RATP 14

Philippines Infrastructure for Rural Productivity Enhancement

Tools for Identifying Rural Infrastructure Investment Priorities

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Acknowledgement

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Foreword

Advisory Support, Information Services and Training in Asia-Pacific (ASIST AP) is a regional programme under the Employment Intensive Investment Branch of the International Labour Organization (ILO). The goal of the ASIST AP programme is to improve access of the population to income earning opportunities and to economic and social goods and services through the effective provision of rural infrastructure.

The programme is providing technical advice to a number of countries in the region on local resource-based approaches to infrastructure development. The programme is also providing training and capacity building for planners, technicians and project field staff on various technical issues related to rural infrastructure development. In the Philippines, ASIST AP and ILO have been involved in sustainable rural infrastructure development for many years.

One of the main outputs of this work has been the development and nation-wide implementation of the Integrated Rural Accessibility Planning (IRAP), a local level planning procedure for improving rural access. This procedure includes a set of planning tools for use at the municipal level to - in a participatory manner - identify local investment priorities based on the real access needs of the local people. The IRAP tools have been described in several publications. [1]

The Department of Agriculture (DA) of the Philippines and ILO expressed interest to co-operate in developing and implementing local level planning tools based on IRAP and introducing labour-based technology in the context of the Asian Development Bank (ADB) supported Infrastructure for Productivity Enhancement Sector Project (InfRES). The collaboration stems from the common objective to address poverty alleviation by strengthening local level infrastructure planning and applying labour-based technology in construction and maintenance.

The co-operation agreement (2003-2006) includes the use of existing IRAP outputs, updated where necessary, to guide the Local Government Units (LGUs) to identify priority areas for interventions on potable water, rural roads and communal irrigation systems. The cooperation also involves the development of a rural access improvement impact evaluation procedure and

the preparation and delivery of training programmes on rural road maintenance planning and organization.

The co-operation has resulted in a number of technical tools to plan for investments in the construction, rehabilitation and maintenance of rural infrastructure. This booklet describes these tools which could equally be used and modified for broader application in the Philippines or elsewhere. By using the tools presented in this booklet, InfRES can increase the impact of its investments on agriculture development, poverty reduction and employment creation.

The authors would like to express their gratitude to Nestor Estoesta, project manager of InfRES, for his guidance, support and cooperation during the process of developing and implementing the different tools.

[1] See for example "The IRAP Guidebook - Integrated Rural Accessibility Planning for Local Governments - ILO Manila 2002".

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Introduction

Agriculture, Infrastructure and Poverty in the Philippines

Agriculture dominates the economy of the Philippines. Even the manufacturing sector largely depends on agriculture for its raw materials. Agriculture accounts for 20% of gross domestic product and more than 20% of total export earnings. It accommodate 36% of the labour force. The performance of the agricultural sector however is poor and is holding back national economic growth.

Over 40% of rural families in the Philippines live in poverty. Recent data shows that the absolute number of poor people in the country is increasing. Despite growth in gross domestic product, it seems that the average real family income is falling. A major cause of poverty in the country is the underperforming agricultural sector, where a substantial number of the rural poor are engaged in subsistence production. The income earning potential of farming families is often constrained by a low agricultural output and lack of alternative sources of earnings.

A recent ADB study shows that "income poverty in the Philippines is a dynamic phenomenon: people move in and out of poverty over time. A first attempt to gauge chronic and transient poverty found that over a 3-year period about one fifth of the surveyed households were chronically poor (e.g., they were poor in each of three observations), whereas nearly one third of the households moved into and out of poverty during the period. Transient poverty can be addressed through improved social safety nets that cushion families against temporary shocks. Examples include conditional cash transfers and labor-intensive public works programs (ADB 2005)". The poorest regions in the country are the Autonomous Region of Muslim Mindanao (ARMM), Bicol and Central Mindanao.

Infrastructure is an important element in agricultural production as it lowers costs of inputs, enlarges markets and facilitates trade. It raises the productivity of factors of production resulting in increased agricultural production and productivity.

Infrastructure development supports agricultural growth upon which much poverty reduction efforts depend. Infrastructure also directly impacts on poverty through improved access to facilities, goods and services.

A principle constraint that many poor farmers in the Philippines face in becoming more productive and profitable is the lack of adequate infrastructure, particularly rural roads and irrigation. The country has low levels of infrastructure expenditure, as low as 2.8% of GDP in 2002. This lack of infrastructure limits the access of people to basic agricultural inputs, transport and storage facilities and results in difficulties to access markets. Getting the goods to the market is a key to rural development.

ADB and World Bank reports show that the provision of all-weather rural roads could reduce the cost of marketing agricultural outputs by 15-20 percent. Only 43 percent of potentially irrigable land is irrigated which constraints productivity. About 30 percent of the rural population currently lacks access to safe drinking water.

InfRES

The Government recognizes the need to improve the agriculture sector and improve productivity and profitability. ADB is supporting the Government by co-financing the Infrastructure for Rural Productivity Enhancement Sector Project (InfRES) which aims to remove constraints to agricultural productivity by investing in rural infrastructure. The InfRES project stimulates agriculture in traditionally neglected areas with high agricultural potential.

InfRES has the dual objective of improving agriculture productivity and reducing poverty. The trust of InfRES is to remove constraints to increasing agriculture productivity and profitability in areas where there is potential for substantially enhanced productivity with pro-poor distributional effects. This is based on the premise that improving rural infrastructure is a main ingredient in achieving agricultural development and poverty reduction.

InfRES provides three types of infrastructure: access infrastructure (mainly rural roads), communal irrigation systems and potable water supplies. The selection of sub-projects is driven by the needs and demands of communities that lack the infrastructure essential for them to realize the productive potential of their land.

Rural Roads

The total road network in the Philippines is about 199,000 kilometres. The average road density is 0.67 kilometre/square kilometre. Only about 14% of the road network in the Philippines is paved. Gravel roads make up about 78% of the total network. The rest are earthen roads.

The condition of the rural road network in the Philippines is poor. About half of the rural villages in the country lack all-weather access to the main transport system. The majority of the existing village roads are in such a poor condition that they need to be rehabilitated first before they can be maintained.

The inadequate rural road network is one of the main constraints poor farmers face in becoming more productive and profitable as it increases the difficulty and cost of hauling their inputs to the farm and their outputs to the market.

InfRES finances the construction and upgrading of farm-to-market roads, drainage systems and slope protection works.

Small-scale Irrigation

InfRES also rehabilitates and expands communal irrigation schemes. The lack of irrigation facilities where both suitable land and sufficient water is available prevents the land from attaining its full productive and profit potential. Construction and rehabilitation of small irrigation schemes has the potential to increase production and income as it will provide farmers with one additional crop per year. Increased agriculture production will also require additional labour inputs, providing income earning opportunities for landless farmers and casual labourers.

Rural Water Supplies

Only 70% of the poorest households have access to safe drinking water (ADB 2005).

InfRES provides potable water supplies for communities whose present source is either contaminated or far from the habitation. Fetching drinking water takes time. The provision of water supplies will reduce the time spent collecting water and will free up time for other potentially productive activities. InfRES supports the construction of intake boxes at springs, the construction

of reservoir and break pressure tanks, the laying of distribution pipes, installation of tap stands and the drilling of tube wells and provision of hand pumps.

Improved access to water also leads to better health, which may have an additional impact on productivity.

Decentralization and Local Governance

The Philippines has gone through a major decentralization process since 1991. The principal responsibility for the delivery of basic services and the construction, operation and maintenance of facilities in the areas of agriculture, transport and water supply have been devolved to the local government units (LGUs). The transfer of functions was accompanied with a corresponding transfer in personnel and budgets. However, full financial decentralization has yet to be realized.

Decentralization in the Philippines is generally considered successful. As a result, service delivery is becoming more focused on local priorities as it moves project identification and implementation closer to the beneficiaries. Challenges remain, but LGUs are now in a better position to decide on the investment priorities with the active participation of the beneficiaries in the planning, construction and operation of facilities.

A key issue is the low capital expenditure at LGU level due to a lack of financial resources, especially in the poorer class LGUs. Without special grants, many of the poorest municipal LGUs would not be able to invest in local infrastructure. InfRES tries to address this by providing additional resources to these LGUs.

InfRES has fully embraced the principles of decentralization. The project strengthens the decentralization process by making LGUs directly responsible for the identification and implementation of sub-projects. LGUs prepare and submit proposals for sub-projects based on a demand-driven approach to reduce the risk that interventions do not meet the priorities perceived by the communities.

To ensure that LGUs are equipped with adequate institutional and technical capabilities, training will be provided on participatory project planning and implementation, contract supervision and procurement procedures and participatory project benefit monitoring and evaluation. InfRES funds are channeled directly to the LGUs.

InfRES and ILO

To ensure that sub-projects proposed by LGUs reflect the needs and priorities of the beneficiary communities and to enhance the development planning capacity of participating LGUs, InfRES has adopted the Integrated Rural Accessibility Planning (IRAP) process of the ILO. IRAP is a needs-based and multi-sectoral methodology for local level planning that aims to contribute to socio-economic development and poverty reduction by setting up effective planning capacity for improving rural accessibility at the local level.

IRAP has been developed and implemented by the ILO in the Philippines since the early 1990s. IRAP defines accessibility as the ease or difficulty for rural people to satisfy their access-related needs. It provides a set of planning procedures and techniques that cut across sectors and can be used for spatial and infrastructure planning. The procedures and techniques respond to the real access needs of the rural population, which include access to the transport system, potable water supplies, primary health care, education, land, markets, agricultural inputs and income earning opportunities. The IRAP process is described in several guidelines and training documents.

The Department of Agriculture (DA), which is implementing the InfRES project, expressed interest to co-operate with ILO on local level planning (IRAP) during the formulation of the project. The DA and ADB agreed to directly select ILO ASIST AP to provide technical inputs on the development and use of selected IRAP tools for the identification of sub-projects to be funded under InfRES.

It was agreed that ILO would provide technical services to InfRES to assist the LGUs and local beneficiaries to identify priority areas for interventions on potable water supply development and to apply the IRAP road planning procedures. It was also agreed that IRAP tools would not be used for the identification and selection process of communal irrigation facilities.

To ensure that sub-projects will indeed be identified through the IRAP process, InfRES stipulates that candidate LGUs will have to participate in IRAP training before they can submit project proposals for consideration.

This document outlines the different planning tools that have been developed and introduced under InfRES.

Document Structure

This document is structured as follows:

- Chapter 1 outlines the mapping procedures necessary at LGU level for the identification of rural road sub-projects
- Chapter 2 describes the recommended process for the pre-identification of rural water supply sub-projects
- Chapter 3 outlines the recommended procedures for the identification of rural road candidates at municipal level
- Chapter 4 outlines the recommended procedures for the identification of rural road candidates at provincial level
- Chapter 5 sets out a simple methodology for measuring the impact of rural roads
- Chapter 6 explains some guiding principles for maintenance planning and budgeting

References

- Report and Recommendations of the President to the Board of Directors on a Proposed Loan to the Republic of the Philippines for the Infrastructure for Rural Productivity Enhancement Project, ADB Manila, October 2000

- The IRAP Guidebook - Integrated Rural Accessibility Planning for Local Governments, ILO Manila, 2002

- Poverty in the Philippines: Income, Assets and Access, ADB 2005

- Rural Roads Maintenance Study in the Philippines, ILO ASIST AP, 2005

Chapter 1
Accessibility Mapping

About 90% of the sub-projects submitted to InfRES by Local Government Units are rural road projects. These infrastructures should be planned as a part of a road network that links agricultural production areas and its consumer market in rural villages and urban population centers. The first activity to understand such a network is the preparation of an updated road map that shows the extent of the road network and its service area coverage. The IRAP procedure, used extensively in the Philippines, has introduced specific steps to do Accessibility Mapping. The process includes the preparation of a municipal

Accessibility Mapping

Introduction

Accessibility Mapping is a major component of the Integrated Rural Accessibility Planning (IRAP) process. It is a graphical representation of access characteristics in a given area and helps in the identification and prioritization of access problems, facilitates the formulation of interventions, and guides the selection of the best development alternatives.

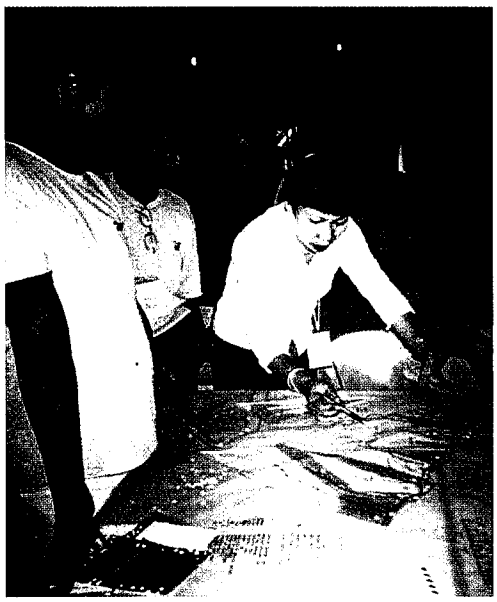
Specifically, Accessibility Maps:

- Show local planners and decision-makers the location of resources, basic service facilities, household concentrations of and how these are connected by the road network;
- Help in the identification and location of access problems and the formulation of interventions and programs of action;
- Facilitate interaction between planners, decision makers and other interest groups during discussion on appropriate plans and programs;
- Help in assessing the impact of access improvement projects and guide future development actions.

Methodology

Accessibility Maps are lifted from the 1:50,000 topographic maps produced by the National Mapping and Resource Information Authority (NAMRIA) and are generally based on aerial photographs compiled during the early 1950s while some maps of selected provinces are based on aerial surveys conducted in the early 1980s. Owing to the period by which these maps were prepared, there is a need to update and reflect information on population centers sites, road networks, service facilities, landforms, vegetative cover, water bodies and channels, and development potentials and constraints.

The Accessibility Maps constitute the basis for rural accessibility analysis. The information contained in the maps is necessary for better appreciation of factors and forces to be considered in plotting the area's development direction.



Accessibility Mapping visualizes levels of access in a particular geographical area. It can show the relationship of a specific service facility and its users. This is achieved by delineating the area of influence of point source service facilities (such as water supply, school, market, health station) and evaluating accessibility levels in terms of number of people affected and the average distance traveled to avail of the service. The catchment (or service) areas of new infrastructure facilities, such as rural roads, could be delineated on these maps, compared and ranked according to their impact using accepted indicators. Such an understanding will favor productive deliberations on access issues and problems and the conceptualization of rational and sensitive development scenarios.

The accessibility maps are prescribed with the following scales:

Provincial Maps 1:200,000
Municipal Maps 1:50,000 or 1:25,000
Barangay Maps 1:10,000

The Process

The general Accessibility Mapping process is illustrated in the diagram on the next page [2].

Step 1: Prepare the accessibility base map of a municipality or a barangay by lifting the needed information from the NAMRIA topographic map. The base map should reflect the following information:

a. Population centers like barangays, sitios and other built-up areas;

b. Major service facilities such as schools, health centers, rice mills, multi-purpose pavements, and other point sources of services;

c. All road links, classification and their existing conditions; and

d. Major drainage channels and water bodies

ACCESSIBILITY MAPPING PROCESS

BASE MAPS PREPARATION	1 :50,000 scale for municipal maps 1:10,000 scale for barangay maps Reflect population centers, road network, water bodies and channels, vegetation, major facilities, etc.
IDENTIFICATION AND LOCATION OF POINT SOURCES OF SERVICE	Identify and locate basic service facilities such schools, health stations, markets, post-harvest facilities, multi-purpose pavements, etc.
DETERMINATION OF AREAS OF INFLUENCE	Using the results of the survey, delineate areas of influence for each basic service facility
EXAMINATION OF ACCESS CONDITIONS WITHIN THE CATCHMENT AREA	Evaluate access conditions as to roads, transport service facilities, number of households affected, finished, on-going and proposed projects that may influence accessibility needs
IDENTIFICATION AND PRIORITIZATION OF ACCESS PROBLEMS	Compare sectoral catchment areas and identify and prioritize access problems
RECOMMENDATION OF APPROPRIATE INTERVENTIONS	Recommend and locate appropriate interventions for each sectoral access needs
IDENTIFICATION OF PRIORITIZED SECTORAL PROJECTS	Consolidate recommended interventions and propose projects to address prioritized access problems

[2] For more details on the IRAP process see "The IRAP Guidebook 2002 - ILO Manila" or "The IRAP Trainor's Manual 2000 - ILO Manila".

Step 2: Identify and plot on the map the facilities that can be considered as point sources of service such as elementary schools, health stations, markets, post-harvest facilities, etc. Indicate the roads either on the base map itself or on a plastic overlay.

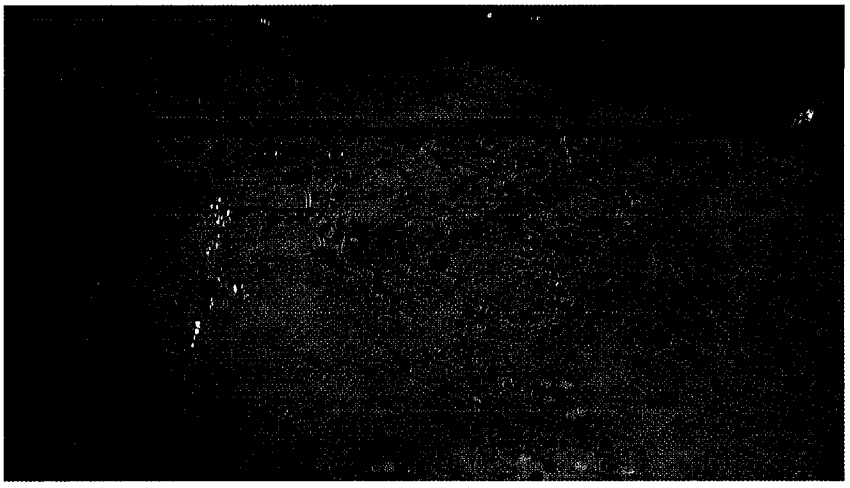
In Steps 1 and 2, the 1:50,000 NAMRIA topographic maps of a municipality are spliced and copied on tracing paper (80/85 grade). The municipal and barangay boundaries should be clearly defined to guide the subsequent application of colors (oil pastel) on the reverse side of the tracing paper. The major road networks are reflected using conventional mapping symbols and representations while the facilities are then plotted and color-coded using luminous color paper cut in small circles with an ordinary office paper puncher. The following information should be reflected on the original 1:50,000 municipal accessibility base map (or 1:10,000 barangay accessibility base map):

a. Administrative boundaries of the municipality, barangays and sitios, and the geographic concentration of households;

b. Point locations of facilities and basic services such as schools, health centers, markets, water supplies, etc; and

c. The road network showing hierarchy of links, lengths, existing conditions and traffic ability.

Information A-C can either be reflected altogether on one base map, or information B and C be indicated on separate transparent plastic and used as overlays on the base map A (see below). Both methods can provide a time-series map of development in a particular area.



Step 3: Identify catchment areas of different service facilities based on the barangay surveys and the planner's familiarity with the territory. To determine the area of influence of rural roads, draw lines at 2 kilometer distance on both sides of the road and consider the area described by these lines as the road's area of influence.

Similar to roads, plastic overlays can be used in delineating other catchment areas. On a plastic overlay on Map A, the sectoral catchment areas for each service facility, i.e. schools, health stations, markets, post-harvest facilities, etc., can be delineated. The size of each catchment area can be determined by looking at:

a. The "Accessibility Data Base", which contains information on household's use of facilities and services;

b. Transport corridors (roads, footpaths, trails, etc.), terrain and other natural features like rivers and mountains that will dictate the directions of the people's movements; and

c. Population concentrations like sitios end barangay centers that form part of the catchment area.

Step 4: Evaluate the access conditions within each catchment area by looking into the: number of people affected; distances to facility; and, existing conditions of road links and transport services.

This activity also enables the planner to identify barangays and sitios that are isolated. For instance, a population center with no road link indicates it is relatively at a disadvantage in availing year-round motorized transport service, thus experiencing difficulty in accessing basic goods and services.

Catchment areas of similar service facilities are studied and evaluated to assess and compare the households' ability to reach and utilize the service facilities provided. Road conditions, existing transport services and distances are also examined. The Accessibility Data Base (ADB) provides this information that can be represented using color coded symbols and form the graphical basis for the evaluation. Typical representations can be: a non-passable road is a heavy red line, or a road passable during dry season only is a broken red line.

Step 5: Rank and compare the sectoral catchment areas.

The household ranking for sectoral catchment areas is based on the computed AIs, or determined by visual inspection of the areas covered and the number of households affected. The graphical interpretation would be: a relatively

bigger catchment area would indicate longer distances traveled to reach a service facility. Deliberations on the selection of the appropriate interventions (Step 6) per sector can commence. It is important that the interventions identified are realistic, practical and will address the immediate access need of the communities.

Step 6: Formulate appropriate interventions to address the identified access needs and indicate diagrammatically on the maps.

For instance, a road link to be given immediate attention is identified and represented on the map, or a site for a new service facility is recognized and delineated and color-coded for easy identification. Symbols and other color-coded representations are used to identify and locate the priority projects on maps or plastic overlays.

Step 7: Integrate all sectoral recommendations to identify and prioritize projects that will address the accessibility needs of the community;

Aside from determining the sectoral interventions to address the access problems, there is also a need to integrate the proposed interventions so that common areas can be identified. Superimposing the sectoral overlays on the base map does this, and while focusing on the sectoral problem areas, determine how improvements in transport infrastructure and/or distribution of facilities will result in improved access.

Understanding the greater benefits to be derived from these common project areas will result in the optimization of the use of meager resources of the local government unit concerned. Redundancy and/or duplication in the projects to be proposed are therefore avoided. The Accessibility Maps will be the integrating mechanism for the sectoral interventions, as these will provide a clear appreciation of location characteristics for better project and site selection decisions.

A matrix to show the relationships of the sectoral catchment areas can also be prepared to guide the integration process.

Step 8: Apply Steps 1-7 to determine accessibility conditions and identify appropriate interventions at barangay level.

Barangay accessibility maps drawn on 1:10,000 scale are used in analyzing accessibility conditions within the barangay including non-point sources of service such as roads, footpaths, trails and fuel wood. The use of a bigger map will provide a higher level of detail as sitio level information is utilized. In addition, water supply source, difficult to present on a municipal map can be clearly shown on a barangay map and help in the selection of the best barangay development option.

Materials

Accessibility mapping and the preparation of presentation materials will not entail considerable strain on the local government budget. These materials are readily available locally and are reasonably priced. The following are needed:

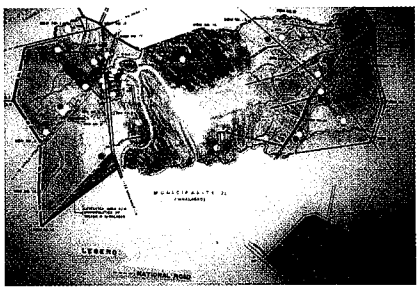
Tracing Paper	one (1) roll No. 80/85
Oil Pastel	one (1) set 12-color (minimum)
Lighter Fluid	one (1) bottle
Cotton	one roll
Technical Pens	Nos. 0.2, 0.3, 0.5, 0.8,1.0,1.2
Color Pens	one (1) set
Mechanical Pencil	one (1) set
Erasers	two (2) pieces
Masking Tape	one (1) roll
Plastic Sheet	four (4) meters
Color Papers	one (1) set fluorescent colors
NAMRIA Maps	one (1) set for a municipality
LeRoy Set	one (1) set (optional)

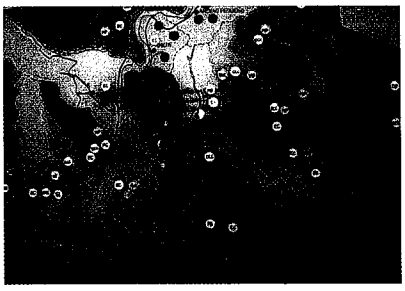
Coloring

Colors are applied on the maps for readability thereby facilitating the delivery of information, findings, and recommendations to decision-makers and other interest groups. Colors to delineate barangays and/or sitios are directly applied on the reverse side of the tracing paper using the oil pastel colors and thinned to erase application strokes using cotton balls with a few drops of lighter fluid. Colors, which go beyond the desired area to be covered, can easily be erased using any ordinary pencil eraser.

Roads and other links can be identified using color pens while the service facilities can be represented using the fluorescent color papers cut with an ordinary office paper puncher.

Labels on the maps can be done either free-hand or with the use of lettering guides or LeRoy Set.





Summary

Rural Accessibility Mapping process, as an integral part of the Integrated Rural Accessibility Planning procedure, is envisaged to facilitate the conceptualization of local level development plans and programs that will address actual people's needs. It has been developed as a "user-friendly" process that can be easily understood even by people without the necessary technical training.

The process utilizes the local planner's familiarity with his area as well as the Accessibility Indicators computed through the use of the IRAP procedure. This information is graphically represented on the base maps and provides the basis for analysis.

By simple inspection, catchment areas are compared and those that cover a relatively wide area exhibit access problems. Some barangays may even fall outside a catchment area. Comparing catchment areas aids in the identification of priority investments. The graphical interpretation of the recommended intervention would be to reduce the area of influence by a strategic location of another facility within the catchment area. If such an intervention is deemed impractical, the alternative would be to enhance the people's mobility by the construction or upgrading of roads, and/or the improvement of transport services and facilities.

The maps produced, using inexpensive materials available locally, are then utilized for conveying the findings and recommendations in a visual form to the local decision makers. This is to enlighten and encourage intelligent deliberations on access issues to reach the best development option for the community. The outputs of this mapping procedure, therefore, will be valuable documents in local level planning.

Accessibility Mapping and InfRES

The ILO implemented a nation-wide IRAP capacity building project in the Philippines during the late 1990s. This project trained local level planners across the country in preparing and using Accessibility Maps. Analyses were undertaken for different sectors including health, education and transports services to identify priority areas for investments at LGU level.

InfRES is primarily concerned with rural roads, small-scale irrigation and rural water supplies. The Accessibility Maps prepared by LGUs will help in the identification of transport bottlenecks that negatively impact on agricultural productivity and profitability. Accessibility Mapping is therefore an

important element for the pre-identification of rural roads to be funded under InfRES. Local level planners need to have a good understanding of their entire road network before they can identify and prioritize investments that will improve the overall performance of the road network.

The ILO is assisting InfRES in providing further training to local level planners at municipal level in preparing, updating and using Accessibility Maps in rural road planning (for more information see chapter 3).

Chapter 2

Identification of Investment Priorities for Improving Rural Water Supply

Access to potable water is a basic requirement. People need to have adequate access to water to fulfill a range of needs. A lack of access to sufficient, year round, potable water may result in health problems and certainly wastes time and effort in collecting water. These factors may have a negative impact on agriculture productivity and profitability. Adequate access to potable water is defined as having an all-year round potable source within 5 minutes walk from the house. The IRAP procedures include tools for the pre-identification of barangays and sitios where improving access to potable water is a priority.

Rural Water Supplies

Introduction

Households in some agricultural rural communities are unable to be as productive as they should be because either some of the household members are unhealthy or sick with water-borne disease caused by drinking contaminated water or a considerable amount of time is spent in fetching water from a distant source. In both cases, time that could have been devoted to productive use is wasted.

In response to the priority placed by rural communities on the provision of safe potable water, InfRES will support the rehabilitation and construction of point sources, communal faucets, springs and tube-wells. In more detail, the following activities will be covered:

- Construction of intake boxes at springs
- Construction of reservoir and break pressure tanks
- Laying of distribution pipes and construction
- Installation of tap stands, and
- Drilling of tube-wells and provision of hand pumps where groundwater of adequate quality for cost-effective extraction is present

Implementation of water supply schemes will be supported in places where (a) the present source is contaminated, inadequate, or so far from the beneficiaries that collection results in loss of agricultural productive time, (b) the potential source is safe, adequate and can be developed in a cost-effective way, and (c) improved potable water supply can result in improved health and contribute to increased agricultural production.

Methodology

The methodology set out below, based on the IRAP process, will help LGUs determine priorities for improving their rural water supply.

InfRES is collaborating with ILO in developing capacity for further applying IRAP procedures at the local level. This collaboration takes off from earlier work done on developing capacity in the Philippines. The current collaboration will help ensure that the subprojects identified by LGUs reflect the actual needs and priorities of the beneficiary communities and at the same time meet the objectives of the project.

Determining the actual needs of the community is done through a needs-based assessment whereby the planner collects relevant information from Key Informants, and analyzes this information using a multi-criteria approach.

The analytical procedure shall use existing LGU IRAP data, updated when necessary, and other relevant secondary information to arrive at recommendations to improve rural water supply. The results of fieldwork and analysis will be presented to stakeholders and decision-makers at local level.

The above-cited process would make sure that stakeholders and constituents get involved in the identification of needs as well as in deciding the development of their respective areas. In this way, community ownership is established, an essential element to sustain the life of the rural water infrastructure provided by InfRES.

Identification of priorities

The provision of safe potable water supply at the local level is envisaged to contribute to improved health conditions and increased agricultural productivity of communities seeking assistance from the project.

To determine potential and priority areas for rural water supply development, the following process has been developed for a proponent municipality:

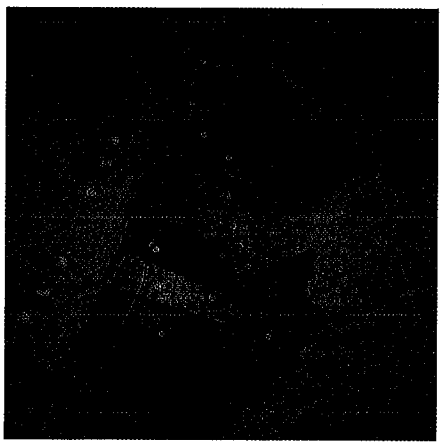
Step 1: Prepare an accessibility map (preferably at barangay level), reflecting the locations/sources, types, and conditions of existing water facilities, potential sources to be developed in a cost-effective way, and areas with incidence of water-borne diseases

Step 2: Identify barangays with level 3 [3] water supply and those without level 3 water supply.

Step 3: Screen the barangays (those identified without level 3 in step 2) to prepare a short-list of candidates for construction and/or rehabilitation of water supply facilities.

Step 4: Prioritize barangays for potable water supply for construction and/or rehabilitation.

Prepare an Accessibility Map (Step 1)



Accessibility Mapping is described in Chapter 1

A sample map reflecting locations of water facilities (levels 1, 2 & 3) is shown. The maps prepared during the ILO IRAP Project are at the municipal level. To accurately reflect the information it is recommended to prepare a barangay level Accessibility Map, showing population concentrations, existing water sources and potential sources.

It is recommended to start with a barangay base-map and use a plastic overlay, to reflect the following (water-specific information) on the base map:

- Identify current sources of water supply facilities (levels 1,2, & 3);
- indicate whether current source is potable, adequate/seasonal supply;
- locate incidence of water-borne diseases (acute gastroenteritis, cholera, amoebiasis, etc.).

Use standard or conventional signs and symbols to reflect the aforementioned information.

Identify barangays and sitios with level 3 water supply facilities (Step 2)

InfRES will support the rehabilitation and construction of point source, communal faucet, spring and tube-well development projects (levels 1 & 2). It is imperative to identify barangays with level 3 facilities and eliminate them as potential candidates for development and/or rehabilitation. The argument here is that communities with level 3 systems are adequately served and do not need additional investments under InfRES.

Screen potential barangays for water supply development (Step 3)

A screening process is to be undertaken for the barangays in the municipality to identify areas that qualify for the provision of levels 1 & 2 water supply construction and rehabilitation. For those which passed the initial screening, a simple prioritization process is carried out to determine which areas need immediate attention for water supply development (Step 3).

The following screening criteria should be used for identifying priority areas for improving rural water supply under the InfRES project:

1) The present source is contaminated, inadequate, would require significant amount of resources to correct or highly vulnerable to contamination.

2) The current source is beyond 0.5 km. from the target beneficiaries.

3) The potential source is safe, adequate and can be developed in a cost-effective way.

4) Potential for barangay agricultural productivity improvement is relatively high.

5) Improved potable water supply is likely to result in improved health and will contribute to increased agricultural production.

6) The proposed project addresses the expressed need of the beneficiaries, both men and women in the community.

[3] There are different existing levels of water supply in the Philippines defined by the type of facility used: level 1 (point source such as a protected well or a developed spring with an outlet but without a distribution system), level 2 (communal faucet system or a standpipe, a system composed of a source, a reservoir, a piped distribution network and communal faucets, located at not more than 25 meters of the farthest house) and level 3 (municipal waterworks systems with individual house connections).

It is recommended that all these criteria are satisfied before a barangay pre-qualifies for a subproject. Barangays that pass the screening criteria will be subjected to the ranking procedures under Step 4.

Prioritization of areas (Step 4)

A multi-criteria approach should be used to rank communities. The criteria to be applied are: (1) number of (households) beneficiaries, (2) amount of time spent to get to the current source, (3) distance of the potential source to be developed, (4) community perception/expression of needs, and (5) number of cases reported on water-borne diseases.

Existing LGU IRAP data, updated when necessary, and secondary information will be utilized to determine priorities based on the above criteria. The available IRAP data should include the following: number of target beneficiaries, travel time and expression of community needs. The necessary secondary data could be sourced at the LGU or from agency records (e.g. health centers, etc.) and include information on: water-borne diseases reported, agricultural productivity, cost of investment and poverty incidence. See Annex 1 for a sample data collection form.

The above-cited criteria will be used to determine communities that need immediate attention to improve on their water supply conditions. Qualitative and quantitative assessments will be made of different conditions, and ratings of 1-3 will be used to describe different levels or conditions. A simple scoring system to indicate the degree of a condition for a given situation in a barangay has been developed.

The final decision on the identification of priority areas (sitios and barangays) needs to be done in a participatory way. Stakeholders shall review a list of areas initially ranked according to the prioritization indicators. The final choice could be influenced by factors such as the cost of investment vis-à-vis

the target number of beneficiaries, resources available, cost-effective manner in developing a potential source, socio-economic, environment and agricultural concerns.

There are seven sub-steps involved to identify priorities for improving water supply at the local level. See Annex 2 for a sample format to be used in determining the priority communities for water supply development. See also Annex 3 for a sample analysis.

Step 4a) Determine the total number of beneficiaries (per barangay) of the proposed water supply project.

Step 4b) Determine the average travel time of households (per barangay) to the present source of water and the distance of these habitations to the potential source.

Step 4c) Determine the average number of cases/incidence of water-borne diseases in the barangay reported in the last five years.

Step 4d) Determine the general perception or expressed need of the community, and differentiate between male and female residents.

Step 4e) Determine the ratings (1-3) of the indicators in Steps 4b and 4c. The value one (1) means low, value two (2) means moderate, and value three (3) means high.

Steps in determining the class intervals (CI) of the rating-levels:

1) Determine the range between the highest and lowest values.

2) Divide the range by 3. The result is called the established class interval.

3) To get the 1st (1 = low rating) class interval, add the established CI to the lowest observed score. The sum of the two variables should be the maximum range of the scores under the first category.

4) To get the 2nd (2 = moderate rating), add 1 to the sum of step 3 plus the CI. The sum is the maximum range of the scores under the second category.

5) To get the 3rd (3 = high rating), add 1 to the sum of step 4 plus the CI. The sum is the maximum range of the scores under the third category.

Indicator of step 4d) will use this standard:

Rating	Description
1	3rd priority of female and male population
2	2nd priority of female and male population
3	1st priority of female and male population

Step 4f) Add the ratings/scores of the indicators in steps 4b-4d to get the total of the sub-indicators. Then multiply the total of the sub-indicators with the absolute value of the number of households affected (beneficiaries).

Step 4g) Rank the barangays according to their total rated scores.

The ranking is based on the highest score down to the lowest score. The barangay that gets the highest score is ranked number 1, the second highest is ranked number 2, and so on.

As earlier stated, the above procedure aims to provide an initial assessment of the condition of communities on the following aspects: level of access towards the facility, size of population affected by the lack or absence for such service, health condition as influenced by the quality of service and people's perception for the need for the intervention. A meeting to review the list of priorities, attended by concerned parties, should be organized to reach a consensus. The decision as to which among the communities will be considered in the proposed sub-project needs to be done in a participatory way. To attain this, the stakeholders must get familiarized as to how the ranking was done and the criteria used in selecting the areas for investment.

Annex 1

BARANGAY ACCESSIBILITY FORM

Instruction:

This form is to be accomplished using the Key Informants (KI) method. Seven to ten persons who are recognized as knowledgeable of the actual situation pertaining to the sectors being studied will be the participants of the KI. The information to be enumerated in this form should be the consensus among the KIs and jot just the response of one person. The KI should be conducted in the barangay itself. Guides to each question are placed in another page of the actual survey questionnaire.

Region _____ Year/Month/Date _____

Province _____

Municipality _____

Barangay _____

Data collected by _____

Last Name First Name Middle Initial

_____

Position

Key Informants:

Name	Sector Represented

Name of Barangay Captain or Representative Signature

BARANGAY ACCESSIBILITY SURVEY FORM - WATER FACILITIES

Region: **Province:** **Municipality:**

* FA (female adult); FC (female child); MA(male adult); MC(male child)

Part 1

Name of Purok/Sitio (Include Barangay Proper)	No. of hhs.	% Hhs w/n .05 kms Source	Description Main Water Source	Purpose/ Use of Water	# Hhs (beyond 0.5 kms Source)	Ave. col. (RT) time (Hhs. beyond 0.5 kms Source) (Seasons)		Secondary Sources of Water	Potable Yes/No	Purpose/ Use of Water	Ave. # water-borne diseases	Who usually collects* F or M	Potential potable source to be developed		
						Wet	Dry						Distance	Type	Adequate Yes/No

Instructions:

1) The **names of the sitios/puroks**, including the barangay proper, are required to be listed in the first column chronologically or alphabetically.

2) **Number of households** refers to the actual number of households in the sitios/puroks. Use the latest NSCO survey or if actual number is available at the barangay , adopt said data.

   Indicate only **the percentage (%) of households** in the sitio/purok where households have **access to water source within 0.5 kms.** Experience showed that the key informants can easily indicate the answer in % than the actual number. It will be easier now to determine those households without direct water source from the responses of the key informants. If the distance from the house to the water source is within 0.5 kms., then the household can be considered with "Direct Water Supply." Beyond that, it is already considered that the household is experiencing difficulty in terms of accessing water and does not have "Direct Water Supply." ILO adopted the standard of InfRES Subproject FS criteria (villages or settlements lack potable water source within 0.5 kms.).

3) The information under **Description of Water Sources (Main or Secondary)** asks the data collector to indicate the sources of water such as spring, creek, river, deep well, dug well, artesian well, communal faucet, etc.

4) **Purpose/use of water** requires the key informants to indicate if the main/secondary source is used for drinking, washing.

5) **Water Collection Time** need to be established for households that DO NOT have a Direct Water Supply and has to walk a considerable distance to a source. The time asked refers to round-trip travel to source including the time spent waiting for their turn to fill up container(s). In most instances, water sources differ during the **wet and dry seasons**, thus differences in travel time should also be indicated. Is the current water source of households that **DO NOT have direct source potable?** The answer should be Yes or No only.

6) **Average number of water-borne** diseases incidence reported in the last three years. Prior to the conduct of the KI, the data collector can refer to the secondary data available at the Municipal Health Office. Said information could be validated during the KI. DOH standard follows a three to five-year (backtrack) period to establish prevalence of water-related health problems in the community.

7) **Who usually collects water.** Ask the KI participants about the sex group (male or female) who usually fetch water. Then ask whether the person is a child ("C") or an adult ("A"). This has to be entered under the relevant Male/Female column. Thus, the resulting data will tell us whether the person(s) usually carrying water are male children, adult males, female children, or adult females. The entries under "Male" or "Female" sub-columns should be "A", "C", or "A and C."

   Accessibility-oriented planning should identify the affected (positively or negatively) groups. It should be able to pin point who gets to benefit from the introduction of a facility or an intervention. In the case of water, the question of who usually collects water identifies the group that has to travel to secure water for their household. Identifying the group whose burden will be relieved is important because the use of the time released would differ among adults and children, females and males. Adults will be able to engage in a livelihood, while children will have more time for schoolwork, play, or helping in the house. Thus, the question seeks to capture two things: the "age" and sex of the person.

8) **Potential source** to be developed. Indicate the **distance** (in kilometers) of the possible potable source being considered for development. Indicate also the **Type (e.g. spring)** as well as the if the source is **Adequate (Yes or No)** to supply the target community beneficiaries.

PART 2: PRIORITY PROBLEMS

BARANGAY	Perceived by Male Population			Perceived by Male Population		
	Priority 1	Priority 2	Priority 3	Priority 1	Priority 2	Priority 3

Instruction

The objective is to document the people's perception or expression of needs (e.g. potable water supply) as regards accessibility problems in their area and how they see them. The respondents are asked to determine if potable water supply development is considered priority by the community. If yes, the respondents are asked to indicate whether it is rank priority 1, 2 or 3. Number 1 is the most significant while number 3 is the least significant among the top three problems perceived. This perception of the respondents can validate the answers to the previous sections.

The question should be asked separately of women and of men. If the KI is jointly held with female and males participants. The facilitator can preface the question by saying that it should be answered only the women/men in the group. Why should we ask this question separately for and from women and men? Women and men share the same concerns for their community, but they may also have very different gender needs and priorities. Distinguishing between the perceived problems of women and men is a way of making sure that the inputs to the planning process do not only come from one gender group. In this way, investments to be provided by the LGU to the community are targeted towards the priorities of the communities.

Annex 2

SAMPLE FORM: Identification of priorities

Note: List down in the form only those barangays which passed the screening criteria.

Barangay	# of Hhs.	(1) # of Hhs affected	(2) T-time (CS)	(3) Distance (PS)	(4) # of WBD	(5) Community Perception	(2)	(3)	(4)	(5)	(6) Subtotal (2+3+4+5)	(7) Total (1*6)	Rank
						M F				M F			

Legend: **CS** - average travel time (2 seasons) current source (two-way) including waiting time - those households beyond 0.5 kms. from the source
PS - potential source (in kms.); **WBD** - average number of cases/incidence of water-borne diseases
Box with bold line - indicate the corresponding equivalent rating of each indicator.

Annex 3

SAMPLE ANALYSIS

Note: List down in the form only those barangays which passed the screening criteria.

Barangay	# of Hhs.	(1) # of Hhs affected	(2) T-time (CS)	(3) Distance (PS)	(4) # of WBD	(5) Community Perception		(2)	(3)	(4)	(5)		(6) Subtotal (2+3+4+5)	(7) Total (1*6)	Rank
						M	F				M	F			
Camagsaan	126	66	30.00	5	2	1	1	2	2	1	3	3	11	726	7
Alagao	151	77	20	7	3	1	1	1	3	1	3	3	11	847	5
Catabaguangan	120	120	40	5	2	2	1	3	1	1	2	3	10	1,200	4
Itok	335	136	30	8	4	1	1	2	3	2	3	3	13	1,768	1
Mabini	139	87	20	5	1	2	1	1	1	1	2	3	8	696	8
Mactang	129	94	30	4	3	1	2	2	1	1	3	2	9	846	6
Villa Aurora	131	131	30	6	2	1	1	2	2	1	3	3	11	1,441	3
Tanawan	115	115	30	8	4	1	1	2	3	2	3	3	13	1,495	2

Legend: **CS** - average travel time (2 seasons) current source (two-way) including waiting time - those households beyond 0.5 kms. from the source
PS - potential source (in kms.); **WBD** - average number of cases/incidence of water-borne diseases
Box with bold line - indicate the corresponding equivalent rating of each indicator.

Column (2) - CS	Column (3) - PS	Column (4) - WBD	Column (5) - Perception/Expressed need by M & F
Highest value - 40 Less Lowest value - 20 ---------- Interval - 20/3 = 6.66 or 7 20 + 7 = 27 (Rating = 1) 28 +7 = 35 (Rating = 2) 36 + 7 = 42 (Rating = 3)	Highest value - 8 Less Lowest value - 4 ---------- Interval - 4/3 = 1.33 or 1 4 + 1 = 5 (Rating = 1) 5 +1 = 6 (Rating = 2) 7 + 1 = 8 (Rating = 3)	Highest value - 4 Less Lowest value - 2 ---------- Interval - 2/3 = .66 or 1 2 + 1 = 3 (Rating = 1) 4 +1 = 5 (Rating = 2) 6 + 1 = 7 (Rating = 3)	1st priority = 3 2nd priority = 2 3rd priority = 1

Chapter 3

Identification of Rural Road Priorities at Municipal Level

Rural roads are essential in agricultural development. Rural roads link communities and their agricultural fields to the main transport system and markets. Improving rural roads reduces transport cost and stimulates marketing. This results in increased production and productivity, crop diversification and increased profitability. A main bottleneck for local economic development is often a limited and poor quality rural road network. InfRES aims to overcome this problem in selected municipalities. The demand for rural road construction and improvements is extensive and it is important that rural roads are identified that respond to the transport needs of rural farmers and contribute to an increased agricultural output and poverty reduction. The IRAP tools include a participatory procedure, based on a multi-criteria analysis, to pre-identify suitable rural road candidates.

Rural Road Priorities

Introduction

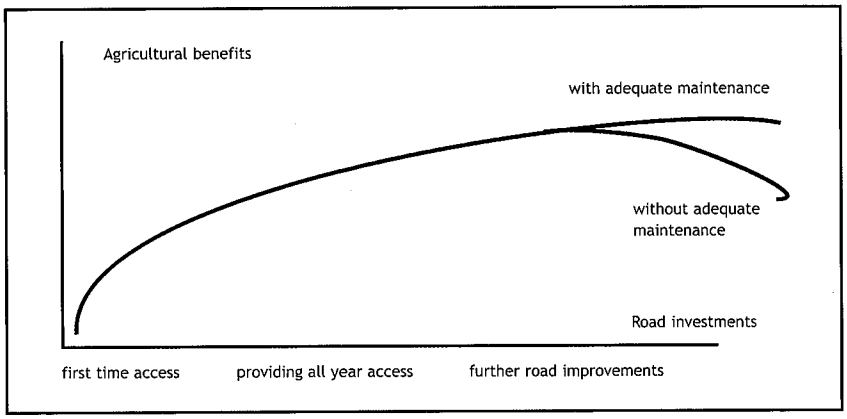
A principal constraint that many poor farmers face in becoming more productive and profitable is the difficulty and costs in bringing in agricultural inputs to their farms and in hauling out their produce to the market. This is primarily caused by the lack of appropriate transport infrastructure.

Part of the interventions to address this problem confronting the farmers, the InfRES Project will finance upgrading and rehabilitation of rural roads that connect to areas with agricultural potential. This includes upgrading of trails or footpaths to all-weather rural roads, construction of landing facilities, footbridges, cableways and other transport infrastructures that will link production areas to markets and help enhance productivity.

The following graph shows the relationship between investments in road development and agricultural benefits. It indicates that the initial investments in providing first time access generate the fastest increase in agricultural benefits, followed by investments that provide all year access (in areas that only have seasonal access). The smallest increase in agricultural benefits results from further road improvement and upgrading. Maintenance works

sustain and compound the benefits generated, while lack of maintenance results in a significant decrease in agricultural benefits over time.

Figure 1: Road Investments - Agricultural Benefits Curve



Road Network Analysis

Most access improvement interventions to be financed under InfRES are associated with improving the rural road network. Unlike water supply, road links should not be planned in isolation, as they are part of a larger road network. It is necessary to look at the total network and prioritize investments that will maximize the returns to the network as a whole.

The prioritization will take the following steps:

Step 1: Prepare a municipal road map and make an overall assessment of the extent, classification and condition of the road links in the network (see chapter 1).

Step 2: Identify rural roads that are in maintainable condition (and prepare a maintenance budget estimate).

Step 3: Identify road links that: i) need to be rehabilitated or upgraded to bring them into maintainable condition, and ii) new rural road links.

Step 4: Screen the roads identified in Step 3 to prepare a short list for construction, rehabilitation or upgrading.

Step 5: Prioritize rural roads for construction, rehabilitation or upgrading.

Step 1: Prepare the Municipal Road Map

The first activity involves the preparation of the municipal road map to show all individual road links, their classification and current conditions.

The road network needs to be reflected on a map to help in understanding the hierarchy of roads, classification and how each link fits into the overall network. To facilitate the analysis, it is recommended to prepare road map as a plastic overlay to be used together with the IRAP base map (see chapter 1).

The map should indicate road classification like national, provincial, municipal or barangay roads, and trafficability based on road conditions such as dry season only, all weather, etc. Represent road classification by using lines of various thickness, while indicate trafficability with designated colors to describe conditions. For example, a thin red line could indicate a barangay road that is only trafficable during the dry season.

The road map should also show river or stream crossings such as bridges or culverts (or the lack of them). For example, a black bridge symbol shows an existing bridge, a blue bridge symbol shows one that needs to be repaired while a red bridge symbol indicates the need for a (new) facility.

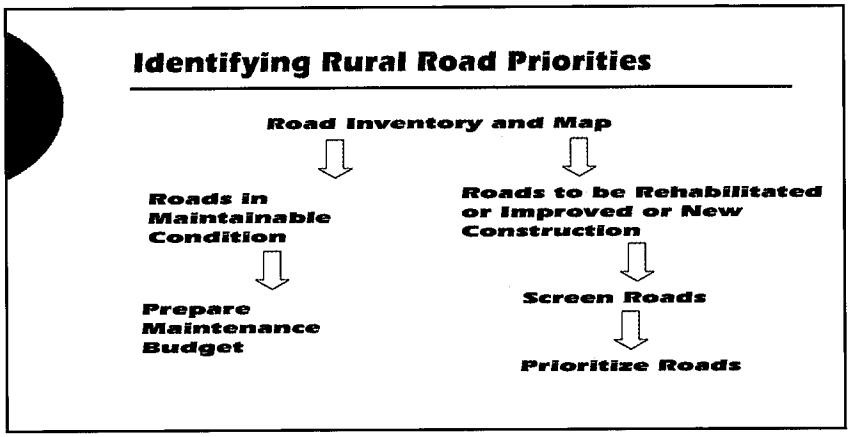
Step 2: Identify Maintainable Roads

InfRES supports rehabilitation of roads, upgrading and new construction. The project will not support routine and periodic maintenance, as this is the full responsibility of the LGUs. Road maintenance is a critical activity since roads deteriorate through continuous use. Experience tells us that roads without maintenance lose their trafficability.

Lack of maintenance results in lost (road) assets and foregone benefits. Road investments generate employment, income and social benefits that can be lost in case the road becomes impassable

One of the requirements for an LGU to become eligible for InfRES funding is a demonstrated commitment towards road maintenance. LGU budgets for the last 5 years will be examined to verify if at least 65% of the rural road maintenance needs have been met through local appropriations.

The procedure for assessing maintenance budgets and identifying rural road improvement priorities proposed in this chapter divides the existing road links into two categories: maintainable roads; and, roads that need rehabilitation or upgrading. New road links will be added as another category later. InfRES will only support works on road links belonging to the second category.



For simplicity, it is suggested to classify maintainable roads as those trafficable throughout the year for the usual transport vehicles such as jeepneys, tricycles and vans. These roads do not need major works to keep them in trafficable condition as routine and periodic maintenance can address the necessary requirements. Once these maintainable road links and their corresponding lengths have been identified, a standard unit maintenance cost can be applied to estimate the annual routine maintenance budget. It is important to distinguish the requirements for annual routine maintenance works from the irregular periodic maintenance needs.

To quickly estimate the budget for the annual routine maintenance, multiply the total length of the road links that are in maintainable condition, and under the responsibility of the local government units, with the estimated costs per kilometer. As roads need periodic maintenance as well, include the periodic maintenance costs in the total maintenance budget requirements estimate (see example below).

The total length of the barangay road network in the municipality of Capalonga in Camarines Norte is 130 kilometers (kms.) of which 75 kms. are trafficable all year-round. The estimated total routine maintenance requirements to keep the 75 kms. in good (i.e. year-round trafficable) condition is Php 6,750,000 annually (75kms. X Php 90,000/km). In addition, specific roads will require periodic maintenance every year and the cost of this should be added to the routine maintenance budget to estimate the total annual maintenance requirements.

For example, assuming that no new roads are added to the maintainable network, that the 55 kilometers that is in non-maintainable position is not improved to maintainable standards and that the periodic maintainable cycle is 5 years:

	Annual Costs
Routine maintenance needs	6,750,00
Periodic maintenance needs	7,500,000
Total	14,250,000

The periodic maintenance requirements are calculated as follows: 75 kms with a periodic maintenance cycle of 5 years means an average, periodic maintenance on 15 kms of road annually. If the average periodic maintenance cost is Php 500,000/ km. Then, the total periodic maintenance requirements is Php 7.5M annually (15kms. X Php 500,000/km.). If more roads are brought into maintainable condition then the total annual maintenance costs will go up.

Chapter 6 provides more background on maintenance planning and budgeting.

Step 3: Identify Rural Roads for Rehabilitation or New Construction

The second category of roads identified under Step 2 comprises the non-maintainable roads. These roads are not passable all year-round and need to be rehabilitated to be of service throughout the year, as well as become maintainable links again. In the event the LGU plans to extend this rehabilitated road network and add additional links to reach nearby new agricultural production areas, these new links should be treated as part of the road that needs rehabilitation.

The InfRES project supports road rehabilitation or new construction if the concerned link would have a major impact on agriculture production and productivity. It is unlikely however that InfRES will

finance all rehabilitation and construction works. It is therefore necessary to prioritize roads in accordance with the objectives of InfRES, i.e. reduce poverty by improving agricultural production and productivity, as well as generate rural employment. (see Steps 4-5).

Step 4: Screening Rural Roads

The road key map and road database list all existing road links in an area that need rehabilitation and indicate new links for construction (Step 3).

To prepare a short-list of rural road candidates and to disqualify roads that do not meet certain criteria, a screening process is used. For those roads that pass the screening test, a simple cost-benefit analysis is applied as part of the ranking process (Step 5).

[4] The annual routine maintenance figure will vary across different locations. For more information see the ILO ASIST Rural Road Maintenance Study (Philippines, 2005).

The following criteria are used for the screening:

1 The road link must run through an inhabited area, and satisfy a minimum number of people per kilometer of road.

2. The road link must run through an agricultural production area, and address a minimum area of agricultural land-use requirement within its zone of influence.

3. The road link should connect with an all weather road and be part of a network leading to local or provincial markets and/or district centers.

4. The road link must not be closely parallel to or in the area of influence of another all-weather road.

5. The road should not require the construction of expensive bridges.

6. The road link should not run through an environmentally-protected area.

7. The road link should serve the local economy at large and not only a special interest group such as a logging or mining firm.

It is recommended that all these requirements must be satisfied before a proposed road link pre-qualifies for rehabilitation or new construction. After the screening process, it is expected that the total length of the road network for rehabilitation is reduced. Roads that pass the initial screening will be subjected to the socio-economic ranking procedures described in Step 5 to help identify the priority links for rehabilitation/construction.

Step 5: Prioritizing Road Links

Rural roads can be prioritized using a simple cost-benefit and multi-criteria analysis to quantify benefits and relate said benefits to an estimated cost.

The process involves a socio-economic ranking based upon *the number of people in the area of influence, the expected socio-economic impact per person and the total cost of the road construction, rehabilitation or upgrading.* The application produces a quick list of priority candidates. For an assessment of higher level roads, such as provincial and national roads, more sophisticated methods can be used. For identifying rural road priority candidates, the following inverse cost-benefit ratio is proposed:

$$\frac{\text{Population Served (P)} \times \text{Economic Benefit Factor (B)}}{\text{Total Cost of the Road (C)}}$$

The procedure consists of five (5) steps:

Step 5.1: Estimate the Number of People within the Area of Influence (P):

To estimate the total number of people served, lay out on the map a 3 to 5-kilometer distance on both sides of the road to describe its area of influence. After having identified the barangays and/or sitios within the area of influence, determine the total number of households within the area of influence. Households that are separated from the road by natural obstacles such as a mountain or a river and households that tend to use another road should not be considered in the computation.

Step 5.2: Estimate the Socio-Economic Impact within the Area of Influence (B):

This step is somewhat more complex and requires some analytical work, considering that road improvements have an impact on the economic development of an area and the quality of life of the population served.

To understand the possible impact of a road improvement project, the potential benefits for each road link need to be valued. A scoring

system to describe the said socio-economic benefits can facilitate the assessment. The following are used in assessing a road's benefits:

- ***Level of isolation.*** *Isolation and poverty are linked. The poorer is the existing access, the higher will be the impact of the road. Providing first time access usually induces rapid changes. Roads that will improve access to communities without or with very difficult, dry season only, road access should have high priority.*

- ***The economic potential of the area of influence.*** *Improved access to markets will encourage people to produce more goods to sell and stimulate interaction with traders. By improving access, the people may be encouraged to use idle resources and increase production of agricultural and non-agricultural items. The greater the volume of potential new production and marketable surplus, the higher is the priority.*

- ***The level of social services.*** *Improved access can extend these services to formerly isolated communities. Road improvements positively affect accessibility through an improved level of transport service (from walking to riding or from high-cost unreliable service to cheaper and reliable service) to social services like existing hospitals and secondary schools. Road improvements could also result in the construction of health centers and in the upgrading of medical services in an area.*

As some criteria may be in conflict with others, or some are more important than others, it is therefore important that major stakeholders such as the direct beneficiaries, local decision-makers and leaders, planners, community and non-government organizations, extension workers and other interest groups are fully involved in assessing the weights of the potential benefits.

The following table identifies potential socio-economic impacts (scores) of rural roads:

Rural Roads - Scores

Indicator 1: Agriculture Potential within the Area of Influence (AoI)	
0	The area around the road has Low Agricultural Potential (if the road is improved or constructed the agriculture production and marketing of products will not change much).
1	The Area Around the Road has Medium Agricultural Potential (if the road is improved or constructed the agriculture production and marketing of products will increase).
3	The Area Around the Road has High Agricultural Potential (if the road is improved or constructed the agriculture production and marketing of products will increase a lot).
Indicator 2: Present Level of Access to Transport Services in AoI	
0	Good (All sitios have road access, road is in good condition most of the year)
1	Fair (Most sitios have road access, road is only in good condition but only during the dry season)
3	Bad (Only few sitios have road access, no road or road is in very bad condition most of the year)
Indicator 3: Present Access to the Markets in AoI	
0	Good (main market is easily accessible, road is in good condition most of the year)
1	Fair (main market is not easily accessible, road is only in good condition during the dry season)
3	Bad (main market is difficult to access, no road or road is in very bad condition most of the year)

Rural Roads - Scores

Indicator 4: Poverty Incidence in AoI	
0	Low poverty incidence in area. 0% - 30% of the households live under the poverty line.
1	Medium poverty incidence in the area. 31% to 70% households live under the poverty line
3	High poverty incidence in the area. 71% or more households live under the poverty line
Indicator 5: Road Condition as Barangay Problem	
0	No Problem (barangays identified road access as no problem)
1	Minor Problem (barangays identified road access as a minor problem)
3	Very Big Problem (barangays identified road access as a big problem)

Each of the factors identified in the table above are provided with three level scores. For instance, Agriculture Potential can be described as "high", "medium" or "low" with scores of "3", "1" and "0" respectively. Local government officials, planners and other technical experts at municipal level decide on the scores. See Annex 4 for the sample forms to assist in determining the weights and calculating the cost benefit indicators. The following choices are prescribed:

3 = very important benefit
1 = of little importance
0 = not an important benefit

Weights	Very Important (3 points)	Of Little Importance (1 point)	Not Important (0 point)
Agriculture Potential			
Access to Transport Services			
Present Access to Markets			
Poverty Incidence			
Road Condition as Community Problem			

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

Weights	Average Number of Points	Weights
Agriculture Potential	3	0.40
Access to Transport Services	1.5	0.20
Present Access to Markets	1	0.13
Poverty Incidence	1.5	0.20
Road Condition as Community Problem	0.5	0.07
Total	**7.5**	**1**

To calculate the total value per factor, multiply the scores per factor with the weight of the factor. The indicator for socio-economic benefit is the sum for all factors.

Once the scores are known it is possible to calculate the total benefit factor for each road. The following formula is used:

$$\sum_{B=1}^{5} (\text{Score} * \text{Weight}) = \text{Benefit Factor}$$

Step 5.3: Estimate the Total Cost of the Road Improvement (C):

At this point, it is recommended to look at the costs of construction, rehabilitation or upgrading. If the total construction, rehabilitation or upgrading costs for each road link are known, there is no need to estimate total costs. If the total improvement costs are not known, use a cost estimate based on past experience.

If the actual improvement cost per road link is known, it is recommended that actual figures are used instead of the cost estimates.

Step 5.4: Calculate the Benefit/Cost Ratio (P*B/C):

Once the construction or rehabilitation costs, the population served and the socio-economic benefits are known, calculate the benefit/cost ratios, as introduced earlier, for all rural roads proposed for rehabilitation or new construction.

Roads serve areas with different economic potentials (agriculture, tourism, industry, mining etc.). The number of people served is not enough to rank roads. The best road candidates are obviously those that serve a relatively large number of people and service an area with a relatively large socio-economic potential. Priority roads should be those that have the largest impact per investment unit, or **roads that have the lowest investment cost per person served weighted with the socio-economic benefit.** Since the ratiorelates benefits to costs, a high value of the ratio indicates high priority for the concerned road link. The high ratio value means more people are served, or benefits are generated (or both) for the amount invested. The ratio value corresponding to a road link, when compared with the other road link values, will be the basis of the prioritisation.

$$\frac{\text{Population Served} \times \text{Socio-economic Benefit Factor}}{\textit{Total Cost of Road Rehabilitation/Construction}} \quad \text{or} \quad \frac{(P * B)}{(C)}$$

Annex 1 provides additional guidance to undertake the prioritisation procedures.

Step 5.5: Participatory Workshop to Review Priorities

The proposed benefit/cost ratio is an initial procedure to identify rural road priorities. A meeting to review the list of priorities, attended by concerned parties, should be organized to reach a consensus. This may result in some shifting of priorities. Once the short-list of priorities has been finalized, the prioritized road links can be subjected to a more thorough technical, financial and environmental analysis.

Annex 1
Guide to implement Step 5 - Prioritizing Road links

Step 1. Determine weights of identified benefit factors

By using the following table, determine how the stakeholders perceive the current conditions normally experienced in the LGU. The objective is to establish a collective perception on the significance of planned interventions to guide the prioritization of the road segments.

How important do you consider the following potential benefits when selecting rural road projects?	Very important (3)	Of little importance (1)	Not important (0)
Agriculture potential			
Access to transport services			
Present access to markets			
Poverty incidence			
Road condition as a community problem			

Each participant, representing an interest at local level, fills out the form based on an understanding of the sentiment of the organization or group he/she represents. Collect the accomplished tables and compute for the weight of each potential benefit by doing the following steps:

1. Compute the average for each potential benefit by adding the rows and dividing the sum by the number of respondents.
2. Compute for the weights of each average by dividing each average score by the sum of the averages. First add the average score of each potential benefit and divide each average score by the total of the average scores.
3. The computed value corresponding to each potential benefit is the weight provided by the collective perception of the stakeholders.

Potential benefit	Sum of all scores given by stakeholders	Ave. score (sum/no. of stakeholders)	Weight (ave.score/ total)
Agriculture potential	24	a 3	a .22
Access to transport services	24	b 3	b .22
Present access to markets	22	c. 2.75	c .20
Poverty incidence	16	d. 2	d .15
Road condition as a community problem	24	e. 3	e .22
	Total	f. 13.75	1.0

Step 2. Rank the road segments

Individual roads segments provide measurable benefits versus costs to their respective areas of influence. By comparing these benefits, a ranking mechanism is developed to identify and prioritize which of these roads if improved would yield the most significant benefits. A numeric value to quantify the benefit-cost ratio of a road segment is determined by using the following formula:

$$\frac{(P \times B)}{C}$$

where P = population; B = economic benefit factor;
C = cost of construction, rehabilitation or upgrading

A higher ratio value means that more people are served or more benefits generated (or both) for the amount invested. The roads with higher ratio value deserve priority.

The residents within a road's area of influence comprise the direct beneficiaries of the infrastructure. The road's area of influence is determined by drawing lines at 3-5 kilometer distance on both side of the road. The total population within the delineated area is the value of **P** in the above formula. The cost **C** can be derived from prevailing standard costs of road construction, rehabilitation or upgrading.

The economic factor **B** in the formula is determined by doing the following steps:

Determine the scores for each road segment by using the following table of indicators. Each stakeholder shall rate the road segments separately by using their understanding of current conditions surrounding the individual road segments.

Rural Roads - Scores

Indicator 1: Agriculture Potential within the Area of influence	
Rating	**Classification**
0	The Area Around the Road has Low Agricultural Potential (if the road is improved or constructed the agriculture production and marketing of products will not change much).
1	The Area Around the Road has Medium Agricultural Potential (if the road is improved or constructed the agriculture production and marketing of products will increase).
3	The Area Around the Road has High Agricultural Potential (if the road is improved or constructed the agriculture production and marketing of products will increase a lot).

Indicator 2: Present Level of Access to Transport Services in Area of influence	
Rating	**Classification**
0	Good (All sitios have road access, road is in good condition most of the year)
1	Fair (Most sitios have road access, road is only in good condition but only during the dry season)
3	Bad (Only few sitios have road access, no road or road is in very bad condition most of the year)

Indicator 3: Present Access to the Markets in Area of Influence Area of influence	
Rating	**Classification**
0	Good (main market is easily accessible, road is in good condition most of the year)
1	Fair (main market is not easily accessible, road is only in good condition during the dry season)
3	Bad (main market is difficult to access, no road or road is in very bad condition most of the year)

Rural Roads - Scores

Indicator 4: Poverty Incidence in Area of influence	
Rating	**Classification**
0	Low poverty incidence in area. 0% - 30% of the households live under the poverty line.
1	Medium poverty incidence in the area. 31% to 70% households live under the poverty line
3	High poverty incidence in the area. 71% or more households live under the poverty line

Indicator 5: Road Condition as Barangay Problem	
Rating	**Classification**
0	No Problem (barangays identified road access as no problem)
1	Minor Problem (barangays identified road access as a minor problem)
3	Very Big Problem (barangays identified road access as a big problem)

1. Add the scores provided by the stakeholders for each indicator and multiply these by the indicators' respective weights determined in Step 1.

2. Add the weighted scores of the indicators for each road. The value is the economic benefit factor B in the formula $\frac{P \times B}{C}$. Fill up the following table.

Here is a sample form to implement the activities in Step 2.

Road Link 1	Participants' Score	Tot	Wt	Weighted Score
Agriculture potential				
Access to transport services				
Access to market				
Poverty incidence				
Road condition as problem				
	TOTAL (Economic Benefit Factor B for the road link 1)			

Road Link 2	Participants' Score	Tot	Wt	Weighted Score
Agriculture potential				
Access to transport services				
Access to market				
Poverty incidence				
Road condition as problem				
	TOTAL (Economic Benefit Factor B for the road link 2)			

Road Link 3	Participants' Score	Tot	Wt	Weighted Score
Agriculture potential				
Access to transport services				
Access to market				
Poverty incidence				
Road condition as problem				
	TOTAL (Economic Benefit Factor B for the road link 3)			

Road Link 4	Participants' Score	Tot	Wt	Weighted Score
Agriculture potential				
Access to transport services				
Access to market				
Poverty incidence				
Road condition as problem				
	TOTAL (Economic Benefit Factor B for the road link 4)			

Road Link 5	Participants' Score	Tot	Wt	Weighted Score
Agriculture potential				
Access to transport services				
Access to market				
Poverty incidence				
Road condition as problem				
	TOTAL (Economic Benefit Factor B for the road link 5)			

Road Link 6	Participants' Score	Tot	Wt	Weighted Score
Agriculture potential				
Access to transport services				
Access to market				
Poverty incidence				
Road condition as problem				
	TOTAL (Economic Benefit Factor B for the road link 6)			

Road Link 7	Participants' Score	Tot	Wt	Weighted Score
Agriculture potential				
Access to transport services				
Access to market				
Poverty incidence				
Road condition as problem				
	TOTAL (Economic Benefit Factor B for the road link 7)			

Road Link 8	Participants' Score	Tot	Wt	Weighted Score
Agriculture potential				
Access to transport services				
Access to market				
Poverty incidence				
Road condition as problem				
	TOTAL (Economic Benefit Factor B for the road link 8)			

Road Link 9	Participants' Score	Tot	Wt	Weighted Score
Agriculture potential				
Access to transport services				
Access to market				
Poverty incidence				
Road condition as problem				
	TOTAL (Economic Benefit Factor B for the road link 9)			

Columns can be added for the participants' score if needed.

3. Estimate the cost of each road segment and substitute this to C in the benefit-cost formula. Likewise, substitute the values of P and B and compute for the benefit-cost ratio. Fill up the following table and sort (or rank) the values in descending order. The highest value corresponds to the road with the highest priority for improvement.

Road Link	Benefit factor (B)	Population (P)	Cost (C)	P x B / C	Rank

Conclusion

This exercise can help guide the actual conduct of a participatory activity among the various stakeholders in a municipality in selecting road links that can be proposed to the ADB-DA InfRES project. The interaction among the participants of the consultation can be further facilitated by preparing and presenting an updated municipal map showing all the road links in the area and overlaid with relevant information from the CLUP or the SAFDZ. The graphical representation of current conditions in the municipality, particularly on infrastructure intervention needs with which the stakeholders can easily relate with, will lead to productive deliberations between and among the various interests represented in the consultative exercise.

Chapter 4

Identification of Rural Road Priorities at Provincial Level

The rural road network in the Philippines primarily consists of barangay roads and provincial roads. Municipal roads are mostly urban roads. The previous chapter introduced a method to pre-identify rural road candidates at the municipal level. The responsibilities for these roads will be with the barangays. This chapter introduces a method to identify such priorities at the provincial level. Different models are available to plan for improving rural road networks and select investment priorities. Most of these models look at benefit cost ratios and rates of return. The model proposed in this chapter does not seek to replace these established models but tries merely to strengthen it by increasing levels of public participation. The priorities identified will still have to undergo an economic and financial analysis to assess whether investment in particular road links is justified.

Rural Road Priorities[5]

InfRES is designed to assist municipalities to improve their agricultural productivity through agricultural support infrastructures. InfRES also encourages provincial governments to collaborate in developing agricultural support infrastructures for the municipalities in their respective areas. Provincial involvement calls for the formulation of an identification and prioritization procedure that considers elements that exert significant influence on provincial development directions, looks beyond municipal boundaries but remains focused in bringing the desired impact on municipal agricultural productivity. An important pre-requisite to understanding such a situation is access to updated and accurate information.

A recent ILO study on rural roads operations and maintenance indicated the lack or absence of updated information on the road network at both the provincial and municipal level. The study states that some Local Government Units (LGUs) do not have an updated road map, others do not even have a map, and basic information such as road inventories and their current conditions are either absent or several years old. The research establishes that data in most provincial and municipal engineering offices are confined to inaccurate listing of road links with minimal technical descriptions on current conditions, traffic patterns, available transport services, etc.

At the national level, the Department of Interior and Local Government (DILG), through the ADB-funded Rural Roads Maintenance Policy Framework Project, started to establish a databank on rural roads in the country. This databank lists the road links, their technical descriptions, surface material used and current conditions. However, the project has ended before completion and the results have not been officially released by the DILG.

Updated information is readily available at barangay level. This is partly the result of the guidance and assistance provided to elected barangay officials on their respective roles in governance by the Department of Interior and Local Government (DILG). Ideally, said information should be reflected at municipal and provincial levels. However, this is not always the case.

To address this inconsistency of information at various levels of governance, a simple participatory procedure is proposed patterned after similar and successful applications in Laos, Cambodia and Indonesia. This participatory approach involves the conduct of a consultation workshop to be participated in by municipal and barangay key informants to update and validate the sets of relevant information to guide provincial actions in identifying and prioritizing agricultural support infrastructure sub-projects.

Objective of the Consultation Workshop and Approach

The activity aims to update, validate and integrate relevant information from barangay to provincial level using municipal base maps prepared by the province. The participatory consultation workshop demonstrates how information is integrated and reflected on the provincial (or district) base map to provide a sound basis for development decisions. The participants of the activity, most of whom come from subject barangays, rely on stock knowledge and familiarity of conditions in their respective areas and refer to official planning documents of their respective municipalities.

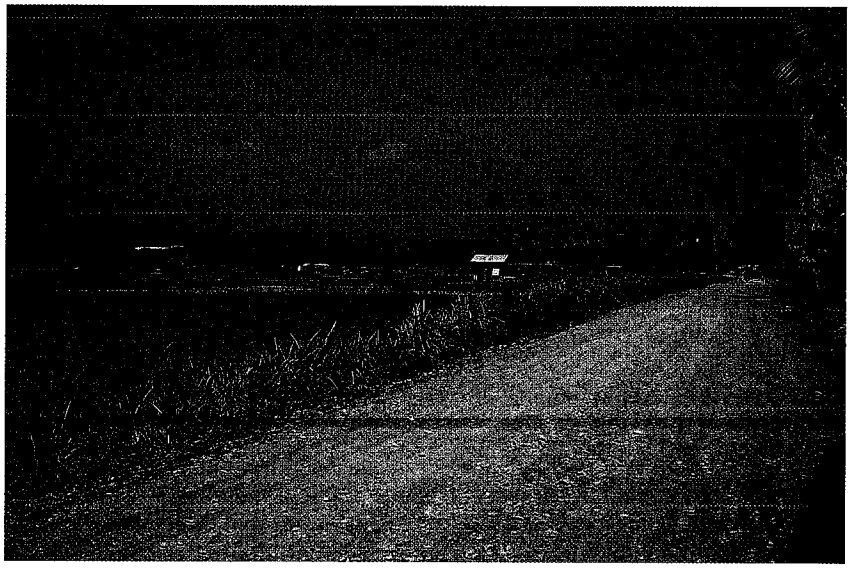
It is essential that the municipal and barangay key informants work together in reflecting on a 1:25,000 scale map (minimum size) the relevant information about their respective areas. Once accomplished, the updated municipal maps will be pieced together to form a composite map that describes conditions within and beyond municipal boundaries. The assessment, to be done by the province with the municipal and barangay key informants, is the meat of the consultation process.

[5] The method described in this chapter is for rural roads. Similar techniques can be used to identify sub-projects in the rural water supply and irrigation sectors (see step 8 in this chapter).

The outcome of the activity is a prioritized list of provincial infrastructure investments. This list can be further evaluated based on: provincial (and municipal if the infrastructure implementation will be a province-municipal collaboration) capacity, resources, technical and managerial capacity, development trends, etc., to further strengthen the selection of the desired infrastructure projects.

It is imperative that the Provincial Planning and Development Office (PPDO) produce the 1:25,000 municipal working maps from the 1:50,000 NAMRIA composite map of the province. If the province does not have the capacity to produce said working maps, assistance from service providers should be sought. The province-produced 1:25,000 municipal maps will facilitate the integration of municipal outputs.

The participants will use inexpensive, locally available, materials to produce the necessary maps. These materials will include sticker color paper, color pens, paper puncher, pentel pens, oil pastel, lighter fluid, pencil, tracing paper, paper cutter and plastic sheet. In addition they will use the municipal map 1:25,000 scale prepared by the provincial planning office.



Provincial Infrastructures Identification and Prioritization Procedure

Step 1: On the 1:25,000 municipal map, indicate the relevant and updated information

Municipal planners, engineers, agriculturists, barangay leaders and other key informants from the target municipalities will attend the consultation workshop. It is recommended that the municipal representatives bring with them the following reference materials:

- CLUP (for the land use data)
- Comprehensive Development Plan (for the sectoral development directions)
- SAFDZ (to identify and help delineate agricultural production areas)
- IRAP Accessibility Data (to establish rural households' perception of priority needs by barangay or for the whole municipality)
- Municipal base map (prepared and maintained by the municipality, in whatever scale available)
- Poverty map (if available, to identify areas with high incidence of poverty)
- Tax map or cadastral map (to help determine location and distribution of public and alienable and disposable lands and average landholding sizes)
- List and location of municipal infrastructure priorities (from the municipal planning documents)

Activity:

On the municipal working maps produced by the PPDO, task the key informants to indicate the following information:

- Barangay center location (some of the barangay centers may be wrongly located, adopt a color scheme and use color sticker paper cut by paper puncher to represent a more accurate location of the sites)
- Road network (roads that are not on the map, or wrongly located, can be easily corrected by the Barangay key informants. Use color pens to differentiate road surface materials used, vary the widths to indicate road classification such as national, provincial, municipal or barangay roads)
- Spot location of basic service facilities (adopt a color scheme to indicate specific service facilities to be applied uniformly by all municipalities)
- Major land uses like croplands, forests, water bodies, swamps, etc. (can be delineated and labeled or specific area colored with oil pastel thinned with lighter fluid, color-coded and applied uniformly by all municipalities)

- ✧ Major infrastructures such as irrigation facilities, dams, bridges, power lines, etc. (agree on the symbols to be used)

Reflect on the updated municipal map the agricultural development zones (refer to the SAFDZ maps, delineate boundaries using broken lines, color pens, etc.) and sites identified as municipal priorities for infrastructure development (from CLUP and/or Comprehensive Development Plan).

Step 2: Produce a composite provincial (or district) map from the updated municipal maps

Gather all the municipal map outputs and piece them together to form a provincial (or a district) map. Together with the participants and using popularly accepted symbols, discuss and indicate the following: settlements and population centers, major infrastructure facilities such as ports or airports, bridges or dams, irrigation and post-harvest facilities; general land uses clearly delineating major agricultural production areas; distribution of poverty levels; and road networks.

The updated location of barangay roads as provided by the barangay key informants are now reflected on the provincial composite map which now describes, on a broader scale the nature and type of the various transport infrastructure links between producers and consumers, suppliers and users, and gives more meaning and significance to roads that will improve access to areas with high agricultural potential.

Step 3: Identify and classify the important road networks

Discuss the location attributes and significance of the elements on the map. For instance, examine how the settlements are located in relation to major service centers, how are they linked and/or what are the transport options available to the residents. Another way is to ask the participants to describe the travel patterns of people in their respective municipalities like: which route is taken by most residents, reasons for and frequency of trips, most visited destinations by residents, traffic volume, sources of household and farm supplies, markets to sell produce, etc. These inputs will guide the identification and classification of the important road networks that have a direct influence on an area's development. With the concerned municipal key informants working with the provincial engineering technical staff, identify the important road segments on the composite map and describe their current surface conditions.

The province must then select from among the identified barangay roads those that satisfy the InfRES selection criteria, as well as the province's infrastructure development agenda. Although InfRES will most likely not support improvement of provincial roads, the PPDO must include, as a criterion for the selection of barangay roads for improvement, the potential for linking respective areas of influence to current and potential growth centers and nodes, transport hubs or major service centers. For example, separate barangay roads that run through agricultural production areas in two adjoining municipalities and that can be connected to provide a more direct route to service centers can be high in the provincial priority list. Or, barangay roads with the potential for improving access to major facilities like post harvest, warehouses, seaports, etc, can be included in the provincial selection.

Road classification brings with it the road's maintenance responsibility. Under the InfRES project, the maintenance of an improved farm-to-market road is the responsibility of the municipality that entered into the contract with InfRES. However, a recent ILO maintenance study reveals that municipalities, especially in the lower income brackets, do not maintain barangay roads because barangays have their own Internal Revenue Allotments (IRA) to use. The study also reveals that barangays along a common barangay road tend not to maintain their respective segments because segments in other barangays are not maintained.

Province-initiated FMR improvement entails maintenance commitment by the province. Considering the better technical and financial capacity of this higher-level LGU, and considering that the FMR will most likely service several barangays that not do any maintenance, the commitment stands a better chance of actual implementation.

Step 4: Identify and prioritize areas within the province (may be just within or may extend beyond a municipality) that would require infrastructure interventions to accelerate the desired agricultural development

This consultation guide, although designed to access InfRES funding, must be anchored on current development plans and programs of the LGUs. The updated municipal maps should be overlaid with provincial preferences as stated in the provincial development plan or through official pronouncements of both the provincial executive and legislative branches of government. Also to be reflected on the composite map are infrastructure development priorities of each municipality. These elements must be highlighted, presented and discussed during the plenary assembly.

Process:

4A. Reflect municipal infrastructure priorities on the composite map.

Each municipality has its own set of infrastructure priorities that are very significant at that level but expectedly are viewed differently from a higher-level LGU. As the consultation/workshop aims to operationalize the participatory component required of the proponent LGUs, considering these municipal priorities in arriving at provincial development decision is an important component of the activity.

4B. Delineate on the updated composite map the areas identified and prioritized for development, specifically on the agricultural sector, using the PPFP (or the Strategic Agriculture Fishery Development Zone map to identify agricultural areas) as reference.

The PPFP is an indicative basis for sectoral plans particularly those that deal with land, natural resources and infrastructure facilities. It helps facilitate the integration of land use proposals among adjoining localities with higher-level framework plans. The document provides the right locations for large-scale projects and gives the reason to link or open up new areas with transport infrastructures to optimize its development potential. The document is designed to influence local investment decisions.

A simple inspection of the composite map can guide the delineation of areas with strong potential for agricultural production development. Should the area indeed fall within the zone identified in the PPFP, it can be declared that the said site is a strong candidate for infrastructure intervention. Should the same site be found located within the agricultural zone identified by the SAFDZ map, the move to introduce interventions for agricultural development becomes obvious.

4C *Identify sites on the composite map that qualify as target areas for development under the InfRES Project. These must have any or all of the following (as prescribed in the InfRES Guidelines):*

- Existing rural transport infrastructures (such as rural roads, footpaths, trails that can be upgraded or rehabilitated) passing through significant human settlements and agricultural production areas
- Social services and economic investments (in place or being planned yet) that can be enhanced by the InfRES infrastructure
- Cultural communities that will also benefit from the InfRES intervention
- Production areas (from SAFDZ) that can be efficiently linked, through a core road network of barangay and provincial roads, to existing markets
- Communities, preferably properly organized, willing and capable of participation in planning, design and project construction

Should the areas identified in 4B and 4C include a municipality's infrastructure priority sites identified in 4A, the convergence is certain to lead to a sub-project(s) to be proposed to InfRES. The said sub-project(s) can either be municipal-provincial collaboration, or a purely provincial initiative depending on the desire of the LGUs involved.

An example of this can be a convergence cropland area covering portions of 2 adjoining municipalities that is currently not fully utilized because of accessibility problems and which may require upgrading of an existing trail or earth road to a gravel surface farm-to-market road (FMR) connecting the two municipalities. The province can package this as its sub-project.

Step 5: Rank the identified sites.

It is likely that several areas with high agricultural development potential will be identified from the composite map. The selection of the appropriate site for provincial infrastructure intervention will

require a simple and transparent ranking procedure that is acceptable to all parties. It must be clearly impressed upon the participants that their involvement is essential in guiding or influencing provincial investment decisions.

The three sets of characteristics for consideration, from InfRES, from the PPFP and from the list of municipal priorities, must mutually reinforce each other in a particular site. Unless there is a strong justification that the province can set forth, all the other areas where the three sets of characteristics do not converge have to be omitted from further discussions.

This method is similar to sieve mapping, sometimes also referred to as the convergence method. IRAP also applies the same concept by eliminating areas that do not experience accessibility problems and focusing only on those that need access improvement interventions.

Step 6: Prioritize the areas that would qualify for InfRES intervention

As Step 5 is done in a plenary session, it is expected that several areas will be identified, promoted and defended by the representatives from the municipalities involved. The province must strongly emphasize that unlike doing the assessment at municipal level, it is now going to make the evaluation from a higher plane and will consider elements that may not be clearly appreciated when done at a lower level.

From among the areas that remain after applying the InfRES, PPFP and municipal qualifying elements, apply a simple prioritization procedure that will satisfy provincial interests. For instance, evaluate whether the envisaged infrastructure will:

- benefit the most number of people
- spur the agricultural development of the biggest area
- efficiently link production with the consumer market by significantly cutting on travel time and transport costs
- develop communities within or adjacent to the infrastructure's area of influence
- identify cost effective infrastructure interventions

Other elements can be considered by the province in consultation with the key informants and factored into the evaluation during the plenary session.

Prepare either a checklist (or devise a scoring system) to prioritize the sites that remained after Step 6. This could follow the scoring system that has been developed for use at the municipal level (see Chapter 3).

As the consultation involves the participation of key informants from barangay level, it is best if a simple ranking procedure can be devised that use variables with which the participants can easily relate with, say number of beneficiaries and costs of infrastructure development.

Step 7: Identify the infrastructure needed to accelerate the identified area's development and help attain the provincial development objectives

After the selection of the sites and the target beneficiaries, identify the type, extent and nature of the infrastructure needed to accelerate the specific area's desired development.

Using the composite map that indicates the prioritized area for development and recipient of provincial development intervention, brainstorm on the infrastructure needed. For instance, examination of the updated information on the map will help delineate the core road network that will link the production area to the existing and potential markets. Closely look at the current conditions of the strategic segments of the road network and other basic transport infrastructures such as footpaths, trails, footbridges, etc. With the municipal representatives acting as the authority, determine what would be the appropriate infrastructure intervention to attain the desired impact.

Facilitate the discussions and aid in arriving at an agreement on the infrastructure project to be proposed to InfRES.

It is important that the representatives from the other non-recipient areas participate in the open discussions to prevent any unwanted statements that may jeopardize the preparation and submission of the proposal. It must be made clear that the procedure aids in the prioritization and systematic programming of capital investments.

Step 8: Group the identified infrastructures as to roads, communal irrigation system and potable water supply and apply the appropriate ranking procedure.

For roads, rank the identified infrastructures by using the IRAP road prioritization procedure (see Chapter 3) used by municipalities in selecting rural roads. The procedure makes use of the following:

- population within area of influence
- social and economic benefits
- cost

For potable water supply, apply the ILO water supply prioritization procedure (see Chapter 2) that considers the following elements:

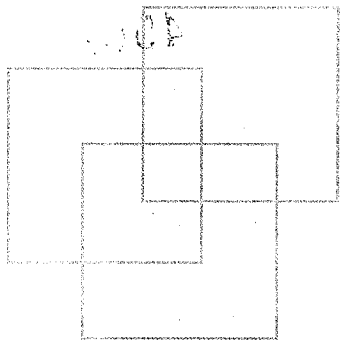
- population within service area
- distance or travel time to current potable water source
- incidence of water-borne diseases
- beneficiary perception

For irrigation system, the National Irrigation Administration (NIA) procedure can be used to select which among the identified areas should be provided with the facility.

The selection as to which among the three types of agricultural support infrastructure projects should be proposed to InfRES is left to the discretion of provincial authorities. Resources, technical and financial capacity, development directions and trends, managerial capability, political dynamics, etc., are just some of the factors to be considered in this selection.

Conclusion

This provincial infrastructure identification and prioritization procedure embodies the participatory component typical of similar methodologies developed by the ILO and applied in several countries in Southeast Asia. Earlier processes were designed for exclusive application at municipal level but changing times necessitate the need for a broader application at a higher-level local government unit: the province. This procedure, pilot-tested in a province and found to be effective, can now be used to assist provinces wishing to avail of InfRES technical and financial assistance.



Chapter 5
Assessing Impact

Rural roads improve rural access, but induce both negative and positive impacts on their service areas. The implicit assumption of InfRES is that improving rural access will increase rural productivity and impact positively on poverty reduction endeavors. These assumptions need to be validated to assess whether the investments are justified and draw lessons for future development projects. Various models for assessing impacts of rural roads have been developed over the years, but most models are rather sophisticated and expensive to apply. This chapter sets out a simple procedure for assessing impacts of rural road projects.

Rural Roads and Impact

Poor access is one of the fundamental characteristics of poverty. Isolation from sources of basic goods, services and facilities is also isolation from information, technology, opportunities, innovations and a chance for a better future. Rural roads aim to improve the links between rural users and suppliers, producers and consumers, and between rural households and their sources of basic goods and social services.

Various studies have been implemented in different countries to measure the impact of rural road investments. These studies vary from relatively straightforward inexpensive qualitative case studies presenting anecdotal information to more costly and sophisticated quantitative socio-economic impact studies.

Rural roads however have no value in themselves. The key role of these roads is to provide access. Access is only improved if road investments result in positive changes in transport. Benefits may then arise from improved access to markets and jobs, improved access to education and health services, improved access to credit and business and improved access to information. Other benefits may result from improved transport services, reduced travel and transport costs and employment created during construction and maintenance.

The procedure presented in this chapter is proposed to assess the impact of InfRES-supported road investments on poverty reduction and agriculture development. The impact of an intervention is best determined after a minimum of 2-3 years from project completion.

Impact assessment is basically determining the effects of an intervention by comparing conditions before and after the project. For the InfRES sub-projects, the impact assessment can focus on the following areas:

On road users:
- ✧ Travel time
- ✧ Frequency of travel
- ✧ Number of road users
- ✧ Transport costs
- ✧ Purpose of travel

On Socio-economic impact
- ✧ Household income and on other measurable changes on socio-economic indicators
- ✧ Agricultural productivity related with production volume, technology, information, new practices

On Environment
- ✧ Description of changes in the natural environment
- ✧ Changes in agricultural and other land uses

To prepare for an impact assessment one needs to first establish a base line database. Household level data needs to be collected through a household questionnaire in the villages that are supposed to benefit from the proposed intervention. This information should include data on assets, travel characteristics, use of services, preferences and perceived benefits. This data represents the before project situation. In order to measure impact one needs a similar data set for the after project situation. A project impact however often needs time to become "visible" and the timing of the after completion survey is important. To evaluate impact one needs to compare the before and after project situation.

In InfRES, the conduct of a feasibility study (FS) is a mandatory activity that provides much of the needed baseline information for the assessment. The FS also provides the justification for the subproject and the rationale behind the site selection. The document prescribed for an InfRES subproject takes off from the profiling and assessment of the target area covering the following information sets[6]:

- Physical and biophysical resources
- Socio-economic situation
- Agricultural resources
- Rural infrastructure
- Internal capability assessment

Other reference materials that also serve as benchmark information can be the municipal Comprehensive Land Use Plan (CLUP) and/or the Municipal Development Plan (MDP). Additional information on agricultural resources is in the Strategic Agricultural and Fisheries Development Zone (SAFDZ) prepared by the Department of Agriculture, while the profiles of the target beneficiaries are in the subproject proposal submitted to InfRES. These also include essential road user information such as traffic count, travel time, frequency of travel, transport costs and purpose of travel.

In the event some of the information needed for the assessment are not available or were not generated, the assessment can be based on primary data generated through beneficiary interviews and/or personal observations.

Impact assessment most often is a difficult process as not all of the changes can be directly attributable to the project but are rather the result of some external factors as well. It is easy to measure the impact of a road improvement on travel time to a health clinic for example, as travel times are reduced as soon as the road is completed. It is much more complicated to measure the impact of the road on the overall health status of the people. Other factors, such as a health awareness programme, might have contributed to an

increased number of visits to the health clinic, which in turn is reflected in improved health statistics. Such developments can also be attributed to better access to information brought about by improved and increased interaction of people with each other and the established sources of relevant information.

One objective of this assessment procedure is to help determine the socio-economic benefits of roads constructed under InfRES. In instances when the roads are constructed using labour-based technology, or when a systematic labour-based maintenance procedure is in place, the impact assessment should also look into the employment creation effects[7].

Assessment Methodology

The remainder of this chapter briefly sets out a methodology for assessing impacts of rural roads under InfRES. The procedure is relatively inexpensive and easy to use and local enumerators could be hired to collect the needed data.

The impact study also aims to assess the magnitude and distribution of both direct and indirect effects of access improvements. Direct effects are the result of reduced travel times and savings in transport costs. Indirect effects consist of increases in income and improvements in health, education, interaction, participation etc.

[6] Training on Subproject Feasibility Study Preparation, InfRES Project, DA 2005

[7] One expert depicts the various *effects* (short-term) and *impacts* (longer-term) that can result from investment in roads as follows:

*Road construction and maintenance
*Employment
*Transport
*Agriculture
*Non-road related employment
*Non-agricultural production
*Income effects
*Social effects
*Institutional changes

"As listed the series approximates to the temporal order of appearance and certainty i.e. employment in the process of improvement provides an immediate and direct source of income, and together with changes in transport can be characterised as *effects*. The remaining aspects are more in the nature of *impacts*, which require that the improved road and transport conditions are sufficiently sustainable to induce positive changes. They are not just a progression in time, the distant things are more difficult to achieve and thus less certain to happen (Howe 2005).

Activity 1: Assess available secondary data and identify data gaps

Gather all the documents used in conceptualizing and formulating the subproject. The documents should include: LGU development plans, project feasibility study, socio-economic profile, project proposal, and Memorandum of Agreement and/or contracts entered into by the LGU. Ensure that the documents provide the following information:

- Description of the infrastructure project
- Rationale, general and specific objectives of the project
- Primary (and secondary, if identified) beneficiaries
- Socio-economic conditions
- Local policy statements relevant to the project

From the available benchmark information, list those that best describe the conditions before subproject implementation and assess whether these have been updated to describe current conditions relative to the project area.

Identify data gaps and prepare for Activity 2.

Activity 2: Conduct primary data generation

The project documents identify the target beneficiaries of the infrastructure, automatically presenting a list of respondents for the primary data collection. The zone of influence of a road project is taken as the area within 2 kilometer distance on both sides of the facility.

The data gathering instrument should be designed to measure the changes brought about by the road on its users, on the household beneficiaries, on the environment, on local institutions and on local policies. The following can be used as reference to measure these changes:

- Travel time
- Frequency of travel
- Number of road users
- Transport costs
- Purpose of trips
- Household income indicators
- Health indicators
- Literacy indicators
- Access to livelihood/employment opportunities
- Unemployment/underemployment rates
- Changes in the natural environment that can be attributed to the road
- Land use within the zone of influence

- ✧ Local policies related to the infrastructure
- ✧ Formation of organization or groups linked to the infrastructure

Different tools exist but it is suggested that this proposed impact evaluation would make use of five tools: i) household survey, ii) village survey, iii) traffic counts, iv) origin-destination survey and v) market price survey.

This activity consists of 3 different sub-activities: i) the design, pre-testing and finalization of the survey questionnaires, ii) the recruitment and training of enumerators, and iii) the conduct and supervision of the survey.

Activity 3: Prepare Base Line Report

Synthesize and aggregate the primary and secondary data and present it in such a way that it can be used in a future impact analysis. It will be necessary to develop indicators which can also be used to measure change. Prepare a report presenting this all.

Activity 4: Implement First Follow-up Survey and Prepare Brief Report

A first follow-up survey will be implemented using a similar survey instrument as developed under activity 2 shortly after the road construction has been completed.

Synthesize and aggregate the data collected and present it in such a way that it can be used in a comparative analysis. Assess the initial effects of road construction by comparing this data set with the base line data. Prepare a report presenting this all.

Using tables prepared for the purpose, process the accomplished questionnaires and summarize the results. Note emerging patterns and/or trends and be ready to relate and/or determine whether these are indeed caused by the infrastructure.

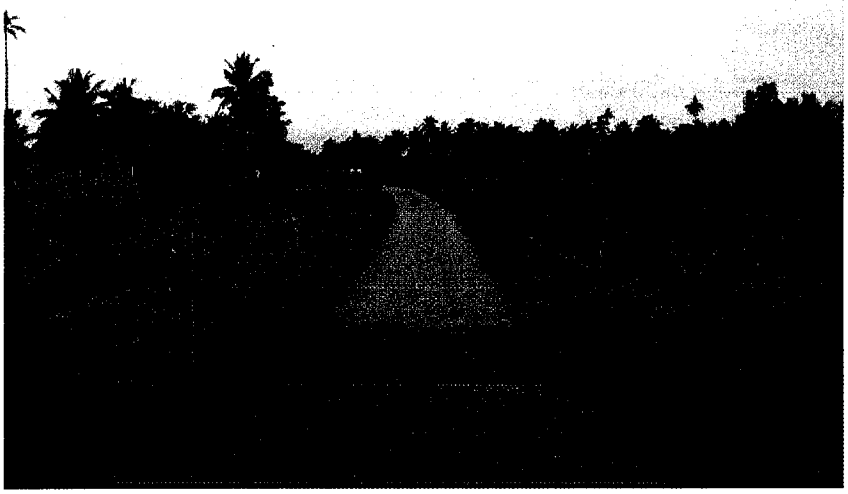
Activity 5: Implement Second Follow-up Survey and Prepare Brief Report

Activity 5 is basically a repetition of activity 4, although additional data may need to be collected.

A second follow-up survey will be implemented using a similar survey instrument as developed under activity 2 about 2-3 years after the road construction has been completed.

Similar to activities 4, synthesize and aggregate the data collected and present it in such a way that it can be used in a comparative analysis. Assess the impact of road construction by comparing this data set with the base line data and first follow-up survey. Prepare the final impact analysis report presenting this all.

Using tables prepared for the purpose, process the accomplished questionnaires and summarize the results. Note emerging patterns and/or trends and be ready to relate and/or determine whether these are indeed caused by the infrastructure.



Activity 6: Prepare Impact Analysis Report

The results of the activities above constitute the basis for the impact assessment. The impact of the road may come in several forms, or in various intensities. Determine which among the impacts have the most significant effect on the beneficiaries, both positive and negative, not only to guide the effective operation and maintenance of the road but also as input to planning of future similar projects. Interpret the findings by relating conditions prior to the completion of the project and establishing how the changes came about as a result of the project. For instance, establish how improvement of the road led to reduction in travel time, changes on the frequency of trips taken by beneficiaries, developments in the number of public transport services, variations in travel cost, current access to information (i.e., technology, pricing, practices, etc.), or on the frequency of visits by technicians, health workers, teachers and/or traders.

Try to relate variations in household income to increased agricultural production, better access to other livelihood or employment opportunities, use of new production techniques, new seed varieties or farm inputs, all of which could have not been possible or would have been beyond the easy reach of beneficiaries if the infrastructure was not constructed.

There are instances when the LGU or barangay governments would enact ordinances regarding the operation and maintenance of the infrastructure, or a community organization dedicated to the upkeep of the facility would be formed, or some institutions are strengthened to ensure the prolonged use of the road. Establish how these developments are brought about by the improvements on the road.

The construction of the road may also result in some environmental changes like flooding, erosion or even landslides. Try to establish how the findings regarding this aspect could have been due to the infrastructure.

The impact assessment report is useful not only to project developers and managers but to the beneficiaries as well. The report can serve as an effective feedback mechanism for barangay beneficiaries, LGU officials, community organizations and other users of the facility and reinforce prescribed ways in operating and maintaining their facility. The document can also be used to strengthen advocacy initiatives as a useful reference that identifies effective practices and guides in correcting non-productive efforts.

Chapter 6
Planning Rural Road Maintenance

The poor condition of rural access roads is a problem common to many Philippine rural communities. This condition is brought about by the lack or total absence of road maintenance. Roads are designed to improve access. However, if they are not properly maintained in spite of their continued use, the infrastructure deteriorates rapidly to the point that motorized vehicles can no longer use it. This leads to increased transport costs, an increasingly difficult access, and the loss of all the benefits derived from an improved road. Nevertheless, current trends indicate that new roads are continuously being added to the network, with maintenance still a consistently neglected activity. For rural road projects to attain its desired objectives, the issue of providing proper, appropriate and timely maintenance must be addressed.

Rural Roads and Maintenance

The InfRES project hopes to break the vicious cycle of doing road rehabilitation without any assurance of maintenance from concerned parties. For this end, sub-project beneficiaries are obliged to prepare a ten-year operation and maintenance (O&M) plan, the LGU proposal describing how the infrastructure will be managed and maintained for the next ten years. InfRES prescribes that the O&M plan should be part of the Implementation Management Agreement (IMA), the contract between the Department of Agriculture (DA) and the recipient local government unit (LGU).

ILO is collaborating with InfRES to establish and strengthen the practice of rural road maintenance in the project areas. The first activity in the collaboration was the conduct of the Rural Road Maintenance Study (RRMS) in 2005 that helped identify several underlying causes of non-maintenance. RRMS also identified action areas that could ensure maintenance of rural roads. The study and its recommendations are described in a separate ILO ASIST AP publication[8].

ILO also responded to a DA request to reinforce LGU capacity on the preparation and operationalization of a 10-year O&M Plan for rural roads provided under the InfRES Project. The training program prescribes that the

LGUs undergo a two-day training course on the conceptualization and development of a realistic and responsive operation and maintenance plan based on the technical and financial capacities of those tasked to maintain the infrastructure.

This chapter describes this module and outlines the different steps in the maintenance planning process.

Preparing the Operation and Maintenance Plan

The O&M Plan should have, among others, a clear description of the appropriate maintenance activities, the timing of the application, costs and budget requirements, the delivery mechanisms and distribution of responsibilities between the LGU and the beneficiaries, sources of funds and schemes on how to sustain the preventive maintenance actions.

An O&M Plan outline has been prepared to guide the LGUs' technical offices in accomplishing the task. The O&M document should clearly demonstrate both the LGU's and the beneficiaries' commitments to protect and ensure proper use of the infrastructure, their understanding of how to prolong its useful life and help realize InfRES' long term objectives of rural poverty alleviation through agricultural productivity enhancement.

[8] See "Maintenance Study in the Philippines", ILO ASIST AP, 2005.

The O&M Plan outline and the prescribed training activities for LGUs were applied in two pilot municipalities. The approach has been proven to be effective in tapping the wealth of exposure and experience among the target beneficiaries on innovative and practical means to do maintenance, convince them on the need to protect and prevent the rapid deterioration of this important infrastructure asset, and solicit their commitments to this significant activity. The O&M Plan preparation activities include site visits, visual inspection of the proposed project sites to visualize how the finished infrastructure would look like, and direct interactions and consultations with stakeholders and affected parties.

The positive results of the pilot activities reinforce the findings and recommendations of the RRMS and indicate that the beneficiaries' direct participation is crucial in realizing the O&M Plan objectives. This calls for the involvement of the stakeholders - the intended beneficiaries, the community, NGOs, people's organizations and other interest groups, in design and construction of the infrastructure to ensure their pro-active role in its operation and maintenance.

The O&M Plan is also envisaged to be a basis for the monitoring activities of the Sub-project Monitoring Board (SPMB), the local multi-sector organization tasked to oversee the operation and maintenance of the roads. It is also foreseen that the DA will refer to the plan extensively in conducting its own monitoring activities.

Data requirement in O&M Plan Preparation

The formulation of the O&M Plan requires reference to the following information sets:

- Detailed engineering design (DED)

  The DED provides basic information on the road's dimensions and specifications, and support structures like side ditches, side slopes, cross drains, bridges, etc. The computations to determine expected maintenance expenditures should be based on the approved design and related with the technical and financial capacity of the LGU.

- Unit costs of materials and labor, equipment rental rates

  Costs of labor, materials and equipment rental vary among LGUs. The costs to be used in the computations should be verified first by the concerned LGU technical office prior to adoption in the training course.

- Updated topographic and land use maps of the subproject site

  The updated topographic maps will aid in understanding the significance the sub-projects in attaining InfRES and LGU objectives, make easy in plotting the site visit itinerary and facilitate in establishing an effective beneficiary-LGU interaction.

- Experiences, lessons and insights solicited from the intended beneficiaries

  Operation and maintenance of rural roads require the participation and involvement of the direct beneficiaries. The evolving consciousness brought about by the deplorable state of rural roads in the country indicates that the direct beneficiaries should be mobilized to play an important role in protecting and preserving their infrastructure assets. Drawing from their experiences and lessons learnt is expected to lay the groundwork for their involvement in future maintenance activities as well as help make the O&M Plan more acceptable, realistic and doable within the technical and financial capacity of the LGU.

The following is the recommended O&M Plan outline.

Proposed Outline
Operations and Maintenance Plan
ADB-DA InfRES Project
ILO ASIST AP
2005

1.0 Introduction

- Background
  The introduction should provide basic information as to how the LGU was able to access the funding support, why it deserves the infrastructure, the difference it will make to the overall agricultural productivity of the area and to the direct beneficiaries, and a statement of a clear commitment to protect and prevent the infrastructure's deterioration and thereby prolong its useful life. The introduction should also provide a brief description of the infrastructure with an estimate of construction costs and the number of residents that will be directly benefiting.

- Current conditions
  This section should describe current socio-economic conditions focusing on the mobility and accessibility status of residents to basic goods and services. Clearly provide the justification for the sub-projects and how the new infrastructure will help attain the InfRES objectives.

- Expression of needs
  Direct discussions on current conditions to highlight the identified beneficiaries' clear need for access-improvement interventions. Refer to socio-economic data, testimonial statements, reports and observations to drive the point.

2.0 Goal

Adopt the goal of the InfRES project:

- ✧ Increase agricultural productivity through rural infrastructure development.

3.0 Objectives

The objective is to preserve the maintenance of the rural roads:

- ✧ Prevent or minimize deterioration of the infrastructure and prolong its useful life

4.0 Strategy

A strategy can be an intervening activity, an approach or tactic that will help facilitate the attainment of the plan's goal and objective. A strategy can be selected from an array of proven approaches, techniques or tools and can be applied by the LGU without losing sight of the objective of the plan. Strategies include:

- ✧ Beneficiary participation
  Decentralization and devolution transferred rural road maintenance responsibilities to the local government units, particularly to the barangays. The infrastructure should not be seen as another dole-out from government but must be clearly projected as a product of collaboration with the beneficiaries. It is understood that the beneficiaries will play a key role in maintaining the infrastructure and should be part of its conceptualization, design development and implementation. This direct involvement is expected to result in better cooperation on the proper use and maintenance of the rural road. Discuss how the LGU will take on board the beneficiaries with regards to protecting and preserving this infrastructure asset.

- ✧ Municipal-barangay collaboration
  This strategy reinforces the previous one. It must be made clear that higher authorities recognize the role of the beneficiaries by entering into a formal agreement on the operation and maintenance of the road. Present LGU options and identify which one would be most applicable to the area. Discuss schemes on how the collaboration can be achieved and the benefits that will accrue to both budget-holding and budget-seeking entities of local governance.

- ✧ Maintenance forecasting
  Discuss when and what maintenance activities are to be implemented. For instance, specific activities are dictated by seasonal climate and weather patterns. This will guide the preparation of an annual forecast of maintenance activities and the appropriate budgetary and manpower requirements. This can also facilitate the conduct of collaborative work where the barangay residents and other interested parties can be engaged.

- ✧ Capacity building
  This strategy will address the lack or absence of capacity at local level to maintain rural roads. It has been established that barangays have few resources and technical capacity to maintain barangay roads and have to rely on higher-level LGUs for the task entrusted to them under the Local Government Code. Present and discuss technical assistance needs of the barangays and how the LGU will address this.

5.0 Maintenance Activities

Describe different maintenance tasks including:

- *Routine maintenance*
- *Periodic maintenance*
- *Emergency maintenance*

> *This section should be devoted to presenting the proponent's understanding of specific activities by road segments. For instance, segments with riprap as side slope protection will be treated differently from the segments with earthen grass-covered side slope. The idea is to divide the road segments into distinct maintenance requirements to clearly prescribe technical assistance actions to the beneficiary barangays and guide the LGU's monitoring and evaluation actions.*

6.0 Schedule

Come up with an indicative schedule on when maintenance activities will be implemented. Some of the activities are considered critical to the start of succeeding actions. Examples of critical activities are: holding of focused group discussion/ consultations with beneficiary barangays; signing of a formal agreement to do collaborative work; or the establishment of village maintenance committees or groups. This section should not be limited to specific road maintenance activities, whether routine or periodic, but should include all the activities described in earlier sections that are needed to ensure proper delivery and application of maintenance actions on the sub-projects.

- Seasonal segmentation of activities by road link
  In areas where project sites experience different micro-climatic conditions, like one section tends to receive more rains or gets flooded more often, or manpower availability in an area is very much influenced by seasonal agricultural production activities. This understanding can guide the local engineer in designing the technical assistance to be provided or applied in specific road segments. If no variations are experienced, this section can be dropped as its contents can be covered in other discussions.

- Annual schedule of activities by road link
  Describe the activities per road link on an annual basis. If this is not possible, a description of the road links describing how they will look like once finished, with a discussion on the expected annual maintenance requirements will suffice.

7.0 Budget

To be based on type and frequency of activities.

> Determine maintenance budget requirements by road links based upon the detailed engineering design, prevailing costs and rates. Prepare an updated list of costs of materials, labor and rental rates. Include costs of fuel and lubricants, hauling of maintenance materials. Productivity standards can be lifted from the DPWH and/ or MRD and DILG maintenance manuals. Compute for unit costs and apply the figures to road segments to get the total figure for budgeting purposes. The budget will be based on the type and frequency of maintenance activities that will be implemented on an annual basis. This section will put a price tag on the maintenance activities discussed in the previous sections.

8.0 Source of Funds

Maintenance of rural roads, being a recurring expenditure, should be funded from the Maintenance, Operating and Other Expenses (MOOE) of the annual budget. However, most LGUs allocate funds from the 20% Development Fund where everybody else competes. LGUs and barangays, especially in 4th-6th income classes have the annual Internal Revenue Allotment (IRA) as their only source of income. Although this is not a convincing argument to support rural road maintenance commitment, this section must present and discuss other funding options and how these can be tapped. In addition, touching upon schemes on how to operationalize resource mobilization strategies will help strengthen the plan.

O&M Plan Preparation Program of Activities

The O&M Plan preparation training module was tested in two pilot municipalities. The LGU-led interaction with the direct beneficiaries of the sub-project provided valuable inputs in writing the plan. Annex 1 is an example of a maintenance plan prepared by the municipality of Talisay after participating in the training.

Conclusion

The ILO prepared this training module to help the proponent LGUs formulate their respective O&M plans prior to IMA signing. The intervention also provided a simple procedure to help LGUs determine the costs of appropriate maintenance activities over a 10-year period and help guide the provision of the needed appropriations from those tasked to take on the responsibility.

A logical follow-through to this training module is the provision of technical assistance on the actual conduct of operation and maintenance activities. This O&M Capacity Building Package will not only present how the O&M Plan can be translated into actual work, but will also provide the system for collaboration among the concerned parties. The O&M Capacity Building Package will be completed by late 2006.

Republic of the Philippines
Province of Camarines Norte
Municipality of Talisay

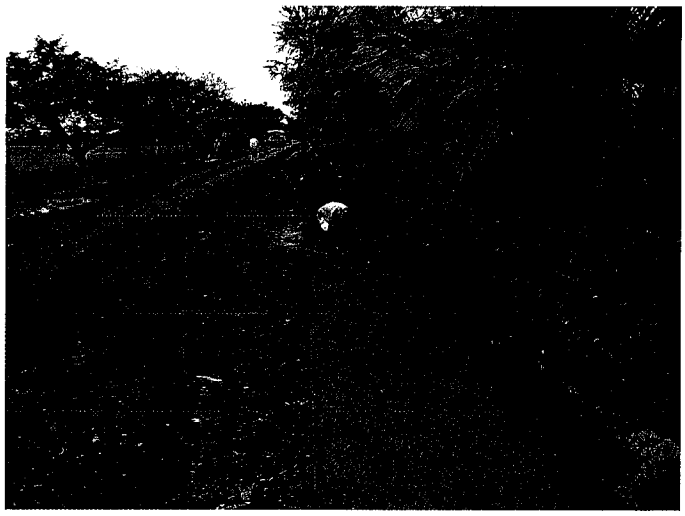
OPERATION AND MAINTENANCE PLAN *2006-2016*

Talisay Roadnetwork Accessibility Improvement Linkage (TRAIL) Project (Upgrading/Improvement and Construction of Farm-to-Market Road Sub-Project)

Republic of the Philippines
Province of Camarines Norte
Municipality of Talisay

OPERATION and MAINTENANCE PLAN

Talisay Road Network Accessibility
Improvement Linkage (TRAIL) Project
(Upgrading/Improvement and Construction
of Farm-to-Market Road Sub-Project)



I. Introduction

I.1 Background

The Talisay Sub-project "Improvement/Upgrading and Construction of Farm-to-Market Roads" is one of the rural infrastructure sub-projects seeking financial support from the Asian Development Bank (ADB)-assisted Infrastructure for Rural Productivity Enhancement Sector (InfRES) Project of the National Government with the Department of Agriculture as the Executing Agency and the Local Government Unit (LGU) of Talisay, Camarines Norte as the implementing agency. This sub-project will be implemented in seven (7) beneficiary barangays of Gabon, Caawigan, San Isidro, Cahabaan, Calintaan, Binanuaan and San Nicolas and is expected to directly benefit some 2,315 households, or about 46.3% of total population.

With a total road length of 9.471 kilometers, the farm-to-market roads sub-projects are divided into three (3) different components namely: 1) improvement of existing roads, 2) construction of new roads, and 3) installation of 19 spans of reinforced concrete pipe culvert (RCPC's). Total project cost is estimated at Php26,000,000.00.

Gravel roads are expected to last 5 years under normal use and with proper maintenance. For the sub-projects, total routine and periodic maintenance costs over 5 years is estimated at Php5,331,365.00, with about 5% annual cost increase on all current figures. On the other hand, if the roads would have to be rehabilitated five years from now, the projected costs would amount to Php32,500,000.00, or 6 times more than what would be spent maintaining it for five years. It is obvious that maintaining the road is the practical and cost effective option that the LGU and the beneficiaries should take. The estimated average to undertake preventive maintenance over the 5-year period is approximately Php59,310.00 per kilometer.

The figures indicate a need for yearly budget appropriations for sub-project operation and maintenance. In addition, the current capacity of the LGU dictates that the contemplated maintenance activities to be effective should involve the user-beneficiaries themselves, as they deal with the facility on a daily basis, can monitor and identify early signs of deterioration, and can easily constitute the quick reaction force on site.

In this context, an Operation and Maintenance Plan has been prepared to support the Sub-project and all its other support structures like roadways, culverts, drainage canals, shoulders and side slopes. This is to protect the farm-to-market roads from rapid deterioration that will not only affect the project's useful life but also the beneficiaries' access to services and the improvement on their socio-economic and living conditions. This is the ultimate goal of the InfRES Project.

This Operations and Maintenance (O & M) Plan describes how the LGU will manage and maintain the sub-projects in the next ten years.

I.2 Current Conditions

The access condition in the municipality specially in using the existing farm-to-market roads (FMR) could not be underscored, considering the FMRs' usefulness in the day-to-day transport activities of the constituents in the sub-project area. The infrastructures are not only used to transport commuters from the barangays to the Poblacion where most services are located, but also for various agricultural purposes like hauling of produce and goods to the market and trading areas, as well as bringing in of farm and household supplies.

Since FMR's are integral part of the development of the community, the overall condition of the roads must always be taken into consideration. The barangays in the sub-project areas can only be accessed through roads, and these are mostly earth roads. Because of this limited access, the provision of basic social services, trade and commerce opportunities, and the development of land resources are not optimized. The implementation of this sub-project is foreseen to boost local economy through sustainable agriculture development and eventually improve the living condition of the beneficiaries.

About nine (9) road segments distributed in seven beneficiary barangays comprise the sub-project. The current access infrastructure conditions in areas where the 9.471 kilometers access roads are distributed are described in the Barangay road inventory (Annex 1). The inventory indicates that dirt roads are the longest at about 7.745 kilometers, followed by gravel roads totaling to 1.476 kilometers and cemented roads of about 0.25 kilometers. There are no existing asphalt roads in the sub-project sites.

Most of the dirt roads are passable, except in barangays Cahabaan, Calintaan, Caawigan and Gabon where there are impassable portions. These segments will soon be opened and therefore need cleaning and clearing of trees and bushes. In barangays San Isidro and San Nicolas, the roads will be widened since most of the existing ones are narrower than the standard. All of the gravel roads are eroded and unsafe, and gets muddy during rainy days. Only the short cemented roads are safe enough for daily commuting and transporting activities.

The current road conditions, as attested to by barangay constituents, is partly caused by the residents themselves due to limited knowledge on the facilities' day-to-day upkeep and preservation, like teetering of animals and/or planting of big trees along the roadway. In addition, pilferage of the gravel surface that is eroded further by continuous heavy rains adds to the infrastructure's degradation.

In likewise manner, lack of laws and ordinances to protect the access roads, roadways, and support facilities, the continuous use of carabao-drawn carts, hauling trucks and other heavy equipment contribute to the deterioration of the farm-to-market roads.

The limited municipal and barangay funds appropriated for regular maintenance work of the existing roads, with the lack of environmental programs to support the road protection activities in the barangays, help worsen the already critical condition of the roads.

Shown in Annex 2 are the apparent causes of road deterioration as perceived by the seven (7) beneficiary barangays during the recent consultation conducted by the municipality.

I.3 Approach

One of the main reasons for maintenance is to avoid if not counter, the early deterioration of the road to avoid the more expensive rehabilitation or reconstruction works that can cost almost the same amount as that of a new road.

Exposure of the stakeholders to the idea of maintaining not only the roads but also other infrastructure support facilities as well will result in fewer expenses for the local government. The need to educate the community on the importance of maintaining the road in addition to imparting knowledge on how rehabilitation works should be carried out at the barangay level is a long overdue measure and institutionalization approach that the LGU should now put into action. This approach reinforces local autonomy as stressed in the Local Government Code of 1991. Section 17, Chapter 2, states that the barangay should maintain facilities and other public works projects such as barangay roads, bridges and water supply systems. Section 287, Chapter 1, provides that each LGU shall appropriate in its annual budget no less than 20% of its internal revenue allotment (IRA) for development projects, while Section 308, Article 1, Chapter 2, provides that local government units shall maintain a General Fund for payment of expenditures and obligations not specifically payable from any other fund. Section 18, Chapter 2, allows the local government units to "create their own sources of revenue ... which shall accrue exclusively for their use and disposition." The law clearly provides the authority, resources and flexibility for LGUs to maintain their roads and it is only a question of convincing local decision-makers on the wisdom of taking on this responsibility.

The municipality, due to its limited resources and capacity, feels there is a strong need for a common and collaborative approach regarding the operation and maintenance of roads. In addition, the local government contends that non-maintenance of barangay roads cause delays in the delivery of basic services, thus jeopardizing the LGU's development commitment to rural communities where poverty brought about by isolation continues to thrive.

II. Goal

The goal in providing the infrastructure subproject is to increase productivity through rural infrastructure development. The infrastructure is seen as a catalyst that will spur development and address the rural poverty conditions in the target areas.

III. Objectives

The objective of the operation and maintenance plan is to preserve the infrastructure and provide a sustainable platform to attain the project's goal. Prescribed maintenance activities are designed to prevent or minimize deterioration of the farm-to-market roads and prolong its useful life.

IV. Strategies

The municipality concedes that it would be difficult to attain the objectives of this Operation and Maintenance (O & M) Plan using solely the LGU's available manpower and fiscal resources. It is believed this can be best addressed by bringing the target beneficiaries and other stakeholders into the road development activities. It is essential that their involvement should be right at the identification, design and construction stages of the project. Presence in these major activities is expected to provide a sense of ownership that hopefully will result in their active participation in road maintenance. The following describes the strategies to help ensure sustained usefulness of the FMR.

IV.1 Beneficiary Participation

The barangay representatives openly expressed interest to be involved in the operation and maintenance of their respective transport infrastructures. This expression of interest is clearly manifested in the following commitments declared during the barangay consultations.

Barangay representatives commit to support of the activities of the O & M plan by enacting barangay ordinances providing for the following:

- Limiting the use of the road for small and light vehicles only;
- Preventing trucks and other heavy equipments from using the road;
- Banning of Pahila or carabao-drawn cart on the road;
- Banning the teetering of animals near the road;
- Disallow the planting of forest and fruit trees along the road right-of-way;
- Banning the quarrying of sand and gravel on the road and the road shoulders;
- Requesting financial assistance from the CDF of the Congressman for funds to maintain the roads;

The barangay councils also commit to form or organize committees in their level that will oversee/monitor the road condition and ensure the strict implementation of the laws and ordinances. The representatives added that

the help of Barangay Tanods to patrol the sub-projects regularly will also be sought.

In order to effectively carry out the maintenance tasks, it is recommended that the spirit of bayanihan be promoted among the households residing along or near the facilities to maintain cleanliness and orderliness on the road premises to be supported by Clean and Green Program implementation. The Sangguniang Kabataan (SK), in line with the environmental and sanitation programs in their respective areas, will spearhead this activity.

Through Barangay Resolutions, resources from the 20% Development Fund of the beneficiary barangays will be appropriated to aid barangay constituents to undertake small road repair and maintenance works.

In addition, the LGU will work together with the barangay leadership in conducting IEC and other information campaigns on the importance of protection and maintenance of the road during barangay assemblies and regular Purok meetings. The commitments of the barangays will be formalized once the approval of the subprojects becomes certain. Summary of activities identified by the barangays beneficiaries are presented in Annex 3.

For the LGU, the MPDO and MEO will work together in ensuring that the commitments of the barangays to do collaborative work with the municipality will be realized. The Office of the Mayor will play a pivotal role in this endeavor.

IV.2 Municipal-Barangay Collaboration

In support of barangay initiatives, the municipal government commits to initiate collaborative actions that will sustain operation and maintenance of the Sub-project.

First is the adoption by the Sangguniang Bayan of all laws and ordinances that will be passed by the different beneficiary barangays to reinforce the initial move of their respective councils. Preliminary information campaign and continuous education programs for the barangay residents on the importance of their direct participation in the maintenance activities and the protection of support infrastructure like the road shoulders, drainage canals, embankments and the clearing of culverts will be waged by the LGU to augment the councils' move.

In addition, appropriate and hands-on skills development training for the barangay residents to carry out immediate and simple road rehabilitation and maintenance works will be sought and provided. Likewise, the conduct of coordinated consultative meetings with the local constituents and the Barangay Councils for feedback and recommendations will be regularly held.

To complement the different activities and help the barangays carry out maintenance works, the LGU will solicit hand tools and equipment like shovels, hoe, pick mattock, wheel borrows, bolo and rakes from relevant government agencies like the Department of Agriculture, Department of Land Reform, the Provincial Government and other NGO's and civic organizations like the Lion's and the Rotary Clubs, who have complementary and similar programs in the countryside.

The Local Government Unit (LGU) will also appropriate annually counterpart funds from the 20% Development Fund for the operation and maintenance of the farm-to-market roads. As road maintenance is a recurring expenditure, efforts to make this part of the regular budget taken from the General Fund will be pursued. Periodic monitoring activities by the Municipal Engineering Office will be conducted and reports will be provided to the Punong Barangays, the Sangguniang Bayan and the Local Chief Executive to ensure well-coordinated development actions.

The local administration will ask for funding support from the different government agencies specifically the DPWH and the Provincial Government to include the Sub-project area in their regular road operation and maintenance budget. Moreover, resolutions will be passed requesting financial assistance from Senators for the maintenance of the farm-to-market roads.

To extensively monitor the operation and maintenance of the Sub-project, and any other projects implemented in the municipality, the LGU will use the Municipal Project Monitoring Committee (MPMC) created under EO 18-2004 in conjunction with the Sub-Project Management Office (SPMO), the office responsible for the over-all coordination, management and monitoring of the Sub-project and the Project Monitoring Board (SPMB). The SPMO and SPMB are tasked to determine and assess the value of accomplished activities based on the established quality standards and its acceptability to the community. These committees have been established for the implementation of the InfRES Sub-project under EO 08-2005.

IV.3 Advocacy and Capacity Building

Capacity building is an essential part of the Operation and Maintenance Plan. Alongside the monthly information and education campaign both for the Barangay Officials and the Non-Government Organizations in the Sub-Project area, IEC's will also be given to households residing within the 2-kilometer distance from the farm-to-market roads. Leaflets and other reading materials on the importance of road maintenance will be provided to barangay beneficiaries. Discussions on these topics will also be part of barangay assemblies and visitations of the different municipal offices as a scheme to maximize information campaign to the communities **(Annex 4)**.

On the other hand, training activities will also be conducted starting with values formation for barangay beneficiaries to inculcate a sense of ownership and responsibility to the Sub-project and all the support infrastructure facilities of the barangay. Leadership training and similar activities will also be provided to the NGO partners, including Gender and Development and other related issues, to help distinguish responsibilities and duties between and among the barangay residents. These activities will be augmented by the provision of practical skills on detection of early signs of road deterioration, the appropriate maintenance actions needed, and the use of necessary tools and materials.

To be able to sustain the operation and maintenance of roads, provision for O & M training will be supplied by the Office of the Municipal Engineer to the direct beneficiaries and the Sangguniang Barangays. The technical assistance will include monitoring and evaluation as well as report preparation procedures.

IV.4 Maintenance Forecasting

Road maintenance has been the waterloo of local government units. LGU's are beset with problems, aggravated by inadequate local funds and limited technical personnel and equipment to undertake operation and maintenance works of existing roads and bridges.

The appropriateness of rural road maintenance activities is primarily determined by the Municipal Engineering Office (MEO). The MEO also takes into consideration the experience and exposure of barangay residents that have been provided and are still making use of whatever remains of earlier earth and/or gravel barangay roads. During the LGU-barangay consultation, the intended beneficiaries of the InfRES FMR's provided useful insights for the MEO to forecast the frequency of application of appropriate rural road maintenance activities on an annual basis. For instance, it was pointed out that the dry months of April-May are ideal for clearing and cleaning of drainage ditches and side slope protection in preparation for the June-October rains. Monitoring and application of appropriate measures can continue during these months to mitigate the effects of surface water on the road. Patching of potholes can be done prior to and/or after the rains, while reshaping of carriageway can commence while there is still moisture on the ground, sometime during the period November-January.

These maintenance activities, to be undertaken on a regular basis, require manpower and financial resources. The annual activities include routine maintenance on the road surface, shoulder, side slope, drainage ditches and channels, culverts, bridges and other support structures. Periodic maintenance, like replacing the gravel road surface material, will be applied on the 5th year.

Computations based on current costs and productivity standards indicate that the annual maintenance of one (1) kilometer of rural road is estimated at Php53,668. (Annex 5) Projected routine maintenance costs for the sub-project's 9.471 kilometers will rise to an average of Php59,309/km. in year 5 and some Php67,502/km. in year 10. Routine and periodic maintenance on the fifth year are estimated at Php3,140,579 while the same activities will cost Php3,815,824 on the 10th year. The cooperation and collaboration between and among the beneficiary barangays, municipal and provincial governments will be pursued with a recommended sharing of 15% for barangays, and 85% for the municipality.

V. Maintenance Activities

V.1 Routine

Routine road maintenance for gravel road includes activities regularly performed solely by road maintenance workers or with the use of heavy equipment. These activities are prescribed to be applied throughout the year, for the upkeep of the original shape and condition of the road:

	Activities	Frequency
1. Road Surface Maintenance	- Patching of potholes	Year-round
	- Regrading/Reshaping	Once a year
2. Road Shoulder Maintenance	- Vegetation Control	Quarterly
	- Surface Restoration	Once a year
3. Road Side Slope Maintenance	- Roadside Slope	Once a year
	- Erosion Control	Once a year
	- Vegetation Control	Quarterly
4. Drainage Maintenance	- Hand Ditch Cleaning	Twice a year
	- Culvert Cleaning and Repair	Once a year

Annex 6 presents cost distribution of operation and maintenance activities per road segment.

V.2 Periodic

Periodic maintenance activities involve more extensive work that is required every several years.

For the Sub-project, periodic maintenance is limited to regravelling once every five years.

V.3 Emergency

Emergency repair and restoration works will be undertaken when applicable and when certain emergency events occur as a result of force majeure like typhoons, earthquakes, flash floods, etc. The budget needed for these activities are provided for under Item 5.1 of the O&M budget.

V.4 Road Segments Application

Operation and maintenance activities will be done by road segments per kilometer. The frequency of operation per segment, such as year round, quarterly, once a year or twice a year, and limited mostly to patching, reshaping, vegetation and erosion control as well as drainage control and maintenance, will be facilitated by the LGU and the barangays. Periodic maintenance, like regravelling,, will be done every five (5) years and will be implemented either by administration or by contract. This activity is costly and will require the participation of the Provincial and/or Municipal Engineering Offices.

For segments on fill, such as the new roads on the rice fields, will have erosion control measures like planting of carabao grass, small trees and shrubs on side slopes and road sides in addition to the usual patching of potholes on the road surface, as a year round activity. It is envisaged that the residents themselves will actively participate in these activities.

For earthen roads on stable flat terrain surfaces, operation and maintenance activities include patching of road surface, cleaning of culverts and vegetation control like grass mowing and cutting of shrubs.

The municipality shall pursue vigorously formation of barangay road maintenance committees as recommended during the stakeholder consultations. The barangay leaders committed to mobilizing the residents near the subprojects to constitute a maintenance team responsible for monitoring and reporting, as well as participating in actual routine maintenance works.

VI. Schedule

VI.1 Schedule of activities

In the previous sections, specific activities in support of FMR operation and maintenance have been identified and described. Annex 7 presents the indicative schedule on when formalization of collaborative work with beneficiary barangays and other organizations will commence and be implemented.

VI.2 Annual Schedule of Activities by Road Links

Road surface maintenance works, usually patching of potholes, will be carried out the whole year round with regravelling works on the fifth and tenth year.

Road shoulder maintenance that includes surface restoration and the roadside slope maintenance is a yearly activity. This is focused on repair/restoration of riprap on both sides of backfill materials. Vegetation control to avoid entrapment of water and clogging of waterways is a quarterly event, hand cleaning of ditches is scheduled twice a year while culvert cleaning and repair will be carried out once a year.

VII. Budget

The 10-year operation and maintenance costs for the 9.471 kms. farm to market road is estimated at Php 11,943,248 broken down as follows:

Link No.	Road Segment	Ten-year Total	
		Length (km)	Amount (Pesos)
1	Upgrading of Cahabaan (P-2) - Calintaan FMR	1.594	2,010,087
2	Upgrading of Cahabaan (P-3) FMR	1.290	1,626,733
3	Upgrading of San Isidro (P-4) FMR	0.600	756,620
4	Upgrading of Gabon (SHS) FMR	0.547	689,785
5	Construction of Gabon - SHS FMR	1.760	2,219,419
6	Construction of Gabon - Caawigan FMR	0.270	340,479
7	Upgrading/Construction of Caawigan - Gabon FMR	0.900	1,134,930
8	Upgrading/Construction of Caawigan (Fausto-Jacob) FMR	0.870	1,097,099
9	Construction of San Nicolas Binanuaan FMR	1.640	2,068,095
	Total	**9.471**	**11,943,248**

Annex 8 shows the projected road maintenance costs and proposed sharing arrangements per road segment over 10 years.

VIII. Sources of Funds

Operation and maintenance activities will be funded thru appropriations from the 20% Development Fund of concerned LGUs. Representations with the local legislative to make road maintenance part of the regular budget will be undertaken. Likewise, funds coming from the 20% Development Fund of the Provincial Government, the CDF of the Congressman and the Senators through the Department of Public Works and Highways (DPWH) will also be sought to cover road maintenance activities.

IX. Plan Implementation

This 10-year Operation and Maintenance Plan is part of the Implementation Management Agreement (IMA) signed between the Municipality of Talisay and the Department of Agriculture and represents the LGU's commitment to protect and preserve the infrastructures provided. The local government, through official endorsement from the Office of the Mayor and acknowledgement of the Sanguniang Bayan (SB) of Talisay, binds itself to the objectives and activities herein described.

Annex 1: Satus of Roads in the Sub-project area (kms.)

Barangay	Dirt	Gravel	Concrete	Asphalt
1. Caawigan (Fausto-Jacob) FMR (.087 km)	0.64	0.23	0.00	0.0
2. Cahabaan-Calintaan FMR (1.594 km)	1.094	0.50	0.0	0.0
3. Gabon FMR (0.547 km)	0.547	0.0	0.0	0.0
4. Cahabaan (P-3) FMR (1.29 km)	1.19	0.0	0.1.	0.0
5. Caawigan-Gabon FMR (0.90 km)	0.90	0.0	0.0	0.0
6. San Nicolas-Binanuaan FMR (1.64 km)	0.894	0.746	0.0	0.0
7. San Isidro (P-4) FMR (0.60 km)	0.45	0.0	0.15	0.0
8. Gabon (P-1 & P-2) FMR (1.76 km)	1.76	0.0	0.0	0.0
9. Gabon-Caawigan FMR (0.27 km)	0.27	0.0	0.0	0.0
TOTAL	**7.745**	**1.476**	**0.25**	**0.0**

Annex 2: Causes of Road Damage

1. Gabon and Caawigan Road Segment
   - Heavy equipments using the road
   - Animal drawn cart plying the area
   - Canals clogged with dirts and eroded lands
   - Teetering of animals on the roadside
   - Untrimmed grasses and other vines

2. Cahabaan and Calintaan Road Segment
   - Animal drawn cart utilizing the road
   - Trucks and other big vehicles make use of the road
   - Flooding due to continuous rains
   - Teetering of animals near the road

3. San Nicolas - Binanuaan Road Segment
   - Continuous heavy rains
   - Ten-wheeler trucks and other heavy vehicles using the road
   - Animal drawn carts
   - Stealing of rocks, gravel and sand and other road materials
   - Teetering of animals on the roadsides
   - Clogged canals with silts, rocks and grasses

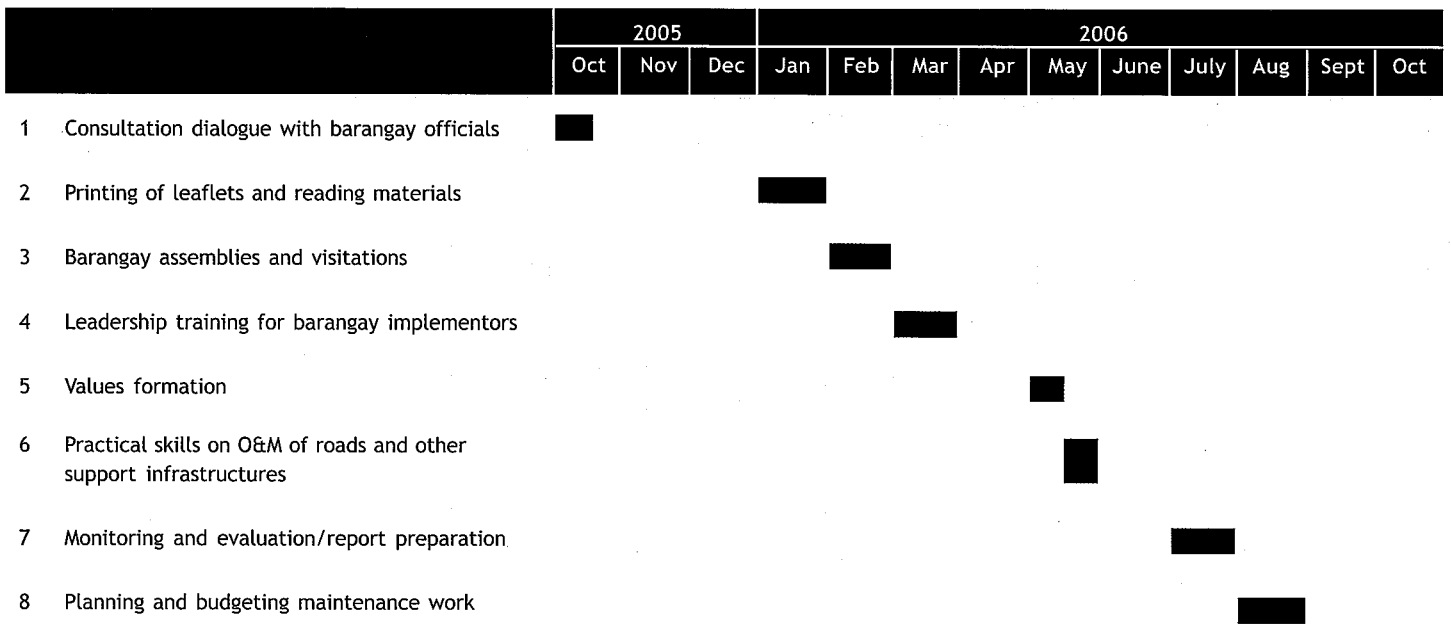
Annex 3: Beneficiary Participation Commitments

1. Gabon-Caawigan Road Segment
   - Pass barangay ordinances to support the road maintenance activities
   - Conduct quarterly clearing and cleaning of roads and immedi ate surroundings
   - Appropriate O & M funds from the 20% barangay fund

2. Cahabaan-Calintaan Road Segment
   - Pass barangay ordinance limiting heavy equipments
   - Pass barangay ordinance banning teetering of animals in the roadside
   - To ban animal drawn cart to use the road
   - Always keep culverts and canals clean
   - Create a committee for the maintenance of the road
   - Allocate local funds
   - Coordinate with the LGU and NGA's for the improvement of the road
   - Encourage residents living near the road to make patrol works along the sub-project.

3. San Nicolas and Binanuaan Road Segment
   - Create a special committee for the InfRES project
   - Promote bayanihan spirit in all O & M undertakings
   - Proper implementation of all ordinances pertaining to the maintenance of roads
   - Use local funds in small road repair works
   - Planting of small trees and ornamental plants along the road through bayanihan
   - Appropriate local funds for the operation & maintenance of the project
   - Encourage cooperative endeavors in the maintenance of the project
   - Encourage the SK members for the clean and green program focusing on areas near the sub-project and allocating funds thereof from the SK fund.

Annex 4: Advocacy & Capacity-Building Activities



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Annex 5: Road Maintenance Unit Costs per Kilometer

Maintenance Costs Computation for a one (1) km. Rural Road

	Work Activity	Materials				Labour					Equipment			TOTAL AMT	Annual Costs				Freq	Total /year
		Target		Unit Price	Amount	Target		Productivity	Rate	Amount	Prod	Rate	Amount		Labour	Mat'ls	Equip	Regrav		
		P. Qty.	Unit	Php /Unit	Php	P. Qty.	Unit	km/man day	Php/ day	Php		Php/ day	Php	Php/ km.						
I	Road Surface Maintenance																			
	1.1 Patching of Potholes	10	cu.m.	330.00	3,300	1	km.	0.080	231	2,888	N/A	N/A	N/A	6,188	2,888	3,300			2	12,375
	1.2 Regrading/reshaping	N/A	N/A	N/A	N/A	1	km.	N/A	N/A	N/A	2 km/day	9,248 (grader)							1	4,624
	1.3 Regravelling	600	cu.m.	330.00		1	km.	0.032	231	7,219	2 km/day	9,248 (grader) 6,500 (roller)		213,093	7,219		15,748	213,093	1	
II	Road Shoulder Maintenance																			
	2.1 Vegetation control to avoid entrapment of water	N/A	N/A	N/A	N/A	1	km.	0.150	231	1,540	N/A	N/A	N/A	1,540	1,540				4	6,610
III	Roadside Slope Maintenance																			
	3.1 Roadside slope - repair/ restoration (particularly embankment)	N/A	N/A	N/A	N/A	1	km.	0.050	231	4,620	N/A	N/A	N/A	4,620	4,620				1	4,620
	3.2 Erosion control - reseeding & sod facing	N/A	N/A	N/A	N/A	1	km.	0.100	231	2,310	N/A	N/A	N/A	2,310	2,310				1	2,310
	3.3 Vegetation control - grass mowing	N/A	N/A	N/A	N/A	1	km.	0.100	231	2,310	N/A	N/A	N/A	2,310	2,310				4	9,240
IV	Drainage Maintenance																			
	4.1 Hand ditch cleaning	N/A	N/A	N/A	N/A	1	km.	0.065	231	3,554	N/A	N/A	N/A	3,554	3,554				2	7,108
	4.2 Culvert cleaning and repair	N/A	N/A	N/A	N/A	2	km.	2 clines/mday	231	231	N/A	N/A	N/A	231	231				1	231
IV	Other Maintenance																			
	5.1 15% of annual cost but excluding item 1.3																			
																Subtotal, routine maintenance				46,668
																15% of annual total				7,000
																Annual total, routine maintenance				53,668
																Periodic maintenance cost/km				213,093

Estimating Number of Crew Workdays for 1 km

	Activitiy	Mdays	labour	wrk days
1.1	rd surface patching of potholes	13	3	4
1.2	rd surface regrading/reshaping			
1.3	rd surface regravelling	31	3	10
2.1	rd shoulder vegetation control	7	2	3
3.1	rdside slope repair/restoration	20	3	7
3.2	reside slope erosion control	10	3	3
3.3	rdside slope vegetation control	10	3	3
4.1	hand ditch cleaning	15	3	5
4.2	culvert line cleaning and repair	1	1	1

Annex 6: Cost of O&M Activities per Road Segment

UPGRADING OF CAHABAAN (P-2) CALINTAAN FMR (1.594 KM.)

	Link 1	Year 1 Qty. in km.		Unit Cost Php/km.		Total
I	ROAD SURFACE MAINTENANCE					
	1.1 Patching of Potholes	1.594	P	12,375/km.	P	19,726
	1.2 Regrading/Reshaping	1.594		4,624/km.		7,371
	1.3 Regravelling (every 5 years)	1.594		213,093/km.		339,670
II	ROAD SHOULDER MAINTENANCE					
	2.1 Vegetation Control to avoid entrapment of water	1.594	P	6,160/km.	P	9,819
III	ROADSIDE SLOPE MAINTENANCE					
	3.1 Roadside Slope-repair/restoration (particularly embankment)	1.594	P	4,620/km.	P	7,364
	3.2 Erosion Control - reseeding and sod facing	1.594		2,310/km.		3,682
	3.3 Vegetation Control (grass mowing)	1.594		9,240/km.		14,729
IV	DRAINAGE MAINTENANCE					
	4.1 Hand Ditching Cleaning	1.594	P	7,108/km.	P	11,330
	4.2 Culvert Cleaning and Repair	1.594		231/km.		368
V	OTHER MAINTENANCE					
	5.1 15% of annual cost excluding 1.3					11,158

Subtotal	Routine maintenance cost (w/o regrav)	85,547
	Average routine maintenance cost/km	53,668
	periodic maintenance cost, if done on year 1	339,670
	periodic maintenance cost, if done on year 5	424,587

UPGRADING OF CAHABAAN (P-3) FMR (1.29 KM.)

	Link 2	Year 1 Qty. in km.		Unit Cost Php/km.		Total
I	ROAD SURFACE MAINENANCE					
	1.1 Patching of Potholes	1.29	P	12,375/km.	P	15,964
	1.2 Regrading/Reshaping	1.29		4,624/km.		5,965
	1.3 Regravelling (every 5 years)	1.29		213,093/km.		274,890
II	ROAD SHOULDER MAINTENANCE					
	2.1 Vegetation Control to avoid entrapment of water	1.29	P	6,160/km.	P	7,946
III	ROADSIDE SLOPE MAINTENANCE					
	3.1 Roadside Slope-repair/restoration (particularly embankment)	1.29	P	4,620/km.	P	5,960
	3.2 Erosion Control - reseeding and sod facing	1.29		2,310/km.		2,980
	3.3 Vegetation Control (grass mowing)	1.29		9,240/km.		11,920
IV	DRAINAGE MAINTENANCE					
	4.1 Hand Ditching Cleaning	1.29	P	7,108/km.		9,169
	4.2 Culvert Cleaning and Repair	1.29		231/km.		298
V	OTHER MAINTENANCE					
	5.1 15% of annual cost excluding 1.3					9,030

Subtotal	Routine maintenance cost (w/o regrav)	69,232
	Average routine maintenance cost/km	53,668
	periodic maintenance cost, if done on year 1	274,890
	periodic maintenance cost, if done on year 5	343,612

UPGRADING OF SAN ISIDRO (P-4) FMR (0.60 KM.)

	Link 3	Year 1 Qty. in km.		Unit Cost Php/km.		Total
I	ROAD SURFACE MAINTENANCE					
	1.1 Patching of Potholes	0.60	P	12,375/km.	P	7,425
	1.2 Regrading/Reshaping	0.60		4,624/km.		2,774
	1.3 Regravelling (every 5 years)	0.60		213,093/km.		127,856
II	ROAD SHOULDER MAINTENANCE					
	2.1 Vegetation Control to avoid entrapment of water	0.60	P	6,160/km.	P	3,696
III	ROADSIDE SLOPE MAINTENANCE					
	3.1 Roadside Slope-repair/restoration (particularly embankment)	0.60	P	4,620/km.	P	2,772
	3.2 Erosion Control - reseeding and sod facing	0.60		2,310/km.		1,386
	3.3 Vegetation Control (grass mowing)	0.60		9,240/km.		5,544
IV	DRAINAGE MAINTENANCE					
	4.1 Hand Ditching Cleaning	0.60	P	7,108/km.	P	4,265
	4.2 Culvert Cleaning and Repair	0.60		231/km.		139
V	OTHER MAINTENANCE					
	5.1 15% of annual cost excluding 1.3					4,200

Subtotal	Routine maintenance cost (w/o regrav)		32,201
	Average routine maintenance cost/km		53,668
	periodic maintenance cost, if done on year 1		127,856
	periodic maintenance cost, if done on year 5	P	159,820

UPGRADING OF GABON (SOCIALIZE HOUSING SITE) FMR (0.547 KM.)

	Link 4	Year 1 Qty. in km.		Unit Cost Php/km.		Total
I	ROAD SURFACE MAINENANCE					
	1.1 Patching of Potholes	0.547	P	12,375/km.	P	6,769
	1.2 Regrading/Reshaping	0.547		4,624/km.		2,529
	1.3 Regravelling (every 5 years)	0.547		213,093/km.		116,562
II	ROAD SHOULDER MAINTENANCE					
	2.1 Vegetation Control to avoid entrapment of water	0.547	P	6,160/km.	P	3,370
III	ROADSIDE SLOPE MAINTENANCE					
	3.1 Roadside Slope-repair/restoration (particularly embankment)	0.547	P	4,620/km.	P	2,527
	3.2 Erosion Control - reseeding and sod facing	0.547		2,310/km.		1,264
	3.3 Vegetation Control (grass mowing)	0.547		9,240/km.		5,054
IV	DRAINAGE MAINTENANCE					
	4.1 Hand Ditching Cleaning	0.547	P	7,108/km.		3,888
	4.2 Culvert Cleaning and Repair	0.547		231/km.		126
V	OTHER MAINTENANCE					
	5.1 15% of annual cost excluding 1.3					3,829

Subtotal	Routine maintenance cost (w/o regrav)		29,356
	Average routine maintenance cost/km		53,668
	periodic maintenance cost, if done on year 1		116,562
	periodic maintenance cost, if done on year 5	P	145,702

UPGRADING OF GABON - SOCIALIZED HOUSING SITE FMR (1.76 KM.)

	Link 5	Year 1 Qty. in km.		Unit Cost Php/km.		Total
I	ROAD SURFACE MAINTENANCE					
	1.1 Patching of Potholes	1.76	P	12,375/km.	P	21,780
	1.2 Regrading/Reshaping	1.76		4,624/km.		8,138
	1.3 Regravelling (every 5 years)	1.76		213,093/km.		375,043
II	ROAD SHOULDER MAINTENANCE					
	2.1 Vegetation Control to avoid entrapment of water	1.76	P	6,160/km.	P	10,842
III	ROADSIDE SLOPE MAINTENANCE					
	3.1 Roadside Slope-repair/restoration (particularly embankment)	1.76	P	4,620/km.	P	8,131
	3.2 Erosion Control - reseeding and sod facing	1.76		2,310/km.		4,066
	3.3 Vegetation Control (grass mowing)	1.76		9,240/km.		16,262
IV	DRAINAGE MAINTENANCE					
	4.1 Hand Ditching Cleaning	1.76	P	7,108/km.	P	12,510
	4.2 Culvert Cleaning and Repair	1.76		231/km.		407
V	OTHER MAINTENANCE					
	5.1 15% of annual cost excluding 1.3					12,320
	Subtotal Routine maintenance cost (w/o regrav)					94,455
	Average routine maintenance cost/km					53,668
	periodic maintenance cost, if done on year 1					375,043
	periodic maintenance cost, if done on year 5				P	468,804

UPGRADING OF GABON - CA A WIGA N FMR (0.27 KM.)

	Link 6	Year 1 Qty. in km.		Unit Cost Php/km.		Total
I	ROAD SURFACE MAINENANCE					
	1.1 Patching of Potholes	0.27	P	12,375/km.	P	3,341
	1.2 Regrading/Reshaping	0.27		4,624/km.		1,248
	1.3 Regravelling (every 5 years)	0.27		213,093/km.		57535
II	ROAD SHOULDER MAINTENANCE					
	2.1 Vegetation Control to avoid entrapment of water	0.27	P	6,160/km.	P	1,663
III	ROADSIDE SLOPE MAINTENANCE					
	3.1 Roadside Slope-repair/restoration (particularly embankment)	0.27	P	4,620/km.	P	1,247
	3.2 Erosion Control - reseeding and sod facing	0.27		2,310/km.		624
	3.3 Vegetation Control (grass mowing)	0.27		9,240/km.		2,495
IV	DRAINAGE MAINTENANCE					
	4.1 Hand Ditching Cleaning	0.27	P	7,108/km.		1,919
	4.2 Culvert Cleaning and Repair	0.27		231/km.		62
V	OTHER MAINTENANCE					
	5.1 15% of annual cost excluding 1.3					1,890
	Subtotal Routine maintenance cost (w/o regrav)					14,490
	Average routine maintenance cost/km					53,668
	periodic maintenance cost, if done on year 1					57,535
	periodic maintenance cost, if done on year 5				P	71,919

UPGRADING/CONST OF CA A WIGAN - GABON FMR (0.90 KM.)

	Link 7	Year 1 Qty. in km.		Unit Cost Php/km.		Total
I	ROAD SURFACE MAINTENANCE					
	1.1 Patching of Potholes	0.90	P	12,375/km.	P	11,138
	1.2 Regrading/Reshaping	0.90		4,624/km.		4,162
	1.3 Regravelling (every 5 years)	0.90		213,093/km.		191,783
II	ROAD SHOULDER MAINTENANCE					
	2.1 Vegetation Control to avoid entrapment of water	0.90	P	6,160/km.	P	5,544
III	ROADSIDE SLOPE MAINTENANCE					
	3.1 Roadside Slope-repair/restoration (particularly embankment)	0.90	P	4,620/km.	P	4,158
	3.2 Erosion Control - reseeding and sod facing	0.90		2,310/km.		2,079
	3.3 Vegetation Control (grass mowing)	0.90		9,240/km.		8,316
IV	DRAINAGE MAINTENANCE					
	4.1 Hand Ditching Cleaning	0.90	P	7,108/km.	P	6,397
	4.2 Culvert Cleaning and Repair	0.90		231/km.		208
V	OTHER MAINTENANCE					
	5.1 15% of annual cost excluding 1.3					6,300
	Subtotal Routine maintenance cost (w/o regrav)					48,301
	Average routine maintenance cost/km					53,668
	periodic maintenance cost, if done on year 1					191,783
	periodic maintenance cost, if done on year 5				P	239,729

UPGRADING/CONST: CA A WIGA (FA USTO-JACOB) FMR (0.87 KM.)

	Link 8	Year 1 Qty. in km.		Unit Cost Php/km.		Total
I	ROAD SURFACE MAINENANCE					
	1.1 Patching of Potholes	0.87	P	12,375/km.	P	10,766
	1.2 Regrading/Reshaping	0.87		4,624/km.		4,023
	1.3 Regravelling (every 5 years)	0.87		213,093/km.		185,391
II	ROAD SHOULDER MAINTENANCE					
	2.1 Vegetation Control to avoid entrapment of water	0.87	P	6,160/km.	P	5,359
III	ROADSIDE SLOPE MAINTENANCE					
	3.1 Roadside Slope-repair/restoration (particularly embankment)	0.87	P	4,620/km.	P	4,019
	3.2 Erosion Control - reseeding and sod facing	0.87		2,310/km.		2,010
	3.3 Vegetation Control (grass mowing)	0.87		9,240/km.		8,039
IV	DRAINAGE MAINTENANCE					
	4.1 Hand Ditching Cleaning	0.87	P	7,108/km.		6,184
	4.2 Culvert Cleaning and Repair	0.87		231/km.		201
V	OTHER MAINTENANCE					
	5.1 15% of annual cost excluding 1.3					6,090
	Subtotal Routine maintenance cost (w/o regrav)					46,691
	Average routine maintenance cost/km					53,668
	periodic maintenance cost, if done on year 1					185,391
	periodic maintenance cost, if done on year 5				P	231,738

CONSTRUCTION OF SAN NICOLAS - BINA NUA A N FMR (1.64 KM.)

	Link 9	Year 1 Qty. in km.		Unit Cost Php/km.		Total
I	ROAD SURFACE MAINTENANCE					
	1.1 Patching of Potholes	1.64	P	12,375/km.	P	20,295
	1.2 Regrading/Reshaping	1.64		4,624/km.		7,583
	1.3 Regravelling (every 5 years)	1.64		213,093/km.		349,472
II	ROAD SHOULDER MAINTENANCE					
	2.1 Vegetation Control to avoid entrapment of water	1.64	P	6,160/km.	P	10,102
III	ROADSIDE SLOPE MAINTENANCE					
	3.1 Roadside Slope-repair/restoration (particularly embankment)	1.64	P	4,620/km.	P	7,577
	3.2 Erosion Control - reseeding and sod facing	1.64		2,310/km.		3,788
	3.3 Vegetation Control (grass mowing)	1.64		9,240/km.		15,154
IV	DRAINAGE MAINTENANCE					
	4.1 Hand Ditching Cleaning	1.64	P	7,108/km.	P	11,657
	4.2 Culvert Cleaning and Repair	1.64		231/km.		379
V	OTHER MAINTENANCE					
	5.1 15% of annual cost excluding 1.3					11,480

Subtotal

Routine maintenance cost (w/o regrav)		88,015
Average routine maintenance cost/km		53,668
periodic maintenance cost, if done on year 1		349,472
periodic maintenance cost, if done on year 5	P	436,840

Summary

Total routine maintenance, year 1	508,288
Total periodic maintenance, if done on year 1	2,018,201
Total periodic maintenance, if done on year 5, 25% increase	2,522,751
Total periodic maintenance, if done on year 10, 50% increase	3,027,302

Assumptions:

Projected annual cost increase, 5% compounded annually
Periodic maintenance projected to increase by 25% and 50% in year 5 and year 10 respectively
Inflation rate at 4.5-4.7%

Annex 7: Schedule of O&M Activities

Description of work	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Roadway, shoulder, side slope and drainage system												
1 Removal of debris, fallen trees and obstruction								■			■	
2 Blading and smoothing of surface					■							
3 Patching and filling of potholes			■			■			■			■
4 Cleaning drainage, ditches, pipes, culverts and mitre drain		■				■						
5 Vegetation control on side slopes and ditches	■			■			■			■		
6 Erosion control on side slopes and ditches					■							
7 Re-gralelling, re-shaping and compacting with water				■								
8 Re-grading ditches prone to stlting				■								
9 Replacing drainage pipes and culverts as needed					■							

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Annex 8: Projected Road Maintenance Costs and Proposed Sharing Arrangement per Road Segment

	Name of Road Segment	Length (km.)	1	2	3	4	5	6	7	8	9	10	Total 10 yrs
1	**Upgrade Cahabaan - Calintaan FMR**	**1.594**	**85,547**	**89,824**	**94,315**	**99,031**	**528,570**	**109,181**	**114,641**	**120,373**	**126,391**	**642,216**	**2,010,087**
	Bragy. Share		12,832	13,474	14,147	14,855	79,285	16,377	17,196	18,056	18,959	96,332	301,513
	MLGU Share		72,715	76,350	80,168	84,176	449,284	92,804	97,444	102,317	107,433	545,883	1,708,574
2	**Upgrade Cahabaan (P-3) FMR**	**1.290**	**69,232**	**72,693**	**76,328**	**80,144**	**427,763**	**88,359**	**92,777**	**97,416**	**102,286**	**519,735**	**1,626,733**
	Bragy. Share		10,385	10,904	11,449	12,022	64,165	13,254	13,917	14,612	15,343	77,960	244,010
	MLGU Share		58,847	61,789	64,879	68,123	363,599	75,105	78,860	82,803	86,944	441,775	1,382,723
3	**Upgrade San Isidro (P-4) FMR**	**0.60**	**32,201**	**33,811**	**35,501**	**37,276**	**198,960**	**41,097**	**43,152**	**45,310**	**47,575**	**241,737**	**756,620**
	Bragy. Share		4,830	5,072	5,325	5,591	29,844	6,165	6,473	6,796	7,136	36,261	113,493
	MLGU Share		27,371	28,739	30,176	31,685	169,116	34,933	36,679	38,513	40,439	205,477	643,127
4	**Upgrade Gabon Socialize Housing Site FMR**	**0.547**	**29,356**	**30,824**	**32,365**	**33,984**	**181,385**	**37,467**	**39,340**	**41,307**	**43,373**	**220,384**	**689,785**
	Bragy. Share		4,403	4,624	4,855	5,098	27,208	5,620	5,901	6,196	6,506	33,058	103,468
	MLGU Share		24,953	26,201	27,511	28,886	154,177	31,847	33,439	35,111	36,867	187,326	586,318
5	**Construction Gabon - Socialized Housing Site FMR**	**1.760**	**94,455**	**99,178**	**104,137**	**109,344**	**583,615**	**120,552**	**126,579**	**132,908**	**139,554**	**709,096**	**2,219,419**
	Bragy. Share		14,168	14,877	15,621	16,402	87,542	18,083	18,987	19,936	20,933	106,364	332,913
	MLGU Share		80,287	84,301	88,517	92,942	496,073	102,469	112,972	118,621	118,621	602,732	1,886,506

6	**Construction Gabon - Caawigan FMR**	**0.270**	**14,490**	**15,215**	**15,976**	**16,774**	**89,532**	**18,494**	**19,418**	**20,389**	**21,409**	**108,782**	**340,479**
	Bragy. Share		2,174	2,282	2,396	2,516	13,430	2,774	2,913	3,058	3,211	16,317	51,072
	MLGU Share		12,317	12,933	13,579	14,258	76,102	15,720	16,506	17,331	18,197	92,465	289,407
7	**Upgrade/Construction Caawigan-Gabon FMR**	**0.900**	**48,301**	**50,716**	**53,252**	**55,915**	**298,440**	**61,646**	**64,728**	**67,964**	**71,363**	**362,606**	**1,134,930**
	Bragy. Share		7,245	7,607	7,988	8,387	44,766	9,247	9,709	10,195	10,704	54,391	170,240
	MLGU Share		41,056	43,109	45,264	47,527	253,674	52,399	55,019	57,770	60,658	308,215	964,691
8	**Upgrade/Construction Caawigan (Fausto Jacob) FMR**	**0.870**	**46,691**	**49,026**	**51,477**	**54,051**	**288,492**	**59,591**	**62,570**	**65,699**	**68,984**	**350,519**	**1,097,099**
	Bragy. Share		7,004	7,354	7,722	8,108	43,274	8,939	9,386	9,855	10,348	52,578	164,565
	MLGU Share		39,687	41,672	43,755	45,943	245,218	50,652	53,185	55,844	58,636	297,941	932,534
9	**Construction San Nicolas-Binanuaan FMR**	**1.640**	**88,015**	**92,416**	**97,037**	**101,889**	**543,823**	**112,332**	**117,949**	**123,846**	**130,039**	**660,749**	**2,068,095**
	Bragy. Share		13,202	13,862	14,556	15,283	81,573	16,850	17,692	18,577	19,506	99,112	310,214
	MLGU Share		74,813	78,554	82,481	86,605	462,250	95,482	100,257	105,269	110,533	561,636	1,757,881
	Annual total		**508,288**	**533,703**	**560,388**	**588,407**	**3,140,579**	**648,719**	**681,155**	**715,213**	**750,973**	**3,815,824**	**11,943,248**

Note: O & M Budget for year 5 and 10 Includes Regravelling Cost
Counterpart: 15% Barangay, and 85% Municipal

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