69,000 km of roads of which only 14,000 km, or about 20%, were paved. Among these, there were about 11,000 km of roads, many of them earth roads, under construction or at various stages of project preparation. As will be seen later, most of the paved roads are in good condition. On the contrary, most of the unpaved roads are essentially tracks and trails in a very poor condition, allowing travel only under exhausting conditions at extremely low speeds and high vehicle operating costs. These roads, parts of which are often not passable in case of rain, do not provide reliable access to services and markets to the rural population. However, a sizable part of these roads are included in long term, poorly budgeted, upgrading projects and are slowly being paved. The following table summarizes the status of the network.

Table 1 - Status of the Road Network

<table>
<thead>
<tr>
<th>Roads that are paved or being paved</th>
<th>Existent (km)</th>
<th>Under construction* (km)</th>
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<tr>
<td>International</td>
<td>3,000</td>
<td>300</td>
</tr>
<tr>
<td>Main</td>
<td>5,500</td>
<td>1,200</td>
</tr>
<tr>
<td>Secondary and Rural</td>
<td>5,500</td>
<td>9,500</td>
</tr>
<tr>
<td>Sub-total</td>
<td>14,000</td>
<td>11,000</td>
</tr>
<tr>
<td>Other earth roads</td>
<td>44,000</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>58,000</td>
<td>11,000</td>
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* to be completed by 2014
Source: MPWH, 2009

The size of Yemen’s paved road network is now at about the level that could be expected given the country’s level of economic development

7. As shown in the diagrams below, the density of paved roads in Yemen is in general lower than the density found in a set of comparable mountainous, low to lower middle income countries, as well as a few key MENA countries.
However, the following broader analysis, which compares the density of paved roads per capita with the national income per capita for about one hundred countries, shows Yemen's paved road network to be slightly above average. This is of course the result of the rapid pace of road construction in the past decade, which has allowed Yemen to catch up with the average.
As will be shown later, a number of these countries, particularly countries in Africa, currently spend considerable amounts on road upgrading and maintenance and the “average” network size is thus constantly moving. Only to keep at such average would require that Yemen’s paved road network continues to expand. Furthermore, one of the main characteristics of transport demand is that it generally increases faster than GDP particularly at low and lower middle income levels (elasticities of 1.2 to 1.5 are common). As Yemen’s GDP grows, its road network should normally move up the above curve to keep up with demand. In this context, it is significant that almost all other countries in the MENA region have a more developed network of paved roads. These countries, which represent a legitimate target for Yemen, have larger and more sophisticated economies and have started earlier to develop their paved road networks.

Figure 3 - Road Density in MENA countries

Asphalted Road density (km per 1000 persons) 2005

Asphalted Road density (km per 100 Sq km) 2005
There are major geographical variations in Yemen’s paved road network

9. Most countries have substantial variations in the allocation of paved roads to sub-national units (regions, provinces or governorates). In the case of Yemen, these variations are striking, as evidenced in the graphs below. In terms of road density per inhabitant, probably the most significant figure, West Yemen, which is where most of the poverty is located, is much less endowed than the East Yemen (see graph on the right). The discrepancy is by more than a factor of ten between the better equipped governorates and the lesser ones such as Taiz, Al Daleh, and Ibb. On the whole, at 0.4 km/thousand inhabitants, West Yemen has a paved road density well below that of most comparator countries (as shown in Figure 1 above). Given the commonly acknowledged contribution of roads and access to economic and social development, West Yemen’s poor endowment should be a major subject of concern. In term of road density per surface area (graph on the left), West Yemen fares better but only because so much of East Yemen is sparsely populated or even desert.

Figure 4 - Road Density per Governorate
The present condition of Yemen’s paved road network is relatively good

10. With about 62% of all paved roads in good or very good condition, Yemen’s paved road network is in better condition that in many comparator countries for which condition data are available. This positive feature, shown in the graph below, is mainly the result of the young age of many Yemeni roads. In most other countries, the network is older and has not been adequately maintained. It has therefore deteriorated much more, a fate that unfortunately awaits Yemen’s network if maintenance expenditures remain at the current low level.

Figure 5 - Road Condition for Various Countries

Access to markets and public services is very poor in rural areas

11. The MPWH estimates that only a quarter of rural households have access to a paved road, meaning that they live at less than two kilometers from the road. Yemen is a very rural country, with more than 70% of the population living in the countryside¹. It is believed to have around 140,000 villages and settlements, many of which still need road access. The rural population lives mostly in steep and rocky mountainous regions of difficult access, in the western part of the country. On average, the World Bank calculated that a rural inhabitant lives at 12.5 km of a paved road. The detailed status and a map showing roads, population and topography are given in Annex 2.

The definition and classification of Yemen’s road network is still at an early stage of development

12. There are large discrepancies between the different data sources on Yemen’s road network. These discrepancies affect in particular the total length of roads under primary,

¹ On average, only 48% of the population in MENA is rural.
secondary, or rural categories, the status of road upgrading works, and the condition of roads. There are for example three sources of information on road condition which give quite different, although consistent, results. These are shown in Figure 6 below. This is a major weakness. It is not possible to plan adequately the road network’s development and maintenance, and monitor results, if its size and condition is not precisely known. This weakness comes mainly from the absence of a good road registrar that would be accepted by all practitioners and the unofficial and ambiguous classification of many roads in appropriate (primary, secondary, and rural) categories. Such a classification was prepared several years ago as part of the National Road Master Plan but it was never enacted.

Figure 6 - Road Condition in Yemen

B. Road use: vehicle fleet and traffic

_**Yemen’s vehicle fleet is relatively large for its level of GDP, but it is apparently growing only slowly**_*

13. With about 27 vehicles (private cars and commercial vehicles) per 1000 inhabitants, Yemen has a larger vehicle fleet in relation to its total population than comparable countries such as Cameroon, Guatemala, and Kenya (see Figure 7 below). It is also significant that, in proportion to its population, Yemen’s vehicle fleet is almost two thirds that of Egypt despite Egypt’s much higher per capita income. This is the sign of a relatively high demand for road transport, which corroborates with the substantial traffic shown in the next paragraph. Yemen’s vehicle fleet seems, however, to be growing only slowly. The total fleet was about 572,000 vehicles in 2007 compared to about 315,000 in 1985 and 510,000 in 1995. This represents an average growth of about 2.7% on the long term and only about 1% in the past twelve years, somewhat consistent with the slower GDP per capita growth in the recent past. It should be noted, however, that there are wide discrepancies in data mainly because vehicle registration is not fully controlled and there is no procedure for removing older and damaged vehicles from the registrar when they are taken out of operation or scrapped.
Figure 7 - Vehicle Fleet per 1000 inhabitants

Vehicle traffic is high in western Yemen

14. Average traffic exceeds 5000 vehicle/day on many of the primary roads in Yemen’s highly populated western area as shown in Figure 8 below. It is even much higher on some of the country’s key roads such as the Amran – Sana’a – Taiz and Sana’a – Hodeidah roads. Although comparisons with other countries are not really possible for lack of detailed data, this traffic level is substantial in absolute terms, possibly higher than in most countries at a similar level of GDP per capita. It justifies that road network quality be a constant concern for decision makers. In addition, a large part of the traffic comprises commercial vehicles, particularly trucks, which often moves at extremely slow speed in the difficult terrain and steep slopes of western Yemen and create congestion at levels of traffic where this rarely happen in normal circumstances. This calls for a careful appreciation of network capacity. On the contrary, in the east of Yemen, except for the Hadramout valley and its link to Mukalla, traffic is rarely above 1000 vehicle/day.
C. Summary diagnostic

15. As shown by the above analysis, Yemen is relatively well endowed with primary roads for its level of GDP and its population size. The paved road network is relatively young and in good condition for the time being despite insufficient maintenance. This allows the country to satisfy economically its relatively high demand for road transport evidenced by its substantial vehicle fleet and traffic. On the contrary, because there were almost no modern rural roads twenty years ago, motorized access is still very poor in Yemen’s rural areas despite the large building effort of the past decade and the progress achieved. Millions of rural inhabitants (many of them, rural poor) are still without good access to markets and public services. The development of secondary and rural roads is clearly the new frontier for Yemen’s road planners. There are also major variations in road assets between different geographical areas, which call for a finer, more economically driven, approach to network development in the future.
III. MAIN SECTOR CHALLENGES

16. This chapter presents the main challenges to policy makers in the road sector. It looks first at public expenditures and discusses both the amounts spent on roads and the way these are allocated to various activities and categories of roads. Then, the institutional framework and performance are reviewed. All the main issues that prevent public expenditures from producing the best results for the country are highlighted. Finally, specific problems regarding the use of roads are addressed.

A. Public expenditure priorities and amounts

17. Overall, public expenditure in the road sector is higher in Yemen than in many comparable countries, but not excessively high. Actual expenditure in the sector for 2007 is presented in Table 2 below. This includes all disbursements including those under foreign financed projects. With total expenditure of 69 billion YR or about US$ 345 million in 2007, the sector was the most important one in the national investment budget.

Table 2 - Road Sector Expenditure

<table>
<thead>
<tr>
<th></th>
<th>MPWH Budget</th>
<th>Other Sources</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Projects</td>
<td>2.0</td>
<td>5.0</td>
<td>7.0</td>
<td>10%</td>
</tr>
<tr>
<td>Strategic Roads</td>
<td>6.0</td>
<td>0.0</td>
<td>6.0</td>
<td>9%</td>
</tr>
<tr>
<td>Inter-Governorate</td>
<td>4.0</td>
<td>0.0</td>
<td>4.0</td>
<td>6%</td>
</tr>
<tr>
<td>Non Urban Roads</td>
<td>18.5</td>
<td>0.0</td>
<td>18.5</td>
<td>27%</td>
</tr>
<tr>
<td>Urban Roads</td>
<td>20.0</td>
<td>2.0</td>
<td>22.0</td>
<td>32%</td>
</tr>
<tr>
<td>Sana’a City</td>
<td>1.0</td>
<td>4.0</td>
<td>5.0</td>
<td>7%</td>
</tr>
<tr>
<td>Lighting</td>
<td>2.0</td>
<td>0.0</td>
<td>2.0</td>
<td>3%</td>
</tr>
<tr>
<td>Maintenance</td>
<td>4.0</td>
<td>0.5</td>
<td>4.5</td>
<td>7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>57.5</strong></td>
<td><strong>11.5</strong></td>
<td><strong>69.0</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

18. As shown in the tables below, annual expenditure on the road sector is around 1.6% of GDP, which is comparatively on the high side. Indeed, most countries in the world spend roughly about 1% of GDP or less on road expenditures. Yet, there are numerous examples of countries which spend larger amounts than Yemen. This is particularly the case of countries with high economic growth. On a per capita basis, notwithstanding the large variations among comparator countries, Yemen’s level of expenditure is about average.
Table 3 – Road Sector Expenditure in Comparable Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Road sector expenditure as % GDP</th>
<th>Road Expenditure per Capita ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>2.1</td>
<td>61</td>
</tr>
<tr>
<td>Algeria</td>
<td>0.8</td>
<td>8</td>
</tr>
<tr>
<td>Cameroon</td>
<td>0.6</td>
<td>20</td>
</tr>
<tr>
<td>Ecuador</td>
<td>0.7</td>
<td>34</td>
</tr>
<tr>
<td>Egypt</td>
<td>0.3</td>
<td>18</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>3.6</td>
<td>5</td>
</tr>
<tr>
<td>Kenya</td>
<td>0.3</td>
<td>18</td>
</tr>
<tr>
<td>Yemen</td>
<td>1.6</td>
<td>8</td>
</tr>
</tbody>
</table>

19. **The allocation of funds to road maintenance is insufficient.** With only about US$ 25 million spent on road maintenance in 2007, Yemen fares badly compared to other countries, especially when maintenance expenditures are expressed as a share of total expenditures. If the usual standards on maintenance expenditures are applied to Yemen, and prices taken into account from the recent bidding for pilot performance based maintenance contracts, about US$ 75 million should probably be spent on routine and periodic maintenance to keep Yemen’s paved network in satisfactory condition. This is three times more than what is currently spent. One notable gap concerns periodic maintenance expenditures which are almost zero. Numerous roads in Yemen, particularly the strategic Sana’a – Hodeidah road, would not have deteriorated to the point of requiring reconstruction, if they had received adequate periodic maintenance, at a much lower budget cost overtime than the cost of reconstruction.

Table 4 - Construction / Maintenance Shares of Total Expenditures

<table>
<thead>
<tr>
<th>Country</th>
<th>Construction</th>
<th>Maintenance</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>87</td>
<td>13</td>
<td>100</td>
</tr>
<tr>
<td>Algeria</td>
<td>80</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Armenia</td>
<td>21</td>
<td>79</td>
<td>100</td>
</tr>
<tr>
<td>Bhutan</td>
<td>85</td>
<td>15</td>
<td>100</td>
</tr>
<tr>
<td>Ecuador</td>
<td>68</td>
<td>32</td>
<td>100</td>
</tr>
<tr>
<td>Egypt</td>
<td>90</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Guatemala</td>
<td>80</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Morocco</td>
<td>49</td>
<td>51</td>
<td>100</td>
</tr>
<tr>
<td>Nepal</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Yemen</td>
<td>93</td>
<td>7</td>
<td>100</td>
</tr>
</tbody>
</table>
20. **Expenditures are probably too high on urban roads.** At a total of 29 billion YR or about US$ 145 million (or 42% of the 2007 total road sector budget), expenditures on urban roads appear excessive, if compared to most countries and in relation to economic requirements. This is mainly due to the priority local authorities have given in the past to extremely high geometric and technical standards for the main arteries and bypasses of Governorates’ capital cities, as noted in paragraph 34 below. These standards are not justified by traffic and congestion. In many cases, “softer” and far cheaper measures such as better traffic management, effective design of intersections, and control of parking and road side activities, would achieve better results than massive investments in road infrastructure in urban areas.

21. **The current balance of expenditures among primary, secondary, and rural roads is probably not economically optimum.** Although there are many uncertainties regarding the actual allocation of expenditures to the various categories of inter-urban roads, it appears that the shares going to primary roads and to secondary and rural roads, respectively, are about equal. This may not be economically appropriate. The primary road network is already mostly developed and paved. Further expansion will likely be in sparsely populated areas. On the contrary, many highly populated areas are not served by all weather roads, and access of the rural population to markets and services is still poor, as emphasized earlier. The comparative benefits of investments in primary versus secondary and rural roads need to be assessed.

22. **Resources are spread far too thin among an excessively large number of projects.** There are more than 750 projects currently registered in MPWH’s budget. Many correspond to small contracts and receive a minor budget annual allocation. However, the total amount expanded on these projects is sizable. This has been a long standing problem and is due to the political need for an equitable distribution of public resources. Yemen is not unusual in this. However, as will be discussed later, it is an inefficient way to spend scarce public resources because of the contractual and supervision problems it creates. The duration of these contracts is also extremely long and, thus, the full benefits of expenditures materialize only many years after the investment.

23. **Certain types of expenditures which in principle would be highly relevant are not included in the work programs and budgets.** Some investments, particularly the construction of passing lanes in mountainous areas and the rehabilitation of some main roads were deemed high priority in the National Highway Master Plan prepared by the international consultant SMEC in 2005 but have not been included in MPWH’s budget so far. Passing lanes would likely have a strong economic justification in West Yemen where the difficult terrain and the significant share of old and underpowered vehicles makes traffic congested, slow, and unsafe. Spot improvements for village access roads could also be an economic way to temporarily increase vehicle speed and improve access until a proper road is built.

### B. Road Management Framework

#### (i) General allocation of responsibilities

24. **A key strength of the current organizational set-up is that all intercity roads, whether national highways, secondary or governorate roads and tertiary (rural access) roads are administered by the same road organization, the Ministry of Public Works and Highways**
There are indeed good reasons for managing all roads in one organization: economies of scale, efficient use of scarce human resources, more appropriate standards, and more optimal allocation of available funding for maintenance and investments. However, despite staff capacity constraints, MPWH is also involved with urban roads, except in the capital city, Sana’a. This should be reconsidered since management of urban roads is often closely associated with issues related to urban planning and land use management. In most countries, the urban road networks are managed locally.

25. **There is a high fragmentation of responsibilities for network management.** Four independent units are involved in road management in Yemen: the Road Sector Directorate (RS), a major organization within MPWH directed by the Deputy Minister of Roads, manages implementation of locally funded projects for all types of roads; the Rural Access Program Central Management Office (RAPCMO) is managing foreign funded secondary and tertiary rural roads, and recently some rural roads funded entirely from MPWH road budget; the Foreign Funded Projects’ Management Unit (FFPMU) is implementing main highway projects with foreign support; and the Road Maintenance Fund (RMF) is responsible for road maintenance and implementation of road maintenance related projects. Road planning, road network programming and budgeting, traffic safety, road laboratory and research, as well as financing and human resources administration are handled by other units within MPWH. This fragmentation is made more complex by some involvement of the different units (except RAPCMO) in implementation and maintenance of primary roads through and around urban areas except Sana’a.

26. **Some current allocations of responsibilities may not be the most effective:** This relates in particular to the RMF which is presently responsible for implementing some strategic road rehabilitation projects, such as the Marib-Safir-Al Abr and Sana’a – Hodeidah road rehabilitation projects (some of which are foreign supported), and was in charge a few years ago of a major improvement to the Sana’a – Dhamar highway. This diverts valuable attention away from regular road maintenance, the very reason for the RMF’s establishment. Also, as is well understood by MPWH and now being tried out, the capacity of RAPCMO could be used more actively to implement some rural roads fully funded by the local budget, especially roads in the vicinity of its rural access road program. Finally, the status of the General Corporation for Roads and Bridges, the large State owned company which used to be in charge of much of the road construction and maintenance in the country, and the other two large public road corporations, remain ambiguous. Although GCRB now operates as an autonomous organization, it is still awarded large maintenance contracts by the RMF every year on a sole source basis. The Minister of Public Works and Highways is Chairman and overall in charge of GCRB, although the Deputy Chairman is the day-to-day General Manager. This situation makes it difficult to have a fair bidding of works by MPWH when both the private sector and GCRB participate. To get a level playing field, GCRB would have to be made more independent of the Government, operate as a commercial private business with its own balance sheet and assets, and have full managerial autonomy from its parent ministry. How the other two public construction corporations have been awarded road contracts in the past is unclear.

(ii) Planning, programming and budgeting processes

27. **Although there had been progress in the past few years in defining strategic priorities**

\[\text{(National Highway Master Plan, Governorate Rural Access Master Plans, Public Investment}\]

\[\footnote{In Yemen, the Ministry of Transport has a very limited involvement in the road sector. Its focus is on land transport services. MOT’s impact on the road sector is through regulations on vehicle dimensions and vehicle weights and on issues related to freight companies and freight forwarding industry.}\]
Program), road planning is still weak and budget processes undeveloped. Main issues can be summarized as follows:

- There is no unit in charge of planning for the road sector as a whole. MPWH’s department of planning covers the entire ministry’s activities. It focuses on programming and budgeting and not on the identification and evaluation of medium to long term expenditure needs.

- Plans and programs are fragmented. Plans for construction/upgrading of main roads, rural roads, and urban roads, and for maintenance are prepared separately by the various units described in paragraph 24 above. This makes it difficult to analyze trade-offs in a systematic way and to optimize expenditures across the entire sector.

- There is also a multiplicity of plans (National Highway Master Plan, Public Investment Program, National Five Year Investment Plan, short term priorities of FFPMU for foreign funded projects, etc) prepared at different times to serve various sectoral or macroeconomic purposes, but no single strategy document that would be well accepted by all stakeholders.

- Foreign funding is not well integrated in the programming process and, in some cases, directs the selection of priorities.

- The data base for the road sector (road network, maps, traffic, etc) is currently inadequate and much information is not fully reliable; there are major inconsistencies in the data; lack of proper maps makes it impossible to have an overall vision of the road network and where there are ongoing activities.

- Despite past efforts, a functional classification of roads has never been completed.

- There is uncertainty as to the extent of the road network under the responsibility of the RMF for road maintenance.

- Locally funded projects (including some costly projects such as city by-pass roads for example) are not subjected to rigorous economic analysis.

- Some projects (rural roads) are split in foreign funded sections and sections funded by the national budget, with the latter usually much slower to complete.

However, the MPWH is making progress on these issues. Realizing the importance of proper planning and programming, it has started to prioritize its investments better. It is now updating the 2006 master plans for three governorates, and taking steps to prepare an updated national master plan integrating planning work from all road units. Also a decision has been made to create a central road planning unit in the ministry.

(iii) Design and Technology

28. Poor quality of design in locally funded projects. The sector is still suffering from the considerable difference between the implementation processes used in 100% locally funded projects and those in projects with donor assistance. For the latter, the design was always carried out upfront as a basis for a good cost estimate. Relocation of utilities and acquisition of land and structures, when necessary, are addressed as parts of the design studies, which are carried out by
reputable local and/or regional consulting firms. This does not mean that there are no implementation issues on foreign funded projects. However, they are often more manageable and easier to resolve due to better upfront design, more accurate quantities, and a better form of contract. Recognizing this, MPWH has started to use local consultants to undertake design of locally funded roads, and in a few cases also agreed to award supervision contracts to local firms. However, given the slow implementation of locally funded projects, the legacy of past neglect in project preparation, when design was done by the contractor, as well as of inadequate forms of contract and insufficient follow-up of contractors, will be felt for years.

29. **RS capacity to review and comment on design and studies is low.** The contractors’ and consultants’ designs of locally funded projects are approved by the Survey and Design Department of RS. However, local contractors and consultants have raised concerns about the shortage of experienced road engineers in RS to review designs and studies and correct them. The errors and sub-optimal designs are not captured and corrected, and review of well executed designs seems to take a lot of time and frequently delays works. Experiences with weak designs are also not internalized by the Survey and Design Department. Plans of MPWH to improve this by recruiting newly graduated engineers will only partially address this problem in the short to medium term. Institutional capacity may in fact decrease at first while on the job training and coaching is provided to a large group of fresh engineers.

30. **The lack of adequate attention to upfront detailed design on many urban road projects implemented by the RS is also the main cause for the widespread lack of coordination between the Municipality, the Governor, MPWH, and the Contractor regarding land acquisition, utility relocations and resettlement.** The design of utility relocations, preparation of land acquisition drawings and administration of expropriation of land and buildings are normally critical preparation activities before tendering of new projects. The RS has limited experience in this area of expertise as land acquisition in rural areas is rarely needed. Within municipal borders, the situation is completely different as full compensation is required and proceedings have to be initiated by the local government to acquire all land and structures required for a road. With MPWH in charge of contracting, design and construction supervision, this rarely happens during project preparation and sometimes even not during implementation. Examples of houses and electric poles left inside a new paved multilane urban street can be observed in some places. In addition to the traffic hazards created by these practices, the quality of the road will eventually suffer when the road has to be excavated to move or replace utilities.

31. **Pavement design for new construction and road rehabilitation could be improved.** Normal engineering practice is that such design should be based on axle load surveys where the punishing effect on road pavements of each truck’s axle loads is converted to an equivalent number of standard 8 ton axles and accumulated for all trucks in the base year and then for all subsequent years throughout the design life for the project. For road rehabilitation road conditions surveys is also a necessity. It seems, however, that, for most locally funded projects, much more relaxed methods are used largely based on past experience and visual survey and not so much on knowledge about traffic, road condition and axle load distributions. Both for geometric design and pavement design there are international standards and manuals that can be adopted, and technical specifications applicable to Yemen are available in many countries in the region (Iraq, Jordan, Oman, to name a few). Pavement design of locally funded projects in Yemen is often kept with standard thicknesses, comprising a thin layer of wearing course ranging between 4-5 cm and 15-20 cm of granular base course layer. In some regions, this has proven to be adequate due to the high quality of naturally occurring granular base course materials and limited loading

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3 RAPCMO has also experienced occasional redesign during construction (design of about 5% of project lengths are reported to need revision).
of trucks. This and low rainfall have helped in holding down the cost of road works in Yemen, where the unit rates for pavement and earthworks is low compared to other countries in the region. But on other roads along the cost and where traffic loading is heavy such as the Sana‘a – Hodeidah road or where good materials and water for compaction are scarce, such as the Marib-Safir-Al Abr road, more attention to pavement design and soils and materials engineering would be appropriate. A good example is the foreign funded Hudeidah – Harad road that was well constructed in the mid-1980s and still has not required any overlay or rehabilitation work to be carried out on the pavement.

32. **Construction practices could improve also.** There seems to be too much reliance on graders to distribute material, to mix base course with water and for leveling before compaction. The dumping of base course materials in piles on the finished sub-base and spreading by graders often bring about segregation of material and uneven moisture content affecting compaction. These practices give variable results, in particular for compaction and evenness of the finished base course before asphalting. For their main road projects, many countries in the Middle East and elsewhere now rely on pug mill mixers to mix material (for good gradation) and water (to get optimum moisture content) and place the base course using finishers with level sensors before compaction. This method provides a better and more uniform quality of construction, better surface roughness and quality control is much easier. This is important where there is a shortage of good graders and experienced operators, and many road contractors with limited experience.

33. **There is a reluctance to vary the technical standards** of roads of different classification and traffic volumes. Too often, the RS in the past has been using a highway-size road width on relatively low trafficked rural roads or low gradient when the mountainous terrain makes this very costly. Also RAPCMO has been reluctant to use single lane standards with passing lay-bys to avoid land acquisition, excessive earthworks, or unstable high maintenance side-slopes (except for village access roads where a 5 meter asphalted width has been used). The use of thin bituminous surface seals is not allowed on rural roads with marginal traffic, even in relatively flat terrain and on shoulders. In the past no attempts were made to explore other pavement types and materials for use in road construction or maintenance, even on a pilot basis on short sections of roads⁴.

34. **Excessive standards on many urban road projects:** The responsibility for national highways within municipal boundaries rests with the Governor of each governorate while implementation of important road upgrading projects is mostly delegated to MPWH. In most cases, when interurban highways cross the municipal border, which often is quite far from any built-up areas, the single carriageway road is widened to six or more lanes as a matter of policy and not traffic demand. Most urban entry roads are 40 meters wide with street lighting, raised median and closed drainage systems, even in predominantly agricultural areas. Also in the case of bypass roads around urban areas, the standards have been excessive, and not matching the expected traffic volumes. These investments are generally highly uneconomic. On some sections in some urban areas, there may be a case for more lanes and parking facilities, but much of the available space is being used for on street marketing activities and traffic flow can be slow even when such roads are completed. The lack of traffic management and urban land use plans make such investments, even when justified, questionable. The policy of the new leadership in MPWH is now to avoid new urban roads projects with excessive standards.

(iv) **Procurement and Contract Documentation**

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⁴ Now, however, all MPWH tendered projects for rural roads have standards similar to those introduced by RAPCMO and even lower on village access roads.
35. **The tender documents of locally funded projects have been weak.** There was until recently a considerable difference between the procurement process and tender documentation used in 100% locally funded projects and projects with donor assistance. For the latter the contract size is generally larger, the procurement process involves pre-qualification (or post-qualification) of contractors according to transparent regulations. The tender documents are based on internationally recognized forms with a detailed Bill of Quantities based on site surveys and designs and provisions for advance payments. For projects entirely funded by the local road budget, the contracts used to be small and tender and contract documents were based on incomplete preliminary designs. They included limited if any upfront survey work and rough quantities were the basis for tendering and contract award. Sometimes, a contract for road works was negotiated directly with a preferred local contractor⁵, every so often in the form of an addendum to an already ongoing contract. These arrangements created adverse incentives as a road design carried out by contractors is likely to increase quantities and costs, exactly the opposite of what a good design, detailed contract documentation and transparent tendering and award are supposed to achieve. A large proportion of the road budget still includes old contracts that occasionally get extended and are difficult to terminate. But now the situation is reportedly different for new works with better tender documents and contracts, better evaluation of bids, more accurate bill of quantities through design by local consultants, and with the use of a new national bidding document based on international best practices. And no new contracts for road works are any more negotiated with private contractors without tendering.

36. **The form of contract used on locally financed contracts was generally inadequate with a Bill of Quantities filled with preliminary quantities.** There were no project specific particular conditions of contract, and the contract allowed for the contractor to carry out the detailed alignment survey, prepare construction drawings and other design work for approval by the RS (as noted above). There was and still is no provision for advance payments to be made to the local contractor for mobilization and purchase of equipment. There were (and still are) also no provisions for price adjustment clauses in the old contracts except for occasional adjustments of contract price by a Presidential Decree. The old form of contract allows for the contractor to pay the MPWH supervisor for his follow-up of the implementation and for processing of payment certificates. This arrangement was recently rescinded when the new de-concentrated supervision units were introduced, funded from the road budget through a 2 percent deduction from all budget allocations. The legacy of many on-going contracts still remains. The updated version of the national tender documents and contracts is addressing many of the old shortcomings, and has been approved by the Tender Board. For new contracts the situation is thus now much better.

37. **Lack of a price adjustment clause in tendered contracts in combination with long time for tendering and contract award and extended implementation periods often make the tendered rates outdated and causes losses to local contractors on many road contracts.** There are no price adjustment clauses in the current contracts and no regular collection of price indexes relevant to the road construction sector. This is an important factor explaining the poor performance of many contractors as the contractors have to find ways of cutting costs to make savings. This is compounded by the allegation that in the past MPWH was trying to negotiate the contract price down with lowest evaluated bidder before award. These practices lacked transparency and were unfair to the bidders. For the old contracts the standard rates are now revised every 3 months and new rate are issued and approved by the Prime Minister.

38. **Too many variation orders:** Possibly to avoid design and tendering of new projects, the RS supervision department has been signing large variation orders and contract amendments for

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⁵ which is still the case with GCRB for maintenance
old contracts, some dating back to the 1990’s. This allowed the contract price and volume of work to increase while the number of projects stayed the same. Some of these negotiated variation orders have been several times the value of the original contract price. The new supervision organization in MPWH is carrying out a major re-evaluation of those contracts and trying to stop these large variations. Attempts are also made to limit non-performing contracts.

39. Competitive tendering of road contracts has now become the norm. A few years ago there was no tendering for locally funded road contracts. These contracts were mostly negotiated based on pre-defined unit rates, or awarded to GCRB. Some of the contracts awarded to GCRB in this way, have been subcontracted fully or partly to smaller local contractors, also without any competition. This practice has fortunately been stopped after the new procurement law was adopted. All new local contracts are now tendered competitively and the evaluation and award process is more transparent. However, there may still be a lack of operational procedures for the new law with limitations on variation orders, minimum size of contracts, etc. And again, there is the legacy of past contracts which needs to be addressed. A review of the law will be made shortly to compare with Bank requirements for local competitive tendering under IDA financing.

40. Responsibilities for contracting and supervision of road works are split. The Contracts and Specifications section in the Studies and Design Department is responsible for all contracting of road works, including some urban road projects (excluding in Sana’a). But after award, all contract issues including amendments and variation orders are handled by the Supervision Department, and most contracts have several amendments that in sum often exceed the original contract price. The technical quality and justification of the amendments are not submitted to the review of the Studies and Design Department as they should. In many countries, the responsibilities for all contract management including tendering, evaluation of bids, contract award as well as supervision of works and general follow-up are under the same department. This arrangement creates better ownership for the results and may also reduce the tendency to accept variation orders and contract amendments.

41. Classification of contractors to be improved: The old classification system was not working well as the classes of contractors were based on small contracts and this limited competition and development of larger contractors to the benefit of public corporations. A new revised system has recently been adopted which is based on a pre-qualification system of larger contract values and include many of the criteria used by international donor agencies in their standard bidding documents (equipment and plant availability, size of contracts undertaken, qualification of key staff, etc). It is too early to say whether this new system will provide a fair and simple classification of contractors, without any of the usual shortcomings encountered in many countries such as classification without due regard to the specifics of contracts, and poor updating by the department responsible. Ideally, the classification of road contractors should be undertaken by the main user, the RS.

42. Need to develop institutional capacity at the RMF: Procurement of consulting services and contractors in the RMF is carried out by the studies, design and contracting directorate with a staff of 25 of which 14 are engineers. The responsibilities of this unit are considerable, as they are expected to carry out or contract out all pavement studies, road rehabilitation and pavement strengthening designs as well as preparation of tender documents, tendering and contracting for all new projects. It is not clear that the unit presently can satisfactorily implement such work load, given in particular the large number of relatively small projects. This set up also adds to the

6 The only exception is the preparation and procurement of the Bank financed performance based road maintenance (PMMR) contracts which was handled by the Project Management Unit set up in the context of the Second Rural Access Project.
fragmentation of responsibilities in RMF. Ways of consolidating procurement and supervision activities of all projects should be considered to make better use of scarce resources.

43. **Direct contracting of routine and emergency maintenance services to GCRB does not seem to be effective in the short as well as the long term.** The prices agreed to long ago by RMF and GCRB for routine and emergency maintenance works on the road network do not any more reflect the costs of providing adequate services. There are also problems with inadequate contract performance criteria and poor supervision which affect the results. In fact, public corporations such as GCRB operate at artificially low cost levels due to the use of civil servant staff and availability of road camps, equipment depots and field offices provided by the government at no cost to them. This lack of competition in the provision of maintenance services works to the detriment of developing a qualified, efficient private road maintenance industry in Yemen.

(v) **Supervision and Contract Management**

44. **The supervision of donor supported projects is generally good.** There is a considerable difference between the supervision of donor supported projects and the supervision of 100% locally funded projects. Donor supported projects are normally supervised by consulting firms while MPWH rely on in-house teams for locally funded projects. Although there have been some faults in the past on donor financed projects caused by inadequate or inappropriate staffing of supervision teams (the early stages of RAPCMO is a case in point for roads with surface treatment) such weaknesses are now becoming rare. Some donors are also requiring more regional consulting firms to provide core technical staff due to the shortage of capacity in the local consulting industry. The supervision and quality assurance arrangements of foreign funded projects at current workload are therefore by and large adequate.

45. **Site supervision of locally funded projects is improving.** Although the MPWH is still not relying on consulting firms for construction supervision as a policy, the situation is now a lot better with the new leadership in MPWH, and considerable improvements have taken place in the recent past. MPWH has abolished the old supervision arrangements whereby the supervision staff from MPWH was partly remunerated by the contractors and made more money by being in charge of more projects whatever the extent of “supervision.” A new system for supervision and quality control was introduced recently based in the governorates. It included the setting up of special projects implementing units staffed with three specialists (experience road manager, surveyor and a soils and materials engineer) selected based on merit, and paid allowances that match private sector salaries. The plan is to have such units in each governorate with responsibility for supervision and quality control of all rural and urban roads funded entirely by MPWH road budget. Additional site supervision staff is included based on work load. In addition, better on-site presence on projects by the RS’s staff is expected.

46. **However, on-site supervision requires urgent attention.** How well the new arrangements will work in practice remains to be seen. There may still be insufficient on-site follow up of the more than 750 locally funded projects in the budget. What constitute good and effective supervision under these new arrangements still needs to be defined, and the initial focus seems to be too much on processing of payment certificates and drafting of progress reports. There is also limited reliance yet on consulting firms to undertake supervision under contract, although it must be recognized that the lack of capacity of local consulting firms may prevent this, and poor interest from international firms to provide quality staff to go to Yemen remains unfortunately a reality. The new system put in place by the government is a good step forward that needs urgent support to make it more functional. There is not yet the equivalent of an independent (of Employer and Contractor) resident engineer on each locally funded project and
still no full time presence on sites due to the large number of projects. There are also no arrangements for independent lab testing of construction materials and works performed close to the projects. Most tests have to be submitted to Sana’a for testing (to MPWH or to GCRB) and a network of independent laboratories is greatly needed. Some assistance is needed urgently to put this new effort on a firm footing, as it would be unfortunate if the arrangement would fail due to lack of manuals, specifications and procedures as well as adequately trained staff and laboratory capacity. An indicator of good follow-up is the number of projects coming to closure every year and leaving the budget. Other indicators are the number of variation orders processed and the average time taken to process payment certificates. Ultimately, the quality of works undertaken would also have to improve and this would have to be assessed through technical audits, for which a new unit in the RS has rightly been set up. For future large contracts, MPWH is planning to use consulting firms to supervise the works on site. However, given the budget constraints, the large number of poor performing old contracts still under implementation, and the limited local consulting capacity, the focus should to a large extent remain on better on-site supervision of ongoing (old) contracts by MPWH staff.

47. **On many road projects in the past, construction quality has been inconsistent.** This was most likely caused by a combination of several factors. The field survey work and design have not always been of satisfactory standards; the supervision of the works was often not consistent nor timely; the technical specifications were relaxed; and the funding and/or key materials may not have been available in a timely fashion causing multiple demobilization and remobilization of the contractor. The underlying problem has been the general easygoingness towards local contractors, a practice established over many years and therefore difficult to change because it affects expectations on both contractor and client sides. The RS has just established a technical audit and quality assurance department, a very good first step to change past practices and improve quality of work.

48. **Too many projects are being implemented at the same time.** compared to the availability of funding for roads and to staff limitations. There are more than 750 projects being executed by MPWH, more than half of which are urban road projects. About 70 new projects are started every year, many with foreign funding, without as many projects being completed. This high number of projects is difficult to manage and small disbursements on each project are causing large construction inefficiencies. The lack of ability to come to closure on projects nearing completion is also a serious issue as the number of active projects is growing every year while the number of dysfunctional projects and projects subject to disputes are not going down. To face this issue, the Minister of Public Works and Highways has rightly set a policy of not initiating any procurement of new locally funded projects unless such procurement is a decision of the Cabinet. MPWH is also now trying to close about a third of all old on-going contracts as they reach physical completion.

49. **Lack of budget funds at the end of the year:** There has been a tradition in MPWH (and possibly in other ministries) of accumulating a large backlog of payment certificates (often equivalent to two –three months of work) at the end of the year in the expectation that supplemental allocations would be granted by MOF within the budget year. This practice has been going on for years caused by MOF’s usual underestimation of revenues (and the setting of low initial budget ceilings for ministries). Whenever such funding does not materialize in sufficient volume, as often is the case, many contractors have to demobilize and remobilize disrupting their work and causing inefficiencies and claims for cost increase and extension of time for completion. This practice causes delays in all payments in fact, including for civil servant salaries.
50. **Independent monitoring and evaluation** (technical audit) is not much used by MPWH for their locally funded projects. This is about to change as the RS has established a department for technical control and audit of both works supervised by MPWH, but also control and monitoring of quality of materials from sub-contractors (asphalt plants, cement batching plants, commercial quarries, etc.). This would require that there are procedures in place for such independent controls and that the classification system for contractors is able to cope with quality as well as capacity. The RS now intends to recruit experienced soils and materials engineers and pavement specialists to provide training and support in these areas.

(vi) **Construction Industry Capability**

51. The road construction and maintenance industry in Yemen has a large number of road contractors but few are capable of undertaking any size road contract. MPWH has registered 60+ road contractors. The current classification system allows public and private contractors to be qualified. But the classification system allows only public corporations to be qualified for the top level and any size contract. These are: the General Corporation for Roads and Bridges (GCRB), the Military Engineering Establishment and the General Corporation for Economic Affairs. All of these three public corporations have large ongoing road contracts for MPWH. There are also a few large private contractors, all based in Sana’a, some of which have several on-going projects for MPWH, RAPCMO and the Social Fund. Sheba Company has 1200 employees and 110 engineers, Hawk International is about the same size, Bin Goribah Makhzom Contracting Co. has also 1200 employees and about 200 engineers and technicians and undertake large flyovers and underpasses in Sana’a; there are also Al Riyah General contracting, Arabian Enterprise and Al Bashiri Group with contracts in the road sector. However, the majority of locally funded road contracts are still undertaken by a large number of small civil works contractors. It should be noted that GCRB’s share of the local road budget is about 20%. GCRB subcontracts about 50% of its works to small subcontractors but this percentage is declining rapidly. These sub-contractors are all locally (district) based and mostly earthworks-only contractors with limited asphaltling capabilities.

52. **Overall, notwithstanding the few large firms noted above, Yemen’s road construction industry is relatively young and fragile.** There are now about 10 private contractors who have taken road projects funded internationally and locally. However, given the large investments in new roads in Yemen over many years, one would expect many more and larger local road contractors. The main reasons local contractors are few and relatively small are:

- for many years, the large public road corporations were sole sourced many of the large locally financed contracts;
- as noted earlier, even when work was tendered, the public corporations could tender at low rates made possible through subsidized plant and equipment, use of publicly owned office space and road camps without charge, and civil servant staff;
- large donor funded projects were too large for local private contractors to pre-qualify and therefore mostly undertaken by international firms without local sub-contracting;
- an effort in the mid 1990s to award many large road contracts to local firms was successful, but, a period with rapid inflation and devaluation of the Riyal in combination with no provisions for price escalation in contracts, caused many of the contractors to go bankrupt and/or leave the business;
- subsequent attempts to allow marginal local contractors to participate in tendering of foreign funded projects were more successful; however, locally funded road projects were often divided into small sections and largely either subcontracted by public
corporations or offered to local firms at rates that were too low to be interesting to major firms;
- the delays in making payments, sometimes several months can cause severe and unpredictable loses to contractors;
- the implementation time on many locally funded projects has often been extremely long (up to 7-10 years) due to low annual budgets.

53. **Role of the General Corporation for Roads and Bridges (GCRB):** GCRB with head office in Sana’a is the leading state corporation constructing roads and bridges. GCRB is a road and bridge contractor only and now competes for all works contracts (except routine maintenance) in competition with other public and private contractors. Due to its former role as highway agency as well as service provider, GCRB has a well developed network of infrastructure to support its operations (road camps, equipment and plant depots, workshops, and fully equipped commercial road laboratories). GCRB receives no financial support from the government although its vast infrastructure network and sole sourced contracts constitute an implicit subsidy. Eighty percent of the profit as well as taxes are turned over to the Ministry of Finance, which does not provide much incentive for cutting costs and does not help growth and development. Currently the GCRB has 65 active projects with a total contract value of YR 78 billion. Given that some of these projects are foreign funded (Qatar) and quite large, the average size of the locally funded contracts is quite small, less than US$ 4 m, with an even smaller annual value of works. The total annual turn-over the last three years for GCRB has been about YR15 – 18 billion. Except for maintenance contracts GCRB now tenders like any private contractor except for works in certain locations where no private contractor can work due to security hazards. GCRB now is operating more in private sector manner and a recent re-structuring has been implemented towards more autonomy.

(vii) **Consulting Industry**

54. **There are few capable firms and these are generally very small.** The consulting industry is generally weak in Yemen and no firm is registered in the top category in the MPWH register for consulting firms. 17-18 firms have registered but only 10 are rated in the second highest category. Besides smaller local assignments, a large part of the local firms’ work load is to provide co-operational and logistics support to foreign firms on donor funded projects. There are about 5-6 firms currently active on a regular basis in the road sector. These have a handful of permanent employees but all have the ability to hire many more engineers whenever new assignments are offered.

55. **The growth of the industry was hampered in the past by reliance on in-house services by government.** The reason for the lack of large and capable road engineering firms has to do with the history of the road sector. GCRB was the highway authority in the North before unification, and for all of Yemen after unification. It had capabilities to carry out studies, design, contracting and supervision, and it eventually also undertook force account works. In the South, there was a similar entity in charge of roads before unification and this unit eventually turned into a consulting and contracting unit. The presence of public corporations either providing all services in-house or relying on foreign consulting firms when foreign funding was available inhibited growth of a local consulting industry for many years.

56. **Much design work has generally been carried out by independent engineers and very small firms in the past.** Eventually, local private contractors were contracted to do design-build contracts where the design was not a specific and important pay-item. The survey work and design was therefore either done by the firm itself, or assistance was sought from local engineers,
some working in public corporations or ministries. This practice may have prolonged the design-build contracting. Currently, GCRB is providing design services to many local contractors as commercial services.

57. **Local construction supervision capacity is low.** However, the area where the needs are the greatest at present is the on-site construction supervision services, and existing firms have very limited capacities at present. Newly recruited staff from the university would need to have some construction experience before being useful in supervision and this will take time. One large contractor was relying on foreign senior engineers on site and estimated that it took the firm 2-3 years with on-the-job training before local engineers were fully useful on site. More generally, the engineering industry also noted the lack of good training programs covering studies, design, environmental engineering, hydrology and production of tender and contract documents. MPWH is in the process of awarding the first construction supervision contract to a local firm to supervise the northern entrance of Sana’a project. MPWH is also about to tender 5 consultancy services contracts to supervise newly tendered road projects (including one large road project awarded to GCRB) through a transparent competitive tendering process.

(viii) **Monitoring and Evaluation**

58. **Despite recent efforts, monitoring and evaluation of road sector performance is still weak.** Monitoring and evaluation systems are in their infancy in Yemen and do not allow key decision makers and stakeholders to develop a well founded appreciation of how well the sector meets its goals and, in particular, satisfies the needs of road users. The main weaknesses are the following:

- There are no “management reports” to regularly inform decision makers of progress in implementing road programs, although there are now reports on progress every month by the newly established supervision units.
- There are no periodic reports for the general public on the performance and achievements of the road sector.
- There are no mechanisms for the Government to regularly consult the users of the road network on their needs and their views on priority investments.
- There are also no mechanisms for consulting other stakeholders (local governments, local leaders, contractors and consultants, construction materials producers, etc.), and for identifying the constraints they may face in fulfilling their responsibilities.

(ix) **Human Resources Management**

59. **There is a serious lack of capacity and skills in the civil service:** While the size of the Yemen civil service in the road sector is not excessive, many civil servants lack the skills needed for using modern efficient systems and procedures. The scarcity of experienced technical and other staff can only be fully addressed by improved incentives, i.e. fundamental reforms to the remuneration system, transparency in appointments, sound transfers and promotion rules, an attractive career path for technical staff, and better training and professional development prospects. There is also a fundamental lack of well structured and continuous training programs. However, to provide training only without addressing the underlying incentive issues, one runs the risk of trained staff leaving the civil service, or even the country, once the training is over, and high staff turnover will continue or staff may carry on with a second job in the afternoon to support their family.

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7 Governors and their staff are now getting more involved in road management although this should not dilute MPWH’s responsibility.
60. **There are staffing imbalances:** There may not be such a lack of engineers overall in the sector, as GCRB seems to have a surplus of experienced technical and administrative staff that could be released at least temporarily for work under MPWH and provide interim capacity pending more comprehensive reforms. The MPWH also plans to speed up recruitment of fresh university graduates and training to address the lack of capacity in the ministry. This is important as it will help change the spirit of the Ministry. However, it should be factored in the plans that the arrival of young staff may result in loss of capacity at the beginning due to on the job coaching and training of new engineers by current staff.

61. **The reliance on Project Management Units may delay the introduction of civil service reforms and capacity building necessary to improve the efficiency of locally funded projects.** The temporary organizational development efforts in the form of PMUs have been effective in the short to medium term, but they are not sustainable in the longer term. By removing human resources constraints on some of the most visible projects, the PMUs may unintentionally cause a postponement of the broad civil service reforms necessary to address the underlying causes of problems and imbalances in technical sectors. The high salary differences within directorates and ministries between staff having essentially the same responsibilities may in particular cause internal conflicts.

### C. Inefficiencies in the use of the road network

(i) **Road Safety**

62. **Road traffic safety is exceptionally poor in Yemen.** Except for possibly Iran and Egypt, Yemen has the poorest traffic safety record in the region with almost 3000 killed every year on the road network. The police reports about 13,000 accidents on Yemen’s road network every year with injuries affecting about 17,000 people. The most common causes of road crashes as reported by the police are speeding and careless drivers. However, undoubtedly the highway network is a challenge to even experienced drivers, and poor road condition is a contributing factor in many fatal accidents. The backlog of maintenance works due to under-funding of regular maintenance for many years, and the fact that the core road network is suffering from overloading and an aging trucking fleet, not only affects the cost of transportation and need for rehabilitation, but also endangers traffic safety.

63. **There is no national traffic safety strategy and monitoring/evaluation of traffic safety activities is insufficient:** Policy making and monitoring/supervision of traffic safety is the responsibility of a Higher Committee for Traffic, headed by the Vice Prime Minister and Minister of the Interior. Members are: MPWH represented by the Chairman of the RMF, Deputy Minister of Health, Deputy Minister of Transport, Deputy Minister of Media, Deputy Minister of Education, and Director General of Traffic Police. There used to be a meeting every three months, but there has not been any meetings now for a long period. A secretariat is yet to be designated officially to provide operational capability to the Committee.

64. **There is a sound set up for traffic safety enforcement:** The responsibility for traffic safety enforcement (among other responsibilities) is with the Traffic Department in the Ministry of Interior. The department has relatively new offices and adequate equipment, and it keeps good statistical records of the accident situation updated almost on a daily basis. The department seems

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8 Estimate only. Official figures from the Government are 2500 for 2007.
to be working well in spite of a compartmentalized setup with many small units with managers reporting directly to the General Director through his Deputy, among them all 21 traffic police units in the governorates. The Traffic Department has 211 staff in Sana’a head office. In all of Yemen there are about 7,000 staff including about 1,200 police officers.

65. The Central Issuance Directorate is the key office as far as traffic is concerned, as it is responsible for fines and penalties for traffic code violations including truck overloading and in relation to road crashes/accidents. The Planning and Statistics unit is responsible for traffic accident surveys/reporting and the data base for all vehicle and driver statistics. All road crash/accident records kept are computerized showing traffic accident details by governorate and by day with types of accident, casualties, and causes.

(ii) Axle Load Controls

66. Current policies permit high axle loads on freight trucks. The RMF currently carries out axle load surveys (24/7) on four locations in the road network (Harad, Hodeidah, Mocha and Aden) and has very reliable statistics on the extent of illegal loading of trucks on these roads. Based on data from 2007, when about 90,000 trucks were weighed, more than 2/3 of trucks controlled were found to carry loads in excess of the authorized 13 ton per single axle. The Ministry of Interior is responsible for issuing fines through the Traffic Police, but of the about 68,000 trucks found to be overloaded only about 1,700 were given a citation. The penalty for overloading is about US$ 13 per ton overweight until over 4 tons, then, for a 5-ton overload per axle and more, the charge increases exponentially by 40 percent for each additional ton. The fine is unrelated to distance traveled, and, in practice, the truckers are now only charged if the load per axle exceeds 18 tons (5 ton overweight). Operators of fuel trucks refuse to pay any fine. All trucks are allowed to continue with the excessive load after paying the fine.

67. These inappropriate practices cause severe damage to road pavements: Yemen’s past and current relaxation of the axle load law has caused a systemic overloading of trucks and such extreme axle loads in combination with high tire pressure result in excessive deterioration of existing road pavements and reduced performance and life expectancy of new roads. Such policies need to be rectified. There are plans to increase the number of axle load control stations to cover all important trade routes and mobile controls are planned for other roads. This should be supported by the donor community. But the government must also show a will to enforce the law and current axle load limits by issuing citations for all overloading at the four weigh bridge stations now operated by the RMF.

(iii) Cost recovery from road users

68. The road sector has been highly subsidized in Yemen for a long time. Normally, there should be a positive taxation of road users at least equal to the marginal cost of road use. But in Yemen, because of the very high subsidy of diesel and gasoline, this taxation was negative until 2009. It was a cost to the general public, as shown in Figure 9 below, which added up to the cost of providing roads. In total, the entire road sector subsidy (including the energy subsidy) was of the order of 8% of GDP in recent years.
(iv) **The gender dimension of road transport**

69. In Yemen, where 70% of the population is rural, roads are a major factor of access to economic resources and social services. To assess this aspect of the road sector, and especially the gender dimension of transport in rural Yemen, a study was conducted from mid 2008 to mid 2009 by the Yemen Center for Social Studies and Labor Research under World Bank financing. As part of the study, 360 individuals were surveyed in six selected villages from the governorates of Taiz and Shabwah. Some 30 focus group discussions also took place in the same villages.

70. Data collected showed that, in rural Yemen, women’s mobility is limited compared to that of men. Indeed, women’s movements and their use of available means of transport are socially constrained. Thus, women walk or travel accompanied by neighbors or family members. Because they travel in groups, women’s travel time and costs are high.

71. The link between roads infrastructure and enhancement of women's lives was made clear through the study. Indeed, the price of basic goods (drinkable water, food) is lower in villages where a good road is available. Families in this situation tend to buy these basic goods. This frees up time for women, which some use for productive activities such as making handicrafts that they can sell later. The existence of a road also makes it easier for women to access markets where they can find basic materials and inputs for their economic activities as well as shops to sell their products to. Moreover, the study showed that, when a girls’ school served by a safe road exists, daughters are encouraged to attend school.
IV. An Agenda for Reforms

72. There is much that can be done in the short to medium term to improve the performance of the road sector in Yemen. There are three main directions for Government action: (i) improve the quality of public expenditure programs for the road sector, (ii) strengthen the institutional framework and capability for road sector management; and (iii) correct present inefficiencies in the use of the road network. These directions are described below.

A. Improve the quality of public expenditure programs

73. Both the overall funding provided to the road sector by the national budget and the donors and the allocation of these funds to projects need to be evaluated and re-balanced. The main improvements to the expenditure programs should be as follows:

- Overall funding for road construction, rehabilitation, as well as maintenance, should remain substantial, at least above 1% to 1.5% of GNP. This level of funding would ensure that roads are properly maintained and, most importantly, the secondary and rural roads network continues to be developed. Additional funding would be warranted to allow faster development of the secondary and rural roads network as well as removal of the last remaining gaps in the primary road network and increases in road capacity wherever justified, while keeping within limitations in overall institutional capability.
- Within this overall envelope, funding for routine and periodic maintenance should be increased substantially and periodic maintenance should be promoted vigorously. The RMF budget should increase from YR 4 billion to at least YR 10 billion over the next three years and reach about YR 15 billion over the medium term.
- Also within the envelope, funding for road rehabilitation and low cost upgrading (climbing lanes, in particular, if proven effective) should be increased as already recommended in the National Highway Master Plan.
- The funding for urban roads should be reduced substantially as, in recent years, it has most likely been far in excess of requirements.
- The focus should be on projects with high economic and social rates of return and premature projects like the Amran – Aden motorway should be postponed.
- The road budget should be rationalized by cancelling non-performing contracts and concentrating MPWH’s own funding on those contracts that are economically sound and making good progress. Such rationalization could also take place by combining smaller and older projects into larger contracts for rebidding and supervision by consulting firms.
- As has already been done last year, some secondary and rural roads projects funded by the national budget should be transferred to RAPCMO for implementation.
- An integrated three-year rolling road sector expenditure strategy should be prepared taking account of realistic estimates of funding availability from the national budget as well as donor agencies. This work would in particular include: (i) updating the National Highway Master Plan, and (ii) preparing a new national strategy for secondary and rural roads.
- The feasibility studies for large projects should be updated in the context of the road sector strategy. The update should in particular include more realistic traffic projections and cost estimates.
- Urban transport master plans should be prepared for all large cities in order to provide a sound basis for interventions by MPWH, if and when appropriate.
B. **Strengthen the road management framework**

74. Even though the Government of Yemen as well as donor agencies have traditionally given high priority to road sector expenditures, funding will likely be highly constrained in the foreseeable future given the international financial crisis and the Government’s fragile fiscal position. It is therefore essential to make the best possible use of available funds. For this, numerous measures need to be taken. In essence, these include the development of the responsibilities, organization, and operating processes of MPWH’s existing main units, the strengthening of the construction industry, the strengthening of the consultant’s profession, the development of monitoring and evaluation systems, and the development of human resources.

(i) **Overall organization**

75. The sector’s overall organization should evolve gradually over time from the current one to one more in line with international best practices. Paramount in this process should be the clarity of each unit’s mission and accountability and the need to optimize the use of heavily constrained manpower resources.

- Although the present fragmented structure of the road sector needs to be transformed over the long term, it would be counterproductive in the Bank’s view to undertake major changes in the short to medium term. It is recommended that, for the time being, the sector remains organized around the four main existing units (RS, RMF, RAPCMO, and FFPMU). Each of them would be developed and improved as recommended below. The main reasons for not proposing major changes are the following: (i) the current organization has grown organically as a result of past experience and is adapted to the actual current problems of Yemen and to the fact that foreign aid is a large part of the funding of the road sector, (ii) the current organization is understood and accepted by all stakeholders, and (iii) the disruption and delays which would result from major changes would probably be high and costly. This organization is also in part justified by the problems of civil service in Yemen and especially the very low civil servant salaries and the difficulty of the Government to attract good young staff and hence the need for autonomous, better paid project or program implementation units (PIUs).

- In the specific case of the road sector, the Government should proceed very cautiously with decentralization given the shortage of qualified technical manpower and the high economic cost of poor implementation of road projects. For the time being, the objective should be to achieve de-concentration (i.e. move the execution of government functions to units located closer to where the beneficiaries are and the action takes place) rather than decentralization. Responsibility would thus remain with MPWH but, whenever feasible, project implementation should be managed by units located in the field, although it may be inefficient for each governorate to have its unit. Consultations and coordination should also be organized more systematically with local authorities. MPWH has already been moving successfully in this direction in the recent past.

- The organization principles and the rights and duties of all stakeholders in the road sector should be clarified by a new road law and its implementing regulations, both to be drafted urgently. This law should include a classification of all roads and, for each category of roads, designate ownership, management responsibilities, financing arrangements and responsibilities for maintenance management and financing.
Ultimately, the appropriate structure for the road sector would likely differ substantially from the existing one. As shown by international best practices, such a structure would be along the following lines: (a) policy matters and sector supervision would be handled by a small Roads Directorate in MPWH, (b) there would be a road fund as a financing-only entity, (c) there would be a lean, autonomous national road agency for managing works on primary roads, (d) responsibility for intermediate roads would be under the Governorates, (e) village access roads would be under the District authorities, (f) urban roads under the municipalities, and (g) there would be a few specialized agencies directly under MPWH for road safety, road research, and other matters. Yemen should aim at moving gradually towards such a structure but over the very long term.

(ii) Development of the Roads Sector Directorate (RS)

76. The RS should be the apex unit for the sector, defining strategies, formulating expenditure plans, monitoring developments in the sector, and providing support to the other, more operational units.

- The RS should assume full responsibility under the Minister’s oversight for road sector policy and planning. For this purpose, it should create a special unit directly under the Deputy Minister for Roads for formulating and monitoring road sector policies and defining expenditure priorities, including annual budgets for the sector.
- In the short to medium term, the RS would keep responsibility for civil works on only a limited number of primary and intermediary roads not funded by donors as well as some major urban roads (except in Sana’a). In the longer term, such responsibilities would be passed on to FFPMU and RAPCMO.
- As much as possible the design and supervision of road works should be passed on to consultants. The RS should concentrate on the organization and management of these consultants.
- Procedures and technical and operational manuals should be prepared for road design, procurement, and supervision. These manuals should be in Arabic; they should be adapted to the conditions in Yemen and reflect best international practices.
- The role of the RS’s new quality control unit should be defined more precisely. The unit should carry out technical audits, directly or through consultants. However, it should not take over project supervision or project management responsibilities or even be allowed to second-guess those in charge of implementation. It should not be involved in implementation matters like contract payments. The unit should also function on a quality assurance mode rather than on a “control” mode. It may also take on other functions such as the certification of materials suppliers.
- The RS should create a small unit directly under the Deputy Minister for Roads or, possibly, under the quality control department, which would deal with technology and research issues in the road sector. One of the main roles of this unit would be to develop and promote the use of appropriate road technologies in Yemen.
- The RS needs to carry out an assessment of its work load and staff needs, including especially at the de-concentrated level. On this basis, it should adopt as soon as possible a well defined organizational structure including job descriptions for all main positions.
- The RS needs a well developed management information system to record activities and financial transactions, and to ensure that proper information goes to all sector managers as well as key stakeholders outside MPWH.

(iii) Development of the RMF
77. The RMF should be the key unit in charge of road maintenance and road network condition monitoring. In order to achieve this, the following is needed.

- The mission of the RMF should be clarified: it should focus on routine and periodic maintenance of all paved roads under MPWH and related activities. Unless there is an exceptional case, the RMF should not be responsible for heavy road rehabilitation and upgrading (as it will for the Sana’a – Hodeidah road reconstruction).
- Performance based maintenance contracts should be used as much as possible because of the potential for increased effectiveness and lower costs which such contracts have demonstrated in other countries. Once progress has been achieved on the two pilot (PMMR\(^9\)) contracts that have now been launched under Bank funding and once lessons of experience can be drawn from these two as well as from other similar contracts such as GCRB’s, an action plan should be prepared for extension of performance based contracts to the entire paved road network. In this action plan, a distinction should be made between roads that can go right away to performance based contracts and those that need first full periodic maintenance or rehabilitation. Area wide performance based contracts should also be considered.
- In the interim, before performance based contracts have been adapted to local conditions, the maintenance contract with GCRB should be extended but improved with the introduction of clear performance indicators and systematic supervision. The RMF should also consider hybrid contracts with GCRB and possibly other contractors with some elements of work which would be performance based (drainage, shoulders, etc) and others (potholes repairs, other asphalt work) which would be paid on the basis of quantities and a contractual unit price. Under such hybrid contracts, the risks to the contractors would be lower and the management easier so that contractors might be much more interested than they have been by the two pilot PMMR contracts.
- Knowledge of the road network and assessment of maintenance and rehabilitation needs should be much improved. For this, priority should be given to the establishment of the road management system currently underway. Later on, the RMF should also establish a simple management system for bridges and tunnels.
- The RMF should concentrate on programming works and organizing/managing their implementation. It should therefore maximize the use of consultants for design of overlays and supervision within the capacity available in the sector.
- The RMF should take over responsibility for the maintenance and repairs of post construction deficiencies of all completed road projects after the one year defects liability period is over. How maintenance should be carried out during the period between provisional and final handover should be clarified in this respect.
- The RMF should prepare an operations manual as well as design and supervision/contract management manuals for periodic maintenance. Similar manuals should also be prepared for routine maintenance once the pilot PMMR contracts have made good progress.
- The needs for de-concentration of the RMF’s operations should be reviewed. The RMF should probably be prudent on this subject, but it should most likely establish branch offices in Taiz, Aden, and Mukalla.
- The RMF needs to carry out an assessment of its work load and staff needs, and probably reduce its number of staff.
- The RMF needs a management information system to record activities and ensure that proper information goes to the key managers in MPWH as well as key stakeholders outside MPWH on a regular basis.

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\(^9\) Performance-based Maintenance and Management of Roads, under the current terminology in Yemen
(iv) Establishment of the FFPMU

78. The FFPMU should assume full responsibility for the implementation of foreign funded projects on the primary road network.

- The FFPMU’s mission and accountability should be clarified. It should be in charge of all aspects of its projects, from design to supervision and contract management.
- The FFPMU is a new unit with limited experience so far. Its likely workload in the future should be carefully assessed assuming a realistic implementation schedule for foreign funded projects. On this basis, and taking into account the experience with RAPCMO, an appropriate organizational structure should be prepared and staff needs defined for the FFPMU; an action plan for recruitment of staff should also be adopted.
- The FFPMU needs a new, larger office with modern IT equipment;
- Like the RS and the RMF, the FFPMU needs an operations manual, a sound management information system, and a communication strategy with all stakeholders;
- The funding needs for the FFPMU’s operations should be assessed and a sustainable system should be established to provide adequate funding possibly under a multi-year contract between the FFPMU and MPWH;
- Priority projects for construction or rehabilitation of primary roads under local funding should gradually be passed on from the RS to the FFPMU with necessary financial and human resources.

(v) Strengthening of RAPCMO

79. RAPCMO, created less than eight years ago, has been remarkably successful at developing the intermediary and rural roads network with modern and efficient methods and procedures. It should continue to evolve as the national agency in charge of such roads.

- RAPCMO’s structure should be reviewed and staff needs reassessed to take account of its much larger workload. Detailed job descriptions, including expected outputs, should be adopted for all main positions.
- As part of the restructuring, the need for de-concentration of RAPCMO should be assessed, including in particular the establishment of branch offices in a few key regional centers like Taiz. However, de-concentration should be limited to those activities which gain from field presence, mainly the management of contracts and the follow up of field design work and supervision activities. It should not include project planning, programming, preparation, and procurement, which are more efficiently managed from Sana’a for the time being.
- The update of RAPCMO’s operations manual, started last year, needs to be completed;
- A sustainable system should be established to provide adequate funding for RAPCMO’s staff and operations, currently ensured by donors, particularly the Bank. This could possibly be under a multi-year contract between RAPCMO and MPWH.

(vi) Strengthening of the construction industry

80. A strategy for strengthening Yemen’s road construction and maintenance industry should be put in place as a matter of priority. It should include the following steps:

- The assessment of the industry planned under the Second Rural Access Project should be started as soon as possible and should involve all stakeholders in a participatory process.
As shown by the experience of other countries, most progress in the industry will come from the establishment of rules, procedures, and practices for selection and supervision of contractors and for contract management, which are fair, steady, predictable, and well understood by all parties. All this will come as a key by-product of the improvements recommended above in the institutional framework for road sector management. The following are especially important:

- Inclusion of a price adjustment clause in contracts
- Prompt payments for work done
- Prompt resolution of technical problems when identified during construction
- Enforcement of technical specifications
- Enforcement of contract duration including use of liquidated damages whenever appropriate
- Contract termination whenever performance is not in line with the terms of the contract and the contractor has not successfully carried out remedial measures

Additional measures are also important. One such measure would be to reduce the problems caused by the differences in price between locally produced and imported materials such as bitumen and cement for which sufficient quantities are not always available in Yemen. In particular, regarding bitumen, whenever there is a risk of shortage of supply, the Aden refinery should import adequate quantities to be sold at the national price if the policy is maintained to keep the price of bitumen under the international price.

- The creation of a Yemeni association of road contractors should be promoted. Effective communication channels should also be put in place between the Government and the construction industry. This could include the establishment of a road construction and maintenance industry council and a unit in the RS dedicated to the liaison with the construction industry.
- The contractor classification system should be used to weed out poorly performing and non-professional contractors.
- The commercialization of Government corporations should be considered (setting them up as business units independent of, while fully owned by, the Government) as a first step before privatization.

(vii) Strengthening of the consulting profession

81. In parallel to the above, it is also urgent to put in place a strategy for strengthening of Yemen’s consulting profession in the field of road studies and road engineering. This would include the following elements:

- The Government should ensure that in the long term there is a regular and predictable demand for consultants’ services in the road sector so that this can be a rewarding and legitimate field of activity for young qualified professionals and an area of interest and investment by experienced mid-career professionals. This implies that, whenever possible, in-house design and supervision by Government staff would be reduced or even eliminated.
- For donor financed road works programs and, possibly, for works financed under the national budget, the Government should use umbrella arrangements with large design and supervision contracts with foreign firms. Only management and oversight would be provided by top level foreign specialists and the bulk of the work would be carried out by Yemeni consultants. These contracts would include a training and mentoring obligation to benefit Yemeni consultants.
- The Government should ensure that consultants’ contracts are managed in a good, fair, and transparent manner.
- Local consultants should be included in training programs developed for Government staff under donor funded projects.

(viii) Development of Monitoring and Evaluation Systems

82. The development of M&E systems should be considered as an essential ingredient for the achievement of satisfactory sector performance. In this respect, the following is needed:

- The Information Technology Directorate of MPWH should be the leading unit for sector monitoring. It should be strengthened and provided with adequate staff, resources and equipment to carry out its functions fully.
- Well designed reports should be prepared regularly, and disseminated widely, to inform all stakeholders of activities and progress in the road sector. These reports would in particular include periodic reports on road condition and traffic, periodic reports on the implementation of the road sector strategy, an annual report on budget implementation, and annual activity reports for each main road sector unit of MPWH.
- A major Road Forum should be organized annually with all stakeholders.
- Road user satisfaction surveys (including especially surveys of freight and passenger transport companies) should be carried out periodically.
- The establishment of non-governmental associations of road users should be promoted.

(ix) Development of Human Resources

83. Finally, the development of human resources should be continued forcefully.

- An assessment of skills needed and a human resources development strategy should be prepared as soon as possible to provide an organized framework for all actions on this topic. The strategy would include a medium term training plan.
- The size, scope, and effectiveness of existing engineering programs in Yemeni universities should be reviewed. These programs should be strengthened if necessary.
- A budget should be provided for a continuous education program for high level government staff. This program would be implemented by local universities.
- The needs for training of technicians and operators should be reviewed. Such training could be implemented under the association of Yemeni contractors when it is created, with assistance from GCRB.
- A process of professional certification for Yemeni road engineers should be considered.
- A clear strategy for improving the salary level and other benefits for Government staff in the sector should be put in place. This strategy should be for the long term and result in predictable employment conditions.

C. Correct inefficiencies in the use of the road network

(i) Improving road safety

84. The deterioration of road safety has become a major issue in Yemen. A multifaceted program of actions is necessary to start reversing the current trend. It should involve the following main elements:
A road safety management capacity assessment should be carried out as soon as possible to better understand the main factors of poor road safety in Yemen, including in particular the policies and institutional settings and the capacity for road traffic injury prevention. It would also build a consensus among all stakeholders on the key actions necessary to make progress.

Following the assessment, a comprehensive national road safety strategy should be prepared. This strategy should include all relevant ministries, including in particular MPWH, the Ministry of Transport, the Ministry of Interior, the Ministry of Education, and the Ministry of Health, and other agencies and stakeholders with interest in improving road traffic safety. The objective should be to significantly reduce the number of road crashes and casualties on the highway network.

On the basis of the strategy, a realistic action plan should be prepared covering all road traffic safety related matters such as awareness campaigns, education (of children, truck drivers and others), enforcement of traffic laws in particular speeding, illegal overtaking, and unsafe vehicles, traffic signs and road marking, and identification and removal of accident black spots (where accumulation of accidents happen due to fault in the road itself or the environment). Once the action plan is agreed upon and fully funded, it is important to have clear targets that can be monitored in order to take corrective actions when targets are not met.

There is a need for a dedicated unit or agency to manage and coordinate the effort at improving road safety in order to move forward quickly. The current Higher Committee for Traffic Safety (HCTS) may be a good overall committee at the policy making level, but there has to be a technical unit/agency that would have the implementation of the agreed strategy as its only focus and appropriate funding in order to give “teeth” to the action plan. The question of where this agency/office should be located has to be addressed.

There is also a need to carry out traffic safety audits/inspections on existing road corridors, for example the Sana’a – Hodeidah road corridor, or Sana’a – Taiz – Aden. Such audits/inspections would identify weaknesses in road signs, marking, access control, road lighting, sight distances and overtaking, and address the need for additional lanes for overtaking and removal of critical black spots identified from police reported accidents. One could start with just one corridor to get experience, and then expand as needed. The RMF could take the lead here, and make sure that parts of the recommendations are included in the next road maintenance budget. Actions and recommendations that would include investments in additional lanes and realignments to improve visibility would have to be addressed as well by the RS with funding from the national investment budget.

(ii) Enforcing axle load regulations

There is an urgent need to start enforcing the current axle load limits which, at 13 tons for a single axle, are already very generous compared to many other countries. Several actions have to be taken in concert to introduce effective axle load controls in the near future:

- An awareness campaign should be designed and implemented in cooperation with the traffic police, the truckers’ association, and MPWH. This would include TV appearances, information on when controls would become effective, how they would be conducted, and what truckers and other road users will have to do.
- More mobile equipment should be acquired for random controls of axle loads. A study should also be carried out of how weigh-in-motion could be introduced.

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10 The EU has a lower axle load limit (11.5 tons).
- The number of permanent axle load stations should be expanded on the key road corridors. All ports and other places where a large number of truck trips are originating should have axle load weighing equipment.
- Truckers should be given some time to modify truck equipment (fuel tankers for example may have to reduce the tank).

(iii) Improving cost recovery from road users

86. It is necessary to improve the recovery of the public costs generated by road use. This is being considered by the Government as part of its national program for removing the energy subsidies and therefore not addressed in this report. The main way to achieve the objective of cost recovery in Yemen is through steady increases in the price of gasoline and diesel, which eventually should cover not only the full cost of providing fuel at the pump but also the cost of providing the road infrastructure as well as the cost of externalities generated by road use. In most countries, annual vehicle registration taxes, including in particular an axle load tax on trucks and buses, also provide a major, if less important, way to achieve cost recovery.

(iv) The gender dimension of road transport

87. The positive impact which roads have on women’s economic activities and on girls’ access to education is a major argument for expanding rapidly the all weather rural roads network, as the Government is presently doing. Since women, as well as children, mainly use the roads for walking, often in groups, rural roads’ design should take into account the special needs of pedestrians.

88. In rural Yemen, public transport is a major transport mode for people and women in particular. The existence of adequate public transport is necessary for the full benefits of roads to materialize. Thus, the Government should ensure that public transport services are available that link villages to the major services centers and markets, with reliable schedules and adequate information provided to the population. Good public transport will enhance mobility for both men and women.
ANNEX 1 – Tables

A. International Comparison of Road Density

Table 5 - International Comparison of Road Density

<table>
<thead>
<tr>
<th></th>
<th>Paved road network (km)</th>
<th>Km paved road per 1000 vehicle</th>
<th>Km Paved Road per 1000 inhabitants</th>
<th>Km Paved Road per 1000 Sq km</th>
<th>Km Paved Road per Million USD GNI</th>
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</thead>
<tbody>
<tr>
<td>Albania</td>
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<td>1.7</td>
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<td>Bhutan</td>
<td>2400</td>
<td>100</td>
<td>3.8</td>
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<td>6000</td>
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<td>13</td>
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<td>50</td>
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<td>Guatemala</td>
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<td>14300</td>
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<td>0.4</td>
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<td>0.8</td>
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<td>Kyrgyz Republic</td>
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<td>72</td>
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<td>Nepal</td>
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<td>31</td>
<td>0.6</td>
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<td>Yemen</td>
<td>11659*</td>
<td>20</td>
<td>0.6</td>
<td>22</td>
<td>0.9</td>
</tr>
</tbody>
</table>

*2006

B. Road Density per Governorate

Table 6 - Road Density per Governorate

<table>
<thead>
<tr>
<th>Governorate</th>
<th>Asphalted road (km, 2006)for 1000 persons</th>
<th>Asphalted Roads (km, 2006)for 1000 km²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abyan</td>
<td>0.6</td>
<td>15.9</td>
</tr>
<tr>
<td>Aden</td>
<td>0.4</td>
<td>30.2</td>
</tr>
<tr>
<td>Al-Baida</td>
<td>0.8</td>
<td>48.2</td>
</tr>
<tr>
<td>Al-Daleh</td>
<td>0.2</td>
<td>28.3</td>
</tr>
<tr>
<td>Al-Hodeidah</td>
<td>0.4</td>
<td>60.7</td>
</tr>
<tr>
<td>Al-Jawf</td>
<td>0.6</td>
<td>6.3</td>
</tr>
<tr>
<td>Al-Maharah</td>
<td>10.8</td>
<td>14.2</td>
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<td>Al-Mahweet</td>
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<td>82.8</td>
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<tr>
<td>Amran</td>
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<td>66.1</td>
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<td>Dhamar</td>
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</tr>
<tr>
<td>Hadramout</td>
<td>2.1</td>
<td>13.0</td>
</tr>
<tr>
<td>Hajjah</td>
<td>0.3</td>
<td>60.3</td>
</tr>
<tr>
<td>Ibb</td>
<td>0.2</td>
<td>91.7</td>
</tr>
<tr>
<td>Laheg</td>
<td>0.5</td>
<td>30.1</td>
</tr>
</tbody>
</table>
C. Road Condition in Various Countries

Table 7 - Road Condition in Various Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Primary network condition (%)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good</td>
<td>Fair</td>
<td>Poor</td>
</tr>
<tr>
<td>Albania</td>
<td>17</td>
<td>17</td>
<td>67</td>
</tr>
<tr>
<td>Algeria</td>
<td>39</td>
<td>35</td>
<td>26</td>
</tr>
<tr>
<td>Bhutan</td>
<td>65</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Cameroon</td>
<td>42</td>
<td>26</td>
<td>32</td>
</tr>
<tr>
<td>Egypt</td>
<td>47</td>
<td>22</td>
<td>30</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>60</td>
<td>25</td>
<td>15</td>
</tr>
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<td>Guatemala</td>
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<td></td>
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</tr>
<tr>
<td>Kenya</td>
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<td>31</td>
<td>18</td>
</tr>
<tr>
<td>Morocco</td>
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<td></td>
<td>35</td>
</tr>
<tr>
<td>Nepal</td>
<td>76</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Yemen</td>
<td>62</td>
<td>16</td>
<td>22</td>
</tr>
</tbody>
</table>

Source: World Bank reports
ANNEX 2 – Views of contractors on the main issues affecting them

In informal discussions between the Bank and some major road contractors on the challenges facing them in the current situation, many contractors noted the difficulties that result from the lack of a price adjustment clause in the contracts. Other main concerns voiced by the contractors were as follows:\(^{11}\):

(i) the initial road design by MPWH often includes reduced quantities due to MPWH’s desire to reduce cost, which leads to frequent design changes during construction and implementation delays;

(ii) the analysis of tenders and award process is generally slow, lasting sometimes more than eight months, and this, in addition to a lack of price adjustment clause in the contracts, makes pricing of bids difficult;

(iii) land for the roads often not available or compensation for land acquisition not addressed before construction start and this is also causing delays;

(iv) payments are sometimes not timely even though the contract allows the Government 52 days to make payments, causing delays and losses due to high interest rates (16-18%);

(v) technical specifications are not good enough in some contracts;

(vi) the lack of axle load controls on road during and after construction is an important issue as overloaded trucks are damaging the newly constructed pavements;

(vii) the engineers’ estimate often is unrealistically low with the lowest bid coming in much above, which causes all bids to get rejected;

(viii) MPWH supervision is not independent from MPWH’s role as Owner and Employer, even when consulting firms are used for supervision;

(ix) poor classification of contractors allows irresponsible bidders to compete for work; and

(x) final handover is not happening on many projects.

\(^{11}\) It should be noted that these are the views of the contractors and not shared by MPWH
ANNEX 3 – Maps

Road Network in Yemen

Legend
- Gov. & Dist. Boundary
- Dist. Centers
- Gov. Seats
- Gov. Governorate
- Under Study Roads
- Future Highways
- Population

Arabian Sea

Spatial Coverage

Kingdom of Saudi Arabia

Republic of Yemen

Oman

K. O. S.