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RURAL TRANSPORT- KEY TO DEVELOPMENT:

Finance, Organisation and Participation

- Country- specific Solutions for

Rural Road Networks

- The GTZ Experience -



by

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Finance, Organisation and Participation for rural road Networks

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Note: This paper may be downloaded starting June 2002 from the GTZ/IRF homepage:
<http://www.zietlow.com/>

Financing, Organisation and Participation for Rural Road Networks - The GTZ Experience -

I. EXECUTIVE SUMMARY

This paper points out the need for rural transport and rural roads, although **conditions of rural roads** are often **unfavourable** and “**uneconomical**” because of their low traffic volume, their short service life and their relatively high maintenance costs, with the consequence that frequently “**nobody wants them, neither the local ministries, nor the foreign donors.**”

The paper identifies the aspects of **FINANCE, ORGANISATION and PARTICIPATION** as the three main factors for solving the rural roads problem, considering each of them equally important.

Based on long-standing **experiences from Bangladesh, Costa Rica, Central African Republic, Ethiopia, Madagascar, Namibia, Nepal, Rwanda, Sierra Leone, Thailand and Zambia**, the paper comes to the conclusions that the general neglect of rural roads can be overcome by country specific solutions:

I. FINANCE

1. For **FINANCING** rural roads not the single project, but the sector approach or **roads family concept** is recommended which comprises all kinds of roads country-wide and is generally based on the **road user pays principle**.

2. As the road network of a developing country in general is expensive and rural road construction costs on average US \$ 20,000/km or 2 kg gold/km, (or 15 kg gold for the average length of 7.5 km rural road), **a self-help approach** by the farmers for rural roads by the farmers is **not feasible** in financial terms (and is not even applied in industrialised countries; p. 7)

Financially, the current and periodic maintenance of rural roads can only, and should be, secured within the framework of the total road network, which – as e.g. calculated for the Rwanda case (p. 16) - can be financed by tax revenue of c. 10 US cents per litre of all motor fuel sold in the country.

3. For financing rural roads only a fixed revenue share of 20-25% of this total revenue is necessary, i.e. approximately **2 US cents per litre**, to forming a stable source of funding for current and periodic rural roads maintenance.

4. Therefore a **2 phase strategy** is recommended: **First national and provincial roads** should be made self-financing by means of fuel or vehicle taxes, and then in a **second step the rural roads** – preferably within the framework of a joint road fund - should be (cross-) financed, as so-called rural “**baby**” roads by their “**parent**” roads (example p. 16).

II. ORGANISATION

5. As for the **second factor**, the **ORGANISATION** and classification of the rural roads network, the paper stresses the need for **country-specific solutions** establishing **5** categories (from LLDC to LDC, MIC, EC and IC countries) which require different **standards of rural roads** (s. page 10). These standards may generally reflect the **level of GDP** (resp. the agricultural productivity of the country, the degree of mechanisation or size and weight of agricultural vehicles), or be based on the expected **traffic density** of vehicles per day (p. 12).

6. A special problem for rural roads is the limit of permitted **axle loads**. This issue can also only be seen in relation to the prevailing rural road conditions (earth, gravel etc.) and depends on the country's general level of economic development (LLDC, MIC or IC). Consequently **3 different** country-specific **axle load standards for rural roads** (of **1.5 tons, 5 tons and >10 tons** each) are defined (page 12).

7. The organisational structure of the administration for rural roads requires a special **rural roads division** to be established within the **Ministry of Works** (preferred solution because of the common financing of all roads) or within the **Ministry of local Government**.

III. PARTICIPATION

8. Finally the **third factor**, the question of **LOCAL PARTICIPATION**, is addressed, as the sheer size of the rural roads network (c. 70% of all roads) generally surpasses the management and supervision capacities of any traditional ministry, even if a separate rural roads division is created.

local participation requires **qualified local partners** able to take over **full administrative ownership of the rural roads**, i.e. requesting central funds (up to 95% of topping-up from central government) and organising local maintenance.

9. local participation may be **easier** to achieve in already more advanced countries, e.g. **Middle Income Countries (MIC)** like **Costa Rica**, where GTZ has been engaged for many years, as it is laid down in its new Rural Roads Law (see Annex).

But special problems for raising local participation still exist in Least and **Less Developed Countries (LDC)** like **Madagascar and India**, where the necessary commitment is often missing, also with newly founded rural communities and district administrations, as long as they aren't permanently paid (cf. the example of India; p. 20).

IV. Recommended ACTION

10. GTZ experience has shown that the 3 main conditions for rural roads - finance, organisation and participation – are best met as follows:

if

- the financing is guaranteed by the central government (e.g. by an earmarked fuel tax of 2 US cents per litre) and this basic decision is supported even by the head of state,
- the organisation is guaranteed by a special rural roads division (of equal importance to the national roads division) within the Ministry of Public Works or the road fund/ roads agency,
- the local participation is guaranteed by a technical roads unit (3 employees; initially paid by central govt.) at local district level, advised by a local district roads committee (e.g. 7 unpaid members of the civil society).

More details may be seen from the summarizing table on page 22 of this paper. The Annexes give additional background information of an UN-ESCAP approach as well as the newest rural roads legislation of Costa Rica.

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II. Rural roads and the GTZ experiences in Asian and African countries.

Poverty reduction strategies are a key element of development policies all over the world; but to alleviating the poverty of the majority of the population, **access to the rural poor** like rural roads constitutes an indispensable pre-condition

Therefore rural access, rural transport and **rural roads** are key elements of any strategy for rural development, as more than **80% of the population in Africa** and 60 to 70% in Asia are still living **in rural areas**. In some countries, such as Ethiopia, the situation may even be described as being disastrous, as agriculture forms the productive basis of the entire country.

What makes the rural access issue more complicated, is the **great confusion** among the countries concerned, as even **basic questions of rural roads** are **by no means solved** and haven't found an generally agreed answer:

- what defines a rural road,
 - from where to where does it lead,
 - what does it cost,
 - who should be responsible,
 - who should take care and pay for it
- etc.

At the same time even among the donors and professionals there are different approaches on the rural roads issue, starting from technical to social and economic as well as to financial and organisational priorities.

Considering this general state of affairs, German Development Cooperation by no means forms an exception, knowing all the ups and downs other donors have experienced, too.

Since its beginning more than 25 years ago, the Deutsche Gesellschaft für Technische Zusammenarbeit (**GTZ**) GmbH as well as the Kreditanstalt für Wiederaufbau (**KfW**) were charged with rural roads projects all over the world.

There are rural roads lessons specifically from countries such as Bangladesh, Central African Republic, Costa Rica, Ethiopia, Madagascar, Namibia, Nepal, Rwanda, Sierra Leone, Thailand and Zambia., .

These **experiences** with **rural roads** may be seen as an evolutionary process leading to the definition of **5 common prejudices** and therefore be highlighted as the following five points:

1. Contrary to common belief: **The rural access problem cannot be handled as a "minor" addendum to other "major" or more important projects.**

These other projects may sound as reasonable and serious as e.g.: increase of rice and other crop production, emergency drought relief, reforestation, rural health care, schooling for rural children, poverty relief for the landless, etc.

Experience has shown that at the beginning of such **projects of other sectors** it was thought that the rural access problem might simply be solved along with other activities. Many such projects had to be abandoned in the end because they failed to recognise **rural access as a problem in its own right.**²

² Madagascar: Projects of Rice Production in the North Western Province, Reforestation in the Southern Province, Food for Work programmes in rural areas.

2. Contrary to common belief, **rural transport is very expensive.**

2.1 Rural transportation costs

Although rural labour is considered cheap and family help even as costing nothing, the transportation of agricultural goods from the farms to the markets is a tedious task and, if calculated financially in costs per ton-kilometre, very expensive.

In Africa they may vary from 3 – 4 US\$ per ton per kilometre for hired porters (as in mountainous regions) to 1.5 – 2 US\$ per tkm on hired animals (donkeys, camels) and reach 0.50 – 0.80 US \$/tkm for oxcarts, bicycles, tractor-trailers, 0.20 – 0.35 US \$/tkm for trucks (up to 7 t payloads) on earth/gravel roads or even 0.10 – 0.12 US \$/tkm for heavy truck-trailers (GVW 40 tons) on asphalted highways.³

In Asia this relatively high price scale is to be found only in exceptional cases (Bhutan⁴); in the Asian lowland cases transport prices are only 1/2 or 1/3 of the above.

But the ratios between traditional and highly productive modern transport still persist:

Rural transportation of goods at market prices **costs** (in US cents per ton-km) locally on traditional **farm-to-market ways and trails** approx. **25 times** and on constructed rural **market-to-highway earth roads** approx. **5 times** as much as on the asphalt concrete of **national highways** (with modern heavy load trailers, calculated for transporting 1 ton for 1 km).

Furthermore the above rural transport price averages are to be seen in relation to the average daily labour revenue of appr. 1 US \$ per day or less, typical for many rural areas.

2.2. Rural roads costs

The demand for road construction in rural areas is known all over the world.

Costs for motorable rural roads vary considerably. Construction costs for earth roads in Asia are in the range between \$US 7,000 and \$US 40,000 per km⁵.

But using the rate of \$US 20,000 per km this means that – at the current gold prices

1km of rural road construction costs as much as 2kg gold.

From this figure⁶ alone it may be seen that given the poverty in rural areas, rural roads cannot be financed and built, as sometimes advocated, by the “self-help” of the often scattered small communities, which often aren’t yet integrated into the monetary economy at all. Roads always are the biggest investment project in any rural community.

Additionally the current road maintenance costs⁷ are to be calculated, which may amount to only 1.5 % of the replacement value for asphalt roads, but approx. 5% annually of the initial asset value for earth roads (or 100 g gold per km per year).

³ Marginal use of transport means (cats, bicycle trailers, tractors), which are owned and used for agricultural purposes may cut the above “tariffs” by half.

⁴ Cf. World Bank Technical Paper WTP496, p. 31 (adapted from Tampil Pankaj).

⁵ Average costs of rural roads are US\$ 20,000 per km (D.Schelling/World Bank: “Community Driven Development CCD and Rural Transport,” Washington D.C. May 2001).

Cost for a fully engineered rural road will typically be in the range of \$20,000 to \$100,000 (acc. to World Bank Technical Paper WTP 496, p. 11).

⁶ Interurban national roads at US \$ 300,000 per km are valued at 30 kg gold per km.

⁷ Maintenance needs of the overall road network of a country are calculated at approx. 2.5 % of the replacement costs per annum (out of which 0.8% (1/3) for the recurrent maintenance and 1.7% (2/3) for the periodic maintenance needed every 7-9 years).

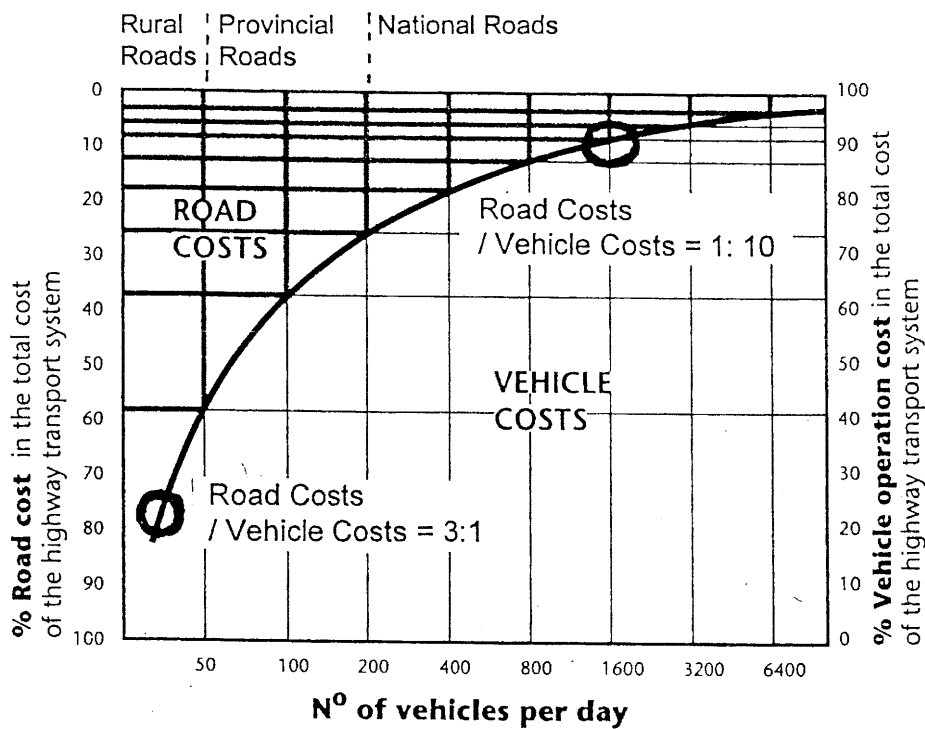
3. Contrary to common belief **rural roads are not as “economical”** as other roads.

Although transportation cost may drop considerably, the high road construction costs often prevent the construction of rural roads, as transport volume (measured in motorised and unmotorised vehicles) often is too low.

This basic problem may best be seen from the following graph, which shows how **road costs** plus the **costs of the use of the vehicle fleet** constitute - economically seen - the total transport cost:

In “normal cases” for roads with **200 vehicles per day or more** the vehicle costs constitute 75% of total costs and road costs only 25% (or less). These highly frequented roads are the **national road** case for which the **HDM-4** calculation method of the World Bank⁸ is suited.

Vehicle (road user) costs vs. rural road costs: the unfavourable frame conditions



[Cost curve of Graph from CEPAL „Roads“, page 26]

In the case of the mostly unpaved “**provincial Roads**” (see graph) of **50 to 200 vehicles** per day, the Roads Economic Decision Model (**RED**)⁹ is recommended.

“**Rural roads**” typically carry **below 50 vehicles** per day¹⁰.

A key ratio for any given road is the cost ratio between the road itself and vehicles on it. The CEPAL curve reveals, that the **ratio of road costs to costs for vehicle use** is 3:1 for rural roads, but for asphalted national roads this ratio is 0.1:1 or 0.12: 1, that means – due to the low traffic volume -:

Road costs for rural roads are
 - if each individual user had to contribute to full cost recovery -
25 times as high as for national roads.

⁸ World Bank Technical Paper WTP496, page 28, of April 2001

⁹ WTP496, p. 29

¹⁰ Cf. the Kenyan road gravelling programme typically covers roads of 30 vpd on average.

Therefore it is no surprise that private and government investment as well as even the commitment of international banks in the rural roads sector, which e.g. in Asian countries on average covers 71 % of the entire road length of the country¹¹, are very scarce. Additionally roads have to **compete with** other investments like **schools and health stations**, for which local engagement is easier to generate.

4. Contrary to common belief, **local participation** for rural roads cannot be taken **for granted**. Especially in least and less developed countries sustainable local participation is **the end point rather than the starting point**¹² of development. As the Indian example shows, the active participation of local communities may take generations to achieve a definite sustainability.

Therefore **the rural roads** problem is **more complicated than the national roads** problem, as no generally “agreed theory” or easy solution exists for them; but nobody questions the need for road access for approximately half of the population of developing countries.

5. Contrary to common belief, the rural roads problem in **Central Europe**, contrary to the appearance, has **not been solved** either, basically and in an economic sense. Despite many failures in this difficult field of transport, intelligent **solutions for financing and organisation** of rural roads are still sought in countries all over the world, including the industrialized ones.

Hence, before going to solve the problems abroad, a look into the rural roads problem in Europe might be helpful.

The financing of **rural roads** (agricultural access ways between fields and markets) in **Germany**¹³ during the last years has been secured by the following **division of different sources**:

1.	Own contribution of the owner (villages, water associations, land consolidation associations etc.) in the form of capital, contributions in kind or other loans	25 %
2.	Grant of federal government (“Green Plan” for rural support)	30 %
3	Additional grants from the provinces	20 %
4.	Low interest loans with 5 % annual charge (2.5% interest and 2.5% repayment, 28 years redemption period), from the federal “Green Plan” budget also	25%
	TOTAL	100%

In view of the **long-term loans** the German agricultural access ways are **high-cost investments**¹⁴ (often concrete slabs, 4m wide and more than 50% more expensive than low-cost constructions) with very low annual maintenance costs (only 10% of normal maintenance costs as calculated for low-cost roads, with an average of 66 vpd).

But although the financial contribution of the German farmers - because of the general subsidies to the agricultural sector - is often minimal, in Germany also, the **central government, providing most of the funds**, must **rely on the local** decentralised **administration** and on the local “civil society” for the effective use of these funds.

¹¹ See: Annex 7.1 General Survey

¹² This proved to be true also in other parts of local infrastructure, as for school and health station buildings

¹³ K. Zanker, Landwirtschaftlicher Wirtschaftswegebau, in: aus “Straßen und Tiefbau,” Heft 8/1962.

¹⁴ The question of high or low-cost investments for rural roads is seen differently in Asian countries (details see list in the Annex 7.4).

III. Traditional donor approaches to the rural roads problem

Rural roads have been financed as part of development cooperation, although not as a priority, for 40 years. Because of the **lack of a general concept for a countrywide approach**, they are often built “donor driven” and on an individual project-by-project basis. Sometimes several single rural road projects are collated to a bi-lateral rural roads “programme”¹⁵.

The most important donor-driven programme for rural roads is financed by the European Union in Brussels in a variety of the African associated countries, where on a regular basis so-called **counterpart funds**¹⁶ from other projects are used locally to construct rural roads.

Generally speaking, in the field of rural roads the donor community is still acting on an ad-hoc basis and on a foreign grant basis.

Though this donor approach may be considered a practical short-term reaction to the complicated issue, it cannot, however, be considered a solution for the general problem, as it **prevents local commitments more often than encouraging them**, a consequence of **missing preconditions** of commitment, before the financing (**preferably in the form of a topping-up**) may start.

But on the other hand it also has to be stated that in Asia¹⁷, Africa and Latin-America¹⁸ the **developing countries themselves** up to now have found no viable solution, either. Their approaches are very different, ranging from a complete neglect of the problem to a **lump sum solution** from the central government budget. Such a general funding approach is mostly a global one, based on fund allocations **on a per-kilometre basis**.

I

It is important to be aware that the developing countries themselves are looking for national solutions of their rural roads problems. Because of inadequate administrative capacity, **no effort is made to handle rural roads individually** or to establish bank-based cost-benefit analyses for each of them. Therefore the donor community also is asked to contribute not to some single projects, but **to a general solution of the rural roads problem**.

IV. “Best practices” for organisation of rural road networks (ownership, classification and responsibilities)

Contrary to the mostly selective donor approach, some governments, mostly in Asia, realised the special need for practical countrywide solutions.

Therefore the organisational responsibility for rural roads may be allocated with the **central government as in the Philippines**, with the **provinces as in Thailand** or with the **districts as in Sri Lanka** (see list in the Annex 7.2).

A general precondition for any solution is a clear definition and demarcation of ownership and responsibilities also between different ministries, as it is given in the following graph:

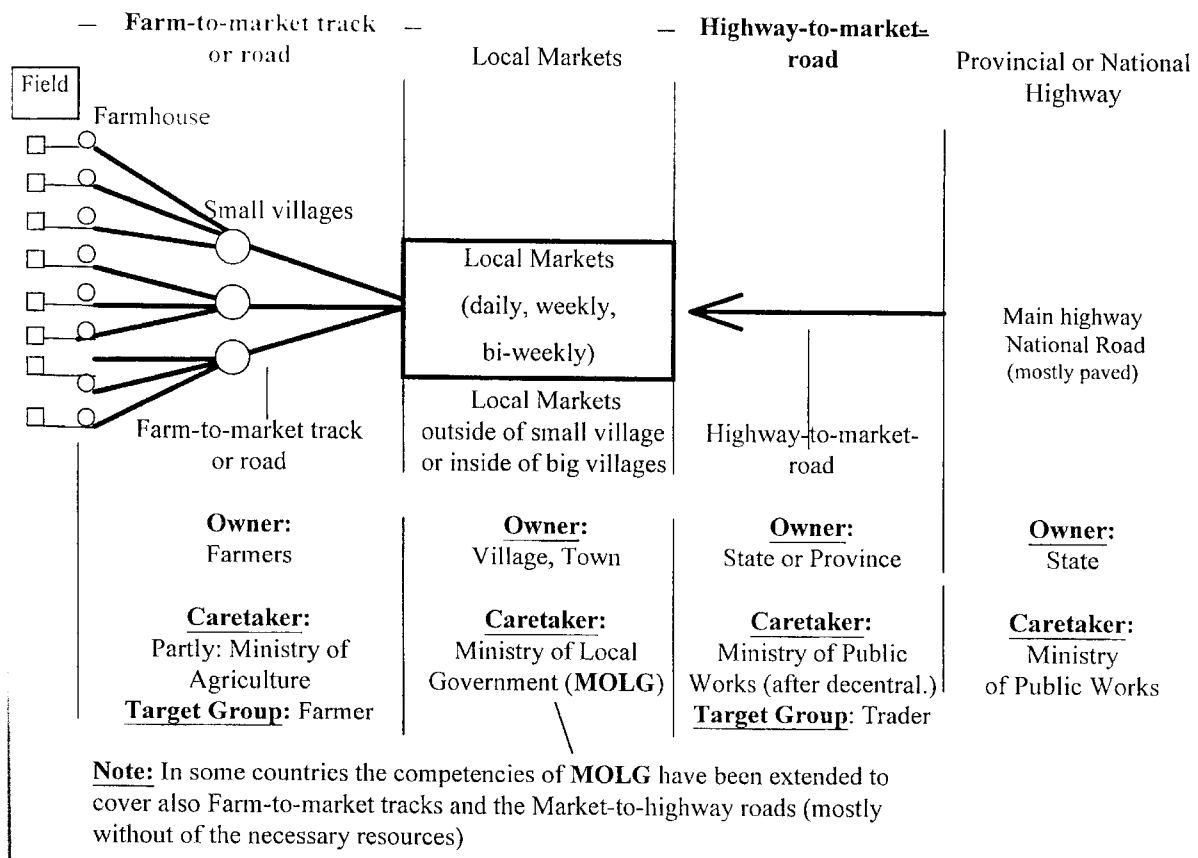
¹⁵ The “Green Roads” programme of the German and Swiss governments in Nepal

¹⁶ There has been no comprehensive research on this issue up to now.

¹⁷ Details see Annex § 7.1 and 7.2

¹⁸ An exception is Costa Rica and its recent Law on Rural Roads (see Annex).

1. From the field to the main highway: structure and definition of rural road networks



The denominations of the above graph take into consideration that in many least developing countries (eg. Ethiopia) the necessary process of “villageisation” is slowly taking place, parallel to the urbanisation in and around the capital. -

Additionally to the above graph there are also **rural access roads**, which directly connect the farmers to the main highway. They are generally **treated as farm-to-market roads** (cf. the Costa Rica regulations in the Annex 7.6).

2. Role of rural markets

The rural market separates the farm-to-market connections (ways, trails, paths, etc.) from the market-to-highway roads.

The graph defines the local **markets as the central changing points**, where the three ownerships change:

- Ownership of the transported goods,
- ownership of the transport vehicles and
- ownership of the roads leading to the main highway.

This is specifically important as in most cases of the less developed countries (LDC) the rural market constitutes the transition **from the subsistence** to the **cash crop** economy.

In most cases the rural markets are combined with public facilities like **schools, health stations**, church/mosque, assembly/sporting places and administrative posts.

Thus rural markets in developing countries form the meeting point between the traditional sector and modern sectors, which is based on the division of labour (money economy).

Generally rural markets fall under the responsibility of the **Ministry of Local Government**; this – often neglected - ministry plays a **crucial rule**, as the rural markets generally form the starting point of the classified road network, beginning with the market-to-highway roads¹⁹.

3. Guidelines for rural road standards

3.1 The “country- specific approach”

GTZ distinguishes **5 country-specific standards** for rural road networks related to:

- (1) **LLDC** Least Developed Countries (eg. **Ethiopia**),
- (2) **LDC** Less Developed Countries (**eg. India**),
- (3) **MIC** Middle Income Countries (**e.g. Thailand/Costa Rica/Namibia**),
- (4) **EC** Emerging countries (eg. **Mexico**) and
- (5) **IC** Industrialised countries (eg. **Germany**) as outlined below:

Country group standards for paving rural roads:

Group of country [approximate category acc. to GNP/per capita]	Paving standard of farm-to-market connection (and of “access roads”)	Installations for periodical rural markets	Paving standard of highway-to-market road	Standard of national or provincial highway
(1) LLDC <250\$ (Ethiopia, Rwanda, Nepal, Cambodia)	Footpath, trail	Drained	Earth road	Gravel or paved
(2) LDC >250\$ (India, Madagascar)	Earth road	Gravelled	Gravelled road	Paved (bitumen)
(3) MIC >800\$ (Costa Rica, Namibia, Thailand)	Gravelled road	Gravel	Gravel road	Paved (bitumen)
(4) EC >3000\$ (Hungary, Czech Republic)	Gravel road	Paved (bitumen)	Paved road (bitumen)	Paved (bitumen)
(5) IC >12000\$ (Western Europe)	Paved road (bitumen)	Paved (bitumen)	Paved road (bitumen)	Paved (bitumen)

The above table leads to **5 mayor conclusions**:

- (1) the **design and construction standard** – and the average traffic to be expected - of the rural road network (farm-to-market roads, market-to-highway roads and even of the provincial highway) are generally dependent on the economic level of the country, i.e. in the above table **dependent on the GNP per capita level**²⁰ of the group of the country.
- (2) There is step-wise **hierarchy of technical standards for rural roads**, starting from the farm-to-market roads, to market-to-highway roads and to the main provincial or national roads. (i.e. in the above table: standards rising horizontally).

¹⁹ Cf. GTZ advisory project to the Ethiopian Roads Authority ERA.

²⁰ The above group classification may alternatively be determined by the productivity of the country (eg. level of wages, resp. productivity of eg. agriculture, whose output per hectare may differ more than 10 times from LLDC to IC, resp. eg. the percentage of agriculture within the national economy, which may diminish from 60% down to 1 % of GDP the world over, etc..

- (3) Farm-to-market roads range from non-motorable trails (for portage and animal transport) up to full fledged paved roads, as they are built for agricultural machinery in industrialised countries (IC).
- (4) Market-to-highway roads are generally motorable roads ranging from
 - Earth roads (c. **1.5 ton axle load as for pickups and minibusses**), to
 - Gravelled roads (c. **5 tons axle loads as for light trucks**) and full
 - Gravel and paved Roads (c. **10 ton axle load as for heavy trucks**).
- (5) The government (Ministry of Public Works/Transport and Ministry of Local Government) intervention of commitment, judicial ownership and financial responsibility (commonly known as the gradual integration into the so-called “**classified road network**”) is dependent on the country’s general administrative capacity, which expands also with the level of economic development.
Practically the classified network starts with the gravelled roads, carrying light trucks (up to a **5.5 ton axle load**) and carrying on average **more than 30 to 35 vehicles per day**, which should be passable and held open most of the year.

These **5 categories** of the above country-specific approach can be underscored by the following **examples**:

a) In **Ethiopia** (LLDC) the GTZ has for many years executed an advisory project with the Ethiopian Road Authority (ERA), which is responsible for the main highway network. Additionally and apart from the ERA, but supported by it, different rural road organisations are being built up within the provinces. They have to see to it that the often remote rural markets and rural centres get motorable access to “the outside world” with market-to-highway roads. . It is intended to have market-to-highway roads for pick-ups and minibuses, motorable during all seasons of the year. But the problem of farm to market roads, which are mainly trails, is so immense that it cannot be tackled yet.

b) In **India** (LDC), where GTZ executed a rural access study within watershed projects in Himachal Pradesh and Rajasthan, efforts are made to establish gravelled road access from small villages to the asphalted network, passable for school buses and light trucks all the year.

c) In **Namibia** (MIC) GTZ executed a study on appropriate maintenance standards of the rural roads network, as level and standards of rural road access are sometimes too high, and even farm-to-market as well as rural access roads were built to gravel standards of heavy axle loads.

In **Costa Rica** (MIC) GTZ initiated a rural roads section within the Ministry of Public Works and Transport (MOPT). Based on a credit of the Kreditanstalt für Wiederaufbau (KfW) it has built rural roads for local communities on a participatory basis for nearly 10 years. The experiences have been laid down in a recent Rural Roads Law, comprising the necessary financial, organisational and technical aspects (see Annex): Rural Roads (“caminos vecinales”) shall be built with a 30 cm base of granular material, at least of CBR >30 and allowing for an **axle load of c. 6 tons (light trucks)**.

Rural roads in Costa Rica may be classified as rural farm- to-market roads, leading to a **centre (defined by at least 3 of the following required criteria: school, bus station, church, health clinic, sporting place or assembly hall)**, while **access roads**, providing a direct link to the main road, **are defined** by leading to at **least 10 houses or 50 people per km** of road.

Furthermore farm-tomarket or access roads must have **at least 30 vehicles per average day** or as a special case: the population served exclusively by such road, still works in a

beginning **cash crop economy** (selling less than 50% of the harvest of the area to the market).

In **Mexico** (EC) a new government programme has been initiated for rural roads providing them with a reinforced base course using cement stabilisation, so that even heavy trucks may pass on them. In **Poland** (EC) as an accession country to the EU, large parts of the rural roads network may be reinforced to complying with the heavy axle loads of the EU, as laid down in the so-called Acquis Communautaire.

In **Germany** (IC) the standards of construction and rehabilitation of rural roads ("Ländliche Wege") was adapted recently to the increase of the permissible axle load of the main road network, which increased from 10 tons to 11.5 tons, allowing for the transport and use of the heavy modern agricultural machinery.

3.2 The traffic density approach for the paving standards of rural roads

The above country approach may give a general orientation, but exceptions with individual rural roads are still possible (as in **Costa Rica**: either for reasons of a missing link of a homogeneous network or for tourist roads in the game parks). Extreme population densities (as in **Bangladesh**) may also lead to higher road standards.

Within larger countries there may also be different economic levels (as in India; in **China** a ratio of 1:10 exists between western and eastern provinces).

Therefore individual cases may be cross-checked by the traffic density approach, which may also comprise **non-motorised vehicles (ox-carts etc.)**,.- especially in rural Asia, where competitive alternatives are in place.

Traffic density and appropriate paving standards – a general orientation²¹:

Traffic density of vehicles per average day ²²	General denomination of road standard and	Allowed axle load of single axle	Standard and technical Dimensioning	Industrialize	Emerging C.	Middle Income	Less Developed	Least Developed
> 30 000	4-lane turnpike	> 10 ton	AsphaltConcr.22 cm	X	-	-	-	-
15 000- 30000	European national road	> 10 ton	AsphaltConcr.18 cm	X	(X)	-	-	-
5 000-15 000	European provincial Road	> 10 ton	AsphaltConcr.14 cm	X	X	(X)	-	-
1 000- 5 000	European district road	> 10 ton	AsphaltConcr.10 cm	X	X	X	-	-
400-1 000	European Community Road	> 10 ton	Asphalt carpet 8 cm	X	X	X	X	-
120 - 400	Asphalted (2cm) on gravel base (African national rd.)	>10 ton	Double surface treatm. (2cm)		X	X	X	X
70 -120	Gravel road	>10 ton (heavy truck)	20 cm base of CBR > 80		X	X	X	X
30/35 - 70	Gravelled road	5 ton (light truck)	30cm base of CBR >30²³			X	X	X
15 - 30/35	Earth road	1.5 ton (pickup)	CBR > 20				X	X
6 - 15	Way	4-wheel drive	Fords, natural ground,					X
< 6	Trail	NMT	-					

²¹ The price ratio between neighbouring road standards may be assumed as c.1 : 2.5.

²² Figures for industrialised countries for comparison only (taken from German RSTO standards).

²³ California Bearing Ratio (CBR) as used for the 30 cm thickness of the base course material in forest areas. In Sahel countries CBR > 60 (laterite) may be available for a 12 cm base. In mountainous regions the crushed rock material of CBR >80 for a 10 cm of the base course may be sufficient.

The above general orientation of appropriate road standards for different traffic densities refers to economic aspects, as laid down in feasibility studies, etc.. **Exceptions** are possible, depending also on the **terrain** and the local availability of suitable **base course material**.

The above table refers also to the **set of road standards** normally applied in the specific country group [rows (5) – (9)]. Experience has shown that the number of standardised road pavement structures in most countries normally covers **5 to 6 different cases**.

It is noteworthy that due to the different traffic and vehicle densities²⁴ in different groups of countries, the set of road **standards for LLDC countries** [row (9)] **ends** where the standards of **IC countries** [row (5)] **start**.²⁵

But there are also “political” exceptions, based on a **political economy** with a different general approach towards the rural population²⁶. Countries following eg. the **basic needs approach**²⁷ may define a “right” of the rural population for high standard roads, whereas an **increasing** number of governments follow a more or less **economic approach** for low-volume roads, leaving more room for direct social investment (for rural schools etc.).

V. “Best practices” for financing rural road networks (road sector approach, road fund and revenues)

There were up to now no general rules in developing countries for financing rural roads²⁸. Nevertheless the international knowledge base on the financing issue is steadily improving and a trend in the developing countries towards appropriate solutions – mostly supported by the international banks and bilateral institutions - can be recognised.

1. The transport sector approach (and its 2 versions)

The **transition** from the former **single project** approach to the **countrywide sector** approach is a worldwide trend. It has been performed also recently by the EU for the countries associated with the EU in co-ordination with the Road Maintenance Initiative of the World Bank.

- In most cases this **sector approach** – **comprising** all roads respectively transport expenditures of the government – in its first version is limited to the **transport budget of expenditures**.

Eg. in **Thailand** funds for rural roads come from government sources only; about 20 to 25% of the total annual road maintenance budget are allocated for rural roads.

A **second version of the sector concept** comprises not only the transport sector expenditures, but the related revenues as well, earmarking clearly defined revenues for the sector expenditures. By this way a balance between revenues and expenditure of the sector is required.

²⁴ Acc. to IRF statistics ranging from 2 (eg. Ethiopia) to 740 (eg. USA) vehicles per 1,000 inhabitants.

²⁵ N.B. This basic fact may specifically influence the appropriate international training standards for qualified staff in the roads sector.

²⁶ Whether rural roads should be paved or not, is controversial: Whereas in China 60% of the rural roads are paved, in Indonesia 55% and in India 34 %, the equivalent figures are in the Philippines and in Iran only 6 % and in Thailand 2%.

²⁷ Within the former basic needs approach rural infrastructure (including primarily piped water, electricity and rural roads) was provided nearly free of charge.

²⁸ UN-ESCAP Survey, see annex § 7.1

Eg. in **Argentina** farm-to-market roads received public finance **out of revenues from fuel and vehicles taxes**. Additionally, the self-contribution of the farmer(s) for the farm-to-market roads must be at least 20% of the construction costs.

Eg. in **Costa Rica** the recent Rural Roads Law stipulates that 25% of the **fuel taxes**²⁹ received by the national roads board are to be transferred to rural districts for rural roads.

This second version of the sector concept including also the revenues of the sector, forms the basis for the **economically defined transport sector**, which requires financially **balanced sector accounts**.³⁰

2. The road fund solution

On the way to the commercialisation of government activities the road fund creates an extra-budget account.

It has the advantage that earmarked revenues (mainly coming from **fuel taxes and/or vehicle taxes**) are received and disbursed according to its statutes as in private business practice, and

secondly for the nation-wide road network securing for the maintenance of all roads in the country.

Thus a stable flow of funds is guaranteed and the financing of all classes of the whole **“family” of roads** is secured, including the non-self-supporting **“baby-roads”** (rural roads) which in fact are cross-subsidised by the **“parent roads”** (national and provincial roads)³¹.

The road fund allocations for different classes of roads comprise the national roads (mostly 65%), the rural roads (mostly 25%) and the main city roads (10%). Thus fixed proportions of expenditures are established for the economic road network of the country. (Best practice as the road fund solution in Ethiopia³²)

3. Prioritisation of expenditures

Experience has shown, however, that the creation of a road fund may be useless if spending priorities aren't set economically.

It is necessary to distinguish between

- *Greenfield projects, i.e. construction of new roads (on new terrain)*
- *Brownfield projects, i.e. rehabilitation and improvement of existing roads, and*
- *Blackfield projects, i.e. maintaining (potholes and most urgent “black spot areas” etc.) of the existing network.*

The above categories approximately may show the following average internal rates of return:

Greenfield projects: 10% IRR,

Brownfield projects: 20% IRR

Blackfield projects: 40 % IRR and more

(dependent on the present state of the road).

Thus it is evident that under the often given budget constraints, a so-called **second generation of road funds** is created, specialising scarce resources for maintenance (blackfield projects) only, but still a strict general auditing and special anti-corruption measures for transparency are necessary

²⁹ See Annex

³⁰ This general transport sector approach is applied also by the World Bank, as revealed by its Rural Transport Portfolio. (D. Schelling, “Community Driven Development and Rural Transport” Annual Road Management Seminar, Washington D.C. 2001, p.5: Out of 128 rural road projects 52% were part of transport sector projects, 22% part of agricultural dev. projects, the rest was part of social and environment funds).

³¹ Or: “The often neglected “step child” of rural roads has found its paying parents within the family of roads.”

³² Cf. GTZ advisory project with the Ethiopian Roads Authority (ERA). Details of the Ethiopian legislation for the Ethiopian Road Fund and its board may be downloaded from the Internet: www.zietlow.com/

The political conflict between new construction, rehabilitation and maintenance is generally decided on economic grounds in favour of maintenance projects, which may contribute best to the economic growth of the country.

4. Sources of revenues (incl. rural roads) and their distribution

Financial resources and a stable source of funds for the roads sector are generally generated – in order of importance - by

- the fuel (gasoline and diesel) tax,
- the annual vehicle tax and
- the special heavy vehicle tax.

Other road related revenues, such as the vehicle import tax, go either directly into the government budget or are, such as parking fees or road tolls, of minor importance.

In view of the hitherto neglected **revenue side of the transport sector**, the GTZ executed several studies, first for the West African countries³³, and then world-wide: The booklet on **“Fuel Prices and Vehicle Taxation for more than 160 countries”**³⁴ was published recently in its 2 nd edition.

Fuel taxation, being the most important road sector revenue, forms the basis of most of the road sector calculations, as in the executed example for an African country (see below).

The basic revenue data reveal that in an average African country

- **10 US cents per litre fuel tax** are sufficient to finance the maintenance of the **entire road network** (out of which 1/3 is needed for the current maintenance and 2/3 for the periodic maintenance)

(In industrialised countries with their higher vehicle populations a 10 US cents fuel tax (as the federal and state road funds in the USA taken together) may finance not only maintenance, but also construction of roads.

But even more important is the result for the hitherto unresolved question of **financing the neglected rural roads**:

- **2 US cents per litre fuel tax** – according to the 20% proportion of the road fund – are needed to maintain the **rural roads** of an average country.

This is an important result for all politicians addressing the rural roads issue, that an earmarked tax of approx. **2 US cents per litre gasoline and diesel may “do the trick”** to secure at least the maintenance of a country’s entire rural roads network.

More details, as e. g. replacing some fuel taxes by the vehicle tax, etc., may be calculated for the individual country. .

But as far as the practical availability of this tax amount is concerned, comparative tables on the fuel prices and tax levels may give more detailed information.³⁵

The redistribution of the revenues among the districts is often a special problem. It may be done according to the

- length of km of the respective local network (as mostly for maintenance);

³³ Metschies/Rausch, “Financing Road Maintenance in West Africa,” Eschborn January 2000,

³⁴ <http://www.worldbank.org/urbtrans.html> or <http://www.Zietlow.com/documents>, published also in the WB/UNDP “World Economic Indicators.”

³⁵ See Annex § 7.5.

- to a set of different influence factors (as formerly in Argentina: 30% at equal parts to each province, 20% acc. to the population, 30% according to the fuel consumption and 20% acc. to the own funds of provinces resp. districts. Also for farmers a contribution of 20% for farm-to-market roads was required);
- to the actual network length in km combined with a social factor, as introduced in Costa Rica: 60 % acc. to km and 40% acc. to a social development indicator, so that the most needy districts may get a more than proportional share.

5.Example: Detailed revenue/expenditure calculation for the road network of Rwanda

An example of how the needs for rural roads maintenance are included in the overall roads and road funding of the entire country may be seen from the following tables handling in detail revenues and expenditures including the rural roads and their specially high maintenance requirements (example for Rwanda):

Expenditure needs of the roads sector based on the asset value approach. A fixed percentage of the replacement value is calculated for the annual maintenance [column (6) in the table].

Road surface	Length		Asset replacement value per km	Total asset replacement value	Total network value	Annual maintenance requirement		Yearly expenditures road maintenance		Rule of thumb for Road Maintenance Fund	Partitioning of fuel fee per litre
	Km	%				% of Asset value	\$/km p.a.	Million \$	%		
	(1)	(2)	(3)	(4)=(1)x(3)	(5)	(6)	(7)	(8) = (4)x(7)	(9)	(10)	(11)
Asphalt (surface treatment)	900	7.3	400,000	360	60 %	1.5 %	6 000	5.40	36	c. 35%	4
Gravel (provincial roads)	2 500	20.2	50,000	125	20 %	3.0 %	1 500	3.75	25	c. 30%	3
Earth (rural roads)	8 500	68.5	10,000	85	14 %	5.0 %	500	4.25	28	20-25 %	2 see note 8
Urban roads	500	4.0	80,000	40	6 %	4.0 %	3 200	1.60	11	10 %	1
Total	11,000	100	-	610	100 %	2.5 %	-	15.00	100	100	10

The revenue calculation for the road sector based on the road user pays principle (UPP) for Rwanda (with 21,000 vehicles and 10 US cents fuel fee and an annual vehicle tax) reads as follows:

Type of vehicle	Number of vehicles	Annual Vehicle Tax	Vehicle Tax revenues	Annual average mileage	Road Fund fuel fee	Consumption	Fuel tax reven. /100 km	Total reven. from fuel	Road Fund revenue
		\$/vehicle	million \$	Km/vehicle/p.a.	US cents/litre	litre/100 km	\$/100 km	Million \$	Million \$
(1)	(2)	(3)	(4) = (2)x(3)	(5)	(6)	(7)	(8) = (6)x(7)	(9) = (2) x (5)x(8)	(10) = (4)+(9)
Passenger car	10 000	75	0.75	15 000	10	12	.2	1.8	2.55
Small goods vehicles/ minibus	10 000	150	1.50	40 000	10	20	2.0	8.00	9.50
Trucks and truck-trailers	1 000	500	0.50	45 000	10	50	.0	2.25	2.75
Total	21 000	-	2.75	-	-	-	-	12.05	14.80 ⁵⁾

Notes:

I. Basic assumptions of the **expenditure calculation** for road maintenance in Rwanda:

- 1.) The replacement value of 1km of asphalt road (2 cm DST) is \$US400,000 .
- 2.) The total asset replacement value of \$US 610 million is equivalent to 41 % of the GNP of the country.
- 3.) Maintenance comprises the annual routine (recurrent) and the periodic maintenance.
 Periodic maintenance as “resealing” is needed every 8 years, “refilling” for gravel roads is needed every 5 years, as well as spot reconstruction for earth roads twice a year.
- 4.) More than 2/3 of the network are rural roads (earth roads).
- 5.) According to lengthmen system: 2 men for 3km (at \$1 per working day+ equipment+ supervision)
- 6) This table is without backlog requirements for previous years and without new construction or rehabilitation.
- 7.) General fund fee in Africa is calculated as 10 US cents (cf. Heggie/ WB) per litre.
- 8.) Main result: Out of the selling price of fuel of 55 US cents per litre 2 cents only are needed for rural road maintenance. This amount is sufficient to safeguard access to the productive centres of the country.**
- 9.) Total amount of expenditures is \$US 15 mill. p.a. For how this amount is recovered by revenues of the vehicle fleet, see revenue calculation next box.
- 10.) The total expenditure needs of \$15 mmio. may also be obtained by generally applying 2.5% of the asset value of \$610 million of the total network.

II. Basic assumptions of the **revenue calculation** for road maintenance in Rwanda:

- 1) Vehicle density is 2.6 vehicle / 1,000 inhabitants at 8.1 mmio. population
- 2) Average annual licence fee
- 3) Estimated
- 4) Fuel fee for petrol and diesel

5) **Main result:** the total amount of \$ 14.8 mio. per year, generated by fuel fee and annual licence fee, is sufficient to cover the road maintenance requirements, **including the appr. \$4 mio. p.a. for the maintenance of the rural roads.**

VI. “Best practices” for participation at local level.

Best practices at the central level, even if they approach the most critical issues of finance and organisation, may prove to be useless if the **third crucial pillar** of successful rural road implementation isn't given: the **local participation**.

The indispensable role of local participation may be realised by the fact that out of the overall road network length eg. in Asian countries **more than 70% are rural roads**. It is evident that any central administration cannot cope with a task of caring for each detail of such a network, especially as most rural roads have short life spans and need periodic maintenance of their surface every 5 years at the latest.

But local participation has to be distinguished from a **self-help approach**, as it is tried occasionally, sometimes by foreign organisations:

- Financially the self-help approach³⁶ for solving the rural roads problem is not suited, as the financial requirements are often grossly underestimated.
- Self-help contributions (e. g. in kind and labour) for creating a basis of own equity capital in order to qualify for government grants – as in Europe – are welcome, but rarely sufficient³⁷.
- Initial enthusiasm for local road committees may cease and this approach may later be abandoned³⁸ as the main and only guiding principle.
- **Maintenance** of rural roads, however, may collapse completely if the local sense of ownership of local roads is missing.
- Creating local commitment in highly developed countries may be less of a problem, but in developing and especially least developed countries, it is often the most difficult factor of success. Especially in rural areas many programmes of “Animation Rural,” as it is called in French-speaking West Africa, or “Village Re-Awakening Schemes” as in South Asia, didn't lead to sustainable success.

Therefore a right combination of the **3 factors**:

- **Central government funding X ,**
- **Centrally organised legal framework and**
- **local participation,**

evidently contributes to success. In other words: There may be defined a formula as a

General Rule:

The **success of rural roads** can be seen as a **product out of financing X organisation X local participation**

If only one of these 3 factors is zero, the total result may prove to be a failure.

³⁶ Acharya, Local participation in rural road construction, cited in: GTZ: Where there is no participation..., Eschborn 1991, p. 45. This applies also to local forestry projects: experience from Ambatolampy/Madagascar as well as road building approaches within GTZ Food-for-Work-programmes in southern Madagascar.

³⁷ Funding for maintenance was scarce also in the Accelerated Rural Development (ARD) Program in Thailand, where only 20% of the required funds were raised.

The same applies to Sri Lanka where a special “*village re-awakening scheme*” signals the key issue of rural areas: the often lacking *motivation of local stakeholders* (the “ordinary local people”).

³⁸ Experience from the Dhading District Development Project (DDD/Nepal), where between 1983 and 1988 some 900 self-help public works projects were implemented.

As generally one of the most difficult factors, the enforcement of local participation was and still is the main emphasis of GTZ projects in the rural roads sector in developing countries.

This holds true especially for the GREEN ROADS PROGRAM in Nepal and the District Roads Program (PARTICIPATIVE ACTION) in Costa Rica, where GTZ projects were active for more than 10 years and where more than 800 km of rural roads in each of these countries were built during this time.

Sustainable local **participation** covers **two aspects**,

- the (unpaid) motivation and **commitment of the rural target groups** and
- the **degree of** existing (paid) local **self administration**, sometimes called decentralisation.

In **Costa Rica** the **GTZ pilot project**, which was based within the Ministry of Public Works and Transport and which specifically cared for the participation of the local districts ("Municipalidades"), recently succeeded in promoting a general **law on rural roads** ("Decreto No. 30263-MOPT" of 5 March 2002", see Annex 7.6).

In **Nepal** the government approach was and still is more complicated and GTZ concentrated mostly on the aspect of local participation, creating the **GREEN ROADS PROGRAM** in the isolated mountainous regions. It may be unique in building up local commitment to rural road construction:

In a framework of a locally and commonly agreed District Transport Master Plan (DTMP) local labour builds **ownership** of the local road **in a 4 year** step-by-step **programme**:

- In the first year: a local **footpath** is laid on the intended rural road connection,
- in the second year a **cycle way 2.5 m** wide is laid,
- in the third year it is enlarged to a **4m wide track for pick-ups**, until
- in the fourth year the **rural road** – now **4.5 m** wide on the mountainous slopes – is made passable for **minibuses and light trucks**.

By this way local ownership gradually is built up in line with the necessary local organisation of labour administration and transparency of funds.

The costs on average amount to **€15,000 (1.03 mio. NRs)** per km, using 65 % of it for local labour, while similar roads built by the central government (DoR) and urban equipment based contractors approximately cost **€50,000 (3.4 mio. NRs)** per km.

The **annual maintenance** is calculated as 2% p.a. of the construction costs for current routine maintenance plus 2-3 % for the periodic surface improvement, which for earth roads is only 5 years, whereas a periodic maintenance by outside firms insufficiently controlled but under central government contract may cost up to 3 times as much.

By this approach local participation is needed not only for appropriate and timely maintenance, but proved to be also the best instrument **to curb corrupt practices** within a sometimes uncontrollable traditional administration.

It is hoped that this **GREEN ROAD participatory approach** is supplemented in future by a stable local source of funds (Road Fund) and that it receives a nation-wide legal basis. By this way a sustainable road development is envisaged.

Nevertheless experiences with rural roads lacking local participation and without long-term effect have to be mentioned also:

BULLDOZER ROADS – or the missing sustainability

Development needs time, especially the often missing local participation and local contribution.

Sometimes local participation is replaced by forced or short-term solutions, in the case of rural roads by the so-called bulldozer roads:

In **Ethiopia** during drought periods rural roads were built by foreign NGOs in order to reach the rural population. Built by foreign planning and by hired bulldozers the roads were too steep for local motorists, got no local maintenance and later on fell into decay.

In **Costa Rica, Nepal** and other countries local elected deputies receive a special budget for the development of their constituencies³⁹. In view of quick political results it is often decided to build a missing road. Bulldozers are called in from contractors, the road is built up to the election time; but missing drainage, lack of funds for maintenance and unclear ownership of the road prevent a longer service life of it. No sustainability is reached.

A promising approach for sustainable solutions is executed in the following GTZ projects:

In **Costa Rica and in Nepal** the GTZ project laid the main emphasis on the encouragement of **local participation**, as even the new law on rural roads in Costa Rica (cf. Annex) explicitly refers to the participation of the local districts.

In this way, like with the so-called “**water parliament**” in the water sector, the local **District Road Committee** (“Junta Vial Cantonal”) a **basis** and **precondition** is given for an effective maintenance and control of works.

In **Ethiopia** the GTZ project laid the main emphasis on the financing side, securing by an appropriate **ROAD FUND legislation** a stable source of funding for rural roads in the country.

VII The country-specific aspects at central and local levels

The GTZ experience on country-specific solutions for rural roads as laid down in this paper, is summarized in the box on the next page.

Country-specific solutions for rural roads are listed in **3 categories**, which first are based on the general **economic level of the country**:

- For **least developed countries such as Nepal** rural roads may be suited only for **1.5 ton** axles and 10 to 15 vehicles per day, while in
- **Middle Income countries like Costa Rica** the **5 ton** axle and traffic densities of more than 30 vehicles per day may be the average. Finally in
- **Industrialized Countries as in Central Europe** the **11.5 t** axle as on the national roads may be adopted also, while a minimum vehicle density of 80 vehicles per day is assumed.

Finance and organisation (left side of the graph) generally are genuine tasks of **the central government**, whereas **participation** (right side of the graph) as well as the maintenance are the tasks of the **local administration** of the community .

Finances preferably come out of a road fund. As government budgets in most developing countries are pre-occupied with social goals at the expense of long-range infrastructure investments, rural roads and their maintenance are paid out of this **extra-budget fund**, which may reserve a **fixed amount of c. 25 %** for this purpose.

³⁹ N.B. Deputies – originally elected for controlling the general budget and finances of the state - receiving funds for local communities, are a special “democratic” feature of several developing countries.

Country-specific solutions

for finance, organisation and participation

“Finance and Organisation” at Central level	Road traffic on RR	“Participation” at local level
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I. Industrialised and Emerging Countries (**Germany**) relevant to Accession

Countries (“Agricultural roads”, “Landwirtschaftliche Wege”, “Farm-to-market roads”)

<p><u>a) Financial sources:</u> General subsidies and agricultural subsidies (“Green Plan”) outside the normal budget</p> <p><u>b) Organisation:</u> Provincial ministries provide “topping-up” grants (c. 80%), Country-wide technical guidelines (RLW 2000), Mostly no public roads</p>	<p>11.5 t axle load ----- More than 80 veh. per day.</p>	<p><u>a) Motivation and Commitment:</u> Farmers associations</p> <p><u>b) Legal situation:</u> - Public regional infrastructure associations (roads unit) provide administrative staff - partner for contractors and gvt. control</p> <p><u>c) Financial contribution:</u> Between 0 -20% of investment by infrastructure associations</p> <p><u>d) Maintenance:</u> Local responsibility 0.5% of investment p.a.</p>
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II. Middle Income Countries (**Costa Rica**) relevant to Namibia

(Costa Rica District Roads, “Caminos Cantonales”, “Vias Vecinales” acc. to GTZ project and Decreto of 5 March 2002)

<p><u>a) Financial sources:</u> Transport taxes, fuel taxes from road users outside the normal budget from special road fund account.</p> <p><u>b) Organisation</u> 25% of Fuel Tax, as paid in the Road Fund Responsible: Ministry of Transport rural roads Law Special axle load standards</p> <p><u>c) Distribution key among districts:</u> 60 % of RR funds acc. to km lengths of existing RR and 40 % acc. to social dev. index, favouring the less developed</p>	<p>5 ton axle load - -More than 30 veh. per day > 50 inhab. per rd.km 14 m right of way</p>	<p><u>a) Motivation and Commitment:</u> District Road Committee (7 unpaid members nominated for 4 years, meeting monthly, for rural area of 40, 000 inhabit.) representing the state administration, ministerial engineer, local parliament, development associations, private commercial sector and road users.</p> <p><u>b) Legal situation:</u> Technical unit of the district council (3 members: road engineer, technical assistant, social promoter)</p> <p><u>c) Financial contribution:</u> acc. to “participation modalities,” administrative budget, maintenance budget</p>
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III. Less and Least Developed Countries (**Nepal**)

relevant to Ethiopia, EU-Accession countries (GREEN ROADS of GTZ-project, Rural Access to Markets)

<p><u>a) Financial sources</u> (e.g. Ethiopia): from transport sector 25% of Road Fund special account outside normal budget</p> <p><u>b) Organisation:</u> Responsible: Ministry of Works (DoR), formerly Min Loc Gvt./ Dept of Local Infrastr.(e.g. Uganda, Nepal), acting as contracting agency, technic. standards of Green Roads</p> <p>c) <u>Distribution key.</u> undefined</p>	<p>1.5t axle ----- 10-15 vehicle. per day ----- Stage constru ction in 4 yearl. phases ----- 1 - 4.5 m wide -----</p>	<p><u>a) Motivation and commitment</u> Local infrastructure and roads committees</p> <p><u>b) Legal situation:</u> District Transport Master Plan, district administration submitted to public audit,</p> <p><u>c) Financial contribution:</u> administrative budget, securing labour force</p> <p><u>d) Maintenance:</u> 2% recurrent and 2-3% periodic maintenance</p>
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The responsible ministry for the **organisation** is generally the Ministry of Public Works, whose planning division and special rural roads division may form the nucleus of rural roads activities. Sometimes the powers may shift from the ministry of local government to the ministry of public works (as recently in Uganda), out of financial and general road fund considerations. The setting of adequate technical standards also requires a central overview and commitment of the Ministry of Works.

Sustainable rural roads concepts in developing countries require a high level of **participation** at local level. Therefore the installation of

- a **District Road Committee** (e.g. of 7 unpaid members of the civil society) as well as
- a **Technical Roads Unit** (e.g. 3 paid members) within the district administration is necessary (Costa Rica example see box).

Such participatory practices may not only help the rural roads situation, but also encourage the much needed **transparency** of public funds.

To further encourage local participation, it is recommended, that instead of prescribing a fixed flat rate of self-contribution (e.g.5% or 10%, as foreseen in Madagascar), it may be considered (but needs reliable control and transparency) to allocate government funds primarily (by “**auction**”) to the communities making the **biggest effort to raise the share of self-contribution**.

Finally the specific problems of **local participation** may be studied best **in the Indian case**, where all preconditions and public support seemed to be fulfilled from the beginning.

Mahatma **Gandhi**, the “prophet of development from below,” proclaimed as early as in 1930⁴⁰ self-government of the villages as the basis of development, subsequently got it incorporated into Art. 40 of the Indian Constitution of 1948. But there was little progress of the Community Development Programmes. Since 1957 laws for local Panchayats were introduced, but without much impact; only in April 1993 by change of the constitution (73rd. amendment) the **Panchayats** at village and district level were **given a sustainable financing for their administration** (mostly from central and state funds, but also including local taxes), so that only now - 50 years later - the local participation in India may experience a general take-off.

Thus generally the local participation (i.e. finding reliable local partners for basic forms of self-government) is still a **major problem all over the world**, especially in the least developed countries. Therefore they still form, as outlined above, the major concern of technical cooperation for many years to come.

⁴⁰ Cord Jakobeit, Steffen Bauer, “M. Gandhi - Ahnherr der Entwicklung von unten,“ in: Entwicklung und Zusammenarbeit E+Z, 2002:3, p.89-91.

VII. Annexes:

7.1 General Survey: Road Network Lengths and Rural Roads in Asian Countries

Roads by type and characteristics	India	Indonesia	Philippines	Sri Lanka	Thailand	Remarks
National (km)	144 832	12 600	26 070	10 478	52 680	
Provincial (km)	536 633	33 500	29 174	61 881	6 173	
Country/Rural (km)	811 086	152 200	85 595	1 497	19 506	
Municipality (km)	143 537	25 200	15 608	1 340	11 924	
Others (km)	207 332	-	-	10 461	86 246	
Total road length (km)	1 843 420	223 800	157 447	95 627	176 529	
Percentage surfaced	48 %	46 %	14 %	33 %	29 %	
Rural road length (km)	1 555 051	160 800	85 598	82 342	105 752	
Percentage of rural to total road length	84 %	72 %	54 %	86 %	60 %	71.2 % (average)

7.2 General Survey: Organisation and Management of Rural Roads in Asia

INDIA	INDONESIA	PHILIPPINES	SRI LANKA	THAILAND
Rural road development is the responsibility of the states . A number of agencies are involved in the development of rural roads. At the centre level, rural roads are looked after by the Ministry of Rural Development .	Rural road development is the responsibility of kabupaten (district) government and centrally administered by Ministry of Home Affairs through its Directorate of Regional Development. Technical advice on the planning, development, and maintenance of rural roads is provided by the Directorate General of Highways, Ministry of Public Works .	Rural road development is the responsibility of the Department of Public Works and Highways.	Rural road development has been largely decentralised down to provincial and district levels . Procedures and organisational structures are being worked out.	Rural roads are the responsibility of the provincial governments .

7.3 General Survey: Funding of Maintenance for Rural Roads in Asia

INDIA	INDONESIA	PHILIPPINES	SRI LANKA	THAILAND
<p>Maintenance funds fall grossly short of actual requirements. In some states, an agricultural levy is collected, part of which is used for the construction and strengthening of rural roads. Some voluntary organisations are involved in rural road development and mobilisation of funds for rural roads through voluntary contributions is recommended. No significant progress has yet been made.</p>	<p>The funds available for rural road maintenance are about 50 per cent of the desired amount. No effort is made to mobilise funds for rural road maintenance. Based on the traffic, maintenance priorities are assigned to drainage, routine maintenance, periodic maintenance and up-grading works.</p>	<p>Rural road maintenance funds are allocated on a per km basis and are dependent on a "basic cost per equivalent maintenance kilometre (EMK) of national roads." This cost is adjusted periodically whenever there is a substantial increase in the cost of road materials, labour and equipment usage. For rural roads, the maintenance allocation is 40 per cent of the basic cost per EMK. No effort is made to mobilise funds for maintenance by taxes on agricultural produce. Some times free or voluntary labour is used in some areas when funds are depleted. Starting from 1992, the maintenance as well as the construction of rural roads became the responsibility of local government where the road is situated.</p>	<p>Funds fall short of the actual requirements. Funds are allocated on a linear kilometre basis, but the climatic conditions are taken into account. No concerted effort is made to mobilise funds for maintenance through voluntary contributions or through taxes on agricultural produce.</p>	<p>Maintenance funds come from government sources only. Maintenance budgets for rural areas are about 20 to 25 per cent of the annual road maintenance budget. Voluntary contributions to maintenance are not made, nor are there any moves to mobilise funds through voluntary contributions.</p>

7.4. Proposition of Vehicle and Roads Classification for Rural Transport* by UN- ESCAP

7.4.1 Vehicle classification

Vehicle class	Vehicle type	Description
A	Small goods vehicle	Bicycle, motorcycles, cycle-trailers, oxcarts with pneumatic rollers, donkey carts and other NMT, pick-up: GVW ≤ 1.5 ton, length ≤ 6.5m, width ≤ 2.0m, and light trailer with GVW ≤ 1.0 t.
B	Minibus and light truck	Rigid light truck: GVW > 1.5 and < 3.5 t, length ≤ 6.5m, width ≤ 2.3m.
C	Light truck	Rigid light truck: GVW > 3.5 t and < 8 t, length ≤ 6.5m, width ≤ 2.3m.
D	Medium	Rigid light truck: GVW > 8 t and ≤ 12 t, length ≤ 6.5m, width ≤ 2.3m. Or farm tractor or traction unit with trailer: GVW > 1.0 t and < 8 t, length ≤ 7.5m and width ≤ 2.3m.

* Acc to UN-ESCAP (Study on Rural Road Transport 1991, p.22) and GTZ (Ländlicher Straßenbau in Entwicklungsländern).

7.4.2 Road categories and vehicle classification

Road category	Maximum axle load (tonnes)	Permitted vehicle classes	Approximate technical road standard
MAL 8	8	A,B,C,D	Gravel road (20 cm base)
MAL 5	5	A,B,C	Gravel road (10 cm crushed rock base)
MAL 3.5	3.5	A,B	Drained earth road
MAL 1.5	1.5	A	Earth road (dry weather)

MAL = Maximum axle load

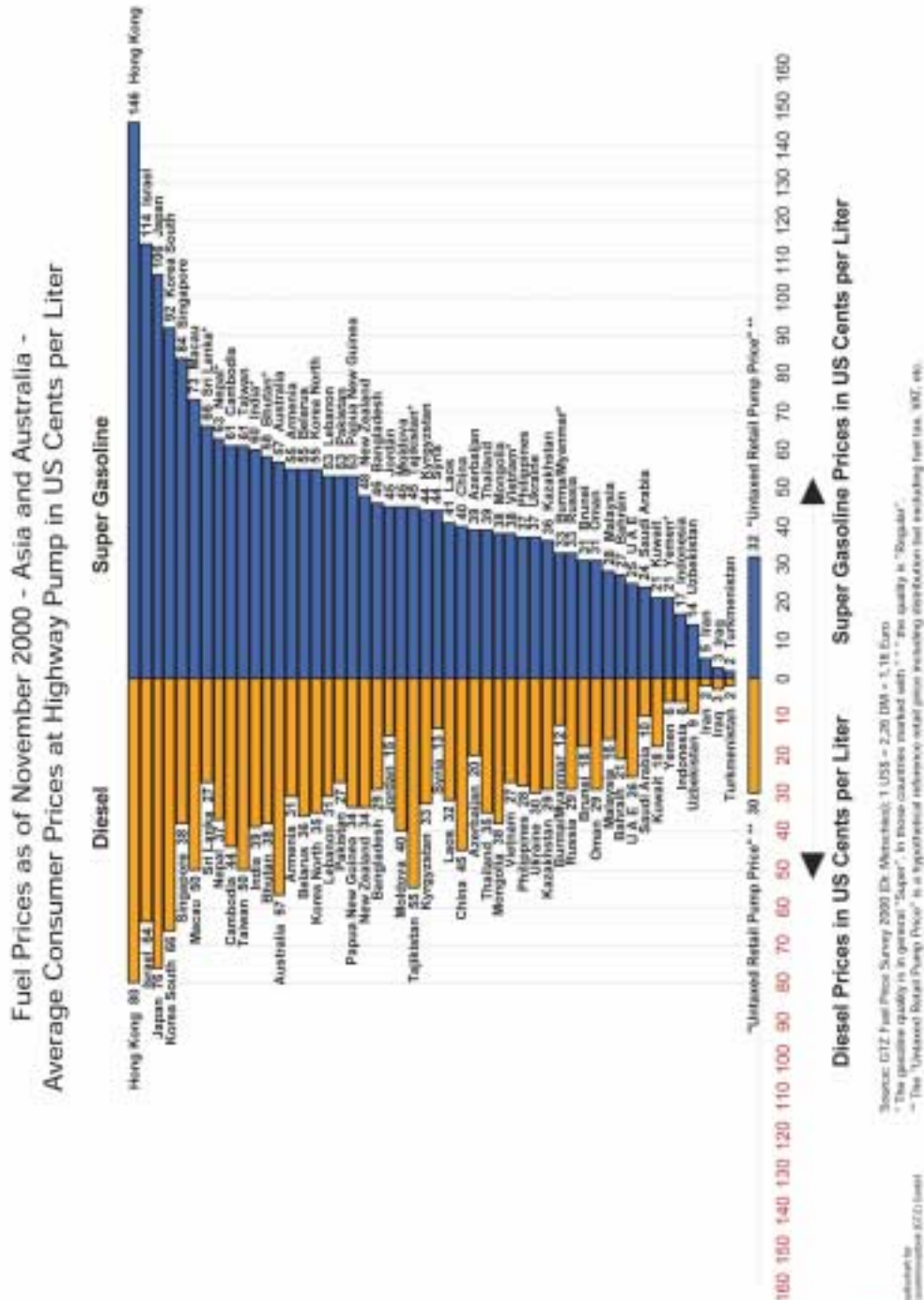
7.4.3 Costs of earth and gavel roads in Asia

Category MAL 1.5	costs appr. €7,500 /km
Category MAL 3.5	costs appr. €17,500 /km
Category MAL 5.0	costs appr. €25,000 /km
Category MAL 8.0	costs appr. €40,000 /km

Prices in Africa are considerably higher than in Asia.

7.5 Fuel prices and level of fuel taxation in Asia

The following list may serve for a cross-check, if fuel prices in the individual countries are covering the “untaxed retail pump price” and allow for road maintenance taxes (c. 10 US cents for maintenance of the entire road network, resp. 2 cents per litre for rural roads.).



Annex: **The RURAL ROADS Decree of Costa Rica**
(Decreto No. 30263-MOPT of 5 March 2002)

Preliminary Remarks

1. The country

Costa Rica in general is a Middle Income Country with a Gross National Income per capita of US\$ 3 600.-. Literacy is universal (95%).

She has 3.8 million inhabitants living in 83 cantons (also called municipalidades) with an average population of

c. 40 000 inhabitants per canton.

(There are also 7 provincial governments in the country with however very limited competences.)

Most of the population is rural, each Canton has 8-12 districts, with c. 4 000 inhabitants each, comprising the major central villages).

The annual budget revenues of the country are c. US \$ 1950 million.

Fuel and vehicle taxes together bring US\$ 152 million.

2. The roads

Roads in general are under the jurisdiction of the Ministry of Transportation and Telecommunications (MOPT).

There are 7 827 km of the asphalted primary National road network and 29 446 km unpaved ("rural") roads; i.e.

the average Canton has c. 750 km rural roads.

(There are also 3500 km urban roads under local jurisdiction. A law for the local financing of these roads by the local residents exists, but is hardly applied due to missing detailed decrees for its execution. The replacement value of the urban roads – at US\$ 70 000.- /km – is estimated at US\$ 245 million.)

3. The vehicles

There are 91 passenger cars per 1000 inhabitants and

23 two-wheelers per 1000 inhabitants

Total Vehicle kilometres on roads are estimated at 507 796 million vehicle-kilometres p.a.

4. Road Financing

Financing of roads is done by fuel and vehicle taxes. Present Fuel prices are:

0.60 US\$ per litre Super

0.57 US\$ per litre Normal

0.42 US\$ per litre Diesel

Present revenues from the fuel tax are US\$ 112 million; out of which 25% or c. US\$ 28 million p.a. are transferred to the cantons. I. e. theoretically

on average US\$ 340 000 per Canton per year are transferred.

The annual vehicle tax in the country brings US\$ 40 million p.a., out of which one half goes to the Ministry of Finance and 50% to the National Road Council CONAVI .

5. Advisory services to the MOPT

German technical cooperation (GTZ) for the rural roads organisation and management as well as financial cooperation (KfW) take place since c. 10 years and are going on.

E. Stührenberg /G. Metschies

EXECUTIVE AUTHORITY

DECREES

Number 30263-MOPT

The PRESIDENT OF THE REPUBLIC

THE MINISTER OF PUBLIC WORKS AND TRANSPORTATION

With base on the faculties conferred in the article 140 clauses 3) and 18) of the Political Constitution and with base on the Law of Tributary Simplification and Efficiency, number 8114 published in the *Alcance* number 53^a, *La Gaceta* number 131, of July 9, 2001, the Law of Creation of the Ministry of Public Works and Transportation number 4786 of July 5, 1971 and the General Law of Public Administration.

Considering:

- I. That the Legislative Power, by means of the Law of Tributary Simplification and Efficiency, number 8114, published in *Alcance* no. 53^a, *La Gaceta* no. 131, of July 9, 2001 established a unique tax to fuels, of which 25% of the percentage assigned to CONAVI, benefits the Town or City Halls for the attention of the cantonal road network.
- II. That these resources have to be transferred to each Town or City Hall at a rate of 60% based on the extension of the road network of each canton, and at a rate of 40% according to the Desarrollo Social Cantonal (IDS) (Cantonal Social Development) index, being understood that the cantons with smaller IDS will in proportion receive greater resources.
- III. That the IDS will be the one appointed by MIDEPLAN and that the extension of the road network of each canton, will be the one resulting from the databases of the Direction for Sectorial Planning of MOPT.
- IV. That is necessary to document the way in which the databases of the road network of the cantons are established and updated.
- V. That the Law of Tributary Simplification establishes a preference, to the participative modality, for the execution of works with those resources, arranging that the appointment of the resources will be proposed by the Cantonal Road Council to each Municipal Council, according to the regulation that is dictated to the effect.
- VI. That the MOPT through its law of creation, is established as the governing organization in the field of transportation and development of the network public roads.
- VII. That considering the experiences of MOPT, it is necessary that the works of road conservation be executed with base in technical standards of general and suitable application to the reality of the country.
- VIII. That the function of an Auditor by law was granted to the Town or City Hall .

Therefore,

They decree:

Regulation to Article 5 Clause B) of the Law of Tributary Simplification and Efficiency on the Public Investment in the Cantonal Road Network

CHAPTER I

Scope and definitions

Article 1. – **Scope of the Regulation.** The present regulation regulates what is stipulated in article 5 clause b) of the Law of Tributary Simplification and Efficiency number 8114 with regard to the public investment in the cantonal road network, in line with the law of creation

of the Ministry of Public Works and Transportation number 4786 and its reforms, and the General Law of Public Roads number 5060 and its reforms.

Article 2. – **Policy responsibility for the Transportation Sector.** The Ministry of Public Works and Transportation in its condition of ruling entity of the Sector will be able to emit the general regulations of the country in road matter, respecting the local legal laws.

Article 3. – **Definitions and Abbreviations:**

Cantonal Road Network: It is constituted by the network of streets and public roads which are not part of the National Road Network and whose administration belongs to the relevant municipal responsibility.

Local roads: They are those roads of the Cantonal Road Network that unite towns and small villages among them, or with the heads of district, and offer connection to national roads or communicate with sites of public interest and complement the concept of connectivity of the road network, to give access to a zone or region. Generally they have moderate traffic volumes, in its majority caused by short distance local trips. They allow the transfer of the farming, tourist and industrial production to the highways of superior category.

Local streets: They are the public roads included within the limits of an urban area, or included within urbanization projects, that count with the corresponding municipal approval, and that are not classified by the CONAVI like transit roads of the National Road Network. They have very diverse volumes of transit depending if these are primary, secondary or tertiary roads, in line with the regulations of the “Instituto Nacional de Vivienda y Urbanismo” (National Institute of House and Urbanism).

Nonclassified roads: They include two different types of public roads: Those that are in use and that can be used during all the year, and the paths and roads that are not in use for the vehicular traffic.

Road conservation: It is the set of activities destined to preserve, in a continuous and sustainable way, the good state of the roads, so that an optimal service to the user is guaranteed. The road conservation includes a routine and periodic maintenance, and the rehabilitation of the different components of the road: right of way, drainage system, bridges, special structures and wearing course of the road or pavement, being this of asphalt, hydraulic concrete, ballast or soil.

Participative modality of work execution: It is also known as Participative Road Conservation and it refers to the coordination and cooperation established between the City or Town Hall, the Central Government, the communal organizations and the civil society of a canton; with the purpose of planning, executing, controlling and evaluating works of different nature, that belong to the conservation and construction of the road, with the understanding that the execution of budget resources does not imply the horizontal transfer of the funds from one organization to another. Its application contributes to guarantee the sustainability of the roads, since, in addition to the resources of the Government and the City or Town Hall, allows to incorporate the valuable contributions of the communities and the civil society in general, in cash or species. This modality, requires accompanying the technical works with other elements such as organization, qualification, promotion and social control that motivate the interest of the users, the cooperation and the solidarity.

Routine maintenance: It is the set of activities that must be execute very frequently throughout the year, to preserve the operative conditions of the road, its level of service and the security of the users. It is constituted, among others, by the cleanness of the drainages, the control of vegetation, the minor repairs of the concrete pavements, the asphalt pavements, the hydraulic concrete pavements and of surface treatments, the manual or mechanized repair of the potholes of gravel roads, the slight maintenance of the bridges, installations for protection and other works of art, as well as the restitution of the demarcation and the signaling.

Periodic maintenance: It is a group of activities programmed every certain period and according to the case, to renew the original condition of the pavements by means of the application of additional ballast layers, burdens, superficial treatments, asphalt seals or asphalt overlay, without altering the structure underlying the surface layer, as well as the restoration of slopes of cuts and fills and the signaling in bad conditions. The periodic

maintenance of the bridges includes the cleaning, painting, repair or change of the structural or protection components, as well as the cleaning of the bottom of the river or gorge, in the nearby zones.

Cases for immediate execution: It includes the repair of any damage that may happen in the road due to unexpected events such as acts of God or force majeure, that due to their nature are not included within the annual working program. The immediate execution of the repairs is necessary for the security of the users, to guarantee the traffic of the road and thus to avoid greater damages.

Rehabilitation: Selective repairs and reinforcement of the pavement or the road, previous to a partial demolition of the existing structure, with the intention of restoring the structural solidity and the original quality of the wearing course. It also considers the construction or reconstruction of the drainage systems. Previous to any rehabilitation in the wearing course, it must be verified that the drainage system works well. In the case of the bridges and larger culverts, rehabilitation includes major repairs such as the change of structural elements or main components, the change of the cover of ditches, repairs of the abutments, aprons or others. In the case of retaining walls the repair or change of the damaged sections by reinforcement is done after analysing the relevant stability.

Reconstruction: It is the complete renovation of the structure of a street or road, with a previous, partial or total demolition of the pavement and bridge structure, the system of drainage and other structures.

Improvement: It is the set of improvements or modifications of the horizontal and/or vertical elements of the roads, related to the width, the alignment, the curvature or the longitudinal slope, in order to increase the capacity of the road, the speed of circulation and the security of the vehicles. It is also included within this category, among others, the extension of the road, the change of the type of surface from earth to gravel or from gravel to asphalt, and the construction of structures such as bigger culverts, bridges or intersections.

New works: It is the construction of public roads that are incorporated into the existing cantonal road network, as product of new urbanization projects or new urban and rural interconnections, among others.

Development of the Cantonal Road Network: It constitutes the set of actions necessary to undertake and adapt the conditions of the cantonal road network to the necessities product of the growth in the volume of traffic, the population and production, derived or projected from the development plans of the canton, of the residence increase independently from the traffic and transportation plans.

Road management: It is the work or actions necessary to reach the goals of conservation, routine maintenance, periodic maintenance, improvement, rehabilitation or road construction, which must be planned and evaluated with the participation of the users. It responds to what to do, where, in what form and when.

Systems of road management: It is the set of procedures, routines, activities, filing mechanisms and handling of information, that in combination with computer programs they constitute the tools for the road management.

ABBREVIATIONS

MOPT:	Ministerio de Obras Públicas y Transportes – (Ministry of Public Works and Transport)
CONAVI:	Consejo Nacional de Vialidad – (National Road Council)
INVU:	Instituto Nacional de Vivienda y Urbanismo (National Institute of Housing and Urbanism)
CFIA:	Colegio Federado de Ingenieros y Arquitectos de Costa Rica (Federated School of Engineers and Architects of Costa Rica).
MEIC:	Ministerio de Economía, Industria y Comercio – (Ministry of Economy, Industry and Commerce)

- SPEM: Sistema de Programación y Ejecución de Mantenimiento - System of Maintenance Programming and Execution.
- SINFOC: Sistema de Información y Caminos – (System of Information and Roads).
- TPD: Tránsito Promedio Diario - (Average Daily Traffic).
- SUCS: Sistema Unificado de Clasificación de Suelos – (Unified System of Soil Classification).
- AASHO: Asociación Americana de Oficiales de Carreteras Estatales – (American Association of State Highway Officials).
- GTZ: Sociedad Alemana de Cooperación Técnica – (German Agency for Technical Cooperation).

CHAPTER II

Public Investment in the Cantonal Road Network

Article 4th. **Destiny of budget resources.** The Council by proposal of the Cantonal Road Board will destine the budget resources that come from the Law of Tributary Simplification and Efficiency, exclusively to the conservation, routine maintenance, periodic maintenance, improvement and rehabilitation; once these objectives are fulfilled (according to the data bases of the Direction of Planning of the Ministry of Public Works and Transportation MOPT), the rest will be used to construct new works in the cantonal road network, such as local roads, non classified and urban roads.

Article 5th. **Budgeting, storing and handling of the budget resources.** In accordance with the Plans of Conservation and Road Development proposed by the Cantonal Road Board, the Municipal Council will budget, every year, its corresponding amount based in the information provided by the Presupuesto Nacional de la República (National Budget of the Country).

The resources coming from the fuel tax , previewed in the Law of Tributary Simplification and Efficiency, must be handled in a specific account, in one of the state banks of the Country, in accordance with the Law of Financial Administration, with the purpose of facilitating its handling so that the Tesorería Nacional (National Treasure Department) can transfer them as appropriate and in corresponding time limits.

Article 6th. **Conservation and Development Plans of the Cantonal Road Network.** The Cantonal Road Boards will formulate Periodical and Annual Plans of Road Development and Conservation, in agreement with the policies and directives issued by the Council, the MOPT and actual Regulating Plans of Cantonal Development.

These plans must at least comprise the following:

- a) A frame of policies that provide support to them, with indication of goals, indicators of profit and the modality of execution to be used. The budget and the sources of financing, according to the contributions of the Town or City Hall , the MOPT and the benefited communities.
- b) The amounts to invest in each project, according to category and type of work.
- c) The plan for road maintenance and rehabilitation.
- d) Evaluation and follow-up forms of the plans. The active participation of the users and of the MOPT
- e) The plans for the development of the road, based in the Regulating Plans and/or in the Plans for Local Development.

Article 7. **Modalities of Work Execution.** The modalities of work execution could be, among others, the following:

- a) Works by administration, with own equipment and personnel.

- b) Works by agreement, with participation of the communities, the MOPT and other public or private organizations.
- c) Works by contract, with its due bids and regulations.
- d) Concession or commission for works and projects.
- e) A combination of the above.

Article 8th. **Preference for the Participative Modality of Work Execution.** The resources originated from the Law of Tributary Simplification and Efficiency, must be executed preferably under the Participative Modality of Work Execution defined in article 3, of this Regulation.

This participative modality allows the use of any of the modalities for work execution mentioned in article 7.

CHAPTER III

Of the Cantonal Road Boards

Article 9th. **Cantonal Road Board:** The Cantonal Road Board is a public organization, which does not pertain to the government, and is named by the Council of each canton, to whom it must be responsible for its management. It is a counseling organization for the planning and evaluation of the public road works and municipal service in the canton established in article 5) clause b) of Law 8114.

Article 10th. **Members.** This Board will be integrated by the following members, that will act *ad honorem* (without pay):

- a) The Mayor, who will preside it.
- b) A member of the Council
- c) An Engineer Director or Engineer Sub-director of the Regional Headquarters of the *Ministerio de Obras Pùblicas y Transporte* – (Ministry of Public Works and Transportation).
- d) Representatives of the District Councils, named in their Meeting.
- e) A representative of the *Asociaciones de Desarrollo Integral* – (Integral Development Associations) of the canton, that will be selected by the Council, by means of a short list that to the effect will send *the Asamblea de la Uniòn Cantonal de Asociaciones de Desarrollo Comunal* – (Assembly of the Cantonal Union of Associations for Communal Development).
- f) A representative of private sector cameras, with office in the Canton, named by the Council from the short list issued for the effect in a public and open assembly of these organizations, summoned by the cameras.
- g) A representative of the community of users, chosen in a public and open assembly, summoned in its opportunity for such effect, by the Council.
- h) The Director of the Municipal Road Management, from the respective Local Government, with voice but without vote.

Article 11 - Operation of the Cantonal Road Board

- a) The members will evolve gratuitously, during a fixed period of four years and can be reelected, as long as they are able to demonstrate the title of the position which they represent. If in some cases the period of some of the members is due, the sector will name a substitute, in a term not bigger than a month.
- b) The Cantonal Road Board will meet once a month, and extraordinarily whenever it decides it, or whenever it is disposed by the organizations of the Municipal Government. The agreements will be approved by simple majority of the members present, except for the cases where the legislation establishes a more qualified vote, and in case they finish equal, the president will exert the quality vote.
- c) Said Board will meet validly with the presence of the absolute majority, this is to say with half plus one of the totality of its members.

What is not anticipated in the present regulation, will prevail in what is ruled by the actual *Ley General de Administración Pública* – (General Law of Public Administration) for the associated organizations.

Article 12. Competition. The following will be an exclusive and not transferable responsibility of the Cantonal Road Board:

- a) To propose the Council the destiny of the resources mentioned in article 4, by means of periodical and annual road conservation and development plans of the canton and to formulate the regulating plans for road emergencies. These plans will be sent to the Council for their respective approval or non approval. These proposals or plans must consider the priority mentioned in article 5, clause b) of Law 8114.
- b) To know and guarantee the projects included in the annual budget for the management of the Cantonal Road Network existing in the canton.
- c) Follow the fulfillment of the policies, norms and applicable regulations in road management, issued by the Council, the MOPT and other competent entities.
- d) Know the information regarding the evaluation of the Municipal Road Management, prepared by the personnel responsible for this work.
- e) Those specifically conferred to it by the Council and accepted by the Cantonal Road Board.
- f) Present, by means of appropriate mechanisms, an annual report with all the related information before the Council and the civil society. In the case of the civil society, the Cantonal Road Board will call for a meeting with the presidents of all the development associations of the community, the cameras and other excellent organizations of the cantonal civil society.
- g) Require from the Council the accomplishment of financial and technical audits, whenever it considers it advisable.

Article 13. Technical Unit of the Municipal Road Management. A Technical Unit of Municipal Road Management will be constituted in each canton, according to the conditions of the respective Town or City Hall, which will act as the Technical Secretary of the Cantonal Road Board. It is suggested that at least it counts with an engineer of roads, a technical assistant and a social promoter. When constituting this Unit, its operations and financing will be included within the Annual Operative Plan of each Town or City Hall, as a service for road management, and as part of the activities to be financed with the resources mentioned in article 4 of this Regulation. When it is related to small town or city halls, the integration of the Technical Unit in a joint form is suggested.

Article 14th. Of the functions of the Technical Unit of Municipal Road Management. Within the main tasks of the Technical Units of Municipal Road Management the following ones are considered:

- a) To elaborate and to execute the programs of road conservation and development, with base in the plans formulated by the Cantonal Road Board and guaranteed by the Council.
- b) To promote participative road conservation, through the fortification of the local organization and its bond with other compatible instances, in order to produce joint works for the conservation of public roads and the social control of the projects that are carried out.
- c) To correctly respect the legal frame and regulations, in effective road matter.
- d) To cooperate with MOPT in the accomplishment and updating of the network inventory of the streets and roads of the canton.
- e) To make the analysis of the necessities for the conservation of all roads and to participate and ask for cooperation and advising from MOPT for the possible designs of improvement and construction works.
- f) To cooperate in the management of municipal machinery dedicated to the attention of public roads, and of the ones contracted or obtained, by means of agreements,

- for this same purpose. In this sense, to guard for the existence of a control system for machinery as well as for the repairs.
- g) To issue and put under the approval of the Municipal Council the cooperation agreements with communal organizations or users.
 - h) Keep a file of each road in the canton which contains the ticket for physical and socioeconomic inventories, requirement inventories, the list of each party line, the interventions and/or investments carried out, as well as the road committees or responsible communal organizations, among others. The information related to the communal organization will also be in a separated data base.
 - i) Cooperate in the elaboration of the plans for road conservation and development of the canton.
 - j) To inspection and follow-up all the works that are made, by means of a daily report of activities carried out in the canton.
 - k) Operate and update the Road Management System (SPEM or similar) for the administration of the cantonal road infrastructure.
 - l) Operate a participative mechanism for the allocation of priorities, based in the social and economic TPF and other criteria.
 - m) Promote alternative local and external management of resources for the conservation of roads.
 - n) Periodically inform the Council, the Cantonal Road Board, the Mayor and the District Councils of the Canton everything regarding the road management of the canton.
 - o) Promote and facilitate the process of education in schools and other organizations of interest, regarding conservation and road security.
 - p) To disclose through the press, murals and other appropriate means for the canton all the work that is being made.
 - q) Promote the equity of gender in all sort of activities.
 - r) Propose technological and administrative alternatives for the conservation and development of the cantonal road network, as well as for the investment in this field.
 - s) Look after the accomplishment of new rehabilitation projects, improvements or new works, the performance of routine, manual and mechanized maintenance of the existing works, by means of an effective program which is properly structured in accordance with the regulations of the Law of Tributary Simplification and Efficiency.
 - t) Look after the fulfillment of the norms for weight control and dimensions of the vehicles, issued by MOPT, for the cantonal road network. To coordinate with the corresponding instances, for such intention.
 - u) Establish a program for securing effectively the quality of the works that guarantees the efficient use of the public investment in the cantonal road network, based in the norms established by MOPT.
 - v) Coordinate activities of planning, promotion and evaluation for the development and conservation of roads with the corresponding dependencies of MOPT.
 - w) Support to obtain permissions for the exploitation of material sources, as well as to maintain an inventory of the possible material sources in the canton.
 - x) Jointly establish with the Direction of Attention of Emergencies and Disasters of MOPT, a System of Prevention, Mitigation and Attention of Emergencies in the roads of the Canton.
 - y) To propose the regulations for the routine and periodic manual maintenance, and for the use and control of the machinery, based in studies of corresponding costs.

Article 15. Pursuit and evaluation of the Road Management. The MOPT will provide the Town or City Halls with the SPEM or its equivalent to be used as a standardized and agile tool for the evaluation, planning and programming of their projects. The Cantonal Road Board, by petition of the Council, will have to carry out a follow-up and the evaluation of the annual plans, based on the information provided by the Road Management System of the Town or City Hall.

CHAPTER IV

The Roll of MOPT in the Road Network of the Country

Article 16. **The Roll of MOPT in the Road Network.** The MOPT will specifically be in charge of:

- a) Providing advice to the Cantonal Road Boards in the elaboration of the Development and Conservation Plans of the Cantonal Road Network, by means of its Regional Directions and other competent dependencies.
- b) Issuing regulations and policies for the development and efficient operation of the national and cantonal road network of the country, that will facilitate the coordination and uniformity of criteria for management and use.
- c) Defining, by means of the Direction for Sectorial Planning, the criteria for the functional classification and nomenclature of the road network and to classify it.
- d) Survey that the national and cantonal road networks of the country are developed in a complementary form, independently from the cantonal or provincial political-administrative limits.
- e) Survey for the harmony that must prevail among the development and conservation of the road network and the atmosphere.
- f) Issue by means of the Public Work Division, the norms, procedures and technical recommendations that rule the road infrastructure of the country, that guarantee the quality of service, security and standards according with the nature and local conditions of the roads. This technical documentation must be communicated by this Division to the Town or City Halls and others interested.
- g) To regulate and to standardize at national level, by means of the Direction of Sectorial Planning, all information and censuses on the road network as well as the procedures, requirements and inscription of the public roads.
- h) Maintain by means of the Direction of Sectorial Planning, an updated data base on the inventories of the road network, based on the inventories of the Cantonal Road Network carried out by competent dependencies of the Public Work Division, with the support of the Town or City Halls. Also, the Direction of Sectorial Planning will integrate the inventories on the National Road Network made by CONAVI, so that its handling allows to obtain information and statistics relevant for projects and evaluations of cantonal or national interest.
- i) Promote the implementation of innovation programs and transference of technology that benefit the road management at national and cantonal level, directed to the communal Town or City Halls, organizations and private companies, according to what corresponds.
- j) Maintain in operation, by the part of the Division of Public Works, a Road Management System (SPEM or similar) applicable in the institution and the Town or City Halls, for the processes of conservation and development of the road network in all the country, differentiated according to each particular region and corresponding characteristics. This must include, among others, the costs and fares for the different activities, norms of execution, norms of intervention and standards of performance.
- k) Maintain available, by means of the Public Work Division, a basic group of machinery and equipment, which will regionally allow the resolution of emergency situations, specialized studies and possible projects of national interest.
- l) Promote by means of specialized dependencies of the Division of Public Works, agreements or initiatives that tend to impel programs for advice and technical assistance in designs, hiring procedures, inspection of works by contract, permissions for the operation of material sources, quality control and other related matters.
- m) Cooperate, by means of specialized dependencies of the Public Work Division, in cases of dispute between laboratories, consulting and construction companies regarding road projects.

Article 17. Transfer of the Revenues from the Fuel Tax to the Town or City Hall. Every year, in its quality of entity responsible for the Transportation Sector, and by means of the Direction of Sectorial Planning, the MOPT will be in charge of making the estimations of the amounts to be transferred to each Town or City Hall, based on the criteria established in the Law of Tributary Simplification and Efficiency, and the certification of public income from the Contraloría General de la República (General Auditor of the Country)

CHAPTER V

Criteria for the classification and constitution of the Cantonal Road Network

Article 18. Road Registry. Create the Road Registry of Costa Rica, depending on the Direction of Sectorial Planning of the Ministry of Public Works and Transportation, with national official character, in which the infrastructure of the Cantonal and National Road Network of the country is detailed, as well as nomenclature, extension, type of surface, state, signaling, traffic censuses and socioeconomic condition, among others, in accordance with the requirements, forms and procedures that are detailed in the present regulations and by means of the corresponding Manual. The acts of this registry do not have public character.

Article 19 - Constitution of the Cantonal Road Network. The Cantonal Road Network will be constituted by the public roads that are not included within the National Road Network, and in accordance with what is arranged by the General Law of Public Roads. It is made of a) local or classified roads, b) local streets and c) non-classified roads.

Article 20. Requirements to classify the local roads. They constitute the local or classified roads that comply with at least three of the following criteria:

- a) Permit the access to centers of rural population that count with at least three of the following services or physical infrastructures in operation: school, sports plaza, communal hall, church, electricity services, transportation services for passengers, health post, telephony.
- b) The population average that pays tribute to the road must be greater than 50 habitants/km of extension of the road, or exist at least an average of 10 visible inhabited houses by kilometer of extension of the road.
- c) The road must be the main communication channel for the transportation of harvests and products of the area that pay tribute to the road. 50% of that area will be at least dedicated actively to farming production (intensive cattle ranch, cultures) or other activities.
- d) The TPD Traffic per day must be greater than 30 vehicles.
- e) The road must be the main road of access to all the zone, river basin or region that needs to be communicated (network concept).
- f) Other criteria to consider in case of doubt: existence of an association or associations of integral or specific development and/or committees of roads, in the zone of influence of the road. In the case of the committees of roads, these will have to be assigned to the Association of Integral Development or the respective Town or City Hall .

Article 21. Other classification criteria for local roads. These are roads that will also be considered as local roads in spite of not fulfilling the requirements mentioned in the previous Article, and that by request of the Municipal Government or other instances and a later analysis and approval on the part of the Direction of Sectorial Planning of the MOPT, fulfill at least one of the following criteria:

- a) They give access to sites described as of tourist interest (main accesses to beaches and volcanoes).
- b) They serve as alternate roads to national roads of recognized importance.

- c) Provide indigenous access to natural resources reserves, Indian reserves or to projects of establishments for farmers impelled by the Government of the Country or the Local Government.
- d) Give access to important storing centers.
- e) They are important roads for the national security or the national interest such as dock berths, communications towers or observatories.

Article 22. **Classification criteria for local streets.** The public roads included in this category, will be classified based on the criteria that to the effect each Town or City Hall will establish, when the respective approved regulation exists; otherwise they will be ruled by what is disposed in the Regulations for the National Control of Fractioning and Urbanizations of INVU, 1982.

Article 23. Classification **Criteria for non-classified roads in use.** The public roads included in this category must fulfill the following criteria:

- a) They are passable during most part of the year.
- b) They give access to some small villages of smaller importance than those previously mentioned in article 20, or to very few users.
- c) They have a wide average of carriage way of at least 4 meters.
- d) They dispose of some elements of drainage infrastructure (roadside ditches, primary sewage system) or bridges.
- e) The road surface is the soil or ground with very little gravel, but it allows the vehicle traffic.
- f) They are alternative roads of little importance and give access to zones of low farming production.

Article 24. **Classification criteria for non-classified roads that are not in use for the transit of vehicles.** The public roads of this category are those that fulfill the following requirements:

- a) They are used for mobility and local communication, by means of motorcycles, bicycles, beasts or pedestrian.
- b) The transit is not apt for vehicles
- c) The right of way is very narrow.
- d) The right of way is populated with trees, shrubs or weeds, which means that the road is not in use, or that is used only in very short periods of the year.

The conservation of this public road network is the total responsibility of the users and direct beneficiaries, therefore its extension is not accountable for the assignment of resources coming from the unique tax to fuels, and foreseen in the Law of Tributary Simplification, however, if the requirements established in articles 20, 21, or 23 of this Regulation are not fulfilled, the Council will be able to ask the Direction of Sectorial Planning of MOPT the re-qualification of one or several roads as long as an acceptable justification mediates. Previous to re-qualification and inclusion in the Road Registry, the public investment in this type of roads will be able to be justified, based on the procedures established by the Town or City Hall, the Cantonal Road Board and this Regulation.

CHAPTER VI

Inventory and codification system of the Cantonal Road Network, file and handling of the information

Article 25. **Inventory of the Cantonal Road Network.** The inventory of the Cantonal Road Network will be made by MOPT, by means of the Public Work Division and according to the procedures that the Direction of Sectorial Planning, of said Ministry, establishes consigned in the corresponding forms and tools.

Article 26. Codification System of the Cantonal Road Network. The public roads pertaining to the Cantonal Road Network will be codified by means of the procedure that for such effect will emit the Direction of Sectorial Planning of MOPT.

Article 27. File and handling of the information. The Direction of Sectorial Planning of MOPT will be the one in charge of the file and the handling of the Costa Rican Road Registry.

Previous contribution of the necessary materials, the Town or City Halls will have access to a faithful copy of this information, for their own files.

Article 28. Updating of the information. The Direction of Sectorial Planning of MOPT, by request of the corresponding Town or City Hall or of the Dependencies of the Public Work Division, will proceed together with the interested parties, to update the databases of the road inventories of a canton, as well as to proceed with the requests of change of category of the public roads.

If the updating of the Cantonal Road Registry is carried out by MOPT's own initiative, this must be communicated to the respective Local Government.

Article 29. Entrance of information and communication to the interested parties. The Direction of Sectorial Planning of MOPT will prepare a cut off and an annual summary, to the 31 of May of every year, in order to communicate the information of the road inventory databases to the City or Town Halls, to institutions of the Central Government and to the interested parties.

The information to be consigned on that date will consider the inventory and the requests for updating that are received no later than January 31 of the corresponding year.

CHAPTER VII

Technical standards for the development and conservation of the local roads

Article 30. Technical standards for the development and conservation of the local roads. The standards mentioned in articles 31 to the 39 of this Regulation are established as a reference. The variants to these criteria will have to be reasoned and justified, and will be under the responsibility of the professional responsible for the work.

Article 31. Minimum standards for the geometric characteristics and the right of way (in case of geometric improvements or realignments)

- a) Maximum gradients: 12%
- b) Minimum radius of curvature: 50 m
- c) Minimum visibility: 50 m/km.
- d) Lengths with over-width for advancing: 100 m/km, in case the visibility is less than the minimum established in the above clause c).
- e) Minimum right of way: 14 ms.

Article 32. Minimum norms for the drainage system

- a) **Transverse gradient of the carriage way**
 - in straight sections: 6% towards both sides of the road.
 - in curves: 6% of road grade.

b) **Roadside ditches on the ground**

- Minimum dimensions cross-sectional section: 0,3 m².
- Minimum slope: 1,0%
- Maximum slope: 6%

(In the cases where it is possible to turn the water of the roadside ditches towards a culvert or a natural exit, slopes bigger than 6% will be able to be used as long as the length between culverts, or in its place the natural exits, is of at least 150 m. Otherwise break-gradients must be used to maintain a maximum slope of 6%. The type of soil and the precipitation must also be considered.)

c) Covered roadside ditches

- Minimum dimensions cross-sectional section: 0,3 m².
- Maximum slope: 15%
- Minimum slope: 1%

d) Counter roadside ditches

- Minimum dimensions cross-sectional section: 0,135 m².
- Maximum slope: 4%
- Minimum slope: 2,0%

e) Pipes for culverts.

- Minimum resistance for the fault: 75 N/ml by mm, of diameter for 60 cm tubes. The resistance must be proportional to the nominal diameter of the pipe. For other dimensions see official regulations for reinforced concrete tubes 18006 MEIC. Also, the use of locally made pipes will be allowed, as long as it is produced based in the following recommendation:
 - Resistance to the compression of concrete: 280 kg/cm²
 - Reinforcement steel: 0,36% that is equivalent to hoops number 3 to 20 cm, longitudinal steel number 3 (supports) to 50 cm.
 - Minimum thickness of wall: 10 cm for 60 cm of nominal diameter, 12 cm for nominal diameters between 90 cm and 120 cm.

f) Culverts

- Minimum dimensions: 0,60 ms of nominal diameter (internal diameter). In case of requiring less diameter due to the volume, 60 cm must be kept for maintenance.
- Maximum slope: 5%
- Minimum slope: 3%
- Minimum length of the culverts = width of the road in meters + 1,5 m at both sides.
- Minimum depth of the filling:
 - For concrete pipes: 0,60 m
 - For pipes of synthetic materials: According to recommendations of the manufacturer *).

*) In case of pipes with thin wall, the depth of the filling is an important engineering variable, as its design is based on the principle where the conditions of the ground allow to assume part of the efforts that take place during the transit of vehicles and the own weight of the ground. For this it is necessary that an optimal in compaction and granulometric distribution is guaranteed, elements that are difficult to reach in the case of works carried out with communal participation. Therefore, the use of concrete pipes is recommended.

- Classification of the filling material; G, GS, SG, SM (gravel, sandy gravel, onerous sands or muddy sands, with less than 15% passing Mesh # 200), with base in the SUCS System or the equivalent one in AASHO.
- Compaction of the filling: 95% Modified Próctor
- Headers: All culverts must have as much structure in the entrance as the exit, as well as aprons or fins in the cases where it is necessary. In addition, when they are located in filled zones it is to provide protection to the foot of the slope. The dimensions of these structures are established in the Manual of Local Roads Volume II, Geometric Design, MOPT 1973.
- Break-gradients: The culverts that sluice the waters towards creeks or rivers or in lands with slopes over 15%, must have structures with break-gradients, built with concrete, rubblework, gabions,

- stakes or other appropriate materials.
 - Use of yielding props; strictly necessary in bigger ditches of 1,6m of depth.
- g) **Exit channels or evacuation**
- a) Minimum cross- section; 2,0 m²
 - b) Maximum slope: 8-10%
 - c) Minimum slope: 3%
 - d) To anticipate coating on soils of the following type: clays of high plasticity (CH) and sandy (S).
- h) **Subdrainages**
- Material of filter; gravel, crushed stone and sand, stratified according to rules of Terzaghi filter. The use of a perforated collector tube of at least 15 cm of diameter and located below the phreatic level, is recommended. Gross stone for a nucleus of 20 cm.
 - Coating: In the case suitable filter material is not available, the use of geotextiles for drainage coating is recommended. In this case it is recommended to construct the filter based on the recommendations of the manufacturer.
- i) **Fords for river crossings** - The characteristics depend on the design that is to be considered, among others, as follows:
- Cross section for water through-put
 - Characteristics and use of ground
 - Topographic characteristics
 - Volume and type of traffic
 - Availability of resources
 - Sediments

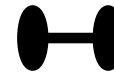
Article 33. **Weights and dimensions for the structure of the road.**

- a) **Weights of the vehicles.** The permissible maximum weights for the commercial vehicles, by axes or by set of axes, as in the total gross weight the following clauses are established:

a.1 Detail of the maximum weights permissible by axes or set of axes:

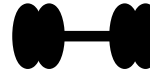
SIMPLE AXLES

1 Simple Rolling



5 Tons

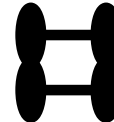
1 Double Rolling



7 Tons

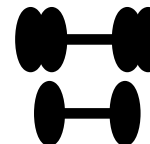
DOUBLE AXLES

2 Simple Rollings



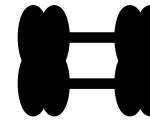
9 Tons

1 Double Rolling
plus
1 Simple Rolling



10,5 Tons

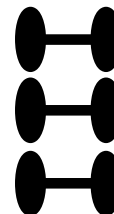
2 Double Rollings



12 Tons

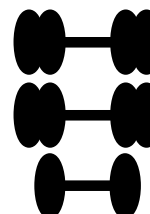
TRIPLE AXLES

3 Simple Rollings



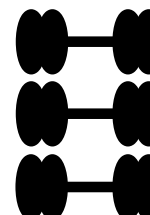
12 Tons

2 Double Rollings
plus
1 Simple Rolling



14 Tons

3 Double Rollings



16 Tons

a.2 Details of the maximum weights permissible by axis or set of axes and totals for the types of common commercial vehicles and more common combinations:

Type of vehicle	Maximum length (m)	Definition of the Axis ^{a)}					Total maximum weight (Ton.) ^{a)}
		1st axis (Ton.) ₁₎	2nd axis (Ton.) ₁₎	3rd axis (Ton.) ₁₎	4th axis (Ton.) ₁₎	5th axis (Ton.) ₁₎	
C2	12	5 a)	7 b)				12
C3	12	5 a)	12 c)				17
C4	12	5 a)	16 d)				21
		5 a)	5 a)	12 c)			22
B2	13,5	5 a)	7 b)				12
B3	13,5	5 a)	12 c)				17
B4	13,5	5 a)	16 d)				21
		5 a)	5 a)	12 c)			22
T2-S1	18,5	5 a)	7 b)	7 b)			21
T2-S2	18,5	5 a)	7 b)	12 c)			24
T2-S3	18,5	5 a)	7 b)	16 d)			28
T3-S1	18,5	5 a)	12 c)	7 b)			24
T3-S2	18,5	5 a)	12 c)	12 c)			29
T3-S3	18,5	5 a)	12 c)	16 d)			33
C2-R1	20	5 a)	7 b)	3,5 a)			15,5
		5 a)	7 b)	7 b)			19
C2-R2	20	5 a)	7 b)	5 a)	5 a)		22
C3-R1	20	5 a)	12 c)	3,5 a)			20,5
		5 a)	12 c)	7 b)			24
C3-R2	20	5 a)	12 c)	3,5 a)	3,5 a)		24
		5 a)	12 c)	3,5 a)	7 b)		27,5
C3-R3	20	5 a)	12 c)	3,5 a)	3,5 a)	3,5 a)	27,5
C4-R1	20	5 a)	16 d)	3,5 a)			24,5
		5 a)	16 d)	7 b)			28
		5 a)	5 a)	12 c)	3,5 a)		25,5
		5 a)	5 a)	12 c)	7 b)		29
		5 a)	5 a)	12 c)	12 c)		34
C4-R2	20	5 a)	16 d)	3,5 a)	3,5 a)		28
		5 a)	16 d)	3,5 a)	7 b)		31,5
		5 a)	16 d)	12 c)			33
		5 a)	5 a)	12 c)	3,5 a)	3,5 a)	29
		5 a)	5 a)	12 c)	3,5 a)	7 b)	32,5
C4-R3	20	5 a)	16 d)	3,5 a)	3,5 a)	3,5 a)	31,5
		5 a)	5 a)	12 c)	Se permiten	3 ejes simples de 3,5 a)	32,5

Notes:

- * The consigned values represent the permissible weights by sets of axes, that at the same time have the maximum number of tires (or rolling surfaces), as indicated in clause a) of the present Article and to the definitions consigned in articles 2 and 3 of the Regulation for the Use of Highways with Base in the Weight and Dimensions of Commercial Vehicles, therefore reductions must be applied when the particular configuration of the vehicle contains less tires in its different types of axes.
- a) Simple or simple axis (IRS) b) Simple axis and double tire double (IRD) c) Double axis or tandem (2RD), d) Triple axis or tridem (3RD)
- In the case of tows (R1), (R2) or (R3) the reductions of weight due to the dragging capacity of the automotive vehicle are recommended by the manufacturer. Other combinations of truck with tow can be included in the previous table, as long as they count with independent brakes to the ones of the vehicle, as it is described in article 27 of the "Regulations of Use of Highways Based on the Weight and Dimensions of the Commercial Vehicles.

b) Sub-soil

- Minimum CBR: 4% -
- Swelling: 6% -

- Compaction: 95%, Standard Proctor. (compaction rules, as it is necessary to reach the minimum CBR).

c) Carriage ground.

- Type of ground: Stony materials, graduated as much as possible, and originated from rivers or pits. IP greater than 7 and smaller than 15. Maximum size of particles = 77 mm.
- Minimum CBR: 30%
- Pumping: 6%
- Total minimum thickness: 30 cm. (rehabilitation can be made in stages, through the time, placing layers of at least 15 cm).
- Compaction: 95% Modified Proctor (compaction rules, as it is necessary to reach the minimum CBR)
The use of stabilizations with cement agents or chemical elements that do not affect the quality of the atmosphere is authorized, as long as the established minimum CBR is guaranteed.

d) Sub-base, base, surface treatment, asphalt overlay or mat

- Dimensions and specifications according to design.

Article 34. **Of the bridges located in local roads.** The respective Local Government, with support of MOPT, will evaluate the condition of each one and will establish on this base the acceptable maximum weight. This data will have to appear properly labeled at each bridge.

Article 35. **Of the routes of passage for heavy transit.** The Local Governments, previous study and coordination with MOPT, will define the routes of passage for the heavy transit in the Cantonal Road Network. Also, in cases of urgency and with the purpose of avoiding a greater damage to the structure or to the human or animal life, the local governments are authorized to temporarily close the structures or severely damaged parts of the route.

CHAPTER VIII

Technical standards for the development and conservation of roads in the natural resources protected areas.

Article 36. **Works of art for the circulation of the fauna.** The roads located in natural resources protected areas will have to count with "passages for animals" or dry culverts, that facilitate the free access for the animals from one side to the other, in the sites in which the studies of the fauna in the zone thus determine it. The minimum diameter to use in these cases is of 120 cm or 1 m x 1 m if they are constructed in a frame.

Article 37. **Minimum Standards for the geometric characteristics and right of way** (in case of improvements of geometric type or realignments).

- a) Maximum gradients: 12%
- b) Minimum Radius of curvature: 30 m.
- c) Maximum right of way: 14 m

Article 38. **Minimum standards for the drainage system.**

a) Cross slopes of the waering course

- In straight sections: 6% towards both sides of the road
- In curves: 6% of road camber

b) Roadside ditches

- Minimum dimensions cross-sectional section: 0,3 m².
- Minimum slope: 1.0% -

- Maximum slope: 6%
(In all the cases where longitudinal slopes are bigger than 6%, break-gradients will have to be used in order to guarantee a maximum slope of 6% at the bottom of the roadside ditch. The type of soil and the rainfall must also be considered).
- c) Coated Roadside ditches.**
The use of roadside ditches will not be allowed.
- d) Counter Roadside ditches. –**
- Minimum dimensions cross-sectional section: 0,1135 m²/ml
 - Maximum slope: 4%
 - Minimum slope: 2,0%
- e) Pipe for culverts**
- Minimum resistance for the fault: 75 n/ml by mm of diameter for 60 cm tubes. The resistance of the pipe must be proportional to the nominal diameter. See official norm for reinforced concrete tubes 18006 MEIC for other dimensions.
- Also the use of locally manufactured pipes will be allowed, as long as they are produced with base in the following recommendation:
- Resistance to the compression of the concrete: 280 kg/cm²
 - Reinforcement steel: 0,36% that is equivalent to hoops number 3 to 20 cm, longitudinal steel number 3 (supports) to 50 cm.
 - Minimum thickness of wall: 10 cm for 60 cm of nominal diameter (internal diameter). In case of requiring less diameter per volume, keep 60 cm for maintenance.
- f) Culverts**
- Minimum dimensions: 0,60 ms of nominal diameter (internal diameter). In case of requiring less diameter due to the volume, 60 cm must be kept for maintenance.
 - Maximum slope: 5%
 - Minimum slope: 3%
 - Minimum length of the culverts = width of the road in meters + 0,5 m at both sides.
 - Minimum depth of the filling: the one that allows the topography and the type of pipe for the minimum earthwork.
 - Classification of the filling material; G, GS, SG, SM (gravel, sandy gravel, onerous sands or muddy sands, with less than 15% passing Mesh # 200).
 - Compaction of the filling: 95% P.E.
 - Headers: All culverts must have as much structure in the entrance as the exit, as well as aprons or fins in the cases where it is necessary. In addition, when they are located in filled zones protection is to be provided to the foot of the slope. The dimensions of these structures are established in the Manual of Local Roads Volume II, Geometric Design, MOPT 1973
 - Use of yielding props; strictly necessary in bigger ditches of 1,6m of depth.
- g) Exit channels for water evacuation**
- Minimum cross-sectional section; 2,0 m²
 - Maximum slope: 8-10%
 - Minimum slope: 3%
 - To anticipate coating on soils of the following type: clays of high plasticity and sandy.
- h) Subdrainages**
- Material of filter; gravel, crushed stone and sand, stratified according to rules of Terzaghi filter. The use of a perforated collector tube of at least 15 cm of diameter

and located below the phreatic level, is recommended. Gross stone for a nucleus not greater than of 20 cm.

- Coating: In the case suitable filter material is not available, the use of geotextiles for drainage coating is recommended. In this case it is recommended to construct the filter based on the recommendations of the manufacturer.

i) Fords form river crossings

- Its characteristics depend on the design that is to be considered, among others, as follows:
 - Volumes
 - Characteristics and use of ground
 - Immediate topographic characteristics
 - Volume and type of transit
 - Availability of resources
 - Sediments

Article 39. Weights and structural dimensions of the road in protected areas.

- a) Weights of the vehicles. The gross weight of the vehicles authorized to circulate in this type of roads in natural resources protected areas is of 12 tons maximum (weight of the vehicle plus payload). The City or Town Halls are authorized to carry out overweight controls (excesses of the weight of the vehicle plus authorized payload) and to sanction with base in the regulation that will be issued to the effect.

b) Sub-soil

- Minimum CBR: 4% -
- Pumping: 6% - 8%
- Compaction: 95%, Standard Próctor. (compaction rules, as it is necessary to reach the minimum CBR).

c) Base course.

- Type of ground: Stony materials, graduated as much as possible, and originated from rivers or pits. IP greater than 7 and smaller than 15. Maximum size of particles = half of the thickness of the coat.
- Minimum CBR: 30%
- Pumping: 6% - 8%
- Total minimum thickness: 30 cm. (rehabilitation can be made in stages, through the time, placing layers of at least 15 cm).
- Compaction: 95% Modified Próctor (compaction rules, as it is necessary to reach the minimum CBR)

d) Sub-base, base, surface treatment, asphalt overlay or mat

The use of pavements or stabilizations with chemistries will not be allowed as they can be injurious for the protected areas.

CHAPTER IX

Transitory dispositions

Article 4. **Data of the present inventory.** Until the physical inventory of the Local Roads and non classified roads network of each canton is completed, the information available in the data bases of the Direction of Sectorial Planning, of the Ministry of Public Works and Transportation will be used, which consists of an identification of routes. The information can be consulted and known by City or Town Halls, physical or legal people, previous contribution of the corresponding materials.

Article 41. **Immediate updating of the inventory of the cantonal road network.** By request of the municipality it will be possible to subscribe agreements with MOPT, by means of the Public Work Division, whenever the Town or City Hall requires an updating of its inventory.

Article 42. **Temporary appointment of the Cantonal Road Board.** The Councils will temporarily name the members of the Cantonal Road Board indicated in clauses d), e), f), and g) of article 10 of this regulation, for a maximum period of three months calendar, starting from the date of publication of this regulation, while the procedure of selection and appointment of the anticipated holders previewed in this regulation is carried out.

CHAPTER X

Derogatory

. Article 43. **Regulation to the Functional Classification of the Public pathways.** Derogate articles 14, 15, 16, 17, 18 and 19 of Chapter II of the Regulation to the Functional Classification of the Public Roads, number 113041-t. of October 20, 1981.

Given in the Presidency of the Republic. San José, on the fifth day of the month of March of two thousand two. By MIGUEL ANGEL RODRIGUEZ ECHEVERRIA. - The Minister of Public Works and Transportation, Carlos Castro Arias. First time. (Request Number 9127) C-210620. (D30263-24602).