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“Rural Road Planning”

“Recommendations for Improving the Rural Road Network in Lao P.D.R.”

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“Rural Road Planning”

“Recommendations for Improving the Rural Road Network in Lao P.D.R.”

by

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“Rural roads represent the grassroots of the road network which feed traffic into the secondary and primary roads opening access to the rural areas (IT Transport 1997)”

“(Rural Roads) are in very poor condition; drainage is inadequate, many bridges are missing or in poor condition and shoulders are not stable (World Bank 1997)”

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Foreword

One of the underlying causes of rural poverty, often, is poor access¹. Rural welfare and access are closely related. Improved access generally improves living conditions and hence reduces poverty. Inaccessibility on the other hand restricts movement of people, goods and services and limits the development of markets and other service centers.

Access cuts across different sectors including health, education, industries and agriculture. The performance of these sectors is often hampered by accessibility constraints. Rural development initiatives often demand improving access. Access can be improved in two fundamental different ways: improving the mobility of the people or improving the distribution of goods and services. One main strategy to improve access is to improve the quality and the extent of the road network in an area². In general, roads facilitate development; new roads will improve transport; improved transport will solve access problems; better access improves living conditions and create alternative income earning opportunities. Improved living conditions and alternative income earning opportunities, in turn, induce development. Improving access, generally, is a sine qua non for rural development.

The road network and in particular the rural road network in Lao PDR has been developing slowly due to the past wars, lack of finance and the country's difficult topography. Most recent efforts to improve the road network in Lao PDR have concentrated on improving the national road network. The Government and the donor community are now shifting their attention from assistance to major highway projects to supporting the development of a rural road network. The demand generated by the communities and provinces for new and improved rural roads is substantial. Resources

¹ Access in the context of this paper is defined as the ability, the level of difficulty, of rural people to use, reach or obtain the facilities, goods and services they need to sustain their daily lives.. Access is inversely related to the time, effort and cost necessary to reach locations (facilities) where the people could avail over goods and services.

² Access can be improved in two fundamental and complementary ways:

1. through a better siting of basic facilities and services that rural people need to use (water supplies, schools, health centers, markets); and
2. through improving the mobility of rural people so that they can travel faster, easier, more convenient and less expensive (rural roads, tracks, trails, footbridges, waterways).

yet are limited and there is an urgent need to establish sound planning procedures to guide Government agencies and donors alike in the identification and selection of rural road improvement projects.

This issue paper is intended to assist persons involved in rural road planning both in Lao PDR and elsewhere. It draws together the main steps in the **rural road planning process** as being developed in Lao PDR as an integral part of the Integrated Rural Accessibility Planning (IRAP) procedures. The aim of this issue paper is to eventually develop a more complete planning system for rural road improvements and maintenance in Lao PDR and to solicit advice on appropriate procedures for rural road planning in general.

The issue-paper on “Rural Road Planning” is the third one in a series of six. The IRAP project intends to produce 6 different issue papers dealing with the following topics:

1. Access and Income Generating Activities (final)
2. Guidelines on Integrated Rural Accessibility Planning (final)
3. Rural Road Planning (final)
4. The Accessibility Data Base (draft)
5. IRAP Prioritization Techniques and Procedures (draft)
6. IRAP at the Village Level (draft)

The issue papers are meant to stimulate and guide discussions to improve the IRAP planning procedures in Laos and other Asian countries where activities are starting such as Indonesia, Cambodia and Thailand. Any comments, suggestions or criticisms are welcome and should be addressed to the IRAP office in the Rural Development Committee (RDC) of the Ministry of Communication, Transport, Post and Construction (MCTPC), Vientiane, Lao P.D.R..

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Rural Roads

Rural roads feed into the main road network and link rural communities to district centers, health facilities and markets. Rural road improvements, as referred to in this issue paper, include activities associated with new construction, upgrading and rehabilitation of roads generally classified as feeder roads, access roads, secondary roads, farm-to-market roads, community roads or rural roads. From here on this paper will, in line with the Lao classification, distinguish three categories of roads: national roads, provincial roads and rural roads. National roads link major towns and provincial capitals and provide connections to neighbouring countries. Provincial roads connect towns and larger villages within the provinces. Rural roads include all roads in the rural areas that do not classify as national or provincial roads. Rural roads often connect villages with other villages or district centers.

Improving the rural road network in Laos will improve the accessibility of district centers, provincial centers and other important locations. It is therefore likely to have a positive effect on the accessibility of high schools, dispensaries, pharmacies and hospitals, markets and shops, government services and employment centers.

Rural roads are important for rural development. Roads improve mobility and improved mobility facilitates access. The improvement of the road network however does not, of itself, improve access. Roads only become **effective** if they are being used. Improved access is dependent on the extent to which road improvements result in:

- *the use of the (improved) road network by (more) vehicles*

- *existing transport services becoming cheaper, faster, more frequent, more reliable and safer or new transport services starting*
- *the use of the (improved) road by (more) traders*
- *(more) extension services and aid workers using the (improved) road to visit villages in the influence area*

Only when such development takes place the actual **travel time, travel cost** and **travel effort** needed to reach certain locations, facilities or service centers will be reduced with increased or new traffic volumes. Roads in fact are facilitators; they facilitate rural development in that they improve mobility and accessibility. If the roads are not used by any kind of vehicles they do not contribute to any kind of development and are of very limited use. Most rural communities in developing countries are poor and it is not common that rural people will start purchasing their own motor vehicles once the road network is improved. The main benefits will come indeed from traders, transport service operators and extension workers.

The overall improvement of a rural road network generally includes 4 activities:

1. rehabilitation of deteriorated roads; bring them back to their original condition;
2. improving/upgrading of existing roads and tracks; improve the quality of a road for example the widening and surfacing of a track or the pavement of a gravel road;
3. construction of new road links; and
4. road maintenance activities; routine, periodic and emergency maintenance to prevent the road network from deteriorating.

Different types of roads have different functions. National roads, for example, establish links between main population centers. The improvement of the national road network will indeed improve access between different population centers but not necessarily in the areas adjacent to the route. Around the main roads there will be an area of influence where living conditions and lifestyles will change. More remote areas however may not benefit at all. Rural access roads will have to provide the more isolated communities with “access” to the developments taking place along the improved road. For the rural population adequate access roads are often as important as the improved national road.

In order to attain an infrastructure development which implies a real benefit for the local population, it is therefore imperative that the improvement of the main road network is accompanied by the improvement of the access road network. It is therefore recommended that all major road works are accompanied by improvements in the rural access road network.

Transport is a derived activity and the actual importance of rural roads will depend on the local demand for transport which in itself is mainly a function of domestic travel and transport patterns, service delivery and economic opportunities. The extent to which a rural household, for example, needs to travel is dictated principally by the access it has to the facilities required to sustain daily life. That is access it has to the fields where it grows food, the markets to trade goods, schools to educate its children, health facilities in time of illness and extension services to increase production.

Rural access roads, in Laos, are often placed at the top of the list of priorities made by village leaders and concentration on improving access roads in the hinterland is often perceived to produce a general increase in human welfare. People living in the area of influence will benefit from improved access to markets and social institutions, from improved income opportunities, an improved supply of food and other needs at more reasonable prices that will follow the improvement of the rural road network. Families will have a stimulus to grow more and different types of crops if rural roads make traveling and transportation to town markets easier. Improved access to roads and to bicycles facilitates school attendance (an accessibility survey in a remote province in the country showed that many pupils dropped out because they were “tired of walking”). Rural access roads will make an area more attractive to visit and could result in social workers (teachers, health personnel and agricultural extension workers) coming more often to the communities. To put it briefly, the improvement of the rural road network in the rural areas will provide isolated communities with better access to the main road network and bring them into the mainstream of economic activities which will contribute to their economic and social development.

A key issue in the effort to improve access is **maintenance**. Investments in rural roads are of little value unless these investments are maintained. The failure to maintain any type of road is equal to **disinvestment** as it sacrifices the past capital investments in these roads. In developing countries where resources are scarce, maintenance often receives a low priority. Deteriorating roads initially seldom discourage people from using them or restrict the volume of traffic until the moment they become impassable and therefore useless. Deteriorating roads will raise the cost and lower the quality of transport which is a restraint on agricultural and economic development. An efficient transport network in an area will certainly stimulate rural development and proper maintenance is essential to keep the network from deteriorating. A separate chapter in this paper is dedicated to rural road maintenance planning.

RURAL ROADS IN LAO P.D.R.

Among Asian countries, Lao P.D.R. has one of the most undeveloped road networks. Recent road improvement works, with a few exceptions, have mainly been focussing on establishing a primary road network first. Consequently, rural roads have received little attention. Now that this primary road network has been established a shift in emphasis towards developing a rural road network is taking place.

In the early 1980s the Lao Government declared roads a priority sector and since then investments in the road sector have absorbed approximately 35% to 45% of the public investment budget. During the past 10 years, Lao P.D.R. has been investing between US\$ 20 million and US\$ 45 million a year to improve the road network. While these investments were large in terms of the total investment of the Government, the effect on the total length of the road network was limited. During the last decade only 200 kilometers of improved and new national and provincial roads a year were added which represents about 2% of the total national and provincial road network.

The lack of roads and the poor condition of the existing network remains a major constraint to development. The following table shows some characteristics of the road network in selected districts where the IRAP survey has been implemented.

Table 1: Road network characteristics

Province	District	Total Length Road Network ³	National	Provincial	Rural	Percentage All year round Passable	Road Density 1: Meters of Road per Person	Road Density 2: Meters of Road per Square kilometer of Land
Louang Namtha	Sing (1996)	121	39	74	8	32%	5.1 m	84 m
Oudomxai	Pakbeng (1997)	30.5	21.5	0	9	70%	1.4 m	31 m
Savannakhet	Tapangthong (1996)	285.5	0	95	190.5	5%	12.1 m	134 m
Sayaboury	Ngeun (1997)	103	0	82	21	33%	8.6 m	182 m
Xiengkhouang	Nonged (1998)	147	69	0	78	59%	4.2 m	65 m
Sekong	Lamaam (1997)	127.7	40.5	87.2	0	59%	6.7 m	70 m
Khammouane	Mahaxay (1997)	449.6	23	34.4	392.2	6%	18.5 m	328 m
Louang Prabang	Ngoi (1998)	83.9	34	48.3	1.6	43%	2.1 m	33.4 m

Table 1 shows that the road characteristics differ considerably per district. The road densities in Mahaxay, for example, are more favorable than Nonged, however only 6% of the road network in Mahaxay is passable throughout the year while in Nonged more than half the network is trafficable all year round.

Looking at this table one could draw some initial conclusions. For example in Tapangthong the existing network should be rehabilitated and a proper maintenance system has to be developed and operationalized before any new roads should be constructed while in Pakbeng there is an obvious need to construct additional road links.

Table 1 indicates that the rural road network in the country is indeed limited and existing rural road links are often in bad condition and not or poorly maintained. It is difficult to provide accurate figures for the number and state of the local roads for the country as a whole, but the IRAP data for selected provinces suggest that very few are passable all year round. The result is that the extent and condition of the road network is a serious constraint to economic and social development.

As mentioned earlier an improved road network only contributes to the development of an area if the roads are being used by vehicles. The following table summarizes vehicle ownership in selected IRAP districts.

³ These totals exclude district roads in the district center.

Table 2: Vehicle Ownership

Province	District	Private Cars	Trucks	Pick-Ups	Tuktuks	Motor-cycles	Hand-tractors	Buses	Bicycles
Louang Namtha	Sing	0	16	4	9	21	161	0	2209
Oudomxai	Pakbeng	0	3	0	1	47	8	6	384
Savannakhet	Tapangthong	0	7	0	0	40	26	0	1561
Sayaboury	Ngeun (1997)	0	0	12	0	73	25	0	955
Xiengkhouang	Nonged (1998)	5	21	8	1	221	1	3	1895
Sekong	Lamaam (1997)	1	25	5	8	152	11	0	1809
Khammouane	Mahaxay (1997)	2	23	7	0	77	42	5	1004
Louang Prabang	Ngoi (1998)	0	2	14	7	39	0	0	563

Table 2 suggests that the immediate users of the road are likely to be bicycles, motorcycles and hand-tractors. This will have to be taken into consideration designing future road rehabilitation and construction initiatives.

In order for Lao PDR to develop in a stable manner it must reduce isolation and bring development to the rural areas and prevent the economic gap between the cities and the rural areas from becoming too wide. Amongst others, the rural transport situation needs to be improved. Its road network is still far behind what could be considered a minimal network. An estimated 50% of the rural population does not have all year round road access. To improve this network presents a major challenge for the Lao Government.

The ILO concludes that the general lack of road access in the country, for example, has its effects on the agricultural sector. Road access is crucial for agricultural development. Farmers will have to transport their produce to the market and agricultural inputs and extension services will have to be supplied to them on a regular basis. Access to agricultural inputs and markets is difficult in most rural areas in the country because of the general lack of rural roads and the poor state of the existing road network. More specific examples could be quoted for the other sectors, for example of district centers which are three days walk from the road network, or of schools which have no teachers because the school is not accessible by road, or of health centers which have no staff or medicines because they are inaccessible.

The Worldbank suggests that “given the critical importance of infrastructure to raise rural incomes and alleviate rural poverty and the severe infrastructure bottlenecks in large areas of rural Lao P.D.R., increased investments in the development of infrastructure, particularly rural access and farm to market roads must be an essential part of Lao P.D.R.s rural development and poverty alleviation scheme”. The Government of Lao P.D.R. acknowledges the need and the Public Investment Programme consequently contains guidelines on the improvement of the rural road network:

Policy: to improve rural communities’ access to the main road network.

Strategies: develop a national programme for feeder road construction in provinces and districts, with funds provided through a national programme budget.

improve local capabilities, particularly for construction of feeder roads and maintenance of all categories of roads.

Actions: Introduce a systematic planning process for feeder roads.

Increase the allocation of funds for feeder roads and bridges.

Promote development of private sector construction and maintenance capabilities.

Laos is a poor country and investment funds are limited. In order to maximize the impact of scarce investment funds a proper selection of projects is essential. How to improve access for a maximum number of people at a minimum cost is a central question. This issue will be addressed in the following chapters.

Road construction and rehabilitation in rural areas of Lao P.D.R can result in significant benefits and improved living conditions for rural populations living adjacent to the routes. According to the findings of the recent evaluation mission for the Sayaboury-Paklay road, six months after its completion “*agricultural production appears to be increasing due to improved trade and market access. Poverty in the area already appears to have been reduced. Access to health and other government services has increased and, in general, “ there is a vibrancy in the province that was reportedly not present prior to the construction of the road (Royds Consulting)”*⁴. Though the Sayaboury-Paklay road is a section of a national road it does, in effect, improve the lives of the rural people living along it. Rural access roads feeding into the main road network can be expected to have similar, although less pronounced, effects. This is confirmed by a study commissioned by ILO to assess the benefits of labour-based rural roads in Oudomxai and Savannakhet province: In Oudomxai “*paddy cultivation has increased after the road construction*”, “*an increase in sales of other agriculture produce like vegetables and fruits can also be noted*”, “*traders travel every day along the road to buy products, or place orders to the farmers*”, “*handicraft (weaving) among the women (Thai Dam) has increased*”, “*the number of rice mills has increased*”, “*seventeen shops have opened*”, “*travelling has*

⁴ In “Paklay-Kentao Road Rehabilitation Project – Environment and Natural Resource aspects – Impacts and Mitigation – Andrew Mittelman (UNDP/UNCDF 1997)

increased as well as transport facilities”, “two clinics have been built”, “the number of students has increased at all levels” and in Savannakhet “business has increased after the road was reconstructed and the bridges repaired”, “the road has made it convenient to travel to town, there are three regular tuk-tuk trips per day, the tuk-tuk drivers live in the village, they started their business after the road was rehabilitated (ILO 1997)”.

Obviously not all developments can solely be attributed to the new and improved roads. It is clear however that the road improvements have lead to a positive development within the areas of influence.

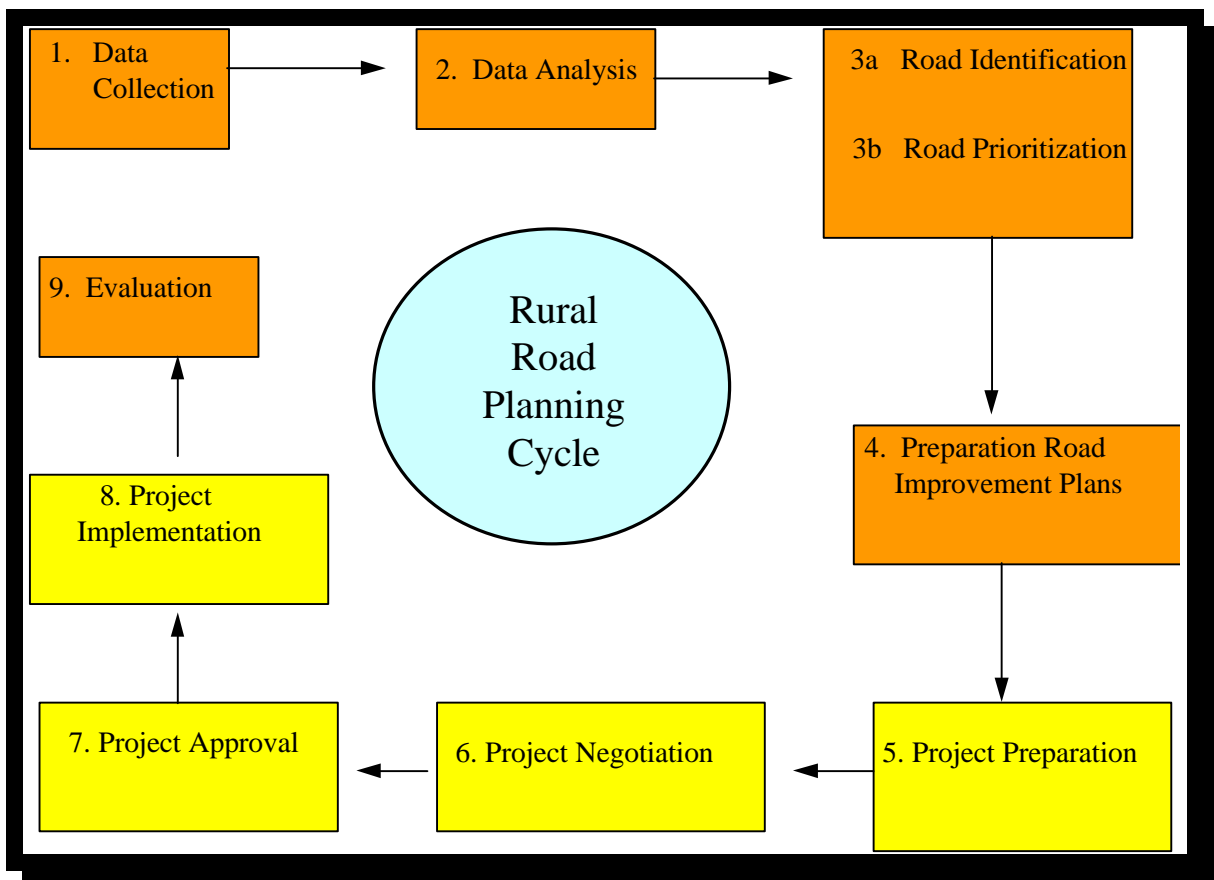
IRAP Rural Road Planning Cycle

To emphasize the key role of rural roads in improving access in a country like Laos, the IRAP process includes a separate rural road planning cycle. Figure 2 illustrates this cycle, which is in fact one of the components or “layers” of the overall IRAP cycle as introduced in a preceding paper⁵.

The collection and analysis of data on the access characteristics and access needs of rural households, the data on the extent and status of the road network and the road key and accessibility maps (step 1) will provide the means to thoroughly assess the extent and the importance of the road network (step 2) and identify and prioritize road links for rehabilitation, improvement or new construction (step 3). The next step is the preparation of a road master plan (step 4), including a strategy for maintenance, first at the district and then at the provincial level. The IRAP project being a planning/capacity building project is narrow in its scope. Other initiatives such as the ongoing Lao Swedish Road Sector Support Programme (LSRSP), different labour-based projects and other internal or external supported undertakings will have to take the process further by strengthening the local capacity to design, implement and supervise rural road construction works (steps 5 and 8). Fund sourcing (step 6) and approval of projects (step 7) are non-planning activities and are the responsibility of the authorities involved, local and national Government and donors, and beyond the scope of IRAP process. IRAP planners however may facilitate this process⁶. The IRAP activity could finally assist the authorities to assess the impact of an improved rural road network (step 9).

⁵ see Issue paper 2

⁶ see Issue paper 2

Figure 2: Rural Road Planning Cycle

Step 1: Data Collection

In Laos information on rural roads is scarce. There are no comprehensive country-wide studies identifying the individual rural road links or the total length of the rural road network⁷. For rural road planning purposes almost always primary data needs to be collected in the field.

Data needs to be collected to undertake two different activities: a) identification, prioritization and selection of candidates for road construction and b) impact evaluation after road construction. The following box identifies the data requirements for the two different purposes:

⁷ With the exception of the IRAP project which has surveyed the entire road network in 8 provinces.

Data requirements:

1. *Base-line data on Socio-economic Characteristics of Area of Influence (selection and impact)*
2. *Information on Village Problems, Needs and Priorities (selection)*
3. *Information on the current Transport System and Vehicle Ownership (selection and impact)*
4. *Data on Traffic Flows and Transport Patterns (impact)*
5. *Data on Shops, Markets and Product Prices (impact)*

As part of the comprehensive IRAP planning exercise⁸, data on general socio-economic characteristics and rural accessibility is collected in all villages in a selected planning area⁹. This data, however, is not enough to sufficiently analyze the extent and use of the road network and needs to be complemented by a “road network survey”.

Data on the engineering characteristics of road candidates is not being collected at this stage. Neither is an environmental impact assessment undertaken. This will be done for priority roads only after the priority road links have been selected using the IRAP planning tools.

IRAP’s survey instrument includes a “**Village-level Survey**”, “**Road Network Survey**”, “**Household Survey**”, “**Market Survey**” and “**Traffic Counts/Origin-Destination Survey**”. These tools are developed to collect different kind of data. Not all surveys are always necessary. The use of different surveys will depend on the objectives of the planning exercise.

<u>Survey Instruments:</u>	<u>Purpose:</u>
➤ <i>Village Level Survey</i>	<i>Road Planning and Impact Evaluation</i>
➤ <i>Household Survey</i>	<i>Impact Evaluation</i>
➤ <i>Road Network Survey</i>	<i>Road Planning</i>
➤ <i>Market Survey</i>	<i>Impact Evaluation</i>
➤ <i>Traffic Counts</i>	<i>Impact Evaluation</i>

⁸ see Issue paper 2

⁹ most often a district, sub-district or zone

Village Level Survey

IRAP has developed standard questionnaires to collect base-line data at the village level through key-informants interviews¹⁰. At the end of the village interview additional information is collected on the perceived problems and village priorities. Data collected will be used for two purposes in connection with the rural road planning activity:

1. To make an assessment of the present living conditions in the area of influence to determine the feasibility of the road and assess its priority compared to other candidates;
2. To measure the impact of the roads several years after construction by comparing the base line survey with follow-up surveys.

Most data collected is quantitative and can be synthesized to describe the current situation in an area around a road.

Household Survey

Household surveys provide additional information on individual household's characteristics such as assets, employment, income, expenditure and travel patterns. The implementation of household surveys is expensive in terms of time and manpower. The use of household surveys should be limited to exceptional cases mainly research and impact evaluations. Household surveys need to be designed in accordance with the objective of the activity. A first step in designing the household survey is to identify what additional data, that can not be collected with other surveys or from secondary sources, is required.

Road Network Survey

The objective of the IRAP Road Network Survey (RNS) is to make an overall assessment of the condition and extent of the road network in a given area. Data collected will be used for two main purposes:

1. To prepare a list of all roads in a certain area and identify these on a map. This information can then be used to prepare **a road key map**. Under the IRAP project in Laos, road key maps are prepared at the district level.
2. To assess the **trafficability** of the different roads. The road inventory will inform about the number of months a year the road is open to traffic.

The survey provides data on the length, condition and trafficability of each road link. It also records the number and different types of crossings. The RNS however is not an instrument survey and does not provide precise data necessary for road engineering. Rather it is a quick means of obtaining reliable data which is of sufficient accuracy to be

¹⁰ see Issue Paper 2

used as a basis for planning including the identification of priorities. A follow-up survey, the **Road Inventory**, should provide specific information necessary for road engineering and environmental assessment (see step 3c).

The RNS is based on one form (see Annex 1) to record data for individual road links. A road link refers to the part of the road between junctions or from the origin to the end if there are no junctions¹¹.

Market Survey

For impact evaluation purposes it is often necessary to implement market surveys prior and after the construction takes place. Information needs to be collected on market characteristics, shops, products traded, users, catchment areas and prices. This information will be used to assess the impact of a road improvement or construction project on the local economy.

Traffic Counts / Origin-Destination Survey

Traffic counts provide information on traffic flows and vehicle types. Traffic flows, for IRAP purposes, are measured as person and vehicle movement and include pedestrians, carts, bicycles and motorized vehicles.

Traffic counts should be carried out by local people after receiving training from the local IRAP team. It is recommended to use the standard form (see annex 3) and observe the following guidelines¹²:

- Traffic should be counted during at least two different days of the week from 5 am to 8 pm. It is important to start early to capture traffic going to the market.
- The traffic station should be located at least one kilometer from a village or junction.
- Traffic should be counted on at least two stations on the road, spread out to capture differences in traffic volumes.
- Both directions of traffic should be counted.

The purpose of traffic counts is to measure average flows. This is complicated by the fact that traffic is not constant and is subject to daily, weekly and seasonal variations. It is therefore recommended to conduct before and after counts at exactly the same time of the day at the same time in the year.

Origin-Destination Surveys provide information on the journey origin and destination, frequency of travel, purpose of travel, type of goods transported and personal characteristics of the traveler. To collect this information pedestrians or vehicles have to

¹¹ see Annex 2

¹² Ulrika Nåhem (1998)

be stopped. A well-planned recording form¹³ (see annex 4) is necessary to limit the delay to travelers to 2-3 minutes. It is unlikely that traffic flows on Lao rural roads are excessive and sampling will not be necessary. Interviewers should be trained by local IRAP teams. Because of the low traffic volumes on rural roads, O-D surveys can take place at the same time as the traffic counts. Interviewers should include both people travelling on vehicles and pedestrians.

Step 2: Data Analysis

Data analysis includes several activities: The preparation of a **Road Key Map**, the identification of the **Area of Influence** and the preparation of a **Socio-economic Profile** for the area of influence.

Preparation Road Key Map

This first activity includes the preparation of a road key map. The road key map in fact is a simple road map identifying the different road links and villages served. This could be a separate map or an overlay for the existing IRAP district map¹⁴. Villages are identified with different colored dots to show whether they have road, river or trail access. Roads are shown by different shaped lines with different colors to identify their classification (national, provincial or rural) and their trafficability (all year round, dry season only or never).

Annex 5 shows an example of a road key map produced for Mahaxay district in Khammouane Province produced with GIS software (Mapinfo). The map displays the individual road links, administrative boundaries and villages. IRAP defines road links as individual links between villages, junctions or junctions and villages. See annex 2 for an example of individual road links.

Road key maps are usually produced at the district and provincial level. Initially they are produced manually and discussed with local officials. Once people agree on the network computerization can start. The manual maps are used during district workshops on road network analysis and priority setting and during presentations¹⁵.

Identify Area of Influence (AoI)

Road investments are likely to change living conditions and lifestyles in an area of influence around a road. Communities close to a new or improved road will benefit most from road improvements. More remote areas benefit to a lesser extent and effects take generally more time to be felt.

The exact limits of the area influenced by a road are difficult to identify. The limits of the area are generally provided by watersheds, rivers or the proximity of adjacent roads. In

¹³ These forms were originally produced by the Transport Planning Unit in Lao's Ministry of Communication, Transport, Post and Construction under a World-Bank supported project.

¹⁴ see Issue Paper 2

¹⁵ see Issue Paper 2

the situation of rural roads in Lao P.D.R., IRAP usually recommends to take an area of 5 kilometers on both sides from the road. One can say that within the AoI, the majority of people living within the area will use the road and improvements will have an impact on their lives.

An influence area map needs to be prepared showing the location of the route to be improved, connecting roads, villages within the AoI and the AoI boundary.

Prepare a Socio-economic Profile of the AoI

Prepare a summary profile for the AoI using the socio-economic data collected during the IRAP survey in the area. This profile should provide the user a quick overview of the general socio-economic characteristics and access situation in a particular AoI. This summary profile can be a one page summary of relevant indicators such as:

- The number of people directly served by the road
- The number of people indirectly served
- Crops grown and marketed
- Other economic activities
- Availability and accessibility of health services
- School enrollment
- District access
- Market access
- Water supply situation
- Extension services
- Road access perceived as a community problem
- Improving road access seen as a community priority

An example of a one-page socio-economic summary is annexed (annex 5).

Step 3: Identification and Prioritization

Rural roads improve access in rural areas. They provide access to markets and social services, stimulate the local economy, stimulate an increase in food production, and help to integrate isolated communities into the national economy. Rural roads contribute to rural development. Ideally all communities should have all year round road access. Road improvements however are expensive and it will take quite some time before all Lao communities will have year round road access. Currently few roads are added every year and it is therefore important that the procedures used to select roads for rehabilitation and construction select the “best roads” first. Rationale road selection and prioritization criteria should be used to select these roads.

Proper **rural road selection criteria** must give consideration to:

- economic development: will road improvements generate rural development in terms of increase agriculture production and a raise in income
- quality of life: will rural road improvements result in higher education levels and an improved health status of the population served and therefore increase the quality of life
- equity: do rural road improvements improve the existing road density of the area and make it more equal (population per kilometer of road and land area per kilometer of road)

A strategy document for rural roads tells us “The system of government in Lao P.D.R. grants a wide degree of autonomy to districts and provinces in the formulation of their rural development programmes. Projects are identified at the local level and forwarded to Vientiane for approval and funding. However, projects are often identified at random, often based on requests from local residents or local political figures. No clear criteria for selecting rural infrastructure projects are available and there is little evidence of planning based on an overall assessment of the demand in the rural areas. In terms of road development, road projects are mostly identified in isolation and do not form part of an integrated strategy to improve living conditions in a selected area”.

Roads to be improved should not just be selected randomly. The top priorities should be determined by a selection process. Roads are constructed for people. Different people have different needs. Different roads therefore will have a different impact. It is essential to assess the future benefits of a road before a decision about upgrading or construction is taken. If substantial benefits are anticipated then the road deserves a priority. If only limited impact is foreseen then the road does not deserve a priority.

As earlier discussed, road improvements include new construction, upgrading, rehabilitation and maintenance.

A basic rule for any roads work program is to allocate funds to the following order:

1. To develop and implement a proper maintenance system and maintain the roads that are already in a maintainable condition (routine and periodic maintenance);
2. To identify a core road network, rehabilitate road links which have fallen into disrepair and bring the core road network in a maintainable condition;
3. To construct new road links and extent the network.

The next section of this module relates to the 2nd and 3rd priority: how to identify road link candidates and how to prioritize these links for rehabilitation. A later chapter will deal with the maintenance issues.

The process of defining priorities for rehabilitation and new construction consists of three different activities:

- Screening (step 3A)
- Socio-Economic Ranking (Step 3B)
- Technical and Environmental Impact Assessment (Step 5)

Step 3A - Screening: Identifying Rural Road Link Candidates

The road key map and road data base should be put to use to list all existing rural road links in an area that need rehabilitation and all new rural road links that are identified for new construction.

The screening process is thereupon used to prepare a short-list of rural road candidates and to disqualify roads that do not meet certain criteria. For those roads passing the screening test, a simple cost-benefit analysis is carried out as part of the ranking process (step 3B). IRAP has introduced the following screening criteria

- The road link must run through an area inhabited by people; there should be a minimum number of people per kilometer of road to justify its construction.
- The road link should connect with an all weather road and should be part of a network leading to local or provincial markets and/or district centers.
- The road link must not be closely parallel to or in the area of influence of another all-weather road; circuits should generally be avoided.
- The road should not have a need for expensive bridges.
- The road link could be maintained using labour and materials (gravel and sand) from the villages served.
- The road link should serve the people at large and not only a special interest group such as a logging or mining firm.

It is recommended that all these criteria must be satisfied and a candidate scores “6 times yes” before a proposed road link pre-qualifies for rehabilitation or new construction. During the screening process the total length of the road network to be considered for rehabilitation is reduced. Roads that “survive” the screening procedures will be subjected to the socio-economic ranking procedures under activity 3B to determine the initial rehabilitation/construction priority of each road.

Step 3B – Socio-economic Ranking

This activity is to identify priority rural road rehabilitation and/or construction projects which should be subjected to a more detailed technical and environmental assessment (step 5). IRAP recommends a simple socio-economic ranking based on the number of people in the area of influence, the expected socio-economic impact per person and the total cost of the road rehabilitation or construction to identify priority rural road candidates for rehabilitation or new construction. If the purpose is to come up with a quick list of priority candidates this procedure may be sufficient. For a proper assessment of higher level roads, such as provincial and national roads, more sophisticated methods need to be used. At the T-2 Training¹⁶ on data analysis district officials are instructed to calculate simplified cost-benefit ratios and use these for ranking the roads. The IRAP recommended cost-benefit ratio is:

$$\frac{\text{Total Cost of the Road}}{\text{Population Served} \times \text{Economic Benefits}}$$

The procedure under this activity consists of 6 different steps:

Step 3B1: List all Rural Road Links for Rehabilitation and New Construction

Planners should list all rural road links in their districts that passed the screening test and are identified to be rehabilitated or constructed. The end result of this step is that participants come up with two lists of roads for one for **rehabilitation** and one for **new construction**. These two groups of candidate road links should be evaluated separately and links should be prioritized within the two different groups.

Step 3B2: Estimate the Total Cost of Rehabilitation/New Construction:

¹⁶ see Issue Paper 2

In case the total rehabilitation or construction costs for each road link are known it is no longer necessary to estimate total costs. If, which is more likely, the total rehabilitation or construction costs are not known, we use a cost estimate based on past experience. In Lao PDR the following data is used:

<u>Roads</u>		
Cost Estimates for Rural Roads in Lao PDR		
Terrain	Rehabilitation	New Construction
Flat	7,500 USD/km	10,000 USD/km
Rolling	10,000 USD/km	15,000 USD/km
Mountainous	12,500 USD/km	20,000 USD/km

<u>Bridges</u>	
The following figures for bridges with wooden decks and steel beams are used:	
With concrete abutments	\$6,000 per meter
Masonry abutments	\$4,000 per meter
Timber abutments	\$3,500 per meter
Irish crossing (4 meter wide)	\$ 750 per meter

Step 3B3: Estimate the Number of People Within the Area of Influence:

To estimate the total number of people served, in Lao PDR, IRAP planners use a 5 kilometer radius as the area of influence. After having identified the villages within the area of influence they calculate the total number of households that are living within this 5 kilometer radius of the road. Villages and households that are separated from the road by a mountain or river and the villages and households that would use another road are taken out.

Step 3B4: Estimate the Socio-Economic Impact Within the Area of Influence:

This step is more complex and requires more analytical work. As discussed earlier in this paper, road improvements are likely to have an impact on the socio-economic development of an area and the quality of life of the population served.

Road improvements could lead to an increased agricultural production in an area because markets are more accessible or traders will come to visit rural communities and start buying their produce. Extension workers and veterinarians may follow the improvements in the road network. Road improvements could affect the accessibility to social services both through an improved level of transport service (from walking to riding or from high-cost unreliable service to cheaper and reliable

service) to existing hospitals and secondary schools. Road improvements could also result in the construction of health centers and upgrading of medical services in an area.

To assess the possible impact of a road improvement project the above mentioned and other benefits need to be valued. This is a difficult task and to facilitate the valuation of possible socio-economic benefits, IRAP recommends the use of a scoring system. Points are assigned to each individual candidate road link according an assessment of potential socio-economic benefits. The total points for each road are related to the population served and the improvement costs for ranking purposes. The top priorities, depending on the available levels of funding, are then recommended, after a technical and environmental assessment, for implementation.

The following are amongst the criteria IRAP recommends to be used for assessing the road's benefits:

- Level of isolation. The poorer the existing access, the higher will be the impact of the road. Providing first time access usually induces rapid changes. Roads providing improved access to communities without or with very difficult, dry season only, road access should have high priority.
- Area of Influence (AoI). The larger the population served, the higher the priority.
- The economic potential of the AoI. Improved access to markets will encourage people to produce more goods to sell and will stimulate traders to visit villages. By improving access, the people may be encouraged to use their idle resources and increase production of agricultural and non-agricultural items. The greater the volume of potential new production and marketable surplus, the higher the priority.
- The level of social and economic services. Improved access can extend these services to formerly isolated communities.

Some criteria may be in conflict with others, some are more important than others. It is therefore important that local people including politicians, planners and extension workers are fully involved in the weighting of benefits.

The following table identifies potential socio-economic impacts of rural roads and is used in the IRAP prioritization process in Lao PDR:

Rural Roads	
Indicator 1: Agriculture Potential	
1	The Area Around the Road has a Low Agricultural Potential (if the road is improved or constructed the agriculture production and marketing of products will not change much).
3	The Area Around the Road has a Medium Agricultural Potential (if the road is improved or constructed the agriculture production and marketing of products will increase).
5	The Area Around the Road has a High Agricultural Potential (if the road is improved or constructed the agriculture production and marketing of products will increase a lot).
Indicator 2: Other Non-Agriculture Potential	
1	The Area Around the Road has a Low Non-Agricultural Potential (if the road is improved or constructed the non-agriculture production and marketing of products will not change much).
3	The Area Around the Road has a Medium Non-Agricultural Potential (if the road is improved or constructed the non-agriculture production and marketing of products will increase).
5	The Area Around the Road has a High Non-Agricultural Potential (if the road is improved or constructed the non-agriculture production and marketing of products will increase a lot).
Indicator 3: Existing Health Services Used by Population	
1	Health Services are Nearby (nearest hospital is less than 2 hours travel)
3	Health Services are an Average Distance Away (nearest hospital is less than 5 hours travel)
5	Health Services are Far Away (nearest hospital is more than 5 hours travel)
Indicator 4: Primary School Attendance	
1	Most Children in the Area Around the Road Go to School (average more than 2 pupils per household) ¹⁷
3	Some Children in the Area Around the Road Do Go To School (average between 1 and 2 pupils per household)
5	Only few children in the Area Around the Road Do Go to School (average less than 1 child per household)

¹⁷ Total Number of Pupils in the Area of Influence / Total Number of Households in the Area of Influence

Indicator 5: Secondary School Attendance	
1	Most Children in the Area Around the Road Go to Secondary School (average more than 7 per village)
3	Some Children in the Area Around the Road Go to Secondary School (average between 2 and 7 per village)
5	Only Very Few Children in the Area Around the Road Go to Secondary School (average less than 2 per village)
Indicator 6: Present Access to the District Center	
1	Good (district center is within an average of 2 hours travel from the villages along the road)
3	Fair (district center is between an average of 2 to 5 hours travel from the villages along the road)
5	Bad (district center, on the average, is more than 5 hours travel away from the villages along the road)
Indicator 7: Present Access to the Markets	
1	Good (main market is within an average of 2 hours travel from the villages along the road)
3	Fair (main market is between an average of 2 to 5 hours travel from the villages along the road)
5	Bad (main market, on the average, is more than 5 hours travel away from the villages along the road)
Indicator 8: Water Supply in the Area	
1	Good (most villages have improved water supplies)
3	Fair (only few villages have improved water supplies)
5	Bad (none of the villages has an improved water supply)
Indicator 9: Road Condition before Improvement	
1	Existing Road is in Fair Condition (trafficable during most of the year)
3	Existing Road is in Bad Condition (trafficable less than 6 months per year)
5	No Existing Road or Road is Never Trafficable
Indicator 10: Road Condition as Community Problem	
1	No Problem (most villages identified road access as no problem)
3	Minor Problem (most villages identified road access as a minor problem)
5	Very Big Problem (most villages identified road access as a big problem)

Indicator 11: Road Condition as Community Priority	
1	No Priority (few or none of the villages identify road improvement/construction as a priority)
3	Medium Priority (many villages identify road improvement/construction as a second or third priority)
5	High Priority (many villages identify road improvement/construction as a first priority)

Each of the factors identified in the table above is rated (scaled) into three levels. The three levels for “Agriculture Potential”, for example, are “high”, “medium” and “low” which receive different scores respectively “5”, “3”, “1”. Each of the factors will be assigned a different weight and to calculate the number of points (score) per factor it is necessary to multiply the rating per factor with the weight of the factor. The indicator for socio-economic benefit is the sum of the points (total score) for all factors.

Local politicians, planners and other technical experts decide on the different weights themselves. Not all benefit factors are equally important. Some benefits may be more important than others. Different benefit factors should therefore have different **weights**. Planners, politicians and other experts, as a group, decide on the different weights of the different benefits. Initially individual participants assign different weights to the different benefits based on their own preferences and perceived importance. A form is circulated, see example below, on which the individual participants can indicate how important they think each specific benefit factor is in prioritizing rural road links for rehabilitation and new construction. Participants have hereby a choice of 5 options:

- 5 = Very important benefit
- 4 = Fairly important benefit
- 3 = Medium important benefit
- 2 = Little important benefit
- 1 = Not important benefit

Weights	Very Important (5 points)	Fairly Important (4 points)	Medium Important (3 points)	Little Important (2 points)	Not Important (1 point)
	<i>tick your preference (0)</i>				
Agriculture Potential					
Other Non-Agriculture Potential					
Existing Health Services Used by Population					
Primary School Attendance					
Secondary School Attendance					
Present Access to District Center					
Present Access to Markets					
Water Supply in the Area					
Road Condition before Rehabilitation/Construction					
Road Condition as Community Problem					
Road Condition as Community Priority					

Each person fills out one form and after receiving a critical number of responses¹⁸, the average number of points of the entire group are calculated. These average number of points will become the weights of the different benefits (an example is shown below):

Weights	Average Number of Points = Weight of Indicator
Agriculture Potential	4.9
Other Non-Agriculture Potential	3.1
Present Access to District Center	2.1
Existing Health Services Used by Population	3.4
Primary School Attendance	2.5
Secondary School Attendance	2.9
Present Access to Markets	4.5
Water Supply in the Area	1.5
Road Condition before Rehabilitation/Construction	4.1
Road Condition as Community Problem	3.8
Road Condition as Community Priority	4.6

Once the benefits and their weights are known it is possible to calculate the benefits points for each road. The following formula is used hereby:

$$\sum_{B=1}^{11} \text{Indicator} * \text{Weight} = \text{Benefits}$$

Step 3B5: Calculate the Cost/Benefit Ratio:

Once the construction or rehabilitation costs, the population served and the socio-economic benefits are known it is possible to calculate the cost/benefit ratios introduced earlier. It is necessary to calculate ratios for all rural roads proposed for rehabilitation or new construction. An example is given below:

<u>Road Link</u>	Costs	Population Served	Benefits	<u>Total Costs</u> Population * Benefits
	(a)	(b)	(c)	(a/(b*c))
A-G	90,000	1050	125	0.7
B-K	50,000	860	106	0.5
L-M	35,000	1800	128	0.2
N-T	28,000	450	75	0.8

Step 3B6: Prioritize the Rural Roads:

Different roads serve different areas with different economic potential (agriculture, tourism, industry, mining etc.) Roads can not be ranked by only looking at the number of people served. The best road candidates are obviously roads that serve a relatively large number of people and serve an area with a relatively large socio-economic potential. Priority roads are roads that have the largest impact per investment unit or with other

¹⁸ It is recommended to have at least 30 different opinions

words: **roads that have the lowest investment cost per person served weighted with the socio-economic benefit.** Since the cost/benefit ratio we are using:

$$\frac{\text{Total Cost of Road Rehabilitation/Construction}}{\text{Population Served} * \text{Socio-economic Benefits}}$$

is relating cost to benefits, we should prioritize roads with the lowest ratio. A lower ratio means that it is less costly to serve a certain amount of people or generate a certain amount of benefits.

If we take the previous example (see table below) we see that road LM clearly deserves the highest priority since the ratio is the lowest (least expensive in terms of benefits). A second priority is road BK. AG is the third priority. The last priority is road NT with the highest ratio (the most expensive for a certain amount of benefits).

Notes:

1. *If the actual rehabilitation/construction cost per road link are known it is recommended that the actual figures are used instead of the cost estimates.*
2. *Sometimes it is necessary to compare networks with each other and re-prioritize certain links. If network A, for example, includes priority link 1 and 3 and if network B includes priority link 2 then priority link 3 in network A could become priority link 2 and priority link 2 in network B could become priority link 3 since it is often costly and time consuming to bring manpower and equipment from one network to the other (see also annex 2).*

IRAP Prioritization versus More Traditional Cost/Benefit Analysis

The economic feasibility of a road construction project is derived from the comparison between economic benefits and economic costs (construction and maintenance) usually calculated over the economic life of the road. Road links that maximize the benefits and minimize the costs are preferred. Before the improvement or construction starts it is advisable to assess the costs and benefits associated with the project. There is a need to identify and quantify the costs and benefits. The nature and level of costs and benefits will primarily depend on the initial condition of the road. Benefits are also related to the importance of the road in terms of its function and the population it serves.

Ideally it would be possible to precisely assess and value the costs and the benefits before any improvement is made in order to select the best feasible candidates. This would even make an impact study unnecessary. Identifying and quantifying the benefits however is not an easy task.

Donors nevertheless often demand an estimation of the economic returns to road investments. Two basic approaches to assessing the benefits of a road are (a) **consumers' surplus** and (b) **producers' surplus**. The former assesses benefits to the users of the road. For existing road use, benefits are represented by the lower costs of providing transport as a result of the road improvement. Benefits are also attributed to the additional traffic which may be generated by the lower cost of the road. The producers' surplus measures the effect of better and lower cost transport on increased production.

For roads with little or no traffic the consumers' surplus can not be applied. The producers' surplus is full of methodological weaknesses and is not recommended for rural roads. Some economic underpinning/justification is necessary however. The solution is to use a surrogate indicator. IRAP is using three proxies: (a) **population density**, (b) **a point score** and (c) **a cost estimate** to rank rural road improvement candidates and select priorities.

The objective of IRAP is to improve rural accessibility for a maximum number of people at minimum cost. The use of **population density** could therefore be a proxy for the consumers' surplus approach. By selecting roads in areas with larger number of people the benefits of lower cost transport are likely to be larger in that more people are likely to use the road and more trips are generated. Roads provide access to markets, health facilities and Government services. Also it facilitates extension services to reach the people and consumables to be transported more easily. On all these grounds, areas of higher population density should have a higher priority than those of lower density.

The effect of road improvement on the local economy is difficult to predict. The extent to which the local economy adjacent to the proposed road will benefit from the investment is dependent on its economic potential. IRAP has developed a ranking/prioritizing procedure, **a point score system**, based on social and economic criteria which it considers acceptable for the first stage of network planning. Scores are used to compare different candidates. A certain score is however not an economic justification for project investment as such.

Step 3C. Technical and Environmental Impact Assessment

Technical Assessment

One of the last activities to confirm the priorities for rehabilitation or new construction is the technical assessment. Engineers will have to visually inspect the priority routes to assess the technical feasibility of rehabilitation/new construction and to undertake a detailed road inventory to better assess the road conditions and the resources required to improve different road links to new standards providing improved access.

After the prioritized roads have been surveyed it is necessary to recalculate the cost-benefit ratios based on the more precise cost data and, if necessary, re-prioritize the top priorities.

The technical assessment should follow the guidelines developed by LSRSP¹⁹. An engineering report should be prepared following the outline below (an example is annexed to this report):

1. Summary of Existing Road/Track Condition
 - 1.1 General
 - 1.2 Terrain categories
 - 1.3 Geometric standards
 - 1.4 Materials
 - 1.5 Bridges and other drainage facilities
2. Outline Design
 - 2.1 Alignment location
 - 2.2 Design standards
 - 2.3 Earthworks
 - 2.4 Pavement
 - 2.5 Bridges and other drainage facilities
3. Options
 - 3.1 Road construction
 - 3.2 Bridges
4. Quantity and Cost Estimates
 - 4.1 Estimation of quantities
 - 4.2 Cost estimate
5. Implementation Arrangements

Environmental Impact Assessment

Selected roads should be required to comply with procedures for environmental approval. The last activity would require a brief report that adequately considers the potential environmental impacts of the proposed roads. Again, it is recommended to follow the guidelines developed by the LSRSP programme²⁰.

¹⁹ See for example chapter 6 of the “Project Profile for Pak Eum-M. Doy Road in Luang Prabang Province” prepared by Lao Montgomery Watson Ltd (1998) following the LSRSP guidelines.

²⁰ See for example chapter 5 of the “Project Profile for Pak Eum-M. Doy Road in Luang Prabang Province” prepared by Lao Montgomery Watson Ltd (1998) following the LSRSP guidelines.

The proposed environmental impact report should assess impact on:

- **Agricultural Production**
 1. Loss of fields
 2. Risk of erosion
- **Settlements Areas**
 1. Relocation of houses
 2. Danger from traffic
 3. Increased dust levels
- **Forest Cover**
 1. Risk of logging
 2. Impact from change of land use
- **Non-timber Forest Products**
- **Wildlife Habitats**
- **Water Resources**
 1. Flooding
 2. Impact on drinking water (sediments)

After the environmental issues have been identified a mitigation plan needs to be prepared to identify measures to limit negative environmental impacts. The extent to which a road network improvement project will or will not significantly affect the environment should form the basis for a decision whether it is environmentally acceptable to improve the proposed route. In case priority road links do not pass this test they may finally “drop out”.

➤ **Step 4: Preparation Road Improvement Plan**

After road candidates have been identified and prioritized it is necessary to synthesize the different results and to prepare an action plan to improve the rural road network in a given area. This plan should contain a socio-economic analysis of the area, the road analysis/inventory data, information on individual road links, improvement costs, lists of priorities and a strategy for maintenance.

A possible outline is as follows:

Part One: Introduction – *describing the importance and function of rural roads*
 Prioritization Procedures – *introducing the applied prioritization techniques*
 Maintenance – *addressing the maintenance issues*

Part Two: General Characteristics – *describing the socio-economic circumstances in the area including data on the road network*
 Road Network Priorities – *identifying the priority road links, the costs of the projects and a consolidation of priorities*
 Maintenance of the Rural Road Network – *identifying the total maintenance requirements*

Annexes

Road Network Statistics
 Road Key Maps
 Individual Road Link Data Sheets

The purpose of the action plan is to provide the province with the basis for identifying the road priorities and the resources required in order to more effectively allocate domestic resources and to request specific additional funding from the donor community.

The plan will consider two “levels of roads”: the main rural road network providing access to district centers and strategically important villages and the secondary rural road network representing a second priority after the main rural road network.

Step 5: Design / Project Preparation

The “action plan for improving the rural road network” contains the initial priorities for rural road projects including their cost estimates. Before any physical works can be undertaken however it is necessary to undertake a more detailed survey and design the new or improved road. This is no longer a planning task but an engineering task and should be left with local engineers.

Resources for improving access are limited and call for serious efforts to develop low-cost rural roads. Since resources are limited and labour is often available during certain times of the year, road improvement works should provide maximum employment to local people. Technology choice is critical in this process. In designing the road it is important to consider the “most appropriate” technology taking into account the different parameters. Improving roads using **labour-based technology** should always be viewed as an option if foreign exchange resources are scarce and local wages are low as in the case of Lao P.D.R..²¹.

If sufficient labour-supply exists in the areas and if construction equipment is absent one should seriously consider applying labour-based techniques²².

The Lao Government, with ILO assistance, has been testing the use of labour-based methods since the late eighties. In general, the different projects have been successful confirming that labour-based techniques are technically and economically viable in the country.

²¹ See “Employment-Intensive Infrastructure Programmes: Labour policies and practices – David Tajgman and Jan de Veen (ILO 1998).

²² For more details see “ strategy document for a labour-based road works programme in Lao P.D.R. - Bjørn Johannesson (1997)

Labour-based programmes should not be confused with labour-intensive programmes. Inasmuch labour-based programmes seek to develop an optimum mix of labour and capital, labour-intensive programmes pursue a strategy of employment maximization.

The following table describes the main differences between the two approaches²³:

Table 3 : Key Differences Between Labour-Intensive and Labour-based Methods

	Labour-intensive	Labour-based
Employment:	Maximum	Optimum
Quality (compared to results obtained with heavy equipment):	Generally lower	Comparable or better
Cost (compared to results obtained with heavy equipment):	Generally expensive in relation to quality	Same or lower
Productivity:	Generally low	High
Modern management (systems, procedures, training):	Not normally of great concern	Essential at all levels
Equipment and tools (good quality, well designed handtools and complementary light equipment):	Generally not available	Essential (main means to obtain high productivity and good quality)
Private sector involvement:	Usually not	Increasing rapidly
Project justification:	Employment main consideration	Socio-economic impact and sustainability
Quality of employment (working conditions, labour standards):	Generally not addressed	Important (essential for large-scale, nationwide application)

In designing the road engineers should pay attention to the function of the road and expected traffic densities. It is of no use to design a two-lane paved highway in areas where the average daily traffic volumes do not exceed 25 vehicles a day.

Characteristics of Low-Cost Rural Roads include:

- Designed for limited number of vehicles a day
- Maximum use of local materials and local labour
- Most of the construction costs go to labour
- No use of heavy equipment
- Participatory organisation to manage maintenance

Steps 6, 7 and 8

Planners and engineers do not decide which roads will be built first. They are technicians and provide technical advice, in our case, based on the IRAP process. The final **funding decision** is made higher up by politicians, department chiefs and representatives of

²³ Jan de Veen in “responding to the Asian Crisis – The report on the inaugural regional planning workshop of ASIST – Asia Pacific – ILO Bangkok

international organizations. They may or they may not follow the recommendations made.

Once approved, roads will be **rehabilitated** or **constructed** by the local departments, private contractors or communities.

Roads are built for people and local people should be involved during the planning, design and implementation phase. There should be a serious concern with **community participation** and an involvement of the communities within the area of influence should start right at the beginning of the road development process.

Step 9: Evaluation / Impact Assessment

An impact assessment aims at appraising to what extent improved road links have led to changes in the area of influence. It evaluates the inter-linkages between the improvements of a road network on one hand, and on the other hand, life and livelihoods in local communities. Impact studies often require sophisticated surveys to collect qualitative and quantitative data necessary to measure changes.

There are 2 different surveys associated with the evaluation of a road project. A **baseline survey**, consisting of a village level survey, a household survey, traffic counts, an origin-destination survey and a market survey, carried out before the implementation of the project (step 1) and the **impact survey**, consisting of the same tools as the baseline survey, carried out when the project is finished. Impact studies can be carried out as soon as a road project is finished and at a later stage, perhaps 3 to 5 years after completion. The different survey instruments are discussed under step 1.

The impact survey, in addition, should collect **quantitative and qualitative data**. Questions should be asked regarding the socio-economic situation before road improvement or construction, the present situation and the envisioned future development of the area.

Impact evaluations are important in that they provide **feedback** to the planning process. Roads are built to improve mobility of people and to facilitate transport of goods. Do the benefits of the project justify the resources spent. If yes, this could lead to an increased allocation of resources. If no, it will be possible to identify alternative options that may improve accessibility.

Rural roads have low traffic volumes and, in Lao PDR, are generally constructed with gravel surfaces. For these roads, the economic justification for investment rests mainly on the expected impact on social and agricultural development. This has to be measured if an evaluation has to be done. Evaluators could make use of the following indicators to find out what the possible impact has been. The indicators are based on general, worldwide, experience of the results of rural road improvements.

Most rural families in Laos are subsistence households or just moving away from subsistence. Many rural households barely produce enough rice to be self-sufficient. Roads will not, in first instance, lead to significant increases in production and income. Roads, however, remain necessary for social and economic development since they provide better access to social and Government services and do lay the groundwork for further development.

It is important to differentiate between direct and indirect impacts.

Positive impacts

Direct

- Road improvements create opportunities for increased travel. Indicators: people travel more often than before; increasing traffic volumes; an expansion in the number of vehicles in the area; a growth in transport services; more people visiting the area
- With an improved road, vehicles can travel faster, cheaper and more easily on the road. Indicators: a decrease in the cost of transportation (lower transport fares); less damage to the vehicles and freight; more regular and frequent transport service; reduced travel times, people travel farther.
- Labour-based roads create employment and generate income: Indicators: increased consumption; increased (short-term) income; an increase in agriculture and domestic investments

Indirect

- Road improvements encourage agriculture production. Indicators: farmers grow more and/or different crops; an increase in crop prices; a rise in farm income; an increase in transport of agricultural goods; increase in the use of hand-tractors; increase in visits by extension workers
- Road improvements encourage non-agricultural production. Indicators: an increase in the number of small scale industrial or service establishments; an expansion of the existing industry or service sector; a rise in non-farm income; an increase in transport of non-agricultural goods
- Road improvements facilitate the marketing of local products. Indicators: petty traders visit the villages more regularly; an increase in the production of cash crops;

an increase in cottage industry production for the market; an increase in “selling” trips to the market

- Road improvements change consumption patterns. Indicators: new goods are being used; there are observable changes in consumption patterns as a result of increased travel and trading
- Road improvements improve accessibility to basic goods and services for the rural people in the influence area. Indicators: the number of shops has increased, there are more health facilities in the villages; doctors and nurses visit more often; teachers have come to live in the communities; agricultural extension agents and veterinarians visit more frequent.
- Road improvements improve access to information and bring in new technology. Indicators: farmers have adopted new technology, there is an increase in the number of rice mills; more people are using hand-tractors; people have invested in road-related services such as bicycle repair shops etc.;
- Road improvements have made the area more attractive and has brought in-migration. Indicators: there has been an in-migration of new families; land values adjacent to the new road have risen; the number of landless people and people with very small holdings has increased.
- Road improvements induce the development of other (infrastructure) projects. Indicators: small irrigation systems have been developed; schools and/or health centers have been built; water supplies have been improved; NGOs have come to work in the area;

Not all villages in the area of influence will benefit equally. It is necessary to find out whether changes occur in all villages in an influence area or that they are unevenly distributed in favour of the villages along the road.

A Sida financed study concluded that as a result of a major highway project “*Few changes have occurred in villages without access roads even though they are only some kilometers from the main road (Håkangård 1992)*”

Also within a village there is a bias and not all families benefit equally from road improvements. The possible changes and improvements pointed out above do not imply that the welfare of all people in the area of influence has increased. Usually better-off families benefit disproportionately and poor families benefit less or do not benefit at all. This could actually mean that the gap between poor and wealthy families increases.

Negative impacts:

Negative impacts are a cost to the individuals and to the society as a whole. Negative impacts of rural road projects could include:

- New roads will “consume” land. Indicators: a reduction in available arable or residential area
- An increased pressure on natural resources. Indicators: increase in logging, reduction in income from non-timber forest products, disappearance of wildlife
- Speculation and increasing land prices due to a lack of land resulting from in-migration. Indicators: increasing land prices; immigration
- Accidents with people and animals with the increase in traffic and speed. Indicators: an increase in the number of accidents
- Changes in culture and tradition; Indicators: a change in culture and tradition
- Dust and pollution; Indicators: increased dust levels and respiratory diseases; an increase in garbage

It is important to realize that not all that glitters is gold. An evaluation of rural roads in Nepal recently showed that: *“The significant common experience with road building in Nepal has been their high costs per kilometre, exceedingly lengthy periods of construction, significant maintenance costs, considerable flood damage every four to five years or so, frequent landslides, and relatively limited economic impact along the road corridors²⁴”*

The impact of projects that will improve or upgrade existing roads will be relatively modest in comparison with projects that will construct new roads and open up new areas. This does not imply that the benefits associated with road improvement projects are by definition small. If road improvement projects induce other complementary investments in the agricultural, water, education and /or health sectors than the combined effect could be substantial. IRAP advocates therefore an integrated approach towards rural infrastructure planning.

In order to be able to measure the impact, as prior discussed, it is necessary to collect data before and after the proposed road project. The indicators presented above could be used

²⁴ ICIMOD (1997)

to hypothesize the possible impact and define an appropriate means for collecting the information required to test the hypotheses²⁵.

²⁵ See Laurent Mercat (1998)

Maintenance

Maintaining the roads costs only a fraction of the construction cost however it is often not being done. One of the reasons is that very often maintenance costs are not included in the provincial budgets as an annual expenditure but as a single time capital investment in projects. Along with this, because of the very limited funds available, often, the maintenance funds that might be available are used to make emergency repairs and not to routinely maintain the roads. Consequently, maintenance of the infrastructure is neither perceived nor implemented as a continuing activity. Maintenance however should be continued on an annual basis otherwise it is of little value.

At present the road network in Lao PDR is in bad shape. Almost all provincial and rural roads need to be rehabilitated first before routine and periodic maintenance makes sense at all. It is therefore recommended, as discussed in the previous chapter, that the Government adopts a strategy in which **rehabilitation of a core network** becomes the top priority. New construction of additional road links should only take place after a proper system for maintaining the rehabilitated network has been developed and is effectively implemented. Therefore IRAP recommends:

- | | |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| first priority: | To develop and implement a proper maintenance system and maintain the roads that are already in a maintainable condition (routine and periodic maintenance); |
| second priority: | To identify a core road network, rehabilitate road links which have fallen into disrepair and bring the core road network in a maintainable condition; |
| third priority: | To construct new road links and extent the network. |

A basic rule is to protect previous investments. Maintain first what you've got already before adding any additional links and therefore increasing maintenance requirements.

For comparison ILO’s Labour-based training manual recommends²⁶:

1. First, provide routine maintenance to the sections of the network which is in good and maintainable condition. “Good” condition is regarded as when the road section requires a minimum of routine maintenance, which can be provided through a lengthman system.
2. Secondly, provide spot improvements and periodic maintenance to halt the deterioration of road sections in fair condition, thereby upgrading them to a maintainable condition.
3. Thirdly, rehabilitate existing roads which have fallen into total disrepair.
4. Once the three activities above have been secured, including regular maintenance for the newly upgraded road sections, one should be looking into new construction and expanding the road network. Once again, new projects should only be accepted when sufficient maintenance resources are available or can be secured when the construction of the new roads have been completed.

Once a core network is rehabilitated to all-weather standard it is critical to allocate sufficient resources to **maintain this rehabilitated network**. Again, the key to developing a sustainable all-weather road network is the proper maintenance of the roads. If the improved road network exceeds the size of a network that possibly can be maintained with the available resources it is likely that the entire network gradually deteriorates.

It would be better for the provincial governments in Lao PDR at present to sustain a limited improved **core network** that can be maintained than trying to develop a larger road network without the capacity to maintain this. In many provinces it seems illogical to invest in new road construction or road improvements as the lack of subsequent routine and periodic maintenance would result in a certain deterioration of the improved network.

Local authorities should carefully plan and budget for their maintenance requirements. To minimize the use of scarce resources and to maximize the use of locally available resources the authorities may opt to adopt a system of **labour-based maintenance and**

²⁶ Björn Johannesson (1997)

self help. An added advantage is that during labour-based construction the local population develops skills and experiences for future maintenance.

A good example is Oudomxai province in Lao PDR where villagers were paid 75,000 kip²⁷ per kilometer of road to maintain. Prior to their responsibility villagers were trained in labour-based methods and received simple tools to carry out their maintenance tasks.

A strategy document prepared for the Lao Government by ILO concludes:

“Road maintenance, whether periodic or routine, is an activity which lends itself to labour-based methods. There are a whole variety of systems, from the simple lengthman system for routine maintenance to small contractors with simple equipment for periodic maintenance, which can be used. The basic concept, however, is that maintenance is an activity which must involve the local communities to the fullest extent possible. For it is clear that even in the long term the Government is not going to have sufficient financial resources to pursue a policy of equipment-based maintenance.

In general, it is proposed that routine maintenance of low volume laterite surfaced roads is most easily and effectively done by labour-based methods, using hand tools only. This labour component (lengthman) could be fully organised and paid under a contract to the DCTPCs²⁸. Periodic maintenance would need to be organised under a contract system, the works carried out by small-scale private contractors (with a limited amount of equipment), and supervised and managed by staff of the DCTPCs. (Johannessen 1996)”.

Maintenance costs only a fraction of the initial investment. The annual cost of routine maintenance in Laos is estimated at USD 500 per kilometer including supervision and inspection costs:

<i>routine maintenance</i>	<i>USD 100 / km / year</i>
<i>regravel every 5 years at USD 2000 per kilometer</i>	<i>USD 400 / km / year</i>
<i>Total</i>	<i>USD 500/ km / year</i>

In order to maintain X kilometers of rural road the provincial Governments will have to set aside X times 500 US Dollars annually. Obviously, if more rural roads are brought into maintainable condition this sum will increase.

²⁷ Approximately USD 75 (1996)

²⁸ Department of Communication, Transport, Post and Construction

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