Transferring road maintenance to the private sector
The Colombian experience

by C C Parkman

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TRL TRANSPORT RESEARCH LABORATORY

PROJECT REPORT PR/OSC/160/99

Transferring road maintenance to the private sector The Colombian experience

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Subsector	Transport
Theme	Reduce the costs of constructing, rehabilitating and maintaining road infrastructure and vehicle operation costs
Project Title	Transferring road maintenance to the private sector
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TRANSFERRING ROAD MAINTENANCE INTO THE PRIVATE SECTOR: THE COLOMBIAN EXPERIENCE

ABSTRACT

Many countries are making increasing use of the private sector for road maintenance activities Since the mid 1980s, the South American country of Colombia has gradually increased its use of private contractors for road maintenance on the national road network A specific emphasis of the Colombian initiative has been to develop local community based contractors and it is considered that this model provides a useful example for other countries keen to develop such an approach In addition, more recently, Colombia has changed its approach to management of maintenance, by the introduction of performance based contracts and also by developing local 'road administrators' who manage the contractors as well as fulfilling other roles The report reviews how both the client organisations and the contractors and administrators have developed and how the management procedures have evolved to administer road maintenance Conclusions highlighting the key issues which appear to have affected the success of developing the private sector for road maintenance are presented at the end of the report This study will contribute to a final report which addresses international experience of private sector road maintenance, which it is hoped will be of benefit to countries considering such changes

1. INTRODUCTION

The Department for International Development (DFID) are funding a Knowledge and Research (KAR) project entitled 'Transferring road maintenance into the private sector' The aim of this project is to assess critically how successful different approaches have been in procuring road maintenance from the private sector, and to identify how the change process from using in-house works (IHW) to using the private sector has been managed in various organisations

The purpose of the study is to identify successful approaches which might be considered by those countries who receive assistance from DFID The South American country of Colombia previously used an in-house workforce for procuring its road maintenance works, but since the 1980s it has turned over an increasing amount of this work to private contractors Political reform in the early 1990s has stimulated further institutional reforms and significant changes to the management of road maintenance For this reason, Colombia provides a useful case study of the experience of transferring road maintenance into the private sector

Periodic maintenance works are more similar to traditional construction projects and therefore more amenable to traditional forms of contract, but there has been more difficulty worldwide in developing suitable forms of contract for routine maintenance (Parkman, 1998) This study therefore focuses on the management of routine maintenance in Colombia, however, as described later, Colombia has developed initiatives in terms of combined routine and periodic maintenance contracts for some roads, and these are also discussed

The case study was developed during a visit to Colombia by the author from 1/12/98 to 18/12/98 Meetings were held during this time with various people as noted in Appendix 1

2. BACKGROUND

The fourth largest country in South America, Colombia covers an area of 1,141,748 km^2, equivalent to that of France, Spain and Portugal combined It occupies the north western part of the continent, with coasts on both the Pacific and the Caribbean, and borders Panama to the north west, Venezuela to the north east, Brazil to the south east, and Peru and Equador to the south The western part of Colombia is mostly mountainous with three chains of the Andes running northwards and rising to 5750 metres, before descending to the Caribbean East of these areas, the country subdivides into two types of lower level terrain - Los Llanos, which is an open savannah area, and the Amazon, which is covered in dense rainforest The climate in each part of the country reflects the various combinations of tropical latitude, proximity to the coast and altitude

More than 70% of the population of approximately 39 million is concentrated in the urban areas (settlements of over 1500 inhabitants), and less than 10% of the population inhabits the eastern zone of the country The road network reflects the population density, with very few roads in the east and most roads in the west Road maintenance problems are those to be expected in mountainous and hilly terrain – landslides are common – and in the urban environments, there are significant levels of congestion

Federal government of the country is exercised through an elected President, and elected members of the Senate and Chamber of Representatives The country is subdivided into 32 departments, each of which is ruled by an elected Governor Colombia has managed to maintain a reasonable rate of growth during the last 20 years, over which time its GNP has doubled and currently stands at approximately $87 billion, but the income distribution remains uneven, with approximately 25% of the country living in absolute poverty (World Bank, 1998) This extreme variation of income distribution is reflected in the level of development across the country In the road sector there is also wide variation, in methods of management of the network, from concessions and advanced term maintenance contracts through to use of local cooperatives for labour based routine maintenance

The evolution of administration of the national road network is typical out of the Ministry of Public Works (established in 1905) developed the Ministry of Public Works and Transport (MOPT) in 1976 This was further rationalised in the 1990s, with the Ministry of Transport (MOT) being established in 1992 as responsible for overall transport policy coordinating the various subsector administrations The administration responsible for roads is the Instituto Nacional de Vias (INVIAS), founded in 1994 INVIAS (as with the earlier MOPT) operate through a central headquarters in Bogota, the capital, and 26 regional offices (one per department for those departments in which there is a network) The state departments are responsible for administration of the secondary and tertiary road networks The length of the road network is given in Table 1

Table 1
The Colombian road network

Road Authority		Length of network (km)		
		Paved	Unpaved	Total
INVIAS	(concessions)	2,150	-	2,150
	(direct control)	9,137	5,009	14,146
	Sub-total	11,287	5,009	16,296
State departments		5,826	67,634	73,460
MOT	local roads/tracks	-	15,950	15,950
Undesignated network		-	17,141	17,141
	TOTAL	17,113	105,734	122,847

Source INVIAS (1998), Roda Fornaguera (1997), and this study
Notes 1 The management of maintenance by the concessionaires has not been reviewed in this study

The condition of the national road network has dramatically improved in recent years, due to substantial increases in funding, which is illustrated in Table 2 However, it is unclear as to the length of the network to which these figures refer, as during 1995, a process of decentralisation was implemented which involved transferring approximately 13,400km of the national network (approximately 26,000km at that time) to the state departments, so that there may be some bias in the figures

Table 2
Condition of national (INVIAS) road network

Year	Paved roads (%)			Unpaved roads (%)		
	Good	Fair	Poor	Good	Fair	Poor
1994	37	51	12	23	49	28
1997	76	20	4	49	35	16

Source Fernandez Ordonez and Lobo Soler (1997) and INVIAS (1997)
Notes 1 For paved roads, the conditions are approximately related to road roughness as follows Good ≤ 4 3 IRI, 4 3 ≤ Fair ≤ 7 0 IRI, Poor ≥ 7 0 IRI

The road maintenance budgets for INVIAS are summarised in Table 3, which excludes the lengths of network maintained by private concessionaires It can be seen that there is a considerable variation in costs between the different methods of maintenance management and this is addressed later in the report, although more detailed figures would be required to enable a more rigorous comparison The difference between the different forms of maintenance management are described later in the report

Table 3
Selected road maintenance budgets for INVIAS

Activity	Road length (km)	Cost(mill Pesos)
Managed through total maintenance contracts[1]		
Routine maintenance	545	3,401
Periodic maintenance and rehabilitation	-	16,352
Road administration and service to users	545	3,366
Other works and contingencies / adjustments	-	6,087
Sub-total	545	29,206
Managed through INVIAS[2]		
Routine maintenance (materials, other works etc)	-	Not established
Routine maintenance (microempresas)	11,676	20,989
Maintenance administrators (road administrators)	11,425	8,544
Periodic maintenance and rehabilitation	-	Not established
Sub-total		Not established

Source *Lopez Aragon (1997) and this study*

Notes 1 These are two year term maintenance contracts covering all aspects of road maintenance for a given length of road (see section 7 for more detailed description) The contracts were awarded January 1997 and the figures are the summation of the contract values

2 For further details of this approach see section 5 Microempresas are small contractors who perform routine maintenance activities - their cost includes labour and tools, but materials are supplied by INVIAS, who also pay separately for the any heavier plant and equipment (possibly by using local contractors) Road administrators are contracted by INVIAS to manage the microempresas as well as perform other road management duties

3 Exchange rate 1550 Pesos ≈ US$1 (December 1998)

The study focuses primarily on the maintenance of the national roads However, where relevant, comparisons are drawn with maintenance of the secondary and tertiary networks by the state departments As noted above, a wide variety of approaches have been adopted by INVIAS in managing the maintenance of their network and more recently these have combined the routine and periodic maintenance operations into single 'total' maintenance contracts The study follows a chronological sequence, addressing in particular the management of routine maintenance

3. THE TRADITIONAL APPROACH AND PRESSURE FOR CHANGE

Prior to 1984, various approaches had been adopted for procuring road maintenance A traditional method of maintenance work by force account, using employees and equipment owned by MOPT operating in each regional depot, had become ineffective and inefficient There was a lack of responsibility and commitment from staff, and the strongly unionised workforce was inflexible to the needs of the organisation

Various attempts had been made to improve the delivery of maintenance One approach had been to adopt piecework contracts for employees of MOPT, activities for which were completed during non-working hours[1] Another approach had been to use the lengthman system, contracting labourers to maintain road sections, up to lengths of 5km, adjacent to

their homes Finally, a system of temporary contracts had been adopted (not only for routine maintenance works), in which MOPT let small task based contracts to petty contractors None of these approaches had met with any success - it is unclear as to the precise reasons, as the latter two systems can be sustainable from evidence elsewhere (Gyamfi and Ruan, 1996) - and MOPT was concerned that it was not achieving its objective of effective and efficient road maintenance

In 1984, the government was promoting a policy of 'Change with Equity' which was aimed at promoting employment and community involvement in all sectors of the economy MOPT responded to this on behalf of the roads sector by proposing that 'microempresas' (microenterprises) be formed for performing routine road maintenance activities It was hoped that with this added political stimulus and support, the issue of effective and efficient road maintenance might be properly resolved The objectives of the new programme were fourfold

(1) Technical To improve the delivery of routine maintenance, in terms of appropriate and timely maintenance interventions, to ensure a higher quality road network
(2) Economic To reduce the costs of routine maintenance
(3) Social To increase employment by establishing new work opportunities[1]
(4) Political To involve local communities in the management of their road network

Microempresas (MAs) are co-operative groups of between 10 and 15 members who are drawn from the local community and perform routine road maintenance on the national roads in their vicinity Each MA is assigned between 25km and 50km of the network (depending on the difficulty of the terrain), and is required to act as a small company in accordance with the national co-operative regulations Fledgling MAs are given basic training in technical, administrative, organisational and legal aspects of their work

The initiative was promoted by a number of government and donor agencies, who all had interest in the programme, under the co-ordination of MOPT These included the Department of National Planning (DNP), the Department for National Administration of Co-operatives (DANCOOP), the National Training Service (SENA), the United Nations Development Program (UNDP) and the International Labour Organisation (ILO) The development of the MAs is described in the following section

4. INITIAL OPERATION OF THE MICROEMPRESAS

4.1 Change within MOPT

In the mid 1980s, the roads department within MOPT had various divisions at headquarters and operational offices in the 26 regions At headquarters, there were divisions for projects, supervision, plant and equipment, and evaluation These supported the operational offices in the regions, each of which consisted of a technical, plant and equipment, and administration

[1] It is noted that it was not the creation of microempresas *per se* that would have increased employment opportunities but the fact that the initiative attracted funding towards routine maintenance in a sub sector which was suffering relative political neglect

division Within the regional technical divisions, there were maintenance, construction and auditing sections Typically, between 600 and 800 staff were employed per regional office

As noted above, the interest of MOPT labourers was strongly represented by their unions, to the extent that working practices had become inflexible Apparently, promotion opportunities had been agreed with the unions to the extent that many labourers were automatically reaching higher positions within MOPT due to their time served This resulted in a shortage of labourers actually available to work on the road, so that the introduction of the new MAs was not a substitution for existing MOPT practice, but rather an addition It is estimated that approximately 13,000 labourers were employed by MOPT in 1984, and it is suggested that only 30% of these were probably performing actual tasks on the road However, at the time of introduction of the MAs in 1984, the government did place a freeze on the recruitment of any new labourers, so that the number of labourers employed by MOPT gradually reduced through natural wastage

4.2 Establishing the system of microempresas

MOPT developed the concept of the project, with the agencies mentioned above, and sought funding from UNDP for its implementation, who provided this over a ten year period from 1984 (total value of funding ≈ US$440,000) Most of this support funded Promoters, who were contracted to develop individual MAs throughout the country Some support was also given to MOPT staff to train them in their new role as contract administrators to the MAs

Promoters were contracted for a period of six months, during which time they would be responsible for developing the MA scheme in a given area of the country, which would usually result in the development of 2 or 3 MAs (i e an area covering between 100 and 150km of the network) Promoters were trained in the technical aspects by MOPT and SENA (technical specifications and management etc), and the co-operative aspects by DANCOOP (management and accounting practices etc), and then provided training and development to the prospective MAs However, as their name implies, it was not only training for which the Promoters were responsible - they were required to disseminate the project concept to the local areas and develop community awareness of the initiative, encouraging locals to set up their MAs and assisting them in all aspects of their development After the completion of their six month contract, if they were judged to have been a success, Promoters often moved on to establish the programme in a new area. The on-going development of MAs established by the Promoters then became the responsibility of MOPT, SENA and DANCOOP

Selection of good Promoters was a fundamental requirement of the project For this reason, considerable attention was paid to the selection process, which followed a four stage procedure

(1) Initial advertisements placed for position in regional offices of government and elsewhere
(2) Examination for candidates, which assessed both technical competence and psychometric aspects This examination was devised by SENA
(3) Evaluation of candidates by DANCOOP to assess their competence for developing MAs from a management / social enterprise perspective
(4) Final interview by MOPT

A high degree of interest was shown for the positions, which probably reflects the fact that unemployment was high in rural areas at that time All successful candidates came from the private sector and most were from a background of small enterprise development and social work A knowledge of the locality in which they were to be appointed was also seen as important in order to ensure a sense of local involvement in the programme

The project programme for development of an MA is summarised in Table 4

Table 4
Establishing the microempresa system

PHASE	TIMING	OUTPUTS	ACTIVITIES
PREPARATION	(Prior to start of project) *From* budget allocation by MOPT *to* workshop for promoters	- Dissemination of objectives of project - Working groups organised - Contracts and agreements defined - Resources organised	
PROMOTION	(Months 0 - 5) *From* definition of area of operation *to* confirmation of potential partnerships	- Socio-economic potential assessed - Area of operation (network) defined - Dissemination of project information	- Analysis of area of operation (network) and possible organisational approaches - Induction of groups (information to potential members, contact with community) - Integration activities (feasibility studies, action plans and team building)
IMPLEMENTATION	(Months 4 - 24) *From* establishing microempresa *to* first activities of microempresa	- Operations of micro commenced - Administration of organisation established - Road activities defined - Institutionalisation of operations	- Establish legal status of micro , insurance policies, agree contract with MOPT, etc - Organise work activities, prepare tools and equipment, management systems - Review process (self analysis, improvement and development plans)
CONSOLIDATION	(Beyond Month 24) *From* standardisation of tasks of microempresa *to* on-going development	- Performance indicators defined - Management autonomy increased - Self analysis and evaluation - Development plans	- Analyses of management processes ('ownership' of approach, execution of improvement plans) - Execution of development plans (co-ordination, feedback)

Source Developed from INVIAS (1995)

The success of the programme, in terms of the number of MAs developed and the extent of the network covered by the MA scheme is shown in Table 5 The reasons for the variation in costs per km have not been fully explained although it can be seen that a significant increase has occurred during the 1990s reflecting the road reform process Otherwise the variations probably reflect wider economic influences such as inflation, exchange rates and the

minimum wage rate (the basic 'building block' for determining the cost of an MA contract), rather than any change in road standards

Table 5
Summary of development of Microempresas

	Microempresas		Network covered		Investment	Routine maintenance costs/km for network	
Year	No	Total staff	Length (km)	%	PESOS (millions)	PESOS (thousands)	US$
1984	28	340	1,531	6	112	?	?
1985	85	997	4,554	18	221	73 4	490
1986	127	1,431	6,820	27	601	88 1	454
1987	203	2,516	10,855	41	1,282	105 7	436
1988	268	3,308	14,486	56	2,083	126 9	424
1989	333	4,047	17,863	70	2,650	158 6	415
1990	361	4,440	19,500	76	3,860	201 5	401
1991	361	4,440	19,500	76	3,700	243 7	385
1992	398	4,900	21,500	84	7,292	307 2	412
1993	398	4,900	21,500	84	8,606	427 3	573
1994	398	4,900	21,500	84	9,900	547 0	659
1995	400	4,860	21,270	84	12,402	668 0	805
1996	264	3,059	11,550	92	12,501	800 - 1,320	850 - 1400
1997	278	3,082	11,354	88	16,514	1,024 - 2,057	855 - 1600
1998	287	3,138	11,436	81	21,037	1,328 - 2,656	860 - 1710

Source *Developed from INVIAS (1995) for 1984-1994, Lopez Aragon et al (1997) and this study 1995 onward*

Notes 1 The step change in 1995-96 is due to the transferral of some roads to the state departments

2 The investment column does not match the product of the cost/km and length of network maintained columns, particularly for costs prior to 1996 The reason for this (certainly for figures since 1995) is that the cost/km of the microempresa is for tools and labour only - more substantial routine activities and materials are costed outside the contracts (see below), and the investment figure also includes tree seeding and rubbish removal programmes Inconsistencies might also appear due to contract terms for MAs not being coincident with financial years

4.3 The system as originally implemented

MOPT drew up simple forms of contract for the MAs and established published rates for the contracts, which were all of a one year term (although they were let in batches throughout the year, for different parts of the country) The size of an MA was limited by the national requirements for cooperatives for between 10 and 15 members By assuming an average productivity (nationally) of five kilometres per worker per year, the average length of network for which an MA would be responsible was approximately 50km In practice, the length of the network included in a contract varied between 40km and 60km depending on the exact size of the MA and the local condition of the road The estimate for productivity was not based on any rigorous analyses of quantities of work, but general experience at MOPT and was confirmed as the system developed

The costs of an MA contract were determined based on salaries for the members, overheads in terms of personal benefits such as health and pension schemes, transport, clothing (uniforms) and equipment An element of profit and taxation requirements were also included The allowance for equipment covered simple handtools for the routine

maintenance activities - more significant activities which required more substantial equipment were supplied by MOPT separately, either by hiring a local contractor or using in-house equipment The cost of materials was also not included in the contract Costs per kilometre are given in Table 5 and reflect a gradual increase with time, which was predominantly caused by inflation

Routine maintenance activities carried out by the MA included

- Vegetation control
- Cleaning of drains and pipes
- Cleaning ditches and culverts
- Sign and barrier cleaning
- Crack sealing
- Pothole patching
- Erosion control and clearing of minor landslips
- Tree seeding for erosion control

In essence, the system was a form of contracted labour under the direction of the local regional engineer of MOPT There were no published maintenance standards and so the MAs worked at the discretion of the regional engineer, who programmed tasks which s/he considered to be of highest priority Where the work required was beyond the capability or capacity of the MA (e g landslides requiring earthmoving equipment), the regional engineer would either hire a local contractor or employ his in-house equipment and operators, with the MA supplying the labourers as required In other cases, such as pothole patching, the regional engineer would supply the MA with the required asphaltic materials and any small plant required for the work

The strength of the system was the socio-economic benefits which it brought to the local communities and the sense of local involvement in the maintenance of the network In addition to providing direct employment for the community, indirect benefits also developed including the opening of community stores and construction materials industries (bricks and concrete blocks) and agriculture related activities The key to the direct success of the programme, in terms of ensuring quality of the maintenance work on the road, was the sense of local pride in the condition of the local network

However, weaknesses still remained in the approach The ability of the regional engineers to properly manage the MAs, with other competing demands on their time, was sometimes a problem The continued use of in-house staff and equipment for more significant activities, as described above, remained a problem (as described in 4 1) so that often these works were not properly completed Finally, the lack of maintenance standards and the use of a global rate for the system produced considerable variation in the efforts of different MAs Some MAs were able to work reasonable hours, but many were required to work long hours in order to achieve standards as agreed with the regional engineer

5 NEW OPERATION OF THE MICROEMPRESAS

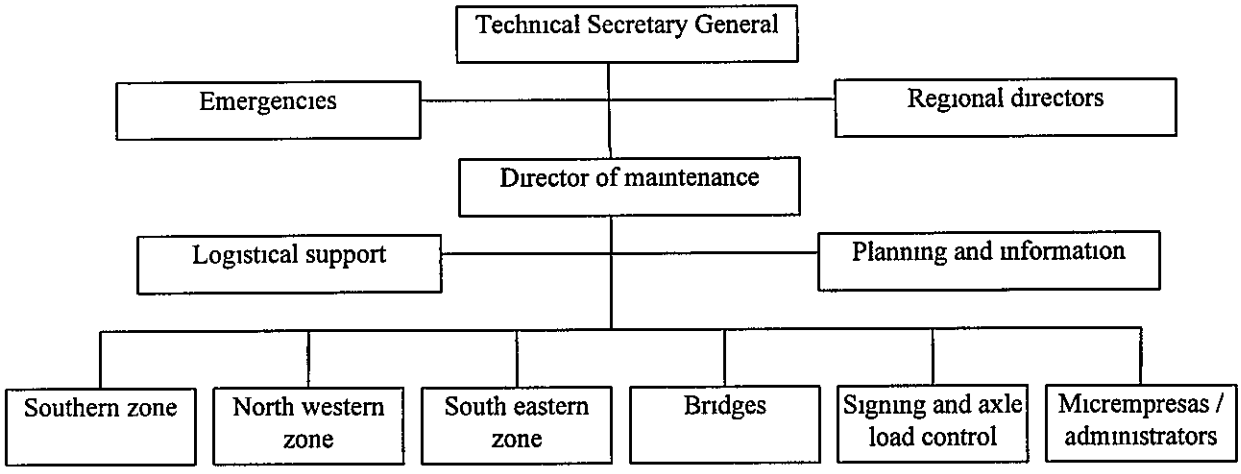
5.1 New client role

The restructuring of the MOPT into the MOT and various executing administrations in the early 1990s affected all maintenance operations on the national network in Colombia In approximate terms, of the 11,400 employees of the MOPT in 1993, 7,800 labourers (the entire labour employed by MOPT) and 2,800 administrative staff were made redundant 400 staff were transferred to the new INVIAS and 400 staff were redeployed in the restructured MOT Current estimates of staff numbers are 1000 at INVIAS (700 at head office, 300 in the regional offices) and 1500 at MOT

Existing staff were encouraged to attend training and reorientation programmes at MOPT and some external assistance was given by UNDP, in collaboration with DANCOOP, to assist retrenched staff in developing new enterprises and employment opportunities Retrenched staff were given redundancy packages in accordance with their contracts of employment All the equipment and depots owned by MOPT in the regions was auctioned and sold off, with priority given to employees of the ministry In this way, many staff set up as small local contractors with the ability to carry out routine and periodic maintenance works, although the long term success of these initiatives is not known It appears that this period of transition, between 1993 and 1995, was not easy as the new role of MOT and INVIAS evolved and during this time INVIAS carried out various studies to evaluate its problems and define action plans for the future

The structure of INVIAS, the new organisation responsible for road network administration, is shown in Figure 1, in terms of the administration of road maintenance

Figure 1
Organisational structure of INVIAS for road maintenance



Source *INVIAS (1996) and this study*
Notes 1 Typically, each regional office consists of approximately 10 staff

In addition to the problems mentioned above with the MA system under the MOPT, the new INVIAS faced additional challenges In particular, the dramatic reduction in capacity of the

regional offices meant that adequate supervision of the MAs was not possible Also, future planning and programming for the needs of the network was not being adequately addressed INVIAS embarked on a major study, using a rigorous institutional analysis technique, to evaluate how they might best address these problems and ensure that the network provided an adequate level of service to the users Conclusions of this study relevant to the management of maintenance on the network were

(1) A rigorous database system for planning and programming the maintenance needs of the network should be introduced
(2) MA system should be strengthened with the introduction of improved supervision, defined performance standards, and improved budget assessment methods
(3) Improved supervision should be implemented through new contracts with 'Road Administrators' (AMVs) from the private sector, who should also assist in monitoring and planning the needs of the network and provide information for the new database system
(4) Introduce a quality assurance system for maintenance operations
(5) On strategic roads, further involvement of the private sector should be sought through the use of longer term 'Total maintenance' contracts (discussed further in section 7)

In early 1996 these conclusions were implemented and have continued, with some evolution, to the present The regional offices now administer contracts with both MAs and AMVs as outlined below

5.2 New role of microempresas

5 2 1 Performance indicators

In order to develop a quality assured approach to road maintenance, and also to ensure that maintenance standards were applied consistently across the network, performance indicators were established for each routine maintenance activity to be performed by the MAs, which were included in their contracts This also enabled a more rigorous procedure for assessing payments to the MAs The maintenance activities required of the MAs increased, and the activities and their corresponding indicators are summarised in Table 6

Table 6
Routine maintenance activities and performance indicators

Maintenance Activity	Responsibility of the Microempresa	Indicator
Surface patching and pothole repair	- Cover all holes with loose material until proper repair takes place - Inform AMV of the defects - Provide labour for proper repair[1]	No holes allowed Availability for the activity
Crack sealing	- Provide the labour required for sealing cracks[1]	Availability for the activity
Shoulder cleaning	- Clean shoulders and dispose materials in an appropriate place	Shoulders always clean In extreme cases, a maximum of 10% of the total area may be covered with obstacles
Manual cleaning of side drains and cut-off drains (covered and	- Clean all drains parallel drainage structures	Always clean No obstructions will be

Maintenance Activity	Responsibility of the Microempresa	Indicator
uncovered)		allowed
Routine bridge maintenance	- Cleaned so that always free from any obstacles which might restrict flow of water Structures should always be free from weeds and rubbish so that all elements work according to specifications (drainage, joints, supports, walls etc)	Bridges will always be clean
Cleaning of box and pipe culverts	- Clean constructions	Always clean - no obstructions will be allowed
Manual cleaning of river beds	- Provide the labour when manual cleaning is feasible	Availability for the activity
Manual cleaning of watercourses	- Clean streams and sources	Always clean - no obstructions allowed
Cleaning and painting of guard rails	- Provide labour for cleaning and painting supports	Always clean and painted
Removal of landslides	- Remove small landslides at once - Be permanently available and report to the AMV in case of a landslide and cooperate in its removal	No obstructions on the road are allowed Permanent availability
Cleaning pavement	- Remove rocks, trees or any obstacle at once	Always clean
Removal of weeds	- Control of vegetation in road reserve to improve visibility Includes the removal of all loose vegetation	Vegetation height less than 300mm
Pruning, cutting and removal of trees	- Provide manual labour whenever pruning, cutting or removing trees is necessary	Availability for the activity
Grass seeding	- Provide manual labour whenever seeding grass is necessary	Availability for the activity
Tree seeding	- Provide manual labour whenever tree seeding is necessary	Availability for the activity
Landscaping	- Wherever feasible, seed and maintain ornamental plants	Properly maintained reserves
Replacement of signs and sign supports	- Provide the manual labour whenever replacing a sign necessary	Availability for the activity
Replacement of milestones	- Provide manual labour when replacing a milestone is necessary	Availability for the activity
Repainting of milestones	- Provide manual labour when painting a milestone is necessary	Availability for the activity
Cleansing of traffic signs and milestones	- Clean signs and milestones	Signs and milestones will always remain clean
Installation of guardrails (single and double)	- Provide manual labour for installation	Availability for the activity
Repair to damaged guardrails	- Provide manual labour when repairing	Availability for the activity
Cleansing of guardrails	- Clean guardrails	Always clean
Surveillance of road reserve	- Control (1) rubbish dumps and rubbish in the road reserve, (2) illegal trespassing, and (3) any unauthorised constructions such as aqueducts, service nets, etc - Prevent fires - Report to AMV any damage to road and bridges	Cooperate with surveillance by reporting at once to AMV
Attention to emergencies for the rapid reinstatement of	- Cooperate in all necessary actions and report immediately to the AMV	Availability for the activity

Maintenance Activity	Responsibility of the Microempresa	Indicator
trafficability	- Provide manual labour whenever necessary	

Source *Fernandez Ordonez and Lobo Soler (1997) and this study*

Notes 1 The road administrator (AMV) will supervise hiring of a suitable contractor, or equipment, and supply of suitable material, in order to complete proper repair of the defects

5 2 2 Determination of rates

As noted above, the previous method of assessing rates for MAs and applying these nationwide was unfair in that it did not recognise the variability in effort required to maintain the network to an acceptable standard Whilst this might have been manageable under a system of payment which was not rigorous in terms of the measurement of work done, it would not be satisfactory under the new approach of applying contractual performance standards For this reason, INVIAS devised the following system for developing the rates per kilometre to be paid to the microempresas

Each homogeneous road section is rated according to a number of factors which are considered to have the most significant effect on routine road maintenance requirements as shown in Table 7

Table 7
Rating of road sections for assessing routine maintenance requirements

Factor	Rating		
	A	B	C
DRAINAGE Number of drainage structures (bridges, culverts, pipes and fords) per kilometre	≤ 5	6 - 9	≥ 10
VEGETATION All vegetation to be ≤ 300mm in height The product of area to be maintained (hectares) by the annual frequency of mowing, per kilometre	< 1 5	1 5 - 5	> 5
TERRAIN TYPE Indicates susceptibility to landslides	Flat / undulating	Rugged / mountainous	Not used

Source *Fernandez Ordonez and Lobo Soler (1997)*

A factor which is rated as A is assigned a value of 1, B is assigned a value of 2 and C a value of 3 The product of the values for the three factors is then determined for each road section and the section is then classified according to the following

TYPE 1 Product of factors lies between 1 and 3
TYPE 2 Product of factors lies between 4 and 8
TYPE 3 Product of factors lies between 9 and 27

For example, a section with more than 10 drainage structures per kilometre, with an annual area of vegetation to be mowed of 3 hectares per kilometre, in flat terrain, would have a product of factors of 3 x 2 x 1 = 6 and would therefore be classified as Type 2

After one year of use of the above system it was observed that the worst road sections were not being rated appropriately by this method For this reason, a TYPE 4 classification was adopted for roads in extreme environments, with rugged terrain, high rainfall and poor access to communications Based on experience of INVIAS, the average productivity for the four types of section was established, and from this an indicative cost/kilometre for each type determined using an approach similar to that described in 4 3 Table 8 summarises the productivities and costs, and a detailed schedule of items included in the rate build up is included in Appendix 2

Table 8
Productivities for different road types and corresponding rates for 1998

Road type	Productivity (km/person/year)[1]	Rate / km / year (Pesos)
TYPE 1	5	1,327,800
TYPE 2	4	1,659,752
TYPE 3	3	2,213,003
TYPE 4	2 5	2,655,603

Source Fernandez Ordonez and Lobo Soler (1997) and this study
Notes 1 This includes the administrative legal representative of the MA

5 2 3 Selection and appointment of microempresas

The selection of the MAs, under the new system, is based on a published objective method which at present does not include price (rates being fixed by INVIAS as above) Prospective MAs are required to demonstrate the following

(1) Registration with DANCOOP (or local chamber of commerce)
(2) At least one member to have completed in excess of 20 hours training with DANCOOP
(3) Evidence of experience in contracts of a similar nature
(4) Ownership of the required tools and equipment
(5) Residency in the locality

Each MA must also be able to produce, if appointed, guarantees for the contract, which include a performance guarantee for a value of 10% of the contract to extend five months beyond completion, and an advance payment guarantee for the same amount of time In addition, evidence of life insurance and health insurance for all members of the MA is required

The marking scheme assigns points to the various criteria mentioned above and the contract is awarded to the MA with the highest score

5.2.4 Payment

On award of the contract and provision of the above guarantees, the successful MA is paid a 20% advance of the value of the contract for mobilisation and to enable the MA to make advance purchases for any additional necessary tools Payment is then made on a monthly basis (total value of contract divided by 12) for the fixed amount defined by the type of road, with deductions for payback of the advance payment, assuming the adequate performance of the MA

Performance is measured against the indicators set out in Table 6 and is agreed with the AMV, who forwards recommendations for payment to the regional office of INVIAS The contract defines the reduced payments to be made if there is non-compliance with any indicators

(1) 10% reduction for first monthly non-compliance
(2) 15% reduction for second monthly non-compliance
(3) 20% reduction for third monthly non-compliance
(4) Termination of contract if any further non-compliance

5 2.5 Current practice and future developments

It should be emphasised that the fundamental basis of the management of the work involves a degree of teamwork and 'partnering' between the AMV, MA and regional office of INVIAS Whilst a comprehensive quality plan for the required standards of the network has been introduced, a degree of judgement is applied when assessing, for example, the performance of the MA against the performance indicators The MA are still relatively unskilled and require considerable direction from the AMV as to where activities are required - indeed, the AMV still issues a weekly programme of activities for the MA, so that the MA is in effect still working as a supplier of contract labour The performance indicators are currently used as a guide on the standards required but it is expected that as the MAs continue to develop, they will take on a greater responsibility for management of the work

It is difficult to compare the costs of this approach with earlier approaches or with the new 'total' maintenance contracts Whilst the costs of the MA contracts themselves are known, and the costs of the AMV, the additional costs in order for the MA to complete their work (materials, equipment etc) have not been identified in this study Also, a comparison of costs without a corresponding comparison in quality of work produced might be misleading However, it is generally considered that the cost for the work done is more efficient than any other approaches adopted to date in Colombia, and that the quality of work is significantly better than earlier approaches using the MAs or in-house methods (see section 3)

It is anticipated that some form of competitive tendering in terms of price will be introduced in the near future This would be implemented by allowing prospective MAs to offer a discount to the rate published by INVIAS for the contract It is not clear how beneficial this will be, for two major reasons

First, the current approach, whilst adopting a competitive procedure (5 2 4), is founded upon a history of development of MA in various districts to match the needs of the network In practice, there is in many cases still only one MA per contract in any given area, and there seems to be little incentive for competing MAs to develop in the same area since there is no

other work which such an organisation might perform if unsuccessful in bidding for the INVIAS contract Conversely, the limit on size of the MA prevents their expansion and possible undertaking of more than one contract over a greater area, and might in itself defeat the object of using the local community to perform the work (a key requirement noted to derive quality and engender a sense of responsibility)

Second, the prices for the contracts as published by INVIAS are based on realistic estimates of costs for a MA If MAs were to undercut these prices, then it should only be by offering enhanced productivity, and it is unclear that this would be possible given the basic technology being adopted If they were to undercut these prices by cutting costs (assuming these are reliably estimated by INVIAS), then the implication would be that the MA is not correctly forecasting future expenditure and development requirements for the cooperative, which would be a problem for long term sustainability of both the network and the MA movement

As noted above, a key element of the new approach is a sense of teamwork between the MA, AMV and regional office of INVIAS The development of the role of the AMV is now discussed in more detail

5.3 Road Administrators (AMVs)

5 3 1 Development of the role

As noted above, the radical restructuring of MOPT into INVIAS in the early 1990s had resulted in a reduced capacity of INVIAS to properly manage maintenance activities on the network In addition, inadequate information was available on the conditions and needs of the network, in order to assist with future programming and planning The need for an AMV was therefore apparent and during 1995 the requirements were properly defined and a project implemented to develop this role

The key requirement of an AMV for proper management of the maintenance activities performed by the MAs was that s/he should be community minded and socially aware, so that s/he was fully committed to the principles of the MA role In addition, the AMV should be technically and administratively competent to carry out the work Considerable interest was shown by the private sector in this new role, and of the initial appointments, approximately half were individuals and half came from local consultancies Initial training was given to the new appointees, who were expected to cover approximately 150km of the network (i e manager between 3 and 5 MAs, in addition to other network management activities) and were appointed for a one year term

A typical AMV consists of the Road Administrator himself, an assistant Inspector to manage site activities, a Secretary to provide information to road users (see below), a driver and vehicle (fitted with required safety and warning lights), and administrative support The development and investment in the new role is summarised in Table 9

Table 9
Development of the role of AMV

Year	Coverage of network (km)	Number of AMVs	Funding (INVIAS) PESOS millions
1995	11,948	66	4,870[2]
1996	11,234	79	9,866
1997	11,444	79	10,986
1998	11,421	68[1]	8,446

Source *This study from INVIAS*

Notes 1 Of the 68 AMVs in 1998, 3 are responsible for the 'total' maintenance contracts (see 7), 3 are working for Quindio and Atlantico regions, and the remainder are covering the MA contracts

2 The low funding for the first year of the programme is understood to be due to the fact that it commenced part way through the year

5 3 2 Key tasks of an AMV

The key tasks of the AMV are to manage the MA and to also perform other network management duties A summary of activities is included in Table 10

Table 10
Tasks of the Road Administrator

Activity	Description
Management of microempresas	Plan, organise, direct, coordinate, evaluate and control all activities of MA for routine maintenance
Bridge management	Inspect bridges and direct and supervise routine maintenance activities and advise INVIAS of results
Network inventory	Record and maintain records on the road inventory and maintenance costs and provide information to INVIAS in format required for their management systems
Estimate residual life of pavements	Based on traffic, pavement strength etc estimate residual life of pavements and present in required format to INVIAS
Road referencing	Maintain road referencing system
Risk and hazard prevention	Perform risk and hazard assessments of the network and advise INVIAS of remedial works at critical sites of instability
Minor works	Perform feasibility and design studies for minor works and assist INVIAS with their supervision
Maintenance planning	Keep INVIAS informed of the need for design and implementation of maintenance, improvement and rehabilitation works
Road safety	Perform road safety audits and define requirements for improved signing Maintain and accident database and advise INVIAS of possible improvements
Asset value data	Provide data to enable calculations of asset value of the network
Capacity / Level of service studies	Conduct highway capacity and level of service studies
Environmental improvement	Design and implement works which maintain and improve the roadside environment
Road regulation	Ensure compliance with road regulations is maintained with respect to the proper use of the road, coordinating with INVIAS and local authorities
Traffic and axle load studies	Supervise traffic (7 day 24 hour) counts and axle load control
Attendance at meetings on training/development	Participate in coordination and technology transfer meetings with INVIAS, held in different parts of the country from time to time
Training MAs	Provide on-going training and support for MAs
Road user assistance	Operate and maintain the Road User Assistance office and keep up to date information on telephones, medical services, tourist information etc
User satisfaction surveys	Perform two user satisfaction studies per year
Origin / Destination studies	Perform up to two origin and destination studies per year

Source INVIAS (1998a)

The AMV meets with the Regional Director of INVIAS on a weekly basis to discuss on-going aspects of the work Every four months, a meeting is held with the Regional Director of INVIAS, senior staff from INVIAS headquarters and the AMV to monitor progress and evaluate the performance of the AMV and the network in general During this meeting, an action plan for the following four months is agreed and training given to the AMV in any aspects required for him/her to complete the required tasks The AMV is required to operate under a registered quality assurance scheme

5 3 3 Selection of the AMVs

As noted above, a key requirement for the AMVs is that they are people of integrity and principle They must be aware of the broader aspects of the work, in terms of providing a service to road users as well as understanding the needs of the MA as a local community cooperative They act as consulting engineers and are expected to have the relevant

qualifications Their selection is competitive, based on the quality and cost of their proposals, according to a marking scheme as follows

(1) Academic qualifications of Road Administrator and Resident Inspector (maximum 35 points)
(2) Professional experience of Road Adminisrator and Resident Inspector (maximum 35 points)
(3) Proposed cost (maximum 20 points)
(4) Outline quality plan (maximum 10 points)
(5) Previous non-compliance on contracts (-10 points)

Proposals which are within five points of the highest scoring proposal are then considered and a final appointment made based on the points awarded to the Road Administrator and the cost

5 3 4 Evaluation and payment of the AMVs

As with the MAs, the AMVs are paid in accordance with performance indicators, which broadly match the activities as shown in Table 10 and are assessed every four months The AMV is paid a fixed monthly sum in accordance with his proposal and deductions are made for any non-compliance with the performance indicators For each performance indicator, a defined percentage reduction is made for non-compliance, the total deduction is the sum of the individual indicators If two evaluations produce a reduction in excess of 30% of the tendered amount, the contract is liable to termination

One interesting point to note is the fact that the performance of the AMV is linked to the performance of the MA by one of the indicators, which defines that if the MA is non-compliant, then so is the AMV The aim of this is to encourage a sense of 'partnering' between all parties involved in maintaining the network, and further demonstrates the focus of the whole system of providing a service to road users of which the local community can be proud

5 3 5 Results of the AMV approach

The success of the programme, in terms of interest from the private sector, is considerable For the recent contracts, more than 500 proposals were received for the available positions and to date, problems have only been encountered with two AMVs in terms of performance However, all parties to the system are keen to ensure that cooperation is paramount and to view the approach as developmental in the early stages, a degree of latitude is required in applying the indicators as the AMVs gain experience in their activities and responsibilities The use of quality assurance is seen primarily as a tool for monitoring the performance of the network and less as a tool for apportioning blame to the non-compliant party

It is expected that the role of the AMV will continue to assume greater importance and that further activities will be assigned to them as they develop In particular, their use is now being extended to monitor the 'total' maintenance contracts as described in section 7 It might also be that the term of their appointment is increased beyond the existing one year – it does seem, considering the number of activities which they are required to perform (Table 10), that a longer term would be beneficial so that experience might be properly applied and knowledge of the network developed

6. PERIODIC MAINTENANCE

The evolution of procurement for periodic maintenance has reflected that of routine maintenance Prior to 1984, all periodic maintenance was carried out by MOPT using their own staff and equipment From the mid 1980s until the restructuring of the MOPT in the early 1990s, a mixed approach was adopted with some periodic works being performed by in-house staff and equipment, and some by the use of local contractors However, with the formation of the MOT and INVIAS, all periodic maintenance was handed over to the private sector, as MOPT disposed of all its equipment

Until 1997, periodic maintenance was let by traditional unit price type contracts (excluding the concessions) with design for such works being undertaken by consultants contracted to MOPT or INVIAS As noted in the introduction, the management of such an approach has not been the focus of this study However, INVIAS has more recently started using 'total' maintenance contracts which combine both the periodic and routine maintenance works required on a section of road into one contract and these types of contract are described in more detail below

7. TOTAL MAINTENANCE CONTRACTS

7.1 Background

In early 1997, INVIAS let three 'total' maintenance type contracts, each for a term of two years For these contracts, the contractor is responsible for all maintenance and administration of the road during the contract term, so that this form of contract represents a significant transfer of risk from the government to the private sector

INVIAS had identified strategic national routes with high volumes of traffic and aimed to maintain these to a high level of service with a considerable investment in order to bring them to an acceptable standard Based on a review of worldwide experience, INVIAS was keen to trial such forms of contracts, as they had been reported as being successful elsewhere An international management consultant advised INVIAS on the strategy for such projects, and a particularly attractive aspect of such contracts was the fact that once signed, funding was confirmed for the term of the contract in so far as there was a contractual obligation to pay the contractor

Two different types of contract were implemented and their development is described below INVIAS published estimated values for the contracts, which were open to international bidders and significant interest was received from the contracting industry Contracts were awarded based on price and quality, and the difference in price between the highest and lowest bidders was approximately 15%, with a typical difference of 5% in price between the best five bidders for each contract The contract details and prices are summarised in Table 11

Table 11
Summary of three 'total' maintenance contracts let to date

Location	Type[3]	Length (km)	Value of works (PESOS millions) 1997 prices				
			Routine	Periodic	Admin[1]	Other[2]	Total
Antioquia - El Chino	Total	115	513	5,000	530	1,573	7,616
Girardot - Bogota	Total	133	1,172	10,800	1,784	3,632	17,388
Magdalena	Total +	297	1,716	552	1,052	882	4,202
	TOTAL	545	3,401	16,352	3,366	6,087	29,206

Source *Lopez Aragon (1997) and this study from INVIAS*

Notes 1 Administration includes all aspects of management required of the contractor, and for provision of services and information to road users

2 Includes adjustments in terms of allowances for inflation and contingencies

3 'Total' type contracts include performance indicators for routine maintenance only 'Total+' type contracts include performance indicators for all aspects of road performance (see below)

7.2 Total maintenance contracts

7 2 1 Activities and payment

The activities for which the contractor is responsible in this form of contract are as follows

(1) Administration of the road
(2) Routine maintenance
(3) Periodic maintenance
(4) Construction of specific works
(5) Miscellaneous urgent works as required to maintain road safety
(6) Emergencies
(7) Information and services for road users

The administration of the road and routine maintenance activities are specified in a similar way to the MA and AMV contracts mentioned earlier, with performance indicators for each item and penalties established for non-compliance However, in these contracts the contractor is responsible for supply of all materials equipment necessary to complete the work, and there is no shared responsibility with INVIAS The contractor is paid for these items based on monthly fixed rates

Outline designs and quantities for periodic maintenance and specific works are defined in the contract and the contractor is required to complete these works within six months of appointment It is the responsibility of the contractor to respond to miscellaneous urgent works and emergencies as required (standards are indicated e g removal of landslides within 24 hours) All these works are paid for based on unit prices bid by the contractor

The provision of information and service to the users, in the form of rest areas, communication facilities, breakdown services and ambulance services are the responsibility of the contractor, the costs for which are recovered from the users

7 2.2 Experience

Both contracts let under the above approach contained sections of road in very poor condition, and required more intensive periodic and rehabilitation works than originally

envisaged Problems included sections of geotechnical instability, poor drainage and poor materials in the original pavement construction However, this additional work could be paid for according to the unit prices offered by the contractors

For the Antioquia - El Chino road, approximately 8 contractors bid for the work and the contract was awarded to a joint venture between international and local contractors For the Girardot - Bogota road, considerably more interest was shown by the industry, since the road is closer to Bogota and the contract value was significantly higher (the road carries a high volume of traffic and contains sections of dual carriageway) 18 contractors bid for the work, with the successful bidder being a joint venture of five Colombian contractors

Road users have been satisfied with the performance of the contractors, although they have often not managed to meet the performance indicators specified in the contract Early problems were encountered with the agreement on values for indicators between INVIAS and the contractors, but these were solved and the contracts have proceeded satisfactorily On the Girardot - Bogota road, the patrol service for assistance to users was provided for by the contractor in accordance with the obligations under the contract, but was insufficient in practice In this case, a change to the requirements of the contract was negotiated with the contractor

7.3 Total maintenance contracts with standards

7 3 1 Activities and payment

The activities for which the contractor is responsible in this form of contract are as for the above contracts, but the difference is in the mechanism of payment to the contractor In this form of contract, only emergencies are paid for by unit price, with all other works (except information and service to users, as before) being paid for with a fixed monthly amount Since the periodic maintenance and rehabilitation works are being paid in this way, performance indicators are established to ensure such works are of an acceptable standard The performance standards related to the pavement are summarised in Table 12

Table 12
Performance indicators for the road pavement

Parameter	Indicator	Form of measurement	Tolerance
Cleanness	Always clean, free from rubbish and oil spills	Continuous visual inspection	Removal within 24 hours
Roughness	International Road Roughness Index (IRI) ≤ (value at start of contract + 1)	Measured with a profilometer of other calibrated equipment	Excluding those areas requiring major strengthening or improvement
Rut depth	Maximum value ≤ value at start of contract	Measured with a straight edge, monthly measurements at 100m intervals for each 5km section	None
Potholes	No of potholes in carriageway	Visual inspection	None Must be repaired immediately
Open cracks	Always sealed	Visual inspection	No crack to be present for more than 24 hours
Patches	Percentage of carriageway with cracks or patches ≤ 10%	Determined for each kilometre by inspection and manual measurement	Compliance within 24 hours excluding those areas requiring major strengthening or improvement
Skid resistance	CRD ≤ 0 45[1]	Measured using a TRRL pendulum	None

Source *Lopez Aragon (1997)*
Notes 1 It is unclear whether this value refers to the portable skid resistance tester or to a measurement of texture depth

7 3.2 Experience

Only one contract has been let using this approach to date Given the increased transfer of risk to the contractor in this form of contract, INVIAS selected a road which was in reasonable condition (better than the two roads described above) in order to ensure interest from the contracting industry Approximately 8 consortia submitted proposals and the contract was awarded to a joint venture of international and Colombian firms

Although it had been anticipated that the road was in a reasonable condition so that periodic and rehabilitation works would be straightforward, once the contractor commenced on site, problems were encountered In addition to local sites of known geotechnical instability, the pavement rehabilitation works on a particular section failed within six months of opening to traffic, due to poor quality materials, fatigue of the pavement structure and extremely high levels of moisture For the additional works required (over and above those originally anticipated) to restore the road to a reasonable condition, extensive negotiations were conducted to agree on the additional price, which was determined after they had agreed a set of unit prices for the additional work

As with the first two contracts, road users have again been satisfied with the performance of the contractors, although they have often not managed to meet the performance indicators specified in the contract Early problems were encountered with the agreement on values for indicators between INVIAS and the contractor, but these were solved and the contract has otherwise proceeded satisfactorily

7.4 New CREMA contracts

Based on the experience of the above contracts, INVIAS have now modified the approach and intend to let nine new contracts (of approximately 250km per contract) in the near future In particular, experience on the latter contract above has led INVIAS to the view that a greater transfer of responsibility for the design of periodic and rehabilitation works should be transferred to the contractors However, with this increased transfer of risk to the contractor it is also considered that the contract terms should be increased and INVIAS are currently seeking approval from government to increase the terms to four years

With such an increase in the term of the contracts, the aim is to encourage contractors to take responsibility for the long term performance of the network For this reason, the indicators to be applied will be more stringent (e g roughness will not be allowed to exceed 4 5 IRI), and the contractor will be expected to carry out rehabilitation and periodic maintenance works within the first 12 months of the contract, to a standard which meets or exceeds the specification, for a fixed lump sum It is expected that an indicator for pavement strength (deflection) will also be introduced to ensure that the contractor meets strength, as well as riding quality, standards

7 5 Use of microempresas and administradores

MAs and AMVs are both being used in the above contracts although their role is slightly different to that previously described The MAs have been taken on by the contractors on their own payroll, rather than as subcontractors, and the contractors have given them additional training and tools for their activities The contractors have viewed this as a means of ensuring local support for their work, and have in some cases (on their own initiative) included bonus schemes for the members of the MAs

The role of the AMV has changed more significantly than that of the MA The AMV is now employed by INVIAS to monitor the overall contract, and is less involved in the programming and planning of work for the MAs Essentially, the AMV has become a quality assurance auditor, monitoring the performance of the contractor and ensuring that he complies with his approved quality plan

As the number of 'total' maintenance contracts increases, more AMVs and MAs will adapt to these new roles Nevertheless, on the less strategic routes it is expected that the approach as described in section 5 will continue to operate

8. MAINTENANCE OF SECONDARY AND TERTIARY ROADS

Each department in Colombia is responsible for maintenance of the secondary and tertiary road network under its jurisdiction, using funds obtained from the state government Departments are made up of provinces, which in turn consist of a group of municipalities (governed by mayors) For example, Cundinamarca, the department surrounding Bogota, consists of 15 provinces with between seven and eight municipalities per province

By contrast with the national network, the management of road maintenance on the secondary and tertiary networks by the state departments seems less consistent Until the restructuring of the MOPT and the subsequent transfer of roads from INVIAS in 1996, there were three methods of procuring road maintenance being used The first method was the traditional use of in-house employees and equipment to carry out the works The second method involved transferring money directly to the municipalities, each of which had some plant and labour to carry out the work The third method involved using Associations of Municipalities (AOM), which were groups formed by the municipalities who pooled their equipment and resources to complete the work Very little use has been made of private contractors for routine maintenance

With the transfer of the national roads in 1996, INVIAS strongly recommended to the state departments that they continue to use the MAs on those roads transferred However, the system was not well received in general, as the MAs represented a threat to the employment of the in-house staff of the departments For this reason, more than 100 MAs went out of business after the handover It is not clear what provision was made for the transfer of funds and this appears to be another example of a more fundamental problem of instability of funding Presumably, if adequate funds had been transferred, then continued use of both the in house workforce on existing roads and MAs on the transferred roads would have been possible The implication therefore seems to be that inadequate funds were made available during the transfer

Cundinamarca retained the use of MAs Out of their current network of 5,276km, 808km were transferred from INVIAS of which 594km were being maintained by 11 MAs The following year, with support from the governor of the department, the MA programme was extended to cover 2086km using 36 MAs However, their terms were different from those adopted by INVIAS - they were paid less (855,000 pesos per kilometre per year as opposed to the 1 2 million paid by INVIAS), and the payments were made in lump sums every six months, rather than on a monthly basis There was management support for the introduction of performance indicators, but no political support and so the contracts were performed as traditionally under the old MOPT

Cundinamarca no longer has its own in-house maintenance workforce and equipment, having transferred all equipment to the AOMs and municipalities during local government restructuring in 1995, when the workforce was retrenched Hence the current approach is for using AOMs, municipalities and MAs, although current budgets mean that very little routine maintenance work is being carried out, with more attention being paid to rehabilitation projects There are no defined maintenance standards for routine maintenance, and the department allocates and transfers funds to each municipality or AOM based on the condition of their network and ability to undertake the work Recently there have been moves to improve accountability for the work being done by AOMs and municipalities by establishing more rigorous contract procedures, but until more funding is available there appears to be little reason to address these issues

It seems surprising that the MA system is not more popular at the departmental level, given the greater extent of their networks in areas serving rural communities which would seem to therefore be more amenable to a community based approach than at the national level with INVIAS However, it appears that there is less political support for road maintenance from

the departments than from the national government, so that the departments have a significantly lower budget allocation for maintenance and are more susceptible to diversion of funds away from maintenance Until the funding issue can be solved, it is unlikely that there will be any drive to improve the delivery of road maintenance

9. CONCLUSIONS

Colombia presents a wide variety of approaches to procuring road maintenance - from advanced concessions and 'total' maintenance contracts through to small, appropriate technology based contracts with local community based contractors Like many countries, Colombia has gradually transferred more maintenance into the private sector sine the mid 1980s

Attempting to improve the delivery of road maintenance, many countries have adopted an approach of moving to unit price routine maintenance contracts as a first step, initially through applying such an approach to an in-house works organisation before opening procurement to competition with the private sector Only then has the next step been taken of attempting to implement performance based contracts (Parkman, 1998) Colombia has not done this - it has moved directly from an in-house workforce, with no accepted standards or unit prices, through a system of contracted labour to a performance based approach

Three aspects of the above approach are pertinent First, corruption in many countries is a cause for concern, and for this reason many administrations are hesitant to administer performance based contracts This is because performance based contracts are possibly more open to subjective judgement than unit price contracts in terms of valuation, and hence a degree of 'partnering' between the parties is necessary, whereas unit price contracts might be considered more 'measurable' in an objective sense The key aspect which seems to mitigate against this in the Colombian situation is the close link which has been developed between the local community and the road contractor, engendering a sense of 'ownership' and pride in their local network Indeed, payment to the AMV, who supervises the MAs, is linked to the performance of the MA which would in many situations seem to encourage inappropriate actions on the part of the MA - but as noted in 5 3 4, the fundamental basis for this is the sense of local teamwork which is being encouraged

Second, the element of 'partnering' appears fundamental to the successful use of performance based contracts in Colombia The performance indicators for different contracts have been presented in Tables 6, 10 and 12 and it is clear that many of the items could be open to a degree of interpretation In a more litigious culture, considerable opportunities for disputes might be exploited by the parties However, in Colombia, INVIAS has noted that with the variation in road standards, it is essential that they act with a degree of 'reasonableness' to the MAs, AMVs and contractors

Third, the issue of future budget allocations is important Funding has not been discussed in detail in the study, but it is apparent at the national level that the government is committed to expenditure on the road network and supports the objectives of the AMVs and MAs in a broader socio-economic sense as well For this reason, future reductions in the budgets for MAs, AMVs and the 'total' maintenance contracts are not anticipated However, were such

reductions to occur, it is unclear how the routine maintenance contracts would be adjusted For unit price based contracts, it could be argued that reductions in the budget are easier to accommodate through selecting and prioritising activities and excluding lower priority activities - it might be argued that it would be more difficult to make adjustments to performance type contracts in which individual activities are not priced *per se*

Finally, whilst it is very difficult to compare costs of different contracts due to the variety of factors which influence contract price, it is interesting to attempt a comparison of the different approaches being adopted in Colombia Assuming the administration costs of the MA/AMV approach are the same as those for the 'total' maintenance contracts, a straight comparison reveals the following

(1) From Table 5 (page 8), MA (routine maintenance) costs per kilometre vary between 1 3 and 2 7 million pesos (1998 prices, which exclude costs of materials and use of plant not in possession of MAs)
(2) From Table 11 (page 21), routine maintenance costs for the 'total' maintenance contracts vary between 4 5 and 8 8, with an average of 6 2 million pesos (1997 prices, fully inclusive of materials and plant)

Assuming annual inflation of between 15 and 20 %, this difference becomes even greater It could be argued that the roads included in the latter contracts, being of a more strategic nature and more highly trafficked, might require more intensive activity But the difference appears to be greater than merely the requirements for plant and materials (many routine maintenance activities, such as off road maintenance, are almost solely labour costs) Hence it could be concluded that the 'total' maintenance contracts are a more expensive approach

Many countries have sought to increase the use of the private sector for road maintenance in an attempt to cut costs and many have reported cost savings (Parkman, 1998) It does appear that competition stimulates efficiency, but such competition must be managed to ensure long term sustainability (see 5 2 5) and the MA approach appears to be deriving its efficiency through local community and user involvement in road maintenance activities The case of Colombia suggests that increased transfer of risk to the private sector does not necessarily bring reduced prices, supporting evidence elsewhere (Madelin, 1994) that to achieve more efficient road maintenance practice, road administrations should first focus on the needs of the network at the most fundamental level, rather than simply introducing policies to increase the involvement of private contractors and hoping that these will provide a panacea for the road network

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Appendix 1 - People interviewed during study

LIST OF PEOPLE MET WITH WHOM DISCUSSIONS WERE HELD CONCERNING THE USE OF PRIVATE CONTRACTORS FOR ROAD MAINTENANCE IN COLOMBIA

Miryam Lopez Aragon	Director of Maintenance, Instituto Nacional de Vias (INVIAS)
Fabio Mohica	Coordinator of maintenance contracts, central and east zone, INVIAS
Carmen Cecilia Morales	Coordinator of Road Administrators and Microempresas, INVIAS
Maria Cristina Valencia	Assistant Coordinator of Road Administrators and Micro , INVIAS
Marta Ines Lobo Soler	Formerly responsible for Microempresas, INVIAS
Hernan Otoniel Fernandez Ordonez	Consultant, formerly Secretary General (Technical), INVIAS
Mauricio Cuellar Montoya	Resident Project Officer (Finance, Private Sector and Infrastructure), World Bank
Jesus Burbano	Road Maintenance Administrator, Bogota - Choconta road
Various members	Covadonga Microempresa, Bogota - Choconta road
Silvio Mejia Duque	President, Asociacion Colombiana de Ingenieros Constructores
Fernando Aguirre Angel	Managing Director, Aguirre, Monrroy y Asociados contractors
Hernando Monrroy	Chairman, Aguirre, Monrroy y Asociados contractors
Juan Manuel Leano	Deputy Secretary for Infrastructure, Departmento de Cundinamarca
Harold Urrea	Engineer, Maintenance Division, Departmento de Cundinamarca
Santiago Henao Perez	Director of Centre for Studies on Roads and Transport, Escuela Colombiana de Ingenieria
Mike Raghib	Student and interpreter
Steve Newport	WSP International, formerly worked for Danish Road Directorate on TA project with University of Cauca in Colombia

Appendix 2 - Detailed development of rate for microempresa

METHOD OF ASSESSING DETAILED RATE PER KILOMETRE FOR MICROEMPRESAS (used in 1998)

Source This study from INVIAS

ITEM	Calculation	Legal value PESOS	Adopted value PESOS
SALARIES			
Minimum wage			
Transport subsidy			
Transport			
Food benefit			
SUB TOTAL SALARIES	A		
SOCIAL OVERHEADS			
Bonus	0 0833 x A		
Holidays	0 0418 x A		
Redundancy compensation	0 0833 x A		
Accrued redundancy benefits	0 0100 x A		
SUB TOTAL SOCIAL OVERHEADS	B		
CONTRIBUTIONS			
Health insurance	0 1833 x A		
Family allowance	0 0400 x A		
SENA - training contributions	0 0200 x A		
ICBF - social welfare contributions	0 0300 x A		
Pension	0 1350 x A		
Savings and other contributions	0 1000 x A		
SUB TOTAL CONTRIBUTIONS	C		
CLOTHING			
INVIAS approved uniforms (3 per year)			
SUB TOTAL CLOTHING	D		
TOOLS			
Tools per month (maintenance)			
Purchase of lawnmowers			
Operating costs			
SUB TOTAL TOOLS	E		
TOTAL MONTHLY COST = F	A+B+C+D+ E		
TOTAL ANNUAL COST = G	12 x F		
TOTAL COST FOR 10 MEMBERS = H	10 x G		
PROFIT = J	0 05 x H		
TAX ON PROFIT = K	0 16 x J		
SPECIAL TAX = L	0 05 x (H-K)		
TOTAL COST FOR CONTRACT = M	H + K + L		
Type 1 50km for 10 people cost per km	M / 50		

Notes 1 The adopted value typically exceeds the legal value by approximately 20%

2 Published cost for Type 1 contract will exceed the calculation shown above (adopted value) This is to account for administration costs and is of the order of 1%