UPSTREAM-CAMB/97/M02/SID

ITC RURAL DEVELOPMENT COURSE

John Tracey-White

January 2001

International Labour Organisation

#8 Street 352, Off Norodom Boulevard
Phnom Penh, 12302, Cambodia

Table of Contents

List of Acronyms

AAP	Accessibility Action Plan
ADB	Asian Development Bank
ADT	Average daily traffic
BMN	Basic minimum needs
CARD	Council for Agricultural and Rural Development
CBR	Cost-Benefit Ratio
CRDC	Commune Rural Development Committee
CREAM	Cambodia Rural Economic Accessibility Model
DRDC	District Rural Development Committee
DRDO	District Rural Development Office
EC	European Commission
EIA	Environmental impact assessment
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization of the United Nations
GIS	Geographical Information System
GPS	Geographical Positioning System
GTZ	Deutsche Gesellschaft Fur Technische Zusammenarbeit
GDI	Gender-related development index
GEM	Gender-empowerment index
HDI	Human Development Index
HPI	Human poverty index
IAA	Initial asset assessment
IEIA	Initial environmental impact assessment
IDPs	Internally displaced persons
ILO	International Labour Organisation
IRAP	Integrated Rural Accessibility Planning
IRI	International Roughness Index
IRR	Internal rate of return
LBAT	Labour Based Appropriate Technology
LFA	Logical framework analysis
MoE	Ministry of Environment
MOU	Memorandum of Understanding
MRD	Ministry of Rural Development
NGO	Non-Government Organisation

NPV	Net present value
PRA	Participatory Rural Assessment
PRDC	Provincial Rural Development Committee
PWD	Provincial Public Works Department
RDD	Rural Development Department
RGC	Royal Government of Cambodia
SEDPI	First Socio-Economic Development Plan
SEDPII	Second Socio-Economic Development Plan
Sida	Swedish International Development Cooperation Agency
SPFS	Special Programme for Food Security (FAO programme)
SWAT	Strengths-weaknesses assessment technique
UNDP	United Nation's Development Programme
UNV	United Nations Volunteer
UTM	Universal Transverse Mercator
VDC	Village Development Committee
VIP	Ventilated improved pit latrine
VOC	Vehicle operating cost
WFP	World Food Programme

Glossary of Terms

Added value is a term used in agricultural marketing to describe the additional value (or price) that may be gained if a crop is cleaned, graded or packed before being marketed.

ADT (average daily traffic) is the total two-way traffic on a stretch of road averaged over a determined period, such as per week, month or year.

Agro-climatic data is a term used to describe data on weather, like rainfall and sunshine that is used for the design of agricultural cropping patterns and irrigation systems.

Arbitrage is a technique in the marketing of produce – storing the crops until a better price can be obtained in the market.

Assembly markets are larger rural markets where quantities of produce are traded (either by the producers themselves or by traders) or assembled (bulked-up) for transport to other markets.

Basic minimum needs or ***basic living standards*** are conditions defined by government policies for providing basic community needs, including adequate food supply, shelter, access to health facilities, sanitation, education services and sustainable employment.

Baseline survey is a survey undertaken before a project starts and represents a "without project" situation. A typical example might be traffic and road conditions before starting repairs.

Basic access is a level of service for roads with low travel speeds and low traffic flows, generally applying to lower/local levels in the road hierarchy.

Central places are settlements, like small towns, with markets and shops that provide the population of the surrounding area with goods and services.

Carriageway width is the overall road pavement or bridge deck surface on which vehicles travel.

Catchment area or ***sphere of influence*** is the area surrounding a central place that can be economically provided with services or goods – the limit of a catchment area is defined by the "range" or "threshold" for a particular service

Colmatage is a French term used for describing a form of canal that is cut each year to bring silt-laden floodwaters to low-lying land behind river levees.

Community based works are undertaken by clearly identifiable groups of people (usually with the help of a facilitating agency) for the benefit of the group as a whole, the assets created being owned, managed, used and maintained by the beneficiaries themselves.

Community facilitators are professionals (from a social science, planning or rural engineering background) who help communities prepare proposals for the development and maintenance of communally owned assets.

Consumers' surplus is a technique used in economic analysis to quantify the project benefits to the consumer, such as the lower costs of providing transport because of road improvements.

Cost-benefit ratio is the ratio between the discounted total costs and the discounted total benefits. If the net present value (NPV) is zero, then the NPV divided by the discounted costs is zero and the cost-benefit ratio is unity (1). If it exceeds unity, the project is profitable.

Design speed is the optimum travel speed for a vehicle related to the type of road, its physical condition and the topography through which it is travelling.

Discount rate is the interest rate at which the banks borrow from a central/national bank.

Discounted cash flows are values represented in "current" costs, allowing the economist to add and subtract the stream of costs and benefits as though they all occurred in the same year.

District accessibility action plan is the final planning output of the IRAP process based on an agreed list of essential and prioritised infrastructure interventions.

Economics is the study of the use of scarce resources to satisfy unlimited human wants.

Economic analysis is a form of analysis used in economics that looks at the worth of a project from the viewpoint of the whole economy – the general public interest or public good. These costs are adjusted to account for any distortions, like subsidies, taxes and transfer payments.

Environmental impact assessment (EIA) is a process for predicting and evaluating the impact that a development activity could have on the natural and human environment - undertaken before the activity starts, to avoid adverse and costly changes resulting from human action.

EIA study or ***statement*** is an in-depth analysis and prediction of impacts, presentation and ranking of alternative plans, development of management/mitigation measures and presentation of proposals for monitoring and evaluation.

Employment-intensive is a generic expression to describe strategies, programmes, projects, activities and assets that will promote direct or indirect, short-term or long-term employment generation at the highest possible level.

Equipment-based technology is the opposite of "labour-based" in that most work is done by labour-replacing equipment, supported by a small labour force – generally effective where labour is not readily available or labour costs exceed around US$ 5 per day.

Extension is a term used in agriculture to describe the services, usually provided by government, to assist farmers in obtaining better production and marketing of their crops.

Evaluation is a process to determine the physical, environmental, social and economic impact and effectiveness of a project in order to use the lessons learned to design new projects.

Factor of production is the term used by economists to describe resources, both natural and human resources (like land and people), that are used to produce "commodities."

Farming systems is a classification of the way land is cultivated, relating the type of crops to local physical (soils), land tenure and socio-economic conditions.

Financial analysis is a form of analysis used in economics that looks at the viability or commercial worth of a project from the viewpoint of a private investor.

Food poverty line is a measure that relates poverty to the basket of food that is needed to achieve an average daily intake per person of 2,100 calories.

Full access is a level of service for roads with high travel speeds and low roughness, generally applying to higher levels in the road hierarchy.

Gender is the social roles and responsibilities of women and men (as opposed to "sex," which is the biological difference between men and women).

Gender awareness or sensitivity is the need to be aware of the differences between women and men's role in society.

Gender division of labour is the work roles, responsibilities and activities assigned to women and men based on gender.

Gender bias is the tendency to make decisions or act based on gender stereotypes.

Gender gap is the difference in the equality of access to jobs, rights and other services between men and women.

Geodetic is a term used in surveying to describe land surveys based on the geometry of the land.

Geographical information system is a mapping and planning tool, which expedites the workflow and replaces many manual operations with computerised tasks. The power of GIS lies in its ability to manipulate complex databases and not just to produce maps.

Geographical positioning system is a hand-held electronic device that determines the co-ordinates of any location using a triangulation system from signals received from three satellite positions.

Grassroots organisations are organisations that might be involved at village level with development activities like labour exchange groups, particularly for rice cultivation and self-help groups (often organised by NGOs) for saving and credit schemes, community forestry, water use, kitchen gardening and small-scale infrastructure development.

Growth centres are major regional and provincial towns or cities based around a sustainable natural resources base.

Growth pole theory is a planning principle based on the concentration or clustering of diverse, though interrelated, activities in a few main centres.

Hierarchy of settlement is a tool for relating the overall pattern of rural towns and villages.

Head count index is the proportion of the population that falls below the poverty line.

Human development index is a composite index used for measuring the status of human development, created by reducing to a single value a range of national indices on life expectancy, educational attainment and standard of living.

Initial asset assessment is a valuation technique used in IRAP that places a financial value on all the existing infrastructure assets in the communes.

Integrated rural accessibility planning (IRAP) is a local level planning tool developed by the ILO that approaches the issue of infrastructure provision and management through the concept of accessibility.

Internal rate of return (IRR) is the discount rate at which the base year value of costs and benefits are equal (i.e. net present value = 0). If the IRR is higher than the planning discount rate (usually 12%) then the project is viable.

Investment costs or ***capital costs*** are all the initial costs required to fund an investment, including land, buildings, equipment, professional fees and bank charges.

IRI (international roughness index) is a method for estimating the condition of a road pavement based on measuring and calibrating its roughness, quantified in terms of metres per kilometre.

Job is usually defined as an effective employment of 200 full day's work per annum, paid at the market rate and not less than the minimum wage.

Key informants are local experts on development, like local formal and informal leaders, teachers, priests, nurses, traders and women's group representatives.

Labour-based technology describes technology in which labour, supported by light or medium-sized equipment, is used as a cost-effective method (when compared with equipment-based methods) of providing or maintaining infrastructure to a specified standard.

Labour constant is a term used in cost estimating to describe the normal amount of time that a particular construction activity will take to achieve a set output, like the earthwork excavation that can be achieved per hour.

Labour-intensive works are those works of government or externally funded programmes that focus mainly on short-term employment creation and income distribution and in general do not emphasise cost effectiveness and quality outputs.

Lane or traffic lane is the portion of the road carriageway, usually defined by road markings, for the movement of a single line of vehicles.

Lengthman or attendant is the person contracted to maintain a section of road.

Local level planning is a locally-based planning system, implemented through MRD and generally based on decentralised decision making (at Commune level) and the use of local participation in defining the community's needs (such as community-based works).

Logical framework analysis is an analytical tool that links together the whole development process – making connections between the objectives of a programme or project, the inputs needed to achieve it and the ultimate outcome.

Marketing groups are community-level organisations, who collectively arrange crop harvesting, transport facilities, manage and maintain collection centres and small-scale packinghouses.

Monitoring and evaluation is the final stage in the project implementation cycle - it allows an assessment to be made of the socio-economic impact of a project, whether resources have been correctly utilised and what adjustments are needed in future project design.

Monitoring is a process of collecting physical, environmental, and socio-economic data as part of the ongoing and day-to-day management of a project to check if activities are being implemented.

Net present value is the sum of the discounted costs and benefits. The higher the NPV the greater the project benefits.

Opportunity cost is the cost of using a resource for a particular purpose - measured in terms of the cost of forgoing the use of the resources for an alternative purpose.

Origin and destination surveys are field surveys that are used to determine where vehicles are coming from and where they are going.

Partial access is a level of service for roads with seasonal/temporary access for specialised uses.

Participatory rural appraisal is a participatory survey method where the engineer facilitates the community to collect and analyse the information. Consequently, the community itself is the owner of the information, which it shares with the engineer.

Participatory mapping is a method of creating community maps through discussions with key informants and other villagers.

Patronage is a term used in anthropology to describe the dependency relationship between different levels and groups in society.

PDIP (Provincial Development Investment Programme) is the official term for the Government's planned three year rolling sectoral investment programmes.

Pilot survey is a preliminary survey undertaken to test whether a survey questionnaire has been properly designed.

PIP (Public Investment Programme) is the official term for the Government's planned 5-year sectoral investment programmes.

Population density is the average number of persons per square kilometre or per hectare.

Poverty gap index is an index that takes account of how far poor households' expenditure has fallen below the poverty line.

Poverty line is a measure that defines the line below which people are considered poor and reflects their food and non-food expenditure needs.

Poverty reduction is means of modifying the level of poverty by raising incomes and basic living standards through long-term institutional mechanisms and structural changes.

Planning cycle or ***development cycle*** or ***project implementation cycle*** is a way of describing and relating the various stages that are involved in development projects.

Post-harvest handling is the operations involved after a crop is harvested until it reaches the consumer and includes grading, packing, transport and marketing.

Primary data is information that has to be collected through field surveys to fill data gaps.

Private good is the term used in economics to describe infrastructure and activities that are exclusively in private sector ownership, like a private company or an individual house.

Producers' surplus is a technique used in economic analysis to quantify the benefits that would go to a producer – like the effect of better and lower-cost transport on increased agricultural production in the road's area of influence.

Primary roads are Class A and B national and inter-provincial highways.

Primary markets are small markets where the trade is characterised by direct sales of small quantities of produce by farmers to village traders and retail sales to rural consumers.

Priority mapping is a stage in the IRAP process where a map is prepared for a whole district showing all the possible interventions that the communes have identified.

Public good is the term used in economics to describe infrastructure and activities that are exclusively in government (public sector) ownership, like a road or communal water supply.

Public works are works undertaken by central or local government agencies for the benefit of the population in general, the infrastructure created remaining in the ownership of the agencies concerned, who assume responsibility for management, maintenance and sometimes, operations.

Radius of curvature is the minimum horizontal curvature of a road that will allow vehicles to travel safely, related to the type of road, design speed and the topography.

Rapid rural appraisal is a survey method where the engineer visits the community to obtain information which is taken away to be analysed.

Recurrent costs are all ongoing costs required to finance the operation of an investment, including staff salaries, utility costs (water, fuel, etc.), land taxes, building and equipment maintenance, loan repayments and interest on the capital borrowed.

Regression analysis is a statistical technique for relating sets of data together to test if one set of data has a close relationship to another.

Roadway is the portion of the road or highway, including shoulders, for vehicular use.

Route infrastructure inventory surveys are field surveys that describe the physical conditions of existing routes and the structures, like bridges and culverts, on the routes.

Right-of-way is the overall width of a road, including its carriageway, shoulders and reserve.

Risks are the short, medium and long-term factors that need to be considered in project design, that are generally outside its control, but could effect the project's outcome

Rural infrastructure assessment maps are documents produced during the IRAP process - integrating accessibility profile data collected at workshops with a rural infrastructure inventory.

Scoping is the second stage in environmental impact assessment - used to describe the present environmental situation and to define the focus of an EIA study.

Screening is the first stage in environmental impact assessment – used to determine if a full-scale EIA is needed.

Secondary data is information that has already been collected and published by others.

Secondary roads are roads linking provincial centres to the capital, to adjacent provinces and to other main industrial and tourism centres.

Sensitivity testing is a tool used in project analysis to test the assumptions made.

Severity index is a poverty index that takes account of the distribution of living standards among the poor.

Sieve mapping is a planning interpretation method that uses "overlay" techniques to allow the manipulation and combination of various thematic maps.

Social stratification or ***wealth rankings*** are a method by which society is divided up into groups with similar income levels and similar ownership of assets.

Social assessments are cross sector analyses that provide the social dimensions of development, combining data available in published books and reports with field research directly with communities as collaborative efforts between the development partners.

Stakeholder analysis is a social assessment method that uses a questionnaire to obtain the opinions of the main stakeholders or "actors" in the development process.

Sustainability is the continuation of an activity after capital funding has finished, which is invariably an issue of access to resources for maintenance and operations

Supervision is part of the monitoring process and refers to the periodic management of a project to verify that construction activities are being implemented according to the contract documents.

Targeted procurement is a contractual system incorporating social targets, which are set to meet policies on poverty alleviation, employment, geographical focussing and the use of local materials and services.

Tertiary roads are public roads that link adjacent districts.

Sub-tertiary roads are public roads that cater for the intra-district transport needs linking rural centres/communes to district towns (ST1), communes to each other (ST2) and communes to villages or villages to villages (ST3).

Special-purpose roads are roads which serve individual economic activities within a limited area, such as mining or forestry, or which are primarily required for national defence.

Thematic maps are map layers showing different characteristics of an area highlighting particular themes or sectors - like levels of accessibility to various services or routes needing improvement.

Transects are cross-sections of an area created during a rural assessment by systematically walking through the area with key informants.

Utility is the term used by economists to define how resources can be used.

Vehicle operating costs are the total of all the costs associated with the operation of a vehicle, including driver's wages, depreciation, fuel and vehicle repairs and maintenance.

Water harvesting is a method of controlling floodwater or surface water to allow it to be utilised for irrigation and other purposes.

Water users groups are community-based organisations established to manage and maintain small-scale for irrigation systems.

Wealth ranking is a term used (usually by the communities themselves) to define the levels of society (poorest through to better-off) depending on the group's ownership of land and other assets, their ability to save and the extent to which they suffer from food shortages.

Zero grazing is a term used in livestock management for the stall feeding of animals, rather than allowing them to graze in the open.

ITC RURAL DEVELOPMENT COURSE

PART A: Theory and Background

SECTION 1: INTRODUCTION TO RURAL DEVELOPMENT PRINCIPLES

contents

1.1 Issues covered in this section

- Why use integrated rural development?
- An introduction to Cambodian rural development policies.
- Social services – basic minimum needs and standards.
- Legislation, development standards and other norms (e.g. road safety).
- The engineer's role in rural development – the engineer serving society.

WHAT IS DEVELOPMENT?

Development is the implementation of a set of activities that improve the wellbeing of society. These activities occur in urban and rural areas and usually include economic, social, administrative and technical aspects, involving central and local government, civil society and the private sector. An example of the development of a new secondary school might include:

- Identifying the need for a school and selecting a site.
- Construction of the school building and other infrastructure.
- Providing desks and chairs for students and teaching equipment.
- Recruitment and recurrent salary payment for teaching staff.
- Other operational costs like the cost of teaching materials, services and the maintenance of the facilities.

The economic and social aspects of the development are included in the initial decision making that determines the need for the school and whether financing is available. Administrative factors would involve whether a local education department has the capacity to manage an additional school. Technical factors, which are the main concern of the engineer, would focus on the actual infrastructure design and construction. Crosscutting issues might also influence how development is effectively designed and implemented. Examples include considering poverty alleviation, gender and the environment. For a school, this may mean encouraging the poorest families to send their children and ensuring that there are equal places for female students.

WHY INTEGRATED RURAL DEVELOPMENT?

Many people in Cambodia live in poverty, especially in rural areas. Most rural people are subsistence farmers, with little income or food security. Poor access to basic minimum needs (BMN) and social services are a major cause of poverty in Cambodia. Poor access to needs and services means rural people remain isolated and unable to take part in development. Therefore, access to BMN and social services needs to be improved for people in rural areas to achieve an acceptable standard of living. Solving these problems requires a change in thinking from a narrow agricultural sector approach to a broader rural sector focus.

The general approach to rural development in Cambodia and in other countries in the region, combines social and economic

objectives :

1.2 Main Objectives of Rural Development

- Reducing rural poverty.
- Increasing economic growth.
- Achieving long-term food security.
- Stopping natural resource degradation.

Development is a crosscutting issue that involves different government ministries, non-government organisations (NGOs) and others. The Ministry of Rural Development (MRD) plays an important role in the development process in Cambodia. This Ministry is also the most relevant to rural engineers. An important role of the MRD is to guide investments in rural infrastructure, to maximise the impact of available resources.

Therefore, the Royal Government of Cambodia (RGC) is currently promoting economic development through the integrated development of rural areas. In Cambodia, integrated development generally includes the following:

integrated rural development

1. Using an approach to rural development that co-ordinates and cuts across the interests of different ministries.
2. Using a decentralised planning system by working with development committees in local communities. Using a mechanism that allows community needs to be incorporated into the planning and budgeting of development projects.
3. Ensuring development activities have maximum impact on specific targets like the rural poor and vulnerable groups like female-headed households or the handicapped.
4. Ensuring that investments made by different Government ministries, grassroots organisations, donors, non-government organisations and the private sector are complementary, reinforce each other and avoid duplication of effort.
5. Ensuring development activities do not conflict with traditional Khmer cultural or religious values.
6. Promoting sustainability, where government and local communities take responsibility for infrastructure developments and provide the resources to ensure they are maintained.
7. Encouraging increased food security through greater agricultural productivity, crop diversification and the cultivation of crops and livestock with added value.
8. Ensuring the effective management of water resources, fisheries and forests.
9. Improving the distribution of basic social services like health

and education and improving access to these services.

10. Improving access to markets and to income-generating employment.

11. Creating new farm and non-farm jobs in rural areas to reduce the number of workers travelling to other regions looking for work in the dry season and to stop the widening gap between rural and urban incomes.

12. Emphasising employment and income generation by using labour-based techniques for rural infrastructure construction and maintenance.

NATIONAL RURAL DEVELOPMENT POLICIES

The Government's social development policies are outlined in the Second Socio-Economic Development Plan 2001-2006. The plan's main objectives for rural development are:

1.3 Second Socio-Economic Development Plan 2001-2006

- To improve the quality of life for rural people by encouraging and facilitating economic self-sufficiency and active social awareness. The MRD aims to encourage a more independent attitude to problem solving among rural people.
- To encourage and assist the rural community to participate more directly in improving farm production, rural industry and the marketing of its products.
- To improve the rural economy and help reverse the present trend of rural/urban migration. Restoring confidence in rural life and encouraging community development to raise living standards will discourage migration from the country to the towns.

the Ministry of Rural Development

The Ministry of Rural Development is the government department mainly responsible for implementing these policies in rural areas. The MRD has staff working at provincial and district levels. Rural development committees have the same structure, working at the village, commune, district and provincial levels. The MRD uses a decentralised participatory planning framework to carry out development work. In this framework, development committees are important to determine needs and priorities.

To implement and co-ordinate rural development activities, the MRD works in co-operation with other ministries, like health and education. A joint ministerial committee called the Commission for Agriculture and Rural Development (CARD), co-ordinates rural development at a national level. More information about the role and policies of the MRD appears in section two. The main responsibilities of the MRD are:

1.4 MRD Implementation Responsibilities

- Construction and maintenance of rural roads.
- Basic health care.
- Sanitation and water supply.
- Education and training.
- Community development.
- Agricultural and rural credit (including non-farm micro enterprises).

STANDARDS

Several ministries have specific policies designed to help the population achieve basic minimum needs. For example, the Ministry of Health has set standards for potable (clean) water. This standard recommends that each well should supply a minimum of 20 litres per day per family and be within 500 metres of the family home. Consequently, the MRD is trying to meet this standard.

These standards are constantly evolving to meet changing social and economic needs. The rural engineer is responsible for identifying these standards and integrating them into the rural development strategy for a particular area.

LEGISLATION

Government standards and legislation govern all development activities. The rural engineer will need to be aware of these requirements. Implementers are legally required to follow these laws. Donors who finance rural infrastructure will also require implementers to follow these laws and may need to demonstrate compliance. Particularly sensitive issues are likely to be employment conditions, gender participation targets, environmental assessment and showing that participatory methods have been used for project preparation.

Some of the Cambodian laws (kram), decrees (kret), sub-decrees (anukret) and regulations (prakas) relevant to rural development activities are:

1.5 Legislation affecting Rural Development

- **Labour:** Law, January 1996 (establishment of the Ministry of Social Action, Labour and Veterans Affairs); Law, March 1997 (labour code).
- **Land rights and construction:** Law, October 1993 (basic land law); Sub-decree, September 1994 (signing on transfer of land ownership and building construction); Circular, January 1996 (land use planning in the provinces and municipalities).
- **Environment**: Law, January 1996 (establishment of the Ministry of Environment); Law, October 1996 (adoption of the Wetlands Convention); Law, October 1996 (adoption of the UN Convention on climate change); Law, December 1996 (protection of the environment and management of natural resources); Sub-decree, August 1999 (environmental impact assessment process).
- **Agriculture and rural development:** Law, January 1996 (establishment of the Ministry of Agriculture, Forestry and Fishery); Law, January 1996 (establishment of the Ministry of Rural Development - MRD); Sub-decree, 1994 (National Permanent Commission for Agriculture & Rural Development Rehabilitation); Sub-decree, 1996 (National Committee for Development and Implementation of Forestry Policy).
- **Administration and governance** – Law, 1998 (provincial budget management); Law (in preparation), commune administration and management; rural development included under the MRD mandate.
- **Health** – no specific law relating to engineering aspects.
- **Transport and traffic** - no specific law relating to road construction.
- **Women's rights** - no specific law relating to rural development.
- **Ethnic minorities** – no specific law relating to rural development.

applying development standards

It is important for rural engineers to understand how to improve social and economic conditions by using development standards. Road safety is a good example. Road improvements usually lead to increased traffic and this can lead to more road accidents. To

prevent accidents, engineers can include traffic calming measures in their designs like speed humps, pedestrian barriers and road width restrictions. If these measures are used near critical land uses like the entry gates to schools, they may significantly reduce the chance of children being injured. Other examples include applying sanitation standards to reduce water-borne disease and including control measures to reduce the environmental impact of road drainage. Engineers should use checklists to ensure that they have considered all the relevant standards and norms.

THE ENGINEER'S ROLE IN RURAL DEVELOPMENT

Rural engineering is more people-focused than other branches of engineering. This means that rural engineers use a lot of information from the social sciences. It also means that when developing rural development policies and designing engineering interventions, the rural engineer needs to understand some of the ideas and methods used by social scientists. Remember the following main points about the engineer's focus in rural development:

role of the engineer

The engineer is a servant of society – rural people are the clients. To work effectively and to facilitate development the engineer will need to learn how to work with the rural population and other professionals, particularly socio-economists.

summary points

By the end of this course the rural engineer should be able to answer these questions:

1.6 Rural Engineers - Basic Issues

How can the engineer work with communities to choose an area for development activities?

How can the engineer help to decide appropriate interventions that meet the community's socio-economic needs?

Which methodologies can the engineer use in the survey, planning and design process?

How can the engineer undertake simple social and economic feasibility studies?

How can the engineer help to prepare a development proposal and make budget estimates to gain outside funding?

How can the engineer decide if the scale of interventions is adequate for an area's short, medium and long-term needs?

scope of this course

- This course introduces some of the basic concepts of the social sciences. It also shows how the rural engineer can work with communities, socio-economists and others to implement successful rural development.
- The MRD and other ministries, with the participation of the rural population, formulate the rural development policies that the engineer helps to implement. MRD policies and programmes are explained in section two.
- It is important for the rural engineer to understand the planning framework for rural development. The most important part of this framework is the project cycle – explained in section three. Carefully following the steps in this cycle will help the engineer to manage the design and implementation of rural infrastructure interventions.

- Rural development is governed by two broad principles. Development must be based on a thorough understanding of present conditions and it must be socially acceptable. The engineer should ensure that development does not conflict with Khmer cultural norms. These principles are outlined in sections four and five.
- Development also needs to be economically viable and sustainable and this is explained in sections six and seven.
- The rural engineer will need to understand how to incorporate national socio-economic data in their designs and to decide when social assessments and additional surveys are needed – explained in section eight. Engineers will need to explain and present ideas in clear written, graphical and mapping formats – explained in section nine.
- After learning these principles, the students will go on a field trip to analyse the social and economic conditions in a typical Cambodian rural area - sections ten and 11. In section 12, students will learn how to document their field experiences.
- One of the key elements of rural development is rural transport, which accounts for the largest expenditure on infrastructure construction and maintenance. The engineer will need to understand how to select routes and how to incorporate social and economic factors into road planning and design. These issues are explained in sections 13 and 14.
- Rural development needs to be understood in the context of community planning – what are the local conditions and what are the community's needs? Section 15 introduces a tool for this purpose – Integrated Rural Accessibility Planning (IRAP). Section 16 covers the IRAP training modules and shows how IRAP can be applied to different sectors. In section 17, the student will learn to analyse accessibility data using information collected locally.
- Section 18 describes the characteristics of the rural economy – agriculture, irrigation, produce marketing, natural resource management and non-farm employment. The section also outlines the role of the rural engineer in development.
- The use of labour and the choice of development technology are outlined in section 19. This section also discusses the targeting of development and the difference between government and community works.
- Section 20 looks at rural infrastructure types and standards and how the rural engineer can achieve these standards.
- Section 21 provides guidelines on conducting an environmental impact assessment for rural development activities. It also discusses when rural engineers will need to incorporate mitigation measures into their infrastructure designs.

- The monitoring and evaluation of infrastructure is essential for learning lessons that can be used in the design of future works. A basic approach to monitoring and evaluation and possible indicators are discussed in section 22.
- The final section before the exam gives an overview of the rural development process and the engineer's role in design and implementation.

FURTHER READING

The student should read the following documents to prepare for the series:

1 **Barwell, I., G. Edmonds, J. Howe, and J. de Veen,** (1985). *Rural Transport in Developing Countries*. Intermediate Technology Publications, London.

2 **ESCAP,** (Volume 1, 1979 and Volume 2, 1990), *Guidelines for Rural Centre Planning.* United Nations, New York.

3 **Howe, J.,** (1996). *Transport for the Poor or Poor Transport?* ILO, Geneva.

4 **ILO,** (2000). *Employment-Intensive Investment in Infrastructure: Jobs to Build Society.* ILO, Geneva.

5 **Ministry of Environment,** (1998). *Cambodia – National Environmental Action Plan 1998-2002*. MoE, Phnom Penh.

6 **Ministry of Rural Development,** (2000). *Second Five-Year Socio-economic Development Plan 2001-2006*. Ministry of Rural Development, Phnom Penh.

7 **Ministry of Rural Development,** (2000). *National Program Framework for Rural Development of Ministry of Rural Development.* MRD, Phnom Penh.

8 **National Institute of Statistics**, (1997). *Cambodia Human Development Report 1997.* Sponsored by United Nations Development Fund. Ministry of Planning. Phnom Penh.

9 **Ovesen, J., I. Trankell and J. Öjendal,** (1996). *When Every Household is an Island.* Uppsala Research Reports in Cultural Anthropology No. 15. Stockholm, Sweden.

10 **Prescott, N. and M. Pradhan.** (1997). *A Poverty Profile of Cambodia.* World Bank Discussion Paper No. 373. World Bank, Washington, D. C.

1.7 Questions for students:

What are the main objectives of rural development?
Give some examples of integrated rural development?
Which main government agencies are responsible for rural development?
Why must the engineer understand the legal background to development?
What is the engineer's overall focus in rural development?

SECTION 2: MINISTRY OF RURAL DEVELOPMENT - POLICY AND PROGRAMMES

contents

2.1 Issues covered in this section

- The mandate of the Ministry of Rural Development.
- Organisational structure of the Ministry.
- The Second Five-year Socio-Economic Development Plan.
- MRD rural development policies.
- Current MRD rural development programmes.

MANDATE OF THE MINISTRY OF RURAL DEVELOPMENT

The Royal Government has given the Ministry of Rural Development complete responsibility for the following rural development initiatives and activities:

- *Co-ordinating, co-operating, implementing, monitoring and evaluating* rural development projects and programmes to rehabilitate and develop rural areas by assisting the rural population.
- *Co-ordinating operational efforts of the various line Ministries* and assistance programmes.
- *Undertaking research* to develop the rural areas of Cambodia. This should be achieved by liasing widely and assessing and investigating possible solutions to maximise opportunities.

STRUCTURE OF THE MRD

The Ministry of Rural Development is headed by a Minister and assisted by two Secretaries of State and five Under Secretaries of State. The MRD structure consists of:

- The General Inspectorate.
- The General Department for Administration and Finance.
- The General Department for Technical Affairs.
- The Cabinet of the Minister.
- Local institutions.

the General Inspectorate

The General Inspectorate has the following responsibilities:

- To regularly audit performance to ensure that all institutions under the Ministry's jurisdiction maintain high standards.
- To report to the Minister on the functioning of audited institutions and any measures needed to improve poor performance.
- To set up the measures and standards needed to strengthen and build the effectiveness of the Ministry's work and submit these plans to the Minister.
- To resolve all problems and make necessary decisions to improve performance within the defined areas of responsibility, according to the rights delegated by the Minister.

the General Department for Administration and Finance

The General Department for Administration and Finance is in charge of relating, co-ordinating, and managing the administration, personnel, material, equipment, accountability, finance, planning, statistics, monitoring and evaluation, national and international co-operation, training, research, extension work and publicity within the scope of responsibility of the Ministry of

Rural Development. The General Department for Administration and Finance consists of four departments:

- The Department of Administration and Personnel.
- The Department of Procurement and Finance
- The Department of Planning and Public Relations.
- The Department of Training and Research.

the General Department for Technical Affairs

The General Department for Technical Affairs is in charge of relating, co-ordinating and administering programs in rural roads, rural water supply, primary health care, community development and rural economic development. This General Department consists of four departments:

- The Department of Rural Water Supply.
- The Department of Rural Health Care.
- The Department of Community Development.
- The Department of Rural Economy Development.

the Cabinet of the Minister

The Cabinet of the Minister is a particular unit assisting the Minister with the following duties:

- To relate with other Ministry cabinets, members of parliament and the mass media.
- To advise the Minister on the general affairs of the Ministry and to assess documents that the Minister has to consider.
- To follow up and co-ordinate all activities of the Ministry to facilitate the Minister's work.

the local institutions

In each Province or Municipality, there is a Provincial/Municipal Department of Rural Development (PDRD) headed by a Director and assisted by a number of deputies. The PDRD is in charge of implementing and co-ordinating all MRD activities within their areas.

the Unit of Financial Control

The Minister of Economy established the Unit of Financial Control and Finance through the Sub-Decree no.81 dated November l6, 1995, about the establishment of a Financial Control Institution on budget expenditure in every Ministry.

THE SECOND SOCIO-ECONOMIC DEVELOPMENT PLAN

The Royal Government of Cambodia defined that the Second Five Year Socio-Economic Development Plan - SEDP II (2001-2006) should continue the progress achieved through the First Five Year Socio-Economic Development Plan – SEDP I (1996-2000). Therefore, eradicating poverty is still the most important long-term objective of the RGC and reducing poverty is the central thrust of SEDP II.

The MRD developed SEDP II to translate the RGC's objectives into operational programmes and activities. This plan reflects the MRD's main strategies, policies and development plans. The MRD's priorities are to improve the standard of living and alleviate poverty among Cambodia's rural poor. However, these issues must be addressed simultaneously by the Royal Government and all development partners, including local

communities. Rural development is the only effective way to alleviate and eventually eradicate national poverty.
Rural development is integrated and participatory in nature. Therefore, the MRD seeks to delineate its mandate, mission statement, main objectives, core activities, strategy and policy to respond to its roles and responsibilities as change agent, co-ordinator, co-operator and implementor of rural development programmes and projects. Eighty per cent of Cambodia's workforce is employed in the agricultural sector. Developments in agriculture will ultimately make Cambodia self-sufficient in rice production, thus improving the living standards of farmers.

Therefore, the MRD's rural development programmes focus on agricultural development. Credit is needed to replace exploitative consumption loans covering household rice deficits and to facilitate and improve rice production and yield by providing money for fertiliser and seed. Loans are also needed to allow income diversification through small-scale enterprise and business.

Developing basic infrastructure like roads, communication facilities and irrigation will improve the overall living standards of rural people. Improvements to education and health infrastructure will help develop the productivity, wellbeing and expertise of the rural population. Meanwhile, all people should actively participate in the preservation of natural resources and protection of the environment. Rural development - resulting in higher farm and non-farm incomes, better education, improved health care and greater food security – will help to discourage rural/urban migration. This migration leads to increased poverty in urban areas.

MRD PROGRAMME AREAS

Rural development programmes and projects are implemented by the MRD to empower and encourage rural people and improve their participation in the development process.

The main MRD programmes are as follows:

- Human resource development and institution strengthening.
- Identification of Basic Minimum Needs (BMN).
- Development of basic services and rural infrastructure.
- Agricultural development within communities.
- Small business/industry promotion.
- Natural resource preservation and environment protection.

MRD RURAL DEVELOPMENT POLICIES

Two key policies have been outlined by the MRD to guide and accelerate rural development:

- Firstly, to ensure that national and international agencies and organisations involved in rural development work together more closely.
- Secondly, to promote a more people oriented and integrated approach to rural development.

CURRENT PROJECTS

The major rural development projects that MRD is implementing and co-ordinating are:

1: Rural Infrastructure Improvement Project (RIIP)
ADB Loan No. 1385-CAM(SF)
Project Area: Kampot, Takeo, Kandal, Kampong Cham, Prey Veng and Svay Rieng.
Project Objectives: The project aims to improve living conditions and economic opportunities for the people covered by the project by providing and improving rural infrastructure and building capacity in the agencies concerned.

2: Programme de Rehabilitation et d' Appui au Secteur Agricole du Cambodge (PRASAC)
Project Area: Kampong Cham, Kampong Chhnang, Kampong Speu, Takeo, Prey Veng and Svay Rieng.
Project Objectives: To implement sustainable rural development activities in six provinces covering:

- Domestic water supply.
- Community development, agriculture extension and agriculture productivity through irrigation.
- Sustained access to rural credit for the target rural communities and micro-enterprise.

3: Integrated Food Security Program – Kampot (IFSP)
Project Area: Kampot.
Project Objectives: To improve the food situation in the districts of Angkor Chey, Dang Tung, Kampong Trach and Chum Kiri in Kampot Province.

4: Provincial Development Program Kampong Thom (PDP)
Project Area: Kampong Thom (Stung Sen, Staung and Santuk districts).
Project Objectives: To enable smallholders, women, young people and representatives of village organisations to place greater trust in their increased self-help capability and to use the services offered by the program's co-operation partners.
Project Activities:

- Capacity building of participating development partners and rural development co-ordination.
- Self-help promotion, village organisation and village development.
- Farming system development, agricultural activities and natural resource management.
- Promoting non-farm income opportunities.
- Rural financial services.

5: Technical Assistance to the Labour-Based Rural Infrastructure Work Program
The Upstream Project: CMB/97/MO2/Sm

Project Area: Phnom Penh and Siem Reap.
Project Objectives: The project will provide technical and managerial advisory support and training to the government at central and local levels. The objective is to create the capacity to plan, design, manage and implement labour-based rural infrastructure works involving domestic small-scale contractors in the execution of the physical works. Among the major activities, the project will develop appropriate standardised methods and procedures for government works using labour-based technologies.

6: Tertiary Rural Road Improvement Program (TRIP) No.95 65 565
Project Area: Kampong Cham and Kampong Thom.
Project Objectives: To improve the quality of the road measures supported by the World Food Programme and selectively improve the traffic links of some villages in Kampong Thom and Kampong Cham provinces.

7: Rural Development & Resettlement Project (RD & RP) Ref. No.: CMB/94/R51
Project Area: Kampong Speu and Takeo.
Project Objectives:

- Promoting food production, income generation and other rural development activities in two provinces.
- Introducing appropriate agricultural and income generation techniques through demonstration, campaigns and/or direct approaches to residents to bring about a healthy rural community development.
- Upgrading education and health in the provinces through individual and/or group teacher and nurse training campaigns and/or direct approaches to the residents.
- Establishing model rural development in the provinces, focusing on raising the living conditions for resettled returnees, demobilised soldiers and the local population in particular and improving the present conditions in rural areas in general.

8: Cambodia Area Rehabilitation and Regeneration (CARERE) UNDP/CARERE-CMB/95/0ll/A/Ol/3l CMB/95/ All/ A/XX/3l
Project Area: Pursat, Battambang, Banteay Meanchey, Siem Reap and Ratanakiri.
Project Objectives: This second phase of the CARERE project will be an experiment in decentralised planning and financing of participatory rural development. It aims to alleviate poverty, strengthen civil society, promote dialogue between the constituents of Cambodian society and contribute to the spread and consolidation of social stability and peace throughout the country.

9: Community Action for Social Development (CASD)

Project Area: Svay Rieng, Battambang, Kampong Thom, Kampong Speu, Takeo, Prey Veng, Kratie and Stung Treng.
Project Objectives: To assure the survival, protection and development of all children in Cambodia, as well as gender equity in the development process, through community mobilisation, involvement and initiative.

10: Food Aid Program for the Rehabilitation of Cambodia WFP PDPO 5483.03
Project Area: 17 provinces.
Project Objectives: To ensure household food security in selected poor rural areas, mainly through food aid in support of rehabilitation activities. Rural credit schemes, training, social service institutions and emergency assistance are other components of the program.

11: Northeast Village Development Project (NVDP)
Project Area: Kampong Cham, Kampong Thom, Kratie and Stung Treng (Mondulkiri to be included later).
Project Objectives:

- To improve income generation opportunities and general productivity in rural areas through agricultural and rural enterprise development.
- To improve basic rural and community infrastructure necessary for economic growth.
- To strengthen institutional capacity to identify, plan, implement and monitor rural development activities.

12: Rural Water Supply and Sanitation Planning and Capacity Building Pilot
Project Area: TBD.

Project Objectives: To improve the living conditions in rural Cambodia, particularly for women and children, through the provision of sustainable rural water supply and sanitation facilities in conjunction with improved hygiene practices. This improvement, in co-ordination with other economic development initiatives, will help communities take charge of their own development.

FURTHER READING

The student should refer to the following documents:

1 **Ministry of Rural Development,** (1999). *Policy for Rural Roads.* MRD, Phnom Penh.

2 **Ministry of Rural Development,** (2000). *National Program Framework for Rural Development of Ministry of Rural Development.* MRD, Phnom Penh.

2.2 Questions for students:

What is the basic mandate of the Ministry of Rural Development?
How is the MRD organised at national and provincial levels?
How does the MRD's work relate to the Government's socio-economic development policies?
What are current examples of MRD rural development programmes?

SECTION 3: THE PLANNING PROCESS AS THE FRAMEWORK FOR DEVELOPMENT

contents

3.1 Issues covered in this section

- The planning process.
- Regional development.
- Rural settlements.
- The development process.
- Implementation of rural development.
- Local planning initiatives.

THE PLANNING PROCESS

Planning is a process, with the long-term goal of gradually raising living standards. The Ministry of Planning is the mandated authority with overall responsibility for co-ordination, formulation and budgeting of development. Individual ministries are responsible for their particular sectors.

decentralisation

Government policy for improving the delivery of rural services depends on decentralising the planning process. Decentralisation requires financial and managerial responsibilities to be managed through provincial development committees. These are then linked to the district, commune and village development committees. The management of budgets is the responsibility of the provincial and commune levels.

participation

To direct government investment in social and economic rural infrastructure, government ministries need to prepare plans to develop their sectors. To avoid duplication when collecting and analysing data the individual sector plans need to be fully integrated and co-ordinated with overall provincial and local (commune and village) rural development plans. The most effective method for preparing plans is through a participatory process that involves all the stakeholders. This process is explained in later sections.

time scale

Any planning process needs to consider the short, medium and long-term time scale. Much of the recent development in Cambodia has been short-term emergency development. This was essential in the years when rehabilitation and reconstruction were the priority. It is also essential when dealing with natural emergencies. The high number of funding sources including special government programmes, donors and NGOs have driven many developments - but long-term plans are also needed.

REGIONAL DEVELOPMENT

Many decisions engineers help to make are locational - i.e. to decide how a road improvement might relate to the development of the whole road network. To understand this, the rural engineer needs to appreciate the regional context of rural development. Although there are no formal regional plans for Cambodia, there are a number of partial plans including those of the Mekong Commission and sector plans like the Ministry of Environment/Danida Coastal Zone Management Plan or the Ministry of Transport's national roads strategy. These plans do not

yet form a comprehensive approach that could result in a clear regional planning framework to guide development investment decisions. A regional planning framework would need to consider:

3.2 Regional Development Framework

- Goals for different sectors.
- The high rural population growth rate (currently at around 2.6% per annum) and internal migration trends.
- Decisions on axis of development based around future transport corridors.
- Future regional and international agricultural marketing patterns.
- Cross-border relations.

growth poles

One of the basic principles incorporated in regional development plans is the idea of the growth pole. This suggests that rapid economic growth (and maximising per capita income) requires the concentration or clustering of economic and social activities in a few main centres. Economic forces normally work to correct structural imbalance and to distribute services and income more equitably. An individual enterprise or business will choose to locate in the most accessible area available and the promotion of growth poles results in population concentrations, normally arranged in a hierarchy of settlements.

Development in these growth areas has implications for the surrounding areas - the pole creates a zone of influence around it. Use of the growth pole policy is likely to be most successful where there is already a population concentration and where it reinforces existing growth patterns. Examples would be where there is new cash crop production, emerging assembly markets or strong transport trends, like growth caused by an improved inter-regional road system (which may encourage voluntary migration or settlement). Thus, growth and development should flow from the more developed to the less developed areas. This reinforces the importance of secondary road links – upgrading local rural accessibility will not have much impact unless linked to areas of development.

RURAL SETTLEMENTS

One of the key concepts the rural development engineer needs to understand is how rural settlements relate to the overall pattern of rural towns and villages. Rural towns and villages are the main forces behind the economy of rural settlements and lead to the creation of new towns and villages.

central places and the hierarchy of settlements

Rural settlements act as central places in providing the population of the surrounding area with goods and services. They may also be the place where large amounts of local farm produce are gathered and transported to urban areas. This relationship or link between centres and individual settlements is normally defined as a hierarchy of catchment areas. The threshold determines the limits of a catchment area where goods or services could be provided economically. The shape of catchment areas is circular, but is normally represented as a series of hexagons. In reality, transport

routes and other geographical features distort the location of centres and the shape of catchment areas. In a hierarchical system the lowest order centres (villages) look to the next level (commune centres) for more specialised services. The top of the hierarchy is the highest level of services provided at the provincial capital.

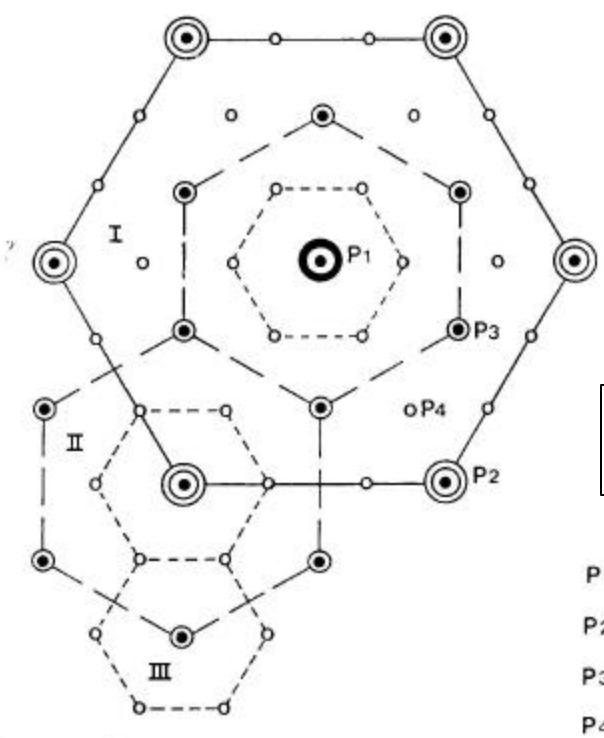
types of settlements in rural areas

A rural settlement policy should be based on the principle of reinforcing the existing hierarchy of service centres. This will reduce regional imbalances in the provision of goods and services and distribute government services on an equitable basis. The system normally has three types of service centres:

Growth centres: major provincial towns or cities based around sustainable natural resources (agriculture or mining) and with strong social and economic links to the surrounding areas. They could contain higher education facilities, hospitals, banking services, a major market (often with some wholesaling functions) and specialised shopping facilities.

District centres: rural settlements where the primary function is to provide administration and deliver services. These centres might contain a secondary school, a health clinic and a market area, which might serve as an assembly point for local produce. The market area is often associated with a transport stand and a number of permanent shops.

Commune service centres: typically, the services provided would include a primary school, a health post or dispensary, a police post and a primary market, often operating periodically, rotating on a weekly or fortnightly basis. They are normally located in the centre of a village serving around 500 to 1,000 families. In other countries a population of 5,000 people at a rural service centre is usual. They have a catchment area of less than a 10 kilometre radius from the market (the Cambodian average is around 7 kilometres).



3.3 Hierarchy of Settlements

Source: Adapted from Christaller

THE DEVELOPMENT PROCESS

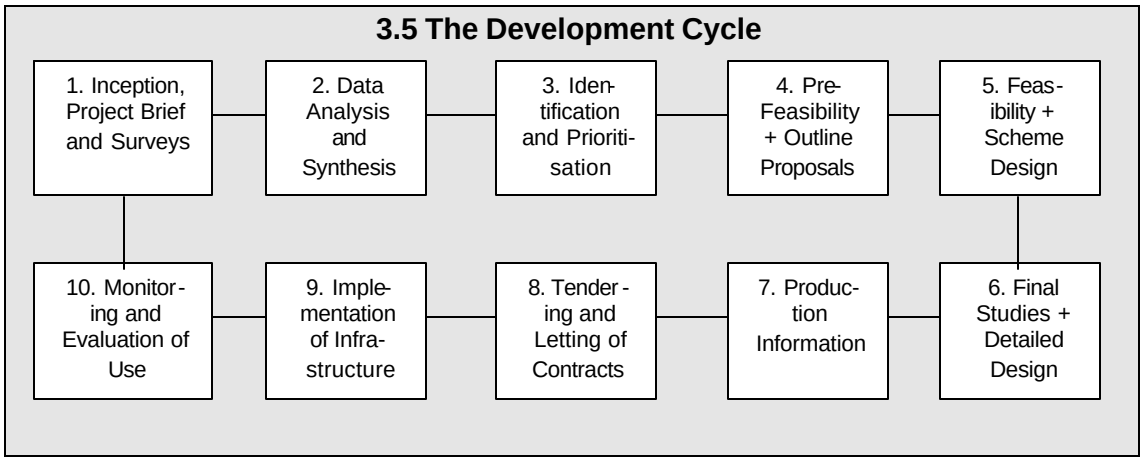
Whether development works are carried out by the local or central government, a community or by an individual, the engineer's role in rural development mainly focuses on the design and execution of individual projects. In this process, the engineer needs to manage the stages of a project so that the needs of all involved groups are considered at each stage. The stages are:

overall project planning methodology

3.4 Stages in the Development Process

- Inception: definition of problems and the need for action, data collection, surveys and development of design brief with users.
- Data analysis and synthesis.
- Identification of possible actions and prioritisation.
- Pre-feasibility studies to evaluate options, re-design and modify the design brief.
- Overall scheme design, detailed evaluation and feasibility studies and decision to proceed with the project.
- Final studies and detailed infrastructure design.
- Production information (bills of quantities, specifications and contract documents).
- Tendering process (selection, tender, review and appointment).
- Implementation – construction and equipment procurement.
- Community use of the infrastructure - monitoring and impact assessment provides data for future planning and designs.

the development cycle The process works in a circular way, as the last stage of monitoring and impact assessment should provide information for the first stage of the next new project. This is shown below:



All development projects go through different stages. The critical stages are from one to five, from the initial idea (for example, to improve a road) through to feasibility studies. These five stages (sometimes called project preparation) will determine the final direction of the project and confirm the decision to proceed with implementation.

inception, project brief and surveys (stage 1) The process starts with the identification of the problem or issue with the users, often using an analysis of their present constraints and opportunities. This leads to a number of recommendations on how the problem might be solved. These recommendations should reflect national policy guidelines. Physical and socio-economic surveys may be required at this stage for the design to proceed.

data analysis (stage 2) Data collected through field surveys or review of existing research or information (like published maps) is brought together and analysed.

identification and prioritisation (stage 3) The next step is to work with the users or the community to identify alternative solutions to the planning problem and to prioritise these. At this stage in the process, it should be clear what the community wants. A detailed social or economic analysis is not usually needed unless a project is very complex. Simple approaches, using logical frameworks and rapid rural assessment techniques, are described in a later section. Special project needs, like targeting vulnerable groups or determining the need for an environmental impact assessment may need to be considered at this time.

pre-feasibility and outline (stage 4) Outline designs are then drawn up. It may be necessary to consider a range of options. Some initial ranking of the options may be made. At this stage it may be necessary to look again at the design brief and make modifications - the design may need

to solve a completely different problem to that originally anticipated!

scheme design and feasibility (stage 5)

In the next stage the proposed infrastructure development is designed in detail and cost estimates are prepared. Usually, for larger projects, an economic analysis is needed to confirm the feasibility of the project. At this stage, a project is often appraised (by a government body or donor) to ensure that it has been properly prepared and conforms to local plans and national policy guidelines. Potential project risks are assessed and possible funding sources are investigated and confirmed. A detailed environmental impact assessment may be undertaken at this stage. The project is then agreed with the funding agency (government, donors, NGOs or local grassroots organisations) through a process of negotiation and approval.

final design, tendering and implementation (stages 6 – 9)

These stages are main, traditional activities of the engineer. The design is finalised with the users and the detailed design drawings are prepared. This is followed by preparing tender documents, the tendering process and the letting of contracts. The project is then implemented (through construction, provision of equipment, technicalassistance/advice, etc.).

monitoring and evaluation (stage 10)

Finally the project is monitored and evaluated after completion to ensure it conforms to the original project design and to learn any lessons that can be applied to new projects.

IMPLEMENTATION OF RURAL DEVELOPMENT

At the beginning of a project, it is important to define the owner of the project – whether a public sector agency, local government, a village community or an individual. If this is not clear, there may be a conflict of interest and the engineer will not be able to serve the client properly. There is no unique way to undertake rural development, but recent experience in Cambodia suggests that levels of government and local community involvement in development vary depending on who pays for development and who maintains it. The different types of infrastructure and the owners involved are.

national public-sector infrastructure

This type of infrastructure is normally constructed and maintained by central government ministries. Examples are the primary road system, senior high schools and general hospitals. Financing is through the national budget. Generally, the priorities for construction or improvement of these facilities would be determined nationally and would need to fit into a regional strategy. For rural development, the main co-ordinating body is the Council for Agricultural and Rural Development. Other government ministries would be involved where appropriate, like the Ministry of Public Works and Transport for primary roads. The involvement of the local community or the users of the facilities would normally be limited to the development of the brief and agreement to the

final programme.

provincial (major) public-sector infrastructure

This infrastructure is also constructed and maintained by the government, but normally by the provincial line departments of a ministry. Examples of this are the secondary road system (Provincial Public Works), tertiary roads (Provincial Rural Development), high schools and health clinics. Funding for these works would be through the three year rolling provincial development investment programme (PDIP). Generally, the Provincial Rural Development Committee (PRDC) would identify the priorities for constructing or improving these facilities locally, endorsed by the Provincial Planning Department. In principle, proposals would still need to fit into a planning strategy (like an integrated district or provincial plan). Users of the facilities - the community – should be heavily involved in identifying the need for a facility, prioritising options for construction or improvement and developing a local planning strategy. The proposals would pass to the PRDC through the lower level development committees at district, commune and village levels.

local (minor) public-sector infrastructure

The involvement of the public sector is usually limited to paying the construction costs in the case of minor infrastructure work. The community undertakes the maintenance using locally generated funds like market fees. Sub-tertiary roads are the main type of infrastructure built and maintained in this way. The commune rural development committee (CRDC) would usually be the key decision making body. Again, the users would be closely involved with decisions about which infrastructure was necessary and where and when it was needed. Funding sources, apart from regular government programmes might include the Social Fund and the Local Development Fund (for example, operated through the UNDP/CARERE Seila Programme).

local social and economic infrastructure serving the whole community

A government agency, an NGO or a community organisation like the Wat Committee may construct local infrastructure. However, the entire decision making process should be conducted by the community itself - either the village development committee (VDC) or a community level committee. Sub-tertiary roads, small-scale irrigation, water supply, rice stores and upgrading primary school classrooms or local clinics are examples of this infrastructure.

local activities, serving targeted groups or individuals

In this case, although VDCs may be involved with facilitating a project aimed at target groups, the main decisions would be in the hands of the targeted groups themselves. Examples are Water Users' Groups or low income families receiving credit for income generating activities like vegetable gardens, pig raising, etc. Money (and management) for these projects may come from outside funding (i.e. NGOs), but ongoing maintenance would normally be conducted by the community

itself, often from self-help schemes by contributing voluntary labour.

local economic infrastructure, primarily serving individuals

Where the infrastructure will only benefit private individuals, the majority (if not all) the financing should come from the direct beneficiaries or users. Where there are wider benefits from the infrastructure (like soil conservation and watershed management), some public contribution may also be appropriate. This type of infrastructure is usually financed through credit or money loans. Farm developments and individual small-scale non-farm enterprises are examples of these works.

LOCAL PLANNING INITIATIVES

Apart from those activities funded by the central government, most development activities should involve a high level of local initiative. Thus, the government's role in the new planning environment will be to help communities become involved in participatory planning. In parallel with this initiative, a number of improved local planning systems have been developed, for example the UNDP/CARERE (Seila) programme, the European Union's PRASAC programme and the ILO IRAP programme. These programmes are currently operating throughout Cambodia. The purpose of these local planning systems is to empower local communities to:

purpose of local planning systems

- Understand the physical conditions (problems and potentials) at village level – using a rapid participatory rural appraisal method, applying a local mapping technique and identifying the roles of village organisations.
- Analyse and rank the main problems faced by the communities.
- Determine costs and evaluate alternative solutions.
- Formulate and implement local action development plans that reflect the needs of the communities. The plans might include annual and medium-term development plans plus a list of local development plan proposals.

sustainability

Apart from the many benefits of the participatory approach, rural development will not be sustainable if project design is not linked firmly to the community. The project could be linked to the normal role or tasks of government organisations, or to established village committees or organisations. Separate project based management units with no links to the community should be avoided. In addition, sufficient time should be given for the start up phase of a project so that the local community's involvement and ownership is established.

FURTHER READING

The student should refer to the following documents:

1 **DBSA, (1992).** *Socio-Economic Enhancement of Development Projects*. Development Bank of South Africa, Transvaal.

2 **ESCAP,** (Volume 1, 1979). *Guidelines for Rural Centre Planning.* United Nations, New York.

3 **ESCAP,** (Volume 2, 1990). *Guidelines for Rural Centre Planning –*

Rural Industrialisation and Organisational Framework for RCP. United Nations, New York.

4 **Ministry of Interior,** (2000). *Commune Administration Management Law (draft).* MoI, Phnom Penh.

5 **Ministry of Planning,** (2000). *Planning Guidelines.* MoP, Phnom Penh.

6 **Seila Programme,** (2001). *Local Planning Process Guidelines.* UNDP/CARERE, Phnom Penh.

3.6 Questions for students:

How does the Government believe local communities can be mobilised for development?
How could regional planning strategies affect rural development?
What are the main levels in the rural settlement hierarchy?
Why is the development process also called a cycle?
What are the likely implementation responsibilities of the provincial governments?
What is the local planning process?

SECTION 4: RURAL SOCIETY

contents

4.1 Issues covered in this section

0 Background to rural society.

1 Poverty alleviation focus.

2 Vulnerable groups in society.

3 Quality of life indicators.

4 Role of the actors in the development process.

BACKGROUND TO RURAL SOCIETY

The purpose of this section is to give a human perspective to the study of rural areas. Who lives there? How does this vary throughout the country? What are the social and physical conditions? What are the constraints to changing these conditions?

the household as the basic planning unit

In the previous section, we looked at the planning framework for rural development. A framework requires strong community structures and institutions to support development activities. However, unlike many societies in Southeast Asia, Khmer rural life is not rigidly structured around village organisations. In Cambodia, the basic concept of space is the *phum,* which is not the village but an inhabited space, more like a household. Thus, the household and the space it occupies is the basic building block in Khmer society. Above this level there are many grassroots organisations like the Wat committees.

There are many explanations for this structure. In part it is obviously because of the historical events of the last 100 years. Many researchers have suggested it stems from Cambodia's Theravada Buddhist beliefs and the doctrine of karma. Many commentators have agreed that it is impossible to understand Khmer society without looking at the complex network of inter-personal relationships. Some observations of Khmer society made by a Sida team are:

Khmer society

4.2 Comments on Khmer society

From "When every Household is an Island" (Ovesen et al).

People are not passive - they are active in shaping and changing their social and cultural conditions.

The Khmer household is not an easily recognisable social structure but is formed by a network of relationships.

Khmer society is structured along cultural and ideological organisations rather than clear social organisations.

Khmer society is not organised in social categories but as a series of links and relationships.

Village temples are important to the community as they demonstrate the moral beliefs of the people.

Because of these social conditions, it has been said that Khmer culture is conservative and values security over economic gain. These cultural attitudes affect the planning approach and the pace of development. This is because any form of assistance causes

social and cultural change.

Therefore, the engineer will need to understand which power structures are being challenged when formulating development proposals. This does not mean that local culture and society are obstacles to change. The role of the engineer is to facilitate these changes. The engineer should work with grassroots organisations and local partners to ensure that everyone agrees with the development goals before the works are planned or implemented. Participatory planning uses this approach to formulate commune and district action plans.

overview of social conditions in Cambodia

Social conditions in Cambodia have been extensively studied in recent years. Some of the most important studies are by the National Institute of Statistics and these are listed at the end of the section. The following sections summarise some key characteristics of Cambodian society.

population distribution and growth

Cambodia's population is made up of 48.4 per cent males and 51.6 per cent females. Those aged 15-64 years are the working age group and make up 56 per cent of the population. Nearly 82 per cent of the population live in rural areas. The average household size is almost the same for urban and rural areas. Many households are female-headed and the highest concentrations are found in urban areas. The largest ratio of non-working dependants is found in rural areas. This is the number of non-working children or old people supported by each working household member.

4.3 Cambodia – Demographic Characteristics (1999 estimate)

Amenity/service	Cambodia	Phnom Penh	Other Urban	Rural
Total Extrapolated population	11,561,000	958,000	1,172,000	9,431,000
Male	5,590,000	461,000	565,000	4,564,000
Female	5,971,000	497,000	607,000	4,867,000
Population as % national total	*100%*	*8.3%*	*10.1%*	*81.6%*
Number of households	2,165,000	174,000	215,000	1,776,000
Average household size	5.3	5.5	5.4	5.3
% Female headed households	19.6%	25.8%	19.5%	19.0%
% Dependency ratio (0-14 and 64+)	76.8%	57.0%	77.1%	79.1%
Disabled population	169,058	13,858	19,291	135,909
% Disabled of total population	1.5%	0.1%	0.2%	1.2%

*Source: **National Institute of Statistics**, (1999). Cambodia Socio-Economic Survey 1999.*

Cambodia has a high population growth rate of around 2.5 per cent each year. This is accompanied by high rates of migration from province to province for work - particularly during the dry season.

spatial variance in Cambodia

There are wide geographical variations within Cambodia. The engineer needs to consider these when designing rural development projects. There are variations in the physical environment and socio-economic conditions. The environmental contrast ranges from:

0 Coastal plains, with beaches and mangrove swamps.

1 Lowland areas along the Mekong River and the delta region, plus the Tonle Sap Lake and plain areas, which are major rice growing areas.

2 Highland areas, typically in Ratanakiri and Mondulkiri provinces with dense forest, a number of ethnic groups and generally a lower state of socio-economic development.

In rural development, the most important variation is population density because it has a strong influence on the distribution and viability of services. Population is also important when determining the feasibility of road improvements. Cambodia's population is unevenly distributed. Around 60 per cent of the population live in the six provinces of the central plains around Phnom Penh. The lowland areas account for over 80 per cent of the population – who live on a third of the country's total area. In Cambodia the population density distribution is:

0 Nationally, average density of 50 persons km2.

1 Lowland areas, average density of 160 persons km2.

2 Highland areas, average density of 4 persons km2.

These figures disguise wide variations between different provinces -Kandal has an average density of 236 persons km2 - and within provinces.

access to facilities The following table shows the variations in access to village level facilities and services between different regions of the country.

4.4 Facilities and Services within Villages (%)

Amenity/service	Cambodia	Phnom Penh	Other Urban	Rural
Motorable road	81.6	98.0	82.1	80.7
Accessible by river/canal	32.7	7.6	38.0	33.7
Electricity	21.2	81.4	42.2	16.0
Piped water	7.3	71.0	21.8	22.5
Food shop/restaurant	14.3	56.9	28.3	10.7
Bank/loan credit unit	7.4	5.8	7.7	7.5
Permanent market	5.9	13.8	8.0	5.3
Agro-chemicals supply shop	9.5	7.5	7.8	9.8
Agricultural technical support	34.0	10.5	35.2	35.2
Agricultural extension worker	3.3	3.7	1.1	3.4

*Source: **National Institute of Statistics**, (1999). Cambodia Socio-Economic Survey 1999.*

rural/urban disparities The figures show wide variations between rural and urban areas. The differences are particularly large for services like piped water and electricity, which are rare in rural areas. Road access to rural villages is relatively good. However, the figures do not give a clear picture, as many rural areas may have reasonable local roads but poor secondary road links into the

primary road system.

social conditions and the environment

Social conditions cannot be understood in isolation. This is true of the interaction between poverty and the environment. The issue has two sides. The first is the extent that the poor need to exploit their environment to survive and the second is how much the poor are affected by environmental degradation. Good project design should try to minimise both effects. This is only possible if social and environmental assessment is undertaken at the beginning of the project cycle.

POVERTY ALLEVIATION FOCUS

Poverty reduction is a priority for the Government and donors in all rural development policies.

measuring poverty

To analyse poverty, it is necessary to measure it. The food poverty line is one way of doing this – calculating the food needed to achieve an average daily intake of 2,100 calories. People who cannot afford this amount of food fall below the food poverty line. This measurement can be adjusted to include other expenditure (e.g. for clothes or medicines) and this is called the poverty line. These two measures can then be used to analyse the extent of poverty. There are three ways this is normally done:

- A head count index – which is the proportion of the population that falls below the poverty line.
- A poverty gap index – which is an index or scale that measures how far a poor households' expenditure has fallen below the poverty line.
- A severity index – which is an index or scale that measures the distribution of living standards among the poor.

These methods produce slightly different results when used to measure the same area, but the results for Cambodia are similar and produce the same conclusions. The highest incidence of poverty is in the rural areas, where 43 per cent are poor compared to Phnom Penh, where only 11 per cent are poor or live below the poverty line. Another important factor about poverty is the type of employment – over three quarters of the poor are from farming households. Therefore, effective poverty alleviation must reach farming households. The following table compares the three measures of poverty related to the poverty line in Cambodia. In each index, rural areas make up 80-85 per cent of the total.

4.5 Cambodia – Distribution of Poverty

Measure of poverty	Cambodia	Phnom Penh	Other Urban	Rural
Head count index	39.0	11.4	36.6	43.1
Poverty gap index	9.2	3.1	9.6	10.0
Severity index	3.1	1.2	3.6	3.3

Source: ***Prescott, N. and Pradhan. M.*** *(1997). A Poverty Profile of Cambodia. World Bank.*

targeting and vulnerability

For the engineer, these measurements are not sufficient for project design. Interventions may need to target special groups like the disabled or try to reach the poorest groups in the community. To do this it will be necessary to identify these groups.

social stratification

It is important to understand how rural society is divided. In the social sciences, this division is called stratification. It is useful to learn about stratification to understand how social conditions are linked to income levels The usual method of stratification is to divide village communities into wealth ranks. Wealth categories can be statistically determined by dividing the population into groups or quintiles (with 20% in each quintile). Alternatively, the population can be subdivided during a rapid rural appraisal of a particular area using community knowledge. This type of wealth ranking usually divides communities into three categories:

- Better-off.
- Poor.
- Poorest.

The general characteristics of each wealth group are:

4.6 Wealth ranking in Cambodian villages

	Poorest	Poor	Better-off
Housing	Palm leaves and woven bamboo	Mixture of palm leaves, tin and wood	Wooden walls and clay roof tiles
Land/rice production	None, or almost no land. No other regular sources of income	Rice production just below household needs or sufficient	Surplus rice production
Animals	No animals other than chickens	Chickens/ducks, pigs, often cows	Chickens/ducks, pigs, cows and buffalo
Assets	No assets	Bicycle, radio, sometimes ox-cart or boat	Radio, television, motorbike, sometimes ox-cart or boat

Source: Zweers and Kassie (2000). Employment in ILO supported road construction and maintenance. Center for Advanced Study.

This table shows the average profile of the three main wealth groups found in rural Cambodia. Not all families will fit exactly into these profiles. In these cases, their wealth rank is likely to be determined by their assets and animals.

village structure

Based on the 1998 census there are 13,406 villages in Cambodia spread over 1,609 communes, 183 districts and 24 provinces. The population of the average village is 1,550 persons. Two thirds of all villages have populations between 1,000 – 2,000 persons.

VULNERABLE GROUPS IN SOCIETY

Many vulnerable groups have arisen within Cambodian society following the political events of the last few decades. The most striking of these groups are the households headed by the

disabled – through war or landmine injury - and those headed by elderly women/widows. In addition, there are large numbers of returnees from border camps (around 370,000 people), demobilised military personnel and internally displaced persons.

These groups make up a substantial proportion of society and have special needs that must be addressed in rural development planning. Special attention should be paid to these groups when allocating land - as many are landless due to lost land title or disputed property rights. Attention should also be given to employment opportunities for these groups.

In Cambodia, non-Khmer ethnic minorities make up around four per cent of the total population. They include the Cham, Vietnamese, Chinese and some indigenous hill tribes. Most minorities live in non-Khmer villages except for the Chinese who live predominantly in urban areas. Land issues are important for the hill tribes in Mondulkiri and Ratanakiri provinces, as pressures on ancestral lands, including encroachment by large-scale private interests, threaten their traditional livelihoods.

QUALITY OF LIFE

Cambodian human development figures are among the worse in the region – only Bangladesh has worse figures. There are also large disparities within Cambodia. Poverty in rural Cambodia is 31 per cent higher (worse) than for urban areas and the poorest quintile (20% of the population) is 50 per cent worse off than the richest quintile.

Similar differences can be seen between males and females – even the poorest males are 20 per cent better off than females in the same income group. This is due to factors like workplace discrimination against women or limited education opportunities for women and girls. Provincial figures are not available but are likely to show even greater differences between richer lowland rice producing provinces and the highland subsistence farming areas.

THE ROLE OF DIFFERENT GROUPS IN DEVELOPMENT

The previous section mentioned the roles of various groups or people in the development process. It is important to understand the role of these local organisations in the development process.

religious authority

The role of the achaa is important - as the religious authority in villages, traditionally dedicated to social activities (including dispute resolution and mediation). Apart from events (like weddings) which are centred around the pagoda and the Wat committee, other types of grassroots organisations or mechanisms that might be involved with village-level development activities are:

grassroots organisations

Labour exchange groups, particularly for rice cultivation.

Borrowing of draught animals.

Arrangements for lending money between relatives.

Self-help groups (often organised by NGOs) for saving and credit schemes, community forestry, water use, kitchen gardening and small-scale infrastructure development.

Villages in Cambodia have an active informal structure for carrying out local development activities. However, there is some evidence to suggest that women's roles in these groups are limited.

village development committees

Although these organisations may have a significant impact at local level, the Village Development Committee will be the main point of contact for the rural engineer. VDCs are the bridge between central and local government and civil society (represented by the grassroots organisations listed above). At present, only 25 per cent of villages have functioning VDCs and the percentages vary greatly between provinces. However in the future, VDCs will be the main organisations responsible for the planning, organisation and management of village development.

FURTHER READING

The student should refer to the following documents:

1 **Collins, W.**, (1998). *Grassroots Civil Society in Cambodia.* Discussion Paper for Workshop organised by Forum Syd and Diakonia. Centre for Advanced Studies. Phnom Penh.

2 **Gorman, S., et al.,** (1999). *Gender and Development in Cambodia: An Overview.* Working Paper No. 10, Cambodia Development Resource Institute. Phnom Penh.

3 **National Institute of Statistics**, (1996). *Demographic Survey of Cambodia 1996.* Sponsored by United Nations Population Fund. Ministry of Planning. Phnom Penh.

4 **National Institute of Statistics**, (1997). *Cambodia Human Development Report 1997.* Sponsored by UNDP. Ministry of Planning. Phnom Penh.

5 **National Institute of Statistics**, (1999). *Cambodia Human Development Report 1999: Village Economy and Development.* Sponsored by UNDP/NORAD. Ministry of Planning. Phnom Penh.

6 **National Institute of Statistics**, (1999). *Cambodia Socio-Economic Survey 1999.* Sponsored by UNDP/Sida and executed by the World Bank. Ministry of Planning. Phnom Penh.

7 **National Institute of Statistics**, (1999). *Cambodia Poverty Assessment.* Sponsored by UNDP/Sida and executed by the World Bank. Ministry of Planning. Phnom Penh.

8 **National Institute of Statistics**, (2000). *Cambodia Human Development Report 2000: Children and Employment.* Sponsored by UNDP/NORAD. Ministry of Planning. Phnom Penh.

9 **Ovesen, J., Trankell, I. and Öjendal. J.,** (1996). *When Every Household is an Island.* Uppsala Research Reports in Cultural Anthropology No. 15. Stockholm, Sweden.

10 **Prescott, N. and Pradhan. M.** (1997). *A Poverty Profile of Cambodia.* World Bank Discussion Paper No. 373. World Bank, Washington, D. C.

11 **Sida,** (2000). *The Country Strategies - Guidelines for the Strategic Environmental Analysis.* Sida, Stockholm.

12 **World Bank,** (2000). *Cambodia: Country Assistance Strategy.* World Bank, East Asia and Pacific Regional Office.

4.7 Questions for students:

What is the most basic building block of Cambodian society?
How does population distribution vary in Cambodia?
How is it possible to evaluate poverty in a particular village?
Who are the vulnerable groups in Cambodian society?
What are the main village organisations that the rural engineer will work with?

SECTION 5: SOCIO-ECONOMIC DEVELOPMENT ISSUES

contents

5.1 Issues covered in this section

INTRODUCTION

This section develops the themes discussed in the previous section on rural society. It examines some of the specific socio-economic issues that can affect the work of the rural engineer.

COMMUNITY PARTICIPATION

An important part of the decentralised planning system is the increased participation of local communities in rural development. This is achieved by using policies that increase the involvement and responsibility of villagers in planning community and village infrastructure – construction, maintenance and management. To do this, VDCs need to be strengthened so they can undertake the planning, co-ordination and management of demand driven village infrastructure.

Instead of using simple development indicators - which tend to lead to the use of crude targets - the approach should be to help rural communities to help themselves. Sustainable community participation is only possible if there are locally generated funds available - irrigation user fees, market fees and other local revenue sources.

participatory planning process

User participation in the formulation process - from identification to design and implementation - is essential. This will ensure a sense of local ownership of the project. Involving the community will ensure that the choice of improvement is acceptable to all parties. A series of steps is needed to achieve this participation:

- An initial meeting with community groups to explain the purpose of the project.
- In-depth discussions with community representatives to develop the design brief.
- A public forum to discuss the brief and to present the development alternatives.
- Meetings to discuss the evaluation process and to agree on charges for maintenance.
- Final discussions before the detailed design to agree on the selected option. It is useful to record this meeting with a Memorandum of Understanding.

MAINSTREAMING GENDER

Women and men have the same rights under the Cambodian Constitution. However, there is still gender inequality in many

areas of Cambodian life. This is true of female access to education, to political representation and other decision making roles. It is important to understand gender in rural development and gender issues should be addressed in project design.

5.2 The Importance of Gender in Development

"Experience has shown that rural and agricultural development projects do not equally affect the lives of men and women. For example, the introduction of cash crops or irrigation and rice cultivation in several sub-Saharan African countries has increased men's income. But it has adversely affected women by increasing the demand for their labour on cash crops and diminishing their ability to grow vegetables or engage in marketing and earn an independent income. This, in turn, has had unfavourable consequences for food availability for the family and the nutritional status of children."

Monitoring and Evaluation Guiding Principles, The United Nations ACC Task Force on Rural Development, 1995.

division of labour In Cambodia, changes are taking place in the division of labour -between what is seen as men's work and what is seen as women's work. The engineer must ensure that they do not think in these traditional ways when giving out tasks, recruiting staff or developing skills. Gender training should be part of project design to ensure that gender issues are considered in the planning process and female staff should be part of the design team.

involvement in decision making Women should take an equal part in rural development decision making. When designing interventions, the engineer should ensure that no conflict occurs and that women participate in planning. For example, introducing new technology should not favour men over women. The benefits of new technology to reduce the burden on women, for example in water collection and rice milling, should result in clear change. Increased free time for women should be available for income generation, education and increased participation in local decision making - in VDCs, Water Users' Groups and other organisations.

land Land registration in Cambodia has been slow. Although possession is considered equivalent to ownership, this does not guarantee land rights. This can be difficult for women when land is only registered in the husband's name. Engineers should ensure that any agreement to use or purchase land protects the rights of both married parties.

targeting of employment Over 20 per cent of households in Cambodia are female headed. A third of these live below the poverty line. Employment creation schemes need to consider these households, as they may not have spare labour to contribute to labour based projects. Before designing schemes, the engineer should understand local labour availability, seasonal labour variations and facilitate female employment – particularly for widows and unmarried women.

rural transport Gender is important in rural transport because of the need to reduce the transport burden of women - although in Cambodia

the gender difference is lower than in many other countries. Women need to be given equal opportunities as users and transport providers.

mainstreaming gender

To attempt to meet these empowerment goals, the engineer should recommend that:

5.3 Mainstreaming Gender

- All community consultations should involve both men and women.
- Gender should be considered in project planning. Any data collected should be disaggregated so gender differences can be understood and gender issues can be identified when estimating costs and benefits.
- Training programmes should aim for a 50% female participation rate.
- Gender awareness should be incorporated - 50% of opportunities for new administrative, labour-based employment and supervision posts should be available for female candidates[1] and female candidates should not be disadvantaged when applying for these jobs.

LAND

Land is a scarce resource in any society and this is also true in Cambodia where there is a shortage of suitable irrigated rice land.

Only a small proportion of landholders have a registered title to their holdings (1% of rural land in 1999). Although the government distributed agricultural land during the 1989 land reform, there is a strong demand for new landholdings. The main pressure comes from newly married couples, particularly if their parents' holdings are small and they cannot sub-divide the land. This problem is likely to increase, as population growth rates in rural areas are high.

One impact of this pressure is increased migration, particularly to provinces where land is available. Another trend is the increasing number of families who become landless after forced land sales to meet debt repayments. Around 20 per cent of families using credit are likely to face this situation. The main reason for this appears to be the need to pay for expensive private medical care.

planning units

There have been many debates about the appropriate geographical unit to use for planning systems. These units guide development plans and provide a context for development initiatives. Plans can be developed based on a specific land area, a community or on provincial borders. There is often conflict between the need for planning within administrative units - official local boundaries - and natural or fixed geographical units like watersheds. Different ministries may argue for other units to be used in planning, like school, health centre, road or market catchment areas. If social criteria are used, grassroots organisations, Wat committees or ethnic groups might use different boundaries.

[1] In accordance with the ILO International Labour Standard (ILS).

EMPLOYMENT

Employment under labour based contract conditions is discussed in a later section. However the possible social conflicts that might arise are reviewed here. Some of the main issues are:

5.4 Labour Recruitment Issues

- Emergency works versus job creation.
- Recruitment method - advertisements or auctions.
- Seasonality of employment.
- Competition between employment and voluntary labour.
- Targeting the poorest groups.

emergency works versus job creation

Employment for emergency relief works (including food-for-work schemes) and longer-term job creation is very different. Emergency works create immediate employment (normally defined as labour-intensive works). Long-term job creation involves using construction technology (labour-based appropriate technology: LBAT) that will increase long-term employment opportunities.

recruitment method: advertisements versus auctions

The differences between these approaches are mainly in the recruitment methods. Labour-intensive projects mainly use fair recruitment methods that give equal opportunities to everyone. Examples include local advertising campaigns or choosing workers by lottery (lottery rules may target special groups, i.e. to employ more female workers).

This is a poor system for LBAT contracts because it prevents the contractor from choosing the workers most experienced in labour-based methods. LBAT mainly uses a patronage system, where workers obtain jobs through personal contacts. LBAT does not necessarily use local labour – the worker's skills are more important than their origins.

seasonality of employment

Recruitment is also affected by season. The possibility of conflict is reduced if a contractor can select workers freely. Where there is an element of making work, workers are likely to want to return to their farms for important seasonal work like planting or harvesting.

competition between employment and voluntary labour

Another issue for the engineer to consider is the competition between paid project work and voluntary labour required by the community. This occurs when workers employed on labour-based projects are required to contribute free labour to a community project at the same time. This may not be a problem for wealthy families, as they can contribute cash instead of labour to the community works. However, poor families cannot afford to do this. To avoid this situation, the engineer needs to negotiate the use of labour with the VDC chairperson or the Wat committee chief.

targeting the poorest

Another difficult issue for the engineer to resolve is how to

target employment at the poorest community members. These people are often unable to take the job opportunities. This is for two main reasons:

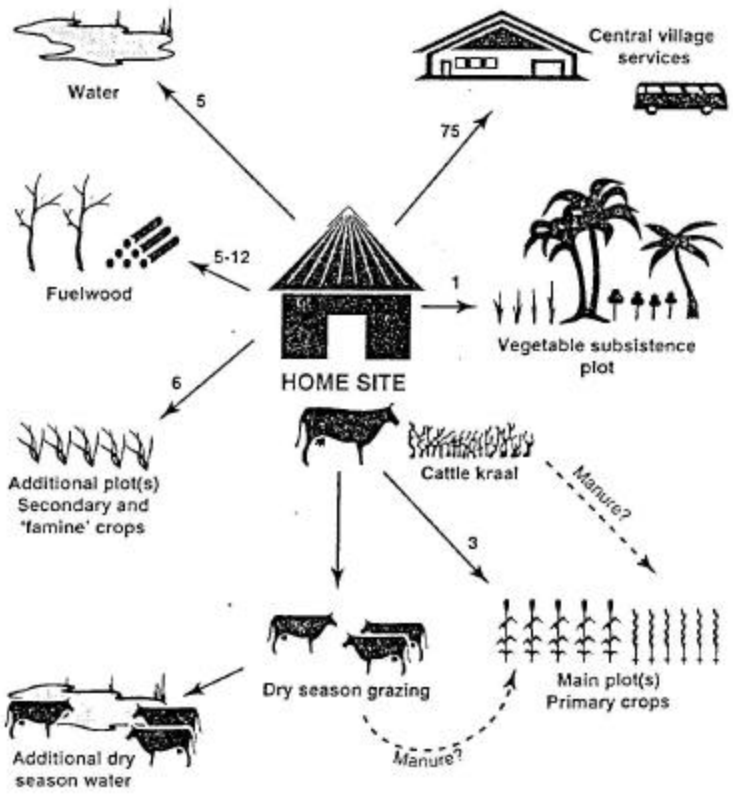
- They have the highest number of dependants (non-working household members) and therefore cannot spare anybody for the job opportunity.
- They are unable to avoid providing free labour to community works, as they cannot afford cash payments as a substitute.

Again, the engineer can only resolve these issues through discussions with community representatives.

USE OF THE FAMILY'S TIME

One of the central issues in rural development is access to basic needs and services. The following diagram illustrates the relationship of the African rural homestead to work-related destinations. The figures on the diagram are in kilometres:

5.5 Relationship of farm holding to work trips



Diagrammatic representation of work trips in an African farming community, showing trip lengths in kilometres. *Source:* based on McCall (1985).

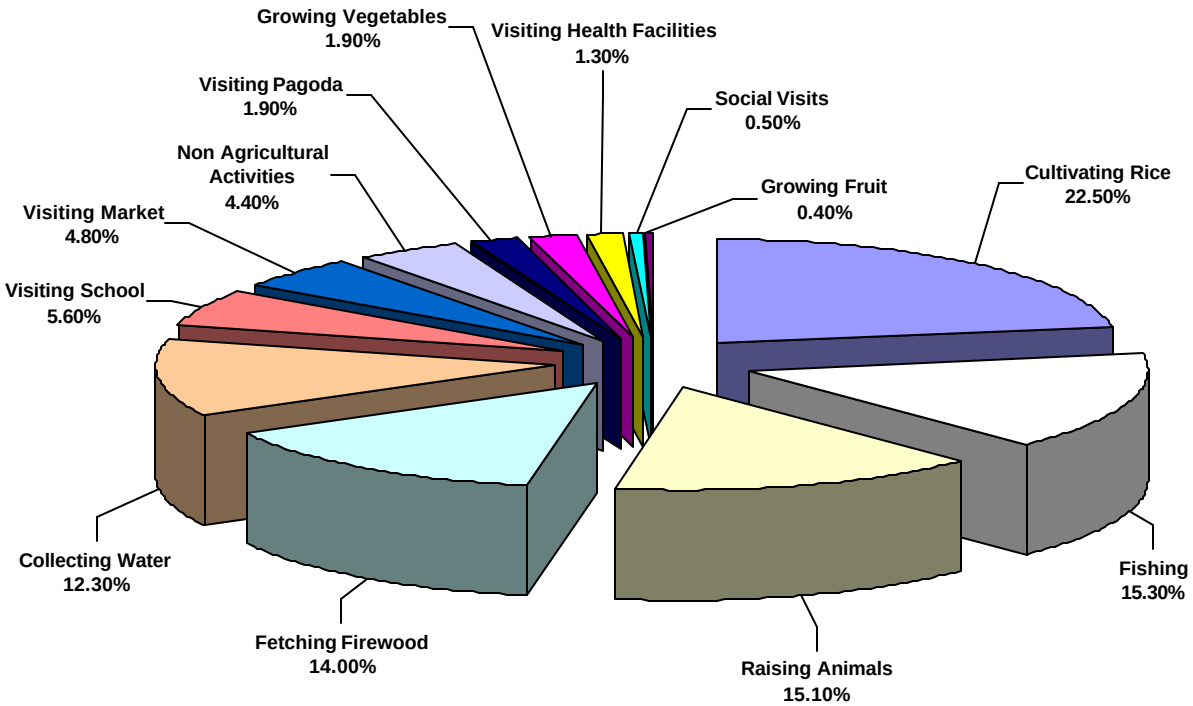
The Cambodian situation is slightly different, as the distances to village services or facilities like markets are much shorter. However, distances to drinking water and firewood are the

same. Although trips to farmland are the same distance, in Cambodia they are more frequent because of the demands of rice growing. Therefore, Cambodian rural families spend a large part of their day travelling to places of work.

Studies by the International Labour Organisation (ILO) in Cambodia have demonstrated that there is a substantial difference in time wasted – or long travel times - between villages with good and bad accessibility. Villages are rated as having good or bad accessibility depending upon how easily they can access goods and services. Households in villages with bad accessibility spend substantially more time travelling per day (8 hours) than villages with good accessibility (5 hours and 6 minutes). Good accessibility villagers make more trips to markets and primary schools. The seasonal differences are also interesting – in the dry season, more trips are made and more kilometres travelled. However, in the wet season more time is spent travelling.

In the ILO survey of Puok District, Siem Reap Province, rural families made an average of 16 trips per day. More than 60 per cent of these were to collect water. They spent 6 hours and 43 minutes travelling and transporting goods every day. During this time, rural families covered over 23 kilometres. Trips to collect water were the most frequent. However, carrying firewood required the most energy when transport effort was calculated because of the longer distances involved.

5.6 Travel Time per Household per Year (Puok District)



MANAGEMENT OF INFRASTRUCTURE

Clear arrangements need to be made for managing local infrastructure. New works should not be undertaken until maintenance and operations arrangements are in place. Rural engineers may not be directly involved with making these arrangements, but they should understand the issues involved.

road maintenance

Tertiary road maintenance is the responsibility of the PRDC, using national funds. Communes are responsible for sub-tertiary roads number one and two. Additional road improvements should not be undertaken unless maintenance funding is available for existing assets and for new works.

Sources of funding may include market revenues. In India and Bangladesh, a common method is to reserve 70 per cent of net market management revenues for this purpose, the rest being used for management and maintenance. A similar arrangement may be used for sub-tertiary roads number three, which VDCs are responsible for maintaining. The lengthman system is a good approach for routine maintenance and emergency repairs.

Water Users' Groups

In Cambodia and other parts of Asia, farmers generally manage small-scale irrigation through Water Users' Groups. Farmers form Water Users' Groups, which then make decisions on the allocation of irrigation water and management of the system. The Ministry of Water Resources has a unit to help establish these groups. However, these groups should only be established if the water users are able to contribute a small initial fund for maintenance - this is only likely if the scheme will work technically and financially. This requires a community able to manage the scheme and willing to establish clear rules for water distribution and fee collection. Rural engineers are most likely to be involved in schemes covering less than 100 hectares.

market management

Investments should not be made in rural markets unless there is a market committee to take responsibility for the investment. Rules for market operation and revenue collection need to be agreed upon. The issues to decide are:

5.7 Market Management Committee Responsibilities

- The use of weights and measures.
- Fair and organised policies for stall allocation and rental.
- Ways of solving disputes.
- Good control and management of traffic.
- Meeting environment, health and food safety standards.
- Ensuring periodic and recurrent maintenance is carried out.

ROAD SAFETY

Deaths, injuries and property damage from road accidents are a considerable cost to the community. The four areas targeted in reducing the dangers of traffic and road use are referred to as the four E's: Engineering, Education, Encouragement and Enforcement. It is the rural engineer's duty to include road

safety measures in rural road design to reduce accident rates. Road safety planning is needed to eliminate, or reduce, road use problems. Traffic segregation may be required at hazardous locations - like junctions with higher-grade roads, school entry gates, etc. Some specific approaches that the rural engineer can use are:

A. Devices to slow the speed of traffic, like speed humps.

- Different surfacing materials - like stone paving or bamboo reinforced concrete - that do not cause dust. Dust may obscure a driver's vision on roads within villages.
- Increasing visibility at junctions by clearing bushes to allow drivers to see other traffic.
- Gentle horizontal curves to improve visibility for drivers.
- Increasing pavement and shoulder sizes in settled areas to a minimum roadway width of five metres to avoid collisions.
- Shallow side slopes on embankments to help prevent vehicles overturning.
- Traffic warning signs to inform motorists of upcoming road conditions.
- Lay-bys for passing lanes and roadside sellers to allow parking.

Some common engineering approaches to road safety are shown at the end of this section.

FURTHER READING

The student should refer to the following documents:

1 **Ahlers, R and S. Vlaar**, (1995). *Up to the Sky. A Study on Gender Issues in Irrigation in Cambodia.* Sawa. Phnom Penh.

2 **FAO/IWMI,** (1999). *Transfer of Irrigation Management Services.* FAO Irrigation and Drainage Paper 58. Rome

3 **Gering, P. and A. Sandström,** (1999). *The Cambodia Rural Road Safety Situation.* Sponsored by Sida. Chalmers University of Technology, Department of Applied Building and Civil Engineering, Gothenburg, Sweden.

4 **Kassie, A. et al,** (2000). *Credit and Landlessness.* Sponsored by Oxfam-GB. Centre for Advanced Studies. Phnom Penh.

5 **Ministry of Rural Development,** (1999). *Policy for Rural Roads.* MRD, Phnom Penh.

6 **Rozemuller, H. et al,** (2000). *Traffic Characteristics around Puok Market.* ILO SE Series No. 1, ILO. Phnom Penh.

7 **Rozemuller, H. et al,** (2000). *Household Travel and Transport Analysis.* ILO SE Series No. 3, ILO. Phnom Penh.

8 **Sida,** (1997). *Handbook for Mainstreaming. A Gender Perspective in the Rural Transport Sector.* Sida, Stockholm.

9 **TRL,** (1988). *Towards safer roads in developing countries – a guide for planners and engineers*. Overseas Unit, Transport Research

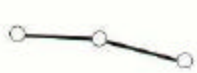
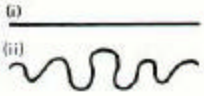
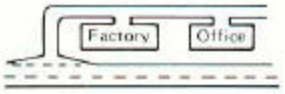
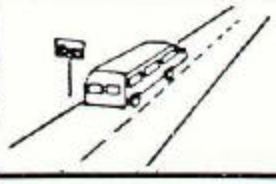
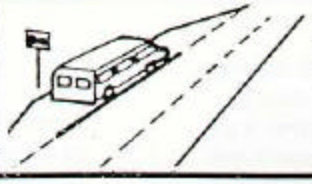
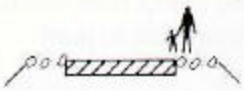
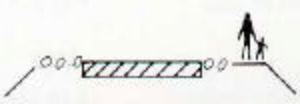
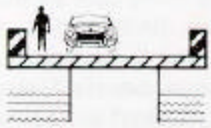
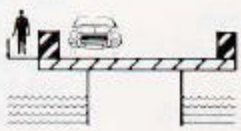
Laboratory, Crowthorne, Berkshire, UK.

10 **Zweers, J and A. Kassie,** (2000). *Employment in ILO Supported Road Construction and Maintenance.* ILO SE Series No. 2, Centre for Advanced Studies. Phnom Penh.

5.8 Questions for students:

How is the participatory planning process organised in Cambodia?
What are the common land problems in Cambodia?
What issues could arise in labour-based contracting?
What do you understand by time wasted and how can rural planning help?
How could the organisation of small-scale irrigation be arranged?
What are the basic principles to follow in mainstreaming gender in rural development?
What are the 4 E's of road safety?

5.9 Examples of engineering design for road safety

	Undesirable	Desirable	Principle Applied
Route location		 + Land Use Controls	Major routes should by-pass towns and villages
Road geometry	 (i) (ii)		Gently curving roads have lowest accident rates
Roadside access	Factory Office	 Factory Office	Prohibit direct frontal access to major routes Use service roads
			Use lay-bys or widened shoulders to allow villagers to sell local produce
			Use lay-by for bus and taxis to avoid restriction and improve visibility
Segregate motorised and non-motorised vehicles, pedestrians and animals			Seal shoulder and provide rumble divider when pedestrain and animal traffic is significant
			Construct protected footway for pedestrains and animals on bridges
			Fence through villages and provide pedestrian crossings

Source: TRL (1988). *Towards Safer Roads In Developing Countries – A Guide For Planners And Engineers*.

SECTION 6: PROJECT ECONOMICS AND FINANCING

contents

6.1 Issues Covered In This Section

- Background to economics.
- Project assessment.
- Estimating intervention costs – capital versus recurrent costs.
- Principles of economic analysis.
- Implementation and financing risks and arrangements.

BACKGROUND

This section provides a background to the basic principles of project economics. It is important to understand these issues for rural development.

what is economics?

There are many different definitions of economics, but this is the clearest for rural development projects:

> ***"Economics is the study of the use of scarce resources to satisfy unlimited human wants (Lipsey et. al.)."***

definitions

Resources are also called the factors of production. In this context, the factors are the natural and human resources - like land and people – that are used to produce commodities. In rural development, commodities can be either goods, like roads or services, like rural credit. The use of these commodities is called consumption – therefore the person who uses a rural market is the consumer.

Because resources are scarce, the concepts of utility and opportunity cost are important. Utility refers to how resources can be used and opportunity cost is the cost of using resources for a purpose, measured by the cost of forgoing the use of the resources for another purpose. Therefore, opportunity cost measures the decision of choosing between different options for using resources. A typical problem for the rural engineer would be choosing between repairing a current road or upgrading it, but with lower future maintenance costs. Resources are scarce, so some combinations will be possible and others will not – in many cases the opportunity costs do not remain constant - as the demand for one commodity increases against another commodity. This is the opposite of one of the basic principles of economics that states as demand for a good increases, supply increases and the price decreases.

Other economic definitions used in this section are:

6.2 Economics definitions

Net present value (NPV): The sum of the discounted costs and benefits. The higher the NPV the greater the project benefits.

Internal rate of return (IRR): The discount rate at which the base year value of costs and benefits are equal (i.e. NPV = 0). If the IRR is higher than the planning discount rate (usually 12%) then the project is viable.

Cost-Benefit ratio (CBR): The ratio between the discounted total benefits and the discounted total costs. If the NPV is zero then the NPV divided by the discounted costs is zero and the CBR is unity (1). If it exceeds unity, it is profitable.

sustainability and public versus private goods

Two other concepts need to be understood. The first is sustainability, which is the continuation of an activity after capital funding has finished. This mainly involves access to resources for maintenance and operations. The second concept is the distinction between private interests and public goods. This distinction, explained later in the section, is made in the difference between a financial analysis and economic analysis.

PROJECT ASSESSMENT

Project assessment helps the investor decide whether to go ahead with the project. This assessment is required whether the investor is a government or local authority, a private company, a donor, an NGO, a local community or a mixture of these. Project assessment aims to answer two important questions:

- If the project is undertaken, will the benefits from development cover the estimated cost?
- If the benefits are already known, what is the total that can be spent on undertaking the development?

An analysis or feasibility study is needed to answer these questions. In this study, the costs and benefits of the project can be represented in financial and economic terms. The steps in this process are summarised below and explained later in more detail:

6.3 Assessment of a simple rural development project

Overall plan of physical requirements – infrastructure and equipment.

Estimate of capital and recurrent costs.

Estimate of revenues (if any), like licence fees or tolls, annual or monthly rents and other fees.

Calculation of economic and financial benefits.

Impact evaluation of the project:

- impact on beneficiaries (e.g. producers, traders, women, poor).
- likely income generation.

Environmental impact and effect on special interest groups.

Definition of project risks and follow-up actions (e.g. land title, detailed survey requirements, etc.).

Methods of project implementation and financing.

ESTIMATING DEVELOPMENT COSTS

It is necessary to assemble all the available information before a financial and economic analysis can be made. The usual components to consider are described in the following sections.

A financial analysis evaluates the commercial worth of a project from the viewpoint of its owner (effectively an individual farmer or market trader), while an economic analysis assesses the project value from the viewpoint of the whole economy (public good).

Economic evaluation of a project depends on development costs and revenues. These fall into two broad categories:

- Initial investment costs.
- Recurrent costs and revenues.

project capital or investment costs

The engineer will need to prepare detailed budget estimates for capital works. This budget will allow an estimate of overall cash flow for the physical requirements for each year. This part of project preparation is vital and should be calculated carefully. The cost of design is only a small proportion of the total investment. Therefore sound, economic project design is essential.

At the initial identification and pre-feasibility stages of the project, it is usual to make budget estimates for each of the major elements using a simple cost per unit calculation:

- Metres squared (m^2) for market buildings or bridge decking.
- Hectares (ha) developed for irrigation.
- Kilometres (km) basis for roads.

At the detailed design stage, costs for each element should be built-up from previous costs that reflect local conditions and material costs. Each project component should be priced in detail using unit rates from recent contracts of a similar size or using current quotations from manufacturers or suppliers (e.g. for vehicles or equipment).

It is usual to add 10 to 20 per cent of costs to allow for uncertainties. These are called physical contingency costs. If the estimate is very broad (i.e. no suitable unit rates are available) or the nature of the works is uncertain, like site preparations where the sub-soil conditions are unknown, then a higher percentage should be used. An allowance for professional fees should also be included if the works are complex and outside consultants are used.

project recurrent costs

In addition to the capital costs of works and equipment, it will be necessary to estimate the annual recurrent or running costs and include the cost of training programmes or other proposed special promotions.

Costs may increase or decrease after the development. Increases will occur if more staff are employed or additional services like electricity are used. Running costs may decrease if staff requirements are reduced or if improved infrastructure leads to lower operating, cleaning, maintenance or insurance costs.

project revenues

The next step is to consider whether the development will generate any additional revenues, for example irrigation or market improvements. There are two basic methods of estimating these revenues. The first is to estimate the rise in fees needed to make them comparable to fees charged by other similar facilities. The second method is to estimate the increases based on additional trade or production – estimated revenues will then relate to the increases in market turnover or agricultural yield for irrigation improvements. It is best to use a combination of both methods, check them against each other and look at the impact on the

producer or trader's margins.

overall costs

A summary of typical costs is shown below. Costs need to be identified carefully as they can be greatly affected by the method of project procurement, i.e. whether by a conventional, targeted or force-account contract.

6.4 Typical cost components for rural development

Investment costs

- Pre-development costs, including site survey, planning fees, official permit fees and financing costs for banks and other lending institutions.
- Land acquisition costs, including legal fees and taxes.
- Site preparation and clearance.
- Construction costs, including.
  - Infrastructure costs.
  - Environmental impact mitigation measures.
  - Structures – buildings, bridges and culverts.
  - Cost of labour, tools, equipment, materials and workers' camps (for direct or "force" account contracts where labour-based technology is used).
- Design and supervision costs (for planning consultants and engineers).

Recurrent costs

- Annual maintenance costs.
- Periodic maintenance costs.
- Opportunity cost of alternative investments that could be financed from the same resources.
- Potential asset value (which is the residual value of structures).

PRINCIPLES OF ECONOMIC ANALYSIS

In an economic analysis, costs are adjusted to account for any distortions. These are specific factors like subsidies, taxes and transfer payments, which may affect the cost of a project. The benefits are not necessarily measured in income but may use factors like reduced produce loss or time saved due to reduced traffic congestion. The benefits that might be used in economic analysis are outlined below and discussed in the next section:

6.5 Typical economic benefits

- Potable water supply - value of time saved in water collection.
- Small-scale irrigation - value of increased food production.
- Rural roads - value of vehicle operating cost savings.
- Marketing infrastructure - value of post-harvest loss savings.

discounted cash flow

The normal approach to project analysis is to make an economic analysis using discounted cash flows. This means that the values are represented in current costs. By using this tool, the economist is able to add and subtract the stream of costs and benefits as though they all occurred in the same year.

approach to economic analysis

An economic analysis is used to decide whether the sum of the discounted benefits exceeds the sum of the discounted costs, to test whether a project is viable. The returns from a development, like a road, should exceed the sum of the investment and recurrent costs. The conventional way to express these costs is as net present value (NPV) and profitability as an internal rate of return (IRR), as a percentage.

cost-benefit ratio A similar technique to the IRR is to express the profitability of a project as a cost-benefit ratio. This is particularly useful when other variables, like environmental or social impact, need to be included.

internal rate of return The IRR is the main criteria used. It measures the project's rate of return when the NPV is equal to zero or the cost benefit ratio is one to one. The IRR assesses a project as a single percentage. Normally an IRR of ten to 12 per cent is required for a project to be viable.

cost-effectiveness There may not be enough information for a full analysis at the project identification stage and other techniques will have to be used. A cost-effectiveness analysis is a simpler technique based on using the benefits as outputs (like the average population density or total community time saving derived from IRAP) related to the cost of development.

simple projects However, for many rural development projects, simpler techniques can be used to measure viability. These methods are discussed in the next section.

complex projects Where complex projects are being analysed, it is essential to seek the assistance of an economist. Complex projects are those with high investment, many options or benefits that are difficult to assess (e.g. when there is a negative environmental cost).

sensitivity testing Sensitivity testing allows the engineer to test the assumptions used in analysis, like those based on extending or shortening the project life, increasing the capital or recurrent cost estimates, reducing the expected income, varying the interest rate or including additional costs (e.g. technical assistance and training). An example of sensitivity testing is shown below:

- Produce prices down ten per cent.
- Capital/replacement costs up ten per cent.
- Operating costs up ten per cent.

These techniques allow the engineer to measure different design and management options.

evaluating the overall impact of a project The formulation of a project should include a technical statement about its overall impact in addition to a quantitative analysis. This statement should contain a clear description of the advantages and disadvantages of a project:

- Who will benefit (i.e. producers, traders, consumers)?
- How will the project provide additional income generating opportunities?
- The social impact – what affect will the project have on different groups (e.g. children, women, rural poor or disabled)?
- What is the potential environmental impact?
- What are the potential risks – during and after

implementation?

- What are the sources of financing?
- How long will it take to implement?

IMPLEMENTATION

Before a project can begin, the development site must be secured, funding must be available, agreement must be reached on institutional issues and management methods. Basic surveys and planning and feasibility studies must also be undertaken. To find a sustainable development approach, it may be necessary to examine different management approaches, particularly if the intended development, like an irrigation scheme or market, will be managed autonomously.

When compulsory acquisition is not possible, site availability is often a major constraint and can cause serious delays. It is important that land ownership is made clear and relevant planning, building and environmental consents are obtained.

Medium-term risks can cause major problems in the operation of a facility. These include delays in hiring staff, lack of suitable training courses and lack of money for operation, staff salaries or maintenance. The major long-term risk is setting targets too high, which can cause people to doubt the viability of a project.

Project design should recognise these risks and minimise or reduce them to an acceptable level. Some risks will remain, particularly if some project components are delayed or not implemented. This may occur if initial finance and technical assistance is not available. Some risks cannot be eliminated because they depend upon the reaction of the users. These risks can only be minimised if the users are involved in the design and formulation of the project. Adequate surveying and long-term monitoring is essential to develop a strong project design.

implementation methods

Implementation methods should be considered from the beginning. The method used will influence the time required to undertake the works and may have an impact on any expected income, like returns from an irrigation scheme. A formal contract with private contractors is usually the quickest approach, however this may not be possible or desirable in remote rural areas. Using private contractors may conflict with the social objectives of a project (e.g. to use landless labourers, poor farmers or women's groups). Another approach, which reduces funding requirements, is self-help schemes, which directly involve the community beneficiaries.

sources of finance

It is important to get a guaranteed source of funding for all rural development plans. External grants may be possible, but the small-scale of many rural development projects, especially those improving existing infrastructure, may make them unattractive to potential donors. A project like a rural market may be self-financing from fees and charges, including annual auctions of rental space. However finding the initial capital for development is always the main problem. All funding sources should be explored,

including:

- Including the project in sector budgets – this may require additional feasibility studies to justify the investment.
- Special government grants like those for small business promotion and environmental improvements.
- A joint venture with private enterprise could be considered for some economic infrastructure, like markets. This could include the market traders (as individuals or groups), or leasing all or part of a site to private entrepreneurs, while maintaining some control over licensing arrangements. This approach can also be used for developing small-scale irrigation.
- Cost sharing, with a donor, other government departments or private enterprise, perhaps as part of an overall integrated rural development project. Cross-subsidy schemes are a variation of this idea - when part of the development generates revenue, which is then used to finance other social construction. Cost sharing can include capital contributions or other forms of equity, like providing land.

beneficiary contributions

Beneficiary labour or labour provided by the local community, would not be expected to cover the costs of building public infrastructure works like link roads, water supply and markets. In the case of markets, however, fees should cover all operational costs. The project should also establish user groups responsible for the maintenance of irrigation and potable water supply facilities. From regional experience, the projects with some beneficiary contribution are:

6.6 Typical beneficiary financing contributions

• Drainage line treatments (related to water harvesting):	**2-3%**
• New and rehabilitated village ponds or tanks:	**4-5%**
• Water harvesting structures, wells and earth dams:	**2-10%**
• Lift irrigation structures and tertiary irrigation channels:	**2-10%**
• Roof rainwater tanks:	**5-10%**
• Potable water supply:	**5%**
• Grain storage bins, livestock shelters and stalls:	**10-20%**
• Energy saving devices:	**15-25%**

While these are shown as a percentage contribution towards the investment cost, beneficiaries will normally make their contribution in labour. Exceptions are items like livestock shelters, energy saving devices (biogas plants, solar cookers and smokeless stoves) and other technical innovations, (like mushroom cultivation and bee keeping). For these examples, a financial contribution of up to 50 per cent of the total value should be expected. The community should provide land for facilities like wells.

FURTHER READING

The student should refer to the following documents:

1 **Lipsey, R. et al.,** (1995). *Economics.* Sixth Edition. Harper Row Publishers, New York.

2 **Price Gittinger, J.,** (1972). *Economic analysis of agricultural projects.* The John Hopkins University Press, Baltimore.

3 **World Bank/EDI,** (1997). *Handbook on Economic Analysis of Investment Operations*. World Bank, Washington D. C.

6.7 Questions for students:

What is the basic purpose of applying economic principles to understanding projects?
What is the difference between capital and recurrent costs?
What is the difference between financial and economic analysis?
What are the possible sources of financing for a rural development project?

SECTION 7: ECONOMIC ANALYSIS AS A PLANNING TOOL

contents

7.1 Issues covered in this section

- Introduction.
- Project benefits.
- Alternative approaches to project analysis.
- Evaluation using economic analysis.
- Using an economic model.
- Using simple models.

INTRODUCTION

This section discusses in more detail the application of project analysis and economics to evaluating typical rural development projects - like road improvements, markets, water supply and small-scale irrigation.

Economic analysis can be applied to the following infrastructure:

7.2 Infrastructure suitable for economic analysis

- Irrigation.
- Community water supplies.
- Transport improvements - particularly tertiary roads.
- Markets and small-scale business enterprises, like workshops.
- Soil conservation and other minor works.

PROJECT BENEFITS

The project benefits from economic rural infrastructure are interrelated and support other non-economic infrastructure. They aim to increase access to mechanisms for improving rural living standards and income through:

- Rehabilitated and expanded small-scale irrigated areas, giving a more reliable water supply and allowing more efficient cropping of areas previously only receiving rainwater. This irrigation may help to diversify agricultural practices. This allows farmers to produce marketable surpluses of higher value crops.
- Augmented potable water supplies, improving water supply, allowing livestock to be watered near the home (stall feeding) and reducing time spent collecting water from distant and unreliable sources.
- Better rural road access, allowing agricultural surpluses to reach collection centres and markets more rapidly and reducing damage to perishable crops. Improved roads also reduce vehicle-operating costs and people are able to make more social and educational journeys.
- Improved market infrastructure to reduce transaction costs (i.e. increase farm profits). More direct and cost-efficient access to marketing channels through marketing groups, better access to market price information and reduced post-harvest losses through better collection and primary marketing facilities.

Using part of the market revenues for maintenance and future expansion makes these activities more sustainable.

ALTERNATIVE APPROACHES TO PROJECT ANALYSIS

Choosing a method of project analysis depends on the information available and the scale of the project. It is possible to group multiple investments and produce an analysis that considers all of them. The rural engineer is more likely to need to make an economic judgement about a type of infrastructure, like choosing between alternative irrigation schemes. The following notes are based on this assumption.

irrigation

The expected benefits of an irrigation system are always difficult to measure. In Cambodia, changes in yields occur because of wide variations in annual rainfall and the months when rain falls. More money may be needed to ensure the irrigation system is effective. These costs include:

- The cost of the drainage line treatment.
- Annual maintenance costs for removing the sediment build-up in channels and structures. Ignoring the silt load shortens the life span of the structures.

It is also important not to double-count other benefits like land gain and improved soil fertility. The land gained may be economically marginal and there may be negative impacts that have not been assessed (e.g. loss of soil fertility from the spread of sediment on arable land).

potable water supply augmentation

The economic analysis of water supply often uses the time saved in collecting water in the evaluation. Based on IRAP and household survey data, the daily time saved for households with a reliable and adequate water source can be up to two hours per day. To measure the benefits it is necessary to know how often water is collected and to estimate the value of the labour. There is always some controversy about how to estimate this value. A common approach is to estimate the opportunity cost of labour, but this is difficult in subsistence economies because there may not be alternative employment available. A typical set of benefits are as follows:

- Hours saved per day - 2 hours per collection.
- Frequency of collection - 200 days per annum.
- Value of labour per hour - 50% of minimum wage.

rural roads

Rural roads represent a substantial investment. Therefore, an initial economic analysis is important. There are two basic methods of assessing the economic benefits of a road. The producer surplus and the consumer surplus, both explained later in the section.

marketing/post-harvest infrastructure

Typically, market improvements are only viable if the investment is relatively small. The incremental benefits of undertaking these improvements should be set to provide enough revenue to cover operating costs, future market expansion and possibly for

maintaining local roads. Revenues are unlikely to cover repaying capital and interest – even with a long repayment period. Thus, after meeting initial selection criteria, the short list of suitable locations for market improvements would be ranked according to whether:

- They are likely to make a significant contribution (in volume turnover) to the trade in fresh produce and/or livestock and dairy products.
- They are important in the overall hierarchy of markets, with priority given to unimproved primary markets serving production areas with surplus produce.
- The works can be linked to other rural infrastructure improvements, like minor irrigation and the rehabilitation of rural roads.

When market improvements reach more than US$10,000, a basic financial analysis should be made to ensure that additional revenues would cover operating costs. An example of this simplified procedure appears later in this section. An economic analysis may also be needed to test whether the potential savings in post-harvest losses are high enough. A saving in post-harvest losses of two to three per cent of the total quantity (or value) marketed is usually considered realistic.

other infrastructure

An infrastructure programme may also include lower level roads, paths, footbridges, drainage structures and roadside erosion control measures. It is not practical to use an economic analysis for these investments. Meetings with the beneficiary communities should be carried out before implementation to ensure the investments meet social, economic and environmental selection criteria. In prioritising these activities consideration should be given to:

Priority 1: Routes that improve public safety i.e. where towns or villages are at risk of landslides or floods. Attention should be given to:

- Providing drainage and flood control next to higher level roads, to allow these roads to function more effectively.
- Structures like culverts and bridges, which help to link the overall road network.
- Protection treatments in areas with unstable slopes to prevent landslides.

Priority 2: Routes justifiable because they are necessary for communities (e.g. routes in high-density areas lacking services or routes that target vulnerable communities).

Priority 3: Other routes, which avoid duplicating services.

EVALUATION USING ECONOMIC ANALYSIS

In the previous section the basic approach to a financial or economic analysis was defined as:

> *A way of assessing whether the sum of the discounted benefits exceeds the sum of the discounted costs. This is whether the returns from a development, like a road, will exceed the sum of the investment and recurrent costs. The conventional way of expressing these costs is as a net present value and the profitability as a percentage internal rate of return.*

financial or economic analysis?

For most rural development projects, an economic internal rate of return (EIRR) is used. A financial analysis is only appropriate for individual private investments like a rural market or for testing an irrigation model at farm level.

Estimating capital costs was defined in the last section. To use these costs in an economic analysis the only adjustment that needs to be made is to deduct taxes and other transfer payments (or add in the case of subsidies). The calculation of benefits is more complex.

There are two basic methods for assessing economic benefits: (a) **producer surplus** and (b) **consumer surplus**. A producer surplus is the benefits for a producer and the consumer surplus is any benefit for the consumer. In most cases the producer surplus method is used – irrigation schemes are a typical case. With roads, either method can be used. As much of the engineer's work involves the development of roads, this example will be used.

producer surplus applied to rural roads

The producer surplus measures the effect of better and lower-cost transport on increased agricultural production in the road's area of influence. This approach requires detailed farm-level surveys of agricultural input supplies, production areas and yields, household food consumption, available surpluses and farm gate prices. Although it may be an appropriate method for a full economic evaluation, this level of information is not available in Cambodia and special surveys would be needed. Evidence from other countries in the region suggests that only around 30 per cent of the total traffic on roads is directly related to agriculture.

consumer surplus applied to rural roads

The consumer surplus approach is simpler and assesses the direct benefits to the users of the road. For existing road users, these benefits are the lower costs of transport due to road improvement. There may also be benefits from additional traffic that can increase as the cost of using the road decreases. An assessment could also include the time saved by road users but this leads to difficulties in quantifying the value of time saved.

The consumer surplus approach is a more direct way to measure the benefits of better access. It considers travel for non-economic purposes (visits to health clinics, for example), which would have to be considered separately if the producer

surplus approach were used. The consumer surplus approach directly measures the effects of road improvements and is easier to observe through traffic counts and other indicators of transport use. It avoids the problem of measuring indirect economic impacts of road improvement (like increased agricultural production and income growth), which depend on other complementary policies and investments beyond the scope of a road improvement project.

conclusion The consumer surplus approach is the approach adopted in developing the simplified economic model explained below.

A SIMPLFIED ECONOMIC MODEL

The model has been developed around four spreadsheets. The outcome of the model is a single value for the road's viability expressed as an economic internal rate of return. These values can be used to select between alternative road proposals. The roads can be ranked using the same method.

basic input data Only three basic pieces of information are required to operate the model in its simplest form:

- Population density in the road's area of influence (this requires mapping for each commune, detailing the average density in persons per square kilometre).
- Length of the road in kilometres (this information does not effect the results of the analysis).
- Estimated construction costs per kilometre of road.

The population density in the area of influence of a road is assumed to determine the level of traffic where the main purpose of the road is to provide access for the rural population. The benefits of the road improvement are then the vehicle operating cost savings for existing and estimated generated traffic and for future normal traffic growth. The model compares this to the existing situation.

road conditions Benefits depend on the initial road conditions. Therefore information needs to be collected on the conditions of rural roads. This data will be used to determine the construction costs for road improvements.

If a detailed road condition survey has been carried out and costs have been estimated, this information can be entered. If a detailed cost estimate has not been made, the supplied low, medium or high cost estimate should be used. These estimates have been constructed from an analysis of available cost estimates, by relating total costs to the major cost components.

objective of the model The model estimates the traffic of people and goods based on the population in the road's area of influence. The model then calculates the benefits of the road improvements given the assumed VOC (vehicle operating cost) savings, the EIRR and the economic NPV for a given level of rehabilitation costs.

The basic assumptions used in the model are summarised

below:

economic assumptions

7.3 Typical assumptions used in economic modelling

An economic analysis needs to use a number of common assumptions.

• Economic discount rate:	12%
• Annual traffic growth factor:	5%
• Wet season factor:	70%
• Economic cost conversion factor:	85% or 90%
• Maintenance costs as % of capital costs:	
- Routine maintenance (annual)	3% of capital
- Periodic maintenance (every 5 years)	40% of capital
• Future vehicle operating cost savings:	40% of existing VOCs
• Minimum acceptable internal rate of return:	12%

At the planning stage, it should be sufficient to use the values below for most rural roads:

7.4 Summary economic analysis of rural roads at varying densities and costs

Population density		Construction costs per kilometre		
Persons per km^2	Households per catchment #	**Low $10,500**	**Medium $14,500**	**High $19,500**
		Economic rates of return (%)		
60	*67*	14.5%	7.9%	2.5%
80	*89*	21.6%	***13.8%***	7.7%
100	*112*	***28.3%***	19.0%	12.2%
120	*134*	34.8%	23.9%	16.2%
140	*156*	41.2%	28.7%	***20.0%***
160	*178*	47.6%	33.4%	23.7%
180	*201*	54.0%	38.1%	27.3%
200	*223*	60.4%	42.8%	30.8%

 # Households per km length of road catchment, overall 6 km wide

example using the model outputs

Let us assume that a rural engineer needs to advise a community on the most viable option for road improvement. There are three possibilities:

- Road number one passes through a high density area of 140 persons per km^2. Due to a lack of paving material in the vicinity it would be expensive to upgrade at around $19,500 per kilometre.
- Road number three passes through an area with a medium density of 100 persons per km^2, but would be inexpensive to upgrade at around $10,500 per kilometre.
- Road number three is in a low density area of 80 persons per km^2. Because of the need to construct many cross-drainage structures it would be moderately expensive to upgrade at around $14,500 per kilometre.

Using the table above it is possible to estimate the economic rates

of return for the three options as follows:

results

7.5 Results of modelling exercise

- Road Number 1 EIRR = 20.0%
- Road Number 2 EIRR = 28.3%
- Road Number 3 EIRR = 13.8%

final decision

With only limited resources available, the results from the above analysis would suggest that the preferred option would be road number two, which gives the highest return. However, if the main goal of the development was to provide benefits to the greatest number of people then road number one should be chosen. Road number three benefits the least number of people and has only a marginal internal rate of return.

A SIMPLE FINANCIAL MODEL

In many cases, like small rural markets or private irrigation schemes, a simpler approach can be used. The following example is a calculation method for financial viability based on obtaining a 20 per cent return. This equation can be done on a normal calculator. This is a good method to use if the investment is locally funded. This approach to project analysis ignores discounted costs and is suitable for checking whether the level of investment matches the incremental increase in rents and other revenues.

The simplified approach uses the basic concept of a return on capital (i.e. how many years it will take to cover the capital cost). The greater the security of income and capital, the greater the certainty of the income being received. Therefore, the yield that would be accepted will be lower (and vice versa). This approach is easy for a local official or bank manager to understand, which makes it useful if a bank loan is needed or if a site valuation is necessary for use as security.

7.6 Assessing the viability of a simple market project

1. Add together the expected annual rents, revenues and expected profit.
2. Deduct the value of any existing total annual rents and revenues.
3. Deduct any additional annual recurrent costs (e.g. electricity, water, etc.).
4. Multiply the result by 5 to obtain a value for 5 years total net revenues (if the project is less risky and/or a high return is not expected, multiply by 10 for 10 years revenues, i.e. equivalent to a 10% yield).
5. Estimate the total costs of buildings, infrastructure and equipment plus the existing site value or cost of site acquisition (if applicable).
6. Compare the total net revenue (4) to the capital cost estimate (5). If they are roughly equal then the project is viable.
7. If capital cost exceeds the revenues, increase the annual or monthly rents.
8. If the result produces rent levels that traders will not be willing to pay (discuss the new rent levels with traders) review the project and reduce capital costs.

FURTHER READING

The student should refer to the following documents:

1 **Price Gittinger, J.,** (1972). *Economic analysis of agricultural projects.* The John Hopkins University Press, Baltimore.

2 **Tracey-White, J. and K. Vaidya,** (1998). *Planning framework for sub-project screening and selection.* Consultancy Services for Implementation of Rural Infrastructure Improvement Project ADB Loan No. 1385-CAM (SF), BCEOM and IT Transport Ltd./ARD for ADB/Ministry of Rural Development, Phnom Penh.

3 **Tracey-White, J.**(1995). *Retail markets: planning guide.* FAO Agricultural Services Bulletin No. 121, FAO, Rome.

7.7 Questions for students:

What infrastructure can be evaluated using an economic analysis?

How would you quantify the benefits from a water supply project?

What is the basic difference between a producer surplus model and a consumer surplus model?

SECTION 8: SURVEY AND PLANNING TECHNIQUES

contents

8.1 Issues covered in this section

Introduction.

Primary data collection.

Social assessments.

Logical frameworks, coefficients and other indicators.

The role of rural engineers in surveying.

This section reviews the surveys and assessments that may be needed for rural development planning. It concentrates on the collection of socio-economic data, rather than physical surveys.

INTRODUCTION

Rural planning information is usually collected through surveys. Surveys are also needed to find the exact location of infrastructure. This section concentrates on planning surveys, which collect socio-economic and environmental data. There are a number of methods for collecting this data:

Assembling secondary data. This is all the data or information relevant to the project that already exists. It includes a literature review of existing reports and maps.

Collecting primary data. Primary data is information that does not already exist and will need to be researched or collected. This includes field surveys, social assessment and involves working with communities to collect data.

Checking base maps.

basic information for rural planning

Existing planning data will need to be assembled to plan projects in rural areas. The many types of secondary data or information required are shown below:

8.2 Secondary data for rural development planning

Identification stage

Population data - age composition, gender, migration, mortality rate, growth rates, etc.

Socio-economic data - education, literacy, health, life expectancy.

Environmental quality data.

Agricultural production data.

Location of agricultural production areas - irrigated and non-irrigated, forested areas, fishing concessions, etc.

Existing market channels – role and location.

Location of agro-processing and storage facilities.

Location of social and cultural facilities.

Studies on infrastructure, crop marketing, planning social facilities, etc.

Pre-feasibility stage

Employment and labour data, income levels, unemployment, etc.

Traffic counts.

Origin and destination data.

Site engineering, physical planning and unit cost data.

PRIMARY DATA COLLECTION

In addition to secondary data, primary data will need to be collected through field surveys to provide extra information. Usually only limited resources are available for surveys. For example, in road improvements it is not practical to prepare designs for each individual route. It is often better to use surveys to get the information needed to design standard models. Surveying a representative sample of roads is one way to achieve this. Community participation needs to be part of the survey process.

survey methodologies

The primary surveys are:

- Route inventory surveys – describing the physical conditions.
- Traffic surveys – measuring the number of vehicles using a route and the type of transport.
- Origin and destination surveys – discovering how vehicles or produce travel between places.
- Accessibility surveys (the IRAP process).
- Time budget case studies – determining how communities use their time for travelling and work.
- Employment surveys - investigating the labour available for LBAT, unemployment levels and appropriate wage levels.
- Socio-economic and environmental impact studies of specific issues or areas.
- Case studies of small-businesses, like brick kilns, to investigate their technical and financial feasibility.

SOCIAL ASSESSMENTS

Social assessments are an integral part of rural development. They cut across sectors and provide the social dimension to development. They combine published data with field research.

purpose of social assessments

The main purpose of social assessment is to ensure that rural development, policies, programmes and projects have a positive social, economic and environmental outcome. Social assessments are collaborative efforts between development partners – communities, government agencies, grassroots NGOs and donors. Each development partner has a different understanding of the problems and the solutions. Social assessments concentrate on the capacities of the partners to implement and manage interventions and on the possible direct and indirect benefits. For example:

8.3 Using social assessment to answer questions

- Does the community have the labour needed to construct a small irrigation structure and rice paddies?
- How will the labour be recruited and how will workers be paid?
- Is the location for the work agreed?
- Are surveys needed, like topographic and hydrological surveys? If so, who pays?
- Is there agreement on cost sharing between the community and local government for purchasing materials for the development?
- Is the community able to set-up and run a Water Users' Group with a local NGO?
- Will enough villagers benefit from the works and does this include landless villagers?
- The new structure may affect the water rights of communities downstream – has this been checked?

The social assessment is a way to share information, a mechanism for consultation with potential beneficiaries and an open and fair technique for decision making. The social assessment approach has strong links to other planning policies, like decentralised decision making and community ownership of assets, including maintenance and operation.

social assessment methods

There are many ways to undertake social assessments. The simplest method is to walk through an area with local villagers to observe the conditions and problems. Another method, often called stakeholder analysis, gives a simple questionnaire to the main actors or people involved to discover their opinions. This approach might be used to find the opinions of market traders on paying additional market fees. The most complex social assessments are large-scale detailed household surveys. These are not likely to be needed for rural engineering purposes.

rural appraisals

Generally, rural engineers are trying to understand local conditions. Detailed information is not usually required. An understanding of the dynamic (changing) cultural and social processes involved and the community's perceptions of problems and possible solutions are needed. Engineers need help to collect this information and may work with teams of researchers or other project staff to conduct appraisals. The two approaches normally used are:

8.4 Social assessment methods

- ***Rapid rural appraisal (RRA)*** – this method is more extractive - the engineer visits the community to obtain information, which is taken away and analysed.
- ***Participatory rural appraisal (PRA)*** – this method is a more participatory approach - the engineer facilitates the community to collect and analyse information. The community owns the information and shares it with the engineer.

rural appraisal methods

The methods used for rapid rural appraisal (RRA) and participatory rural appraisal (PRA) are very similar. The features they have in common are:

- Semi-structured open-ended interviews – with groups, individuals or following a chain of connections.

- Wealth ranking (described in section 4).
- Comparing differences between groups and individuals – like attitude by gender or wealth.
- Participatory diagrams like pie charts, flow charts and bar graphs to describe processes and relationships – e.g. marketing channels for crops.
- Case studies of particular issues – like how a family copes with debt.
- Transects – walking through an area to understand resource distribution, changes in cropping patterns, etc.
- Participatory mapping and modelling (described in the next section).
- Timelines of local events and local histories.
- Seasonal diagrams of planting and harvest times, rainfall periods, when people are available for non-farm work, etc.
- Group discussions to cross check information.

key informants Both RRA and PRA rely on key informants. These include local leaders, teachers, priests, nurses, traders, women's group representatives, etc. Acquiring an insight into local knowledge is an important part of the RRA and PRA processes. Research teams or engineers should attempt to reach a cross section of the community, including families like widowed households, which are often ignored in surveys. Research teams or engineers should also be balanced in terms of gender and professional discipline.

mixing methods The strong similarities between the two methods mean they can be used together. An example could be where financing is available for well construction and PRA is used so the community can select the locations and organise community labour. At the same time, it may be possible to upgrade some footbridges, but only if they are more financially feasible than the footbridges in an adjacent community. To avoid raising community expectations, RRA may be used After the footbridges are demonstrated as viable, the engineer may return to the community and conduct a PRA to work out the future maintenance arrangements.

integration with analytical tools These appraisal methodologies can be supplemented or integrated with conventional survey techniques and with analytical tools, like integrated rural accessibility planning and logical framework analysis, described below.

USE OF LOGICAL FRAMEWORKS, COEFFICIENTS AND OTHER INDICATORS

In rural development, as in sector planning, the engineer needs to:

- Identify community problems and needs.

- Facilitate project selection and help set priorities.
- Plan project interventions effectively.
- Follow up and evaluate the projects.

logical frameworks

The survey, planning and evaluation techniques described here help to complete these steps. The mapping methods described in the next section are some of the most powerful tools the rural engineer has for project planning and design. However, a more complete approach is needed, that can provide a logical analytical instrument that pulls together the whole process. This instrument is a logical framework analysis (LFA).

what does LFA do?

LFA links the whole process – making connections between the project objectives and the ultimate outcome. It allows a dialogue between the various development partners (community, NGOs, local and central government and donors), by using a common approach that lets them structure their thoughts in a logical, hierarchical and sequential way. Therefore, LFA is:

LFA approach

5 A planning method.

6 A facilitator for brainstorming and mind mapping.

7 A suitable format for preparing project documents.

LFA questions

To prepare the LFA, it is necessary for the engineer to follow a sequence of questions that address the following issues:

- How are the participants involved in the project design?
- What is the actual problem being addressed (problem analysis)?
- What are the real objectives of the programme or project (objective analysis)? Do these objectives conflict?
- What are the risks and have alternative strategies been analysed (risk analysis)?
- How do you plan to implement the proposals?
- What are the pre-conditions for sustainable and economically sound development?

LFA process The LFA process links together project inputs ↦ project activities (and their costs) ↦ results or outputs ↦ project objectives ↦ and the overall development objectives. A typical example follows:

8.5 Example of logical framework analysis - water supply

	Intervention logic	Objectively measurable and verifiable indicators	Source of verification	Important assumptions
Development objectives	Improved health for target group	20% reduction in diarrhoea cases at local clinics	Health clinic annual data and annual Provincial health reports	
Project objectives	Use of clean water increases from 2 to 3 litres per day	100 new lined wells constructed	PRDC office annual reports	Water remains unpolluted. Health education provided
Results (outputs)	50% of target group supplied with sufficient quantities of clean water	Wells in working order and put into operation	Regular site visits by project engineer Quarterly reports to CRDC	Maintenance system functions Budget is available for operations
Activities	Survey Design Train contractors Procure materials Procure equipment	**Activity costs:**	$ Equipment $ Infrastructure $ Operating cost $ Technical help $ Total cost	Financing is available Target group and communities co-operate
Inputs	Identification through participatory planning of the community's need for water supply improvement		**Conditions:**	Adequate supply of groundwater Government support for capital expenditure

In many projects, it is necessary to decide how different components will interact. In a project to improve roads and markets, investment in local markets may be superfluous if improving access and feeder roads encourages the farmer to market produce at the farm gate or to deliver produce directly to urban markets.

measuring change The LFA is a useful instrument for project design, however it is essentially static. It can be used like a camera to provide a series of snapshots of project progress. What is often needed is a way to measure change – to show trends, time series and tendencies. This allows policies and projects to be adjusted to match evolving circumstances.

indices An index number, like consumer price indices and consumption indices, is a useful way to measure change. Normally, the index relates a number to a base year. Thus, an index number is a ratio of two numbers, expressed as a percentage as follows:

8.6 Construction of an index

Ii =100 x Yi/Yo

Where: Ii = index number in year I, Yi = measurement in year i and Yo = measurement in base year.

THE RURAL ENGINEER'S ROLE

Rural engineers may find that they can undertake physical surveys but need help with the socio-economic surveys. Thus, the engineer will commission surveys from specialists, like government agencies, NGOs and private consultants. These surveys are needed at the identification stage of project, but may also be needed at later stages of the project development cycle.

purpose of surveys

Before starting, it is essential to define the purpose of the survey:

- An initial social assessment and participatory mapping – using PRA and RRA techniques.
- Formal surveys identifying particular issues.
- A baseline survey conducted before a project starts, representing the situation before the project. An example might be traffic and road condition survey before starting repairs.
- The baseline survey may be repeated during project implementation. This is called monitoring and evaluation, described in a later section. These surveys may involve both formal surveys and social assessments.
- Environmental surveys, which may have many stages, including screening and assessment. These are described in a later section.

steps in setting up a survey

To plan a survey, the following questions must be answered:

- Who will be responsible for undertaking the survey (this may require specialist contractors and universities)?
- Who will pay for the survey?
- Is there a formal procedure for recruiting consultants - are a number of bids required?
- Who will prepare the terms of reference for the survey?
- Who is responsible for the survey design – determining the location and size of the survey, including the sample size?
- How will it be supervised and by whom?
- Who is responsible for logistics, like transport?
- Who will be responsible for data handling – spreadsheets and databases?
- Does a pilot survey need to be undertaken before starting

the main survey?

- When will it be undertaken – e.g. a major purpose of route surveys is to identify the impact of roads at the main peak agricultural production periods?
- Are special consents required from adjoining owners, traffic authorities or local communities?
- Is special equipment required or do special safety procedures need to be followed?

FURTHER READING

The student should refer to the following documents:

1 **CRD,** (1999). *Participatory Rural Appraisal: a training manual based on the experiences of Cambodian Researchers for Development.* CRD, Phnom Penh.

2 **Eyben, R.,** (1998). *The role of social assessments in effective development planning.* Social Development Division, DFID, London.

3 **Hudson, N. and R. Cheatle,** (Editors) (1993). *Working with Farmers for Better Land Husbandry.* Intermediate Technology Publications, London.

4 **Knowles, J.,** (1997). *Capacity Development for Socio-Economic Surveys and Planning Project*. Technical Report, Ministry of Planning, Phnom Penh.

5 **McCracken, J., J, Pretty and G. Conway,** (1988). *An Introduction to Rapid Rural Appraisal for Rural Development*. IIED, London.

6 **Sida,** (1996). *Guidelines for the Application of LFA in Project Cycle Management.* Sida, Stockholm.

8.7 Questions for students:

What are secondary data sources and can you list some?
What are primary data sources and can you list some types of formal survey?
When would you use a social assessment?
What is the difference between RRA and PRA?
What is the purpose of using logical frameworks?
What are some of the steps that the engineer must consider in commissioning surveys?

SECTION 9: MAPPING AND PRESENTATION

contents

9.1 Issues covered in this section

Purpose of mapping.

Participatory mapping.

Manual mapping.

Use of GPS and other methods to verify data.

Interpreting maps– layers, thematic maps and application of GIS.

Standard presentation techniques.

PURPOSE OF MAPPING

Mapping is an integral part of the rural development process. The purpose of mapping is to:

- Provide a picture of conditions in a given area.
- To help identify problems and formulate interventions.
- Enhance communication and development of interventions with the communities.
- Provide a baseline to evaluate the impact of rural development projects.

approaches to mapping

There are three basic approaches to mapping, which can be applied singly or together. The choice may depend on available resources and equipment:

- Participatory mapping.
- Manual mapping.
- Geographical Information Systems (GIS).

Each of these mapping approaches may need to be supplemented with field survey work.

PARTICIPATORY MAPPING

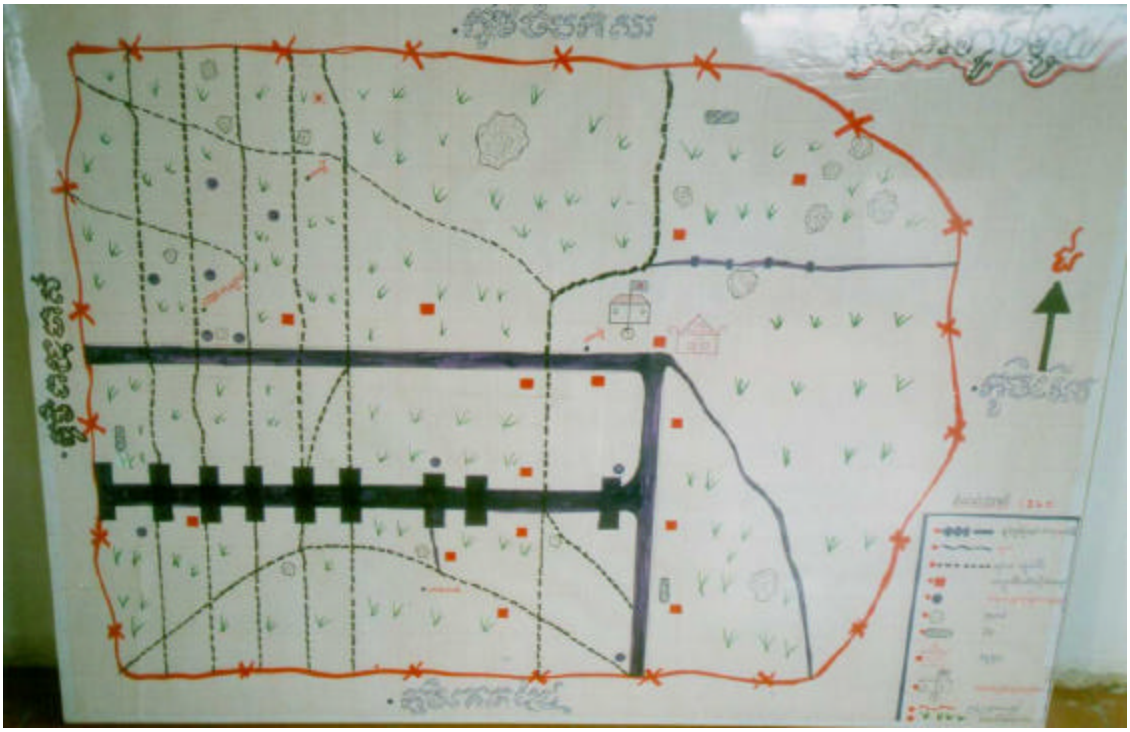
Participatory mapping (also called village mapping) is usually part of the rapid rural appraisal or participatory rural appraisal methods. It may also be used during specialised surveys – particularly those that work with villagers to define local processes that are not covered by formal mapping methods.

The participatory mapping process is a method of creating maps through discussions with key informants and other villagers. The maps are not to scale, as they are essentially mental maps of the communities. These maps clarify the relationship between the various components of a community and highlight what is important to the community.

When planning resource management, forestry, water use, soil conservation, agricultural farming systems or irrigation areas, mapping is often combined with transects. These are done by systematically walking through the area with the key informants. Transects are particularly valuable when combined with mapping – this gives a three-dimensional view of the community, which can be useful for understanding processes of

change. A typical map, hand-drawn by villagers is shown below :

9.2 Hand-drawn Map of Kcheay Village, Puok District



Source: Rozemuller, H. et al, 2000. Household Travel and Transport Analysis.

MANUAL MAPPING

Manual mapping is simple to apply to planning activities. It allows the engineer and community to visualise the location of activities and infrastructure within a given area. It can help to identify and prioritise access problems, facilitate the formulation of interventions and guide the selection of the best development alternatives.

purpose of manual mapping

Manual mapping is a process that can be easily understood without technical training. The maps are plotted to scale (usually 1:50,000 or 1:100,000) and depending upon the care taken, are accurate. They are produced using local, inexpensive materials like tracing paper or some transparent paper that can be copied.

procedure for manual mapping

Manual mapping is undertaken in three stages:

- Preparing a base map of the area.
- Preparing thematic maps, showing characteristics of the area like accessibility, routes needing improvement, etc.
- Preparing planning maps.

9.3 Preparing manual base maps

Base maps are used to develop general information about an area. There are four main steps to produce these maps:

- **Step 1:** Collect copies of all current maps.
- **Step 2:** Identify provincial, district and/or commune boundaries, the provincial centre, district centre, commune and village centres.
- **Step 3:** Draw or re-draw on a base map, province, district and/or commune, village names and lakes and rivers.
- **Step 4:** Reproduce several copies of the original base map on tracing sheets.

thematic mapping of population, roads and social factors

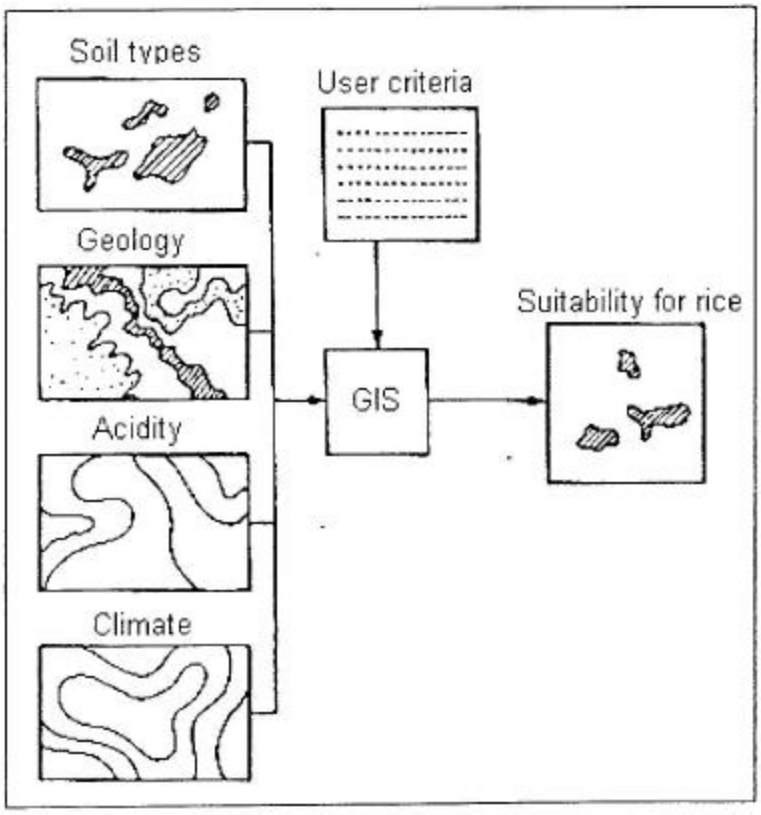
After preparing base maps, thematic maps are prepared highlighting particular themes or sectors. Some mapping can be undertaken directly with a community, but others may require careful field verification or survey (like a road condition inventory).

Typical maps could include the following characteristics:

- Physical conditions (topography, soils, etc).
- Population distribution, showing administrative boundaries, population centres, population densities and any specially targeted communes or villages.
- Road and transport facilities, showing road and water transport links (following standard codes), type of link (secondary, tertiary, etc.), names, lengths, surface type and condition.
- Social facilities map, showing schools and health facilities.
- Economic facilities, showing primary markets, rice mills and small-scale local enterprises.
- Complementary projects by donors and NGOs.
- Infrastructure proposals, like roads, identified locally by the VDC, CRDC, DRDC or PRDC.

These are all working maps. Although useful to understand the present pattern of development, their main use is to identify and plan development activities.

9.4 Thematic maps used to develop a planning proposal



VERIFYING MAPS

One of the common problems for the rural engineer is that the base maps are out of date. This can be true whether manual or GIS methods are used for the mapping. There are two methods that can be used to verify data and update base maps:

- Global Positioning Systems (GPS).
- Aerial photographs and satellite imagery.

using a Global Positioning System

The GPS is a hand-held electronic device that determines the coordinates of any location using a triangulation system from signals received from three satellites. The device is battery-operated, has an antenna, a small keyboard and a display screen. The GPS gives the coordinates of its position at the time of taking the reading. The GPS allows up to ten different coordinate systems to be used – the most common being UTM (Universal Transverse Mercator) and latitude/longitude (Lat/Lon). Correction factors (based on the Conventional Terrestrial Reference System) are entered into the GPS to allow values to be mapped. Accuracy is high – but can be out by up to 15 metres. It is possible to calibrate a reading by taking a reading in the morning and the afternoon.

aerial photographs and satellite imagery

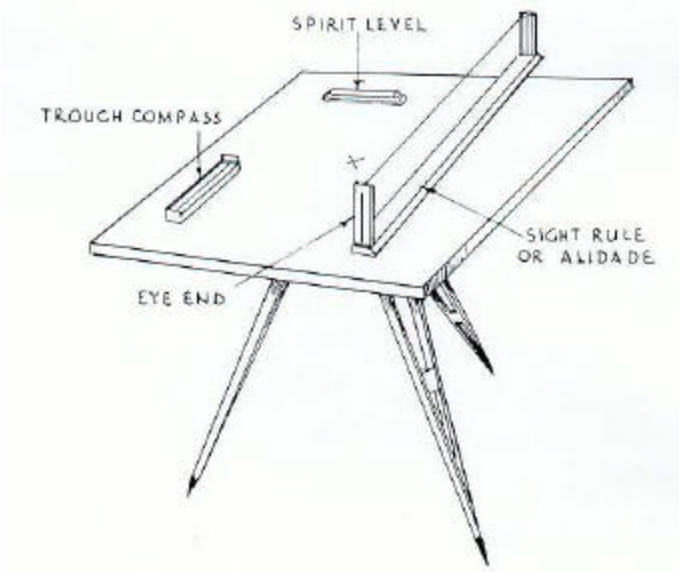
Aerial photographs allow highly accurate map corrections to be made, but are unlikely to be useful for rural engineers, except on large-scale projects. Ground control points are needed and interpretation (called photogrammetry) is a highly specialised

skill. Interpreting soils, crop and forest cover, flood inundation, etc. are all difficult without specialist help.

plane tabling

While GPS and aerial photographs are invaluable aids, traditional surveying techniques should also be used to fill in missing detail on maps. One such technique is plane tabling. This allows direct plotting in the field using very simple instruments. This technique is particularly useful in combination with a GPS for defining an irrigation area arrangement or delineating the edges of land use, field boundaries, forests, water features, etc.

9.5 Accessories for plane tabling



INTERPRETING MAPS

Any of the approaches above could be used to prepare planning maps. Planning maps take the base maps or thematic maps a stage further and use them as an analytical or modelling tool.

The types of planning analysis that might be undertaken are:

3 Testing theories – like whether all inaccessible villages have the lowest proportion of children attending primary school?

4 Separating or regrouping data to create new maps (called re-classing). These express combinations of ideas – like whether it is possible to identify all primary markets with direct bus services to the main district and commune towns?

5 Undertaking suitability analysis - to identify which areas would be suitable for rice cultivation (as in figure 9.4).

6 Re-classing themes or issues, based on community priorities or government policy.

7 Re-colouring maps to give a picture that can be read directly – so that complex interrelationships in an area can be studied.

8 For route planning, thematic maps can be used for network analysis to determine the fastest routes or the shortest distance to services and to choose between multiple or alternative routes.

constraints and opportunities

By evaluating the important constraints and opportunities and mapping only those elements, map images can be generated that can be used for design. Sometimes only three or four conditions are important and all four can be shown simply on one map. Using this analysis, the engineer can easily show the community the effect of the constraints and opportunities.

Geographical Information Systems

GIS is a computer software program used to produce maps. GIS mapping replaces many manual operations with computerised tasks. The speed of GIS makes some previously almost impossible tasks easily achievable. However, the basic approaches to planning are nearly the same whether undertaken manually or by computer. Effectively the same planning exercise is undertaken using manual methods, but GIS is also a database management system. Thus, the power of a GIS lies in part in its ability to act on data, not just to produce maps. For mapping, the advantages of GIS include:

- The scale of the drawing can be changed with a few simple commands and a fresh copy produced quickly.
- Very large areas (like whole provinces) can be stored in the computer and viewed at different scales or in pieces.
- Graphic selections of colour, pattern or line style can be changed very quickly. With the proper output device, colours and patterns can be printed or plotted fairly close to the image shown on the computer monitor.

STANDARD PRESENTATION TECHNIQUES

An important rule of mapping is to use standard presentation techniques. The ILO publications listed below give standards for paper sizes, pen line thickness, shading and standard legends, etc. to use in mapping.

FURTHER READING

The student should refer to the following documents:

1. **CRD,** (1999). *Participatory Rural Appraisal: a training manual based on the experiences of Cambodian Researchers for Development.* CRD, Phnom Penh.
2. **Kumar, K.,** (1993). *Rapid appraisal methods*. World Bank Regional & Sectoral Studies. Washington DC.
3. **ILO,** (1999*). Guidelines for Manual Accessibility Mapping*. ILO Sub-Office, Siem Reap.
4. **ILO,** (1999). *Manual for Global Positioning System* (*GPS*). ILO Sub-Office, Siem Reap.
5. **ILO,** (2000). *GIS Manual*. ILO Sub-Office, Siem Reap.
6. **Monmonier, M.,** (1993). *Mapping it out: expository cartography for the humanities and social sciences.* University of Chicago Press.
7. **Stern, P.,** (1983). *Field Engineering*. Intermediate Technology Publications, London.

9.6 Questions for students:

What are the main mapping techniques used by the rural engineer?
How would you map an irrigation system in the field?
What techniques would you use to verify a base map?
When would you use planning maps?
What are the advantages of using GIS?

SECTION 10/11: INTEGRATED RURAL DEVELOPMENT FIELD TRIP

PURPOSE OF THE FIELD TRIP

The students will make a short (1 day) field trip to a rural area close to Phnom Penh. The field trip should concentrate on the conditions in a single commune area.

The field trip should start with a short briefing on the area by staff from the Provincial Rural Development Committee and from the commune-level Rural Development Committee chairperson.

The rural development infrastructure the students could be shown during the field trip are:

10.1 What to see in a rural area

- Typical village housing conditions, including basic minimum needs like sanitation and drinking water supply.
- Energy sources.
- Agricultural production areas, including irrigated rice areas and areas with diversified cropping, like vegetables.
- Unimproved and improved tertiary roads, including crossings and structures. The road should preferably have been improved using labour-based methods.
- Other transport facilities like water transport.
- Local industry and handicrafts.
- Social services and cultural facilities, including primary schools, health posts and temples.

EQUIPMENT

The class should ensure that they go into the field properly equipped. Students should take the following:

10.2 What to take with you

- A map of the commune area.
- A notebook and pens/pencils.
- A compass and/or GPS.
- A camera.
- An umbrella or some type of rainwear!

COLLECTING DATA

As part of the field trip the class members should individually collect time budget and accessibility data from villagers on market/health facilities. This data will be used to write a brief report on the field trip (see Section 12). The data collection is in two parts:

- General village data, from PDRD staff, village leaders and VDCs.
- Specific accessibility related questions from individual villagers.

10.3 General data to be collected

- Number of families in village.
- Distance to District/Provincial centre.
- Sources of income for villagers.
- Types of agricultural and non-agricultural production in village.
- Standard of living in village.
- Rural development problems (for example food shortage/ floods/etc.).
- Number of markets/health centres etc. in the area.
- Types of markets/health centres etc. in the area (provincial/district/local markets etc.; hospital/ pharmacy/*kruu khmer* etc.).

10.4 Family accessibility data to be collected

- Total distance to market/health centre.
- Total time (minutes per day) spent travelling to market/health centre in dry season.
- Total time (minutes per day) spent travelling to market/health centre in wet season.
- Number of trips per day/week in dry season.
- Number of trips per day/week in wet season.
- Who visits the market/health centre in the family (gender and age)?
- Condition of infrastructure.
- Type of transport used.
- Costs of travelling to market/health centre.

SECTION 12: WRITE UP OF INTEGRATED RURAL DEVELOPMENT FIELD T RIP

The students should write a brief report (maximum 4 pages) on the field trip.

REPORT CONTENTS The suggested structure for the report is:

1. Introduction:

- Dates of trip.
- Who was met?
- Acknowledgements.

2. Background:

- Brief history of the area.
- Who lives there – population, ethnic groups, etc?
- Main economic activities – w hat is grown?
- Other features of area (tourism, pilgrimages, etc).

3. Observations on infrastructure - what was seen:

- Transport network – condition and adequacy.
- Basic minimum needs – condition and adequacy.
- Social services – condition and adequacy.
- Non-farm employment.
- Accessibility to facilities.

4. Conclusions:

- Overall comments on the socio-economic and infrastructure conditions in the area – perhaps comparing them to another area known to the student.

5. Recommendations:

- The student's ideas on what might be done to improve the area.

6. Map of the Area

ITC RURAL DEVELOPMENT COURSE

PART B: Practice and Applications

SECTION 13: INTRODUCTION TO RURAL TRANSPORT PLANNING

contents

13.1 Issues covered in this section

INTRODUCTION

Rural transport planning combines physical planning, socio-economic and technical engineering factors. A good rural transport programme provides the maximum socio-economic benefit at the lowest initial cost. The programme must also be sustainable in the long-term. The purpose of this section is to give an approach to analysing rural road developments. It provides a simple planning framework for evaluating and monitoring rural roads.

WHAT ARE RURAL ROADS?

The road system in Cambodia can be classified into two main functional levels:

1. core system Comprising the Class A and B **primary** road system covering national and inter provincial highways. These include highways that link Asian capitals with each other and with major international ports. The core system also covers the **secondary** road system, linking provincial centres to the capital, to adjacent provinces and to other main industrial and tourism centres.

2. other roads Includes **tertiary** and **sub-tertiary** rural roads, which are public roads that cater for internal district transport or which link adjacent districts (called agricultural feeder roads); village link roads; local paths, farm tracks and **special-purpose** roads.

This rural road classification is summarised below. The main function of the secondary and tertiary roads is to provide access to the rural population. Both these types of rural roads could be selected for rehabilitation under a rural road programme.

This section is concerned with the planning of the *other* roads category, mainly of the tertiary level. Later sections consider local access planning based on an Integrated Rural Accessibility Planning (IRAP) technique. Much of the data collected during IRAP is useful for assessing the overall need for all rural road improvements.

13.2 Rural Road Classification

Tertiary Roads: linking district to district.

Sub-Tertiary Roads: connecting rural centres/communes to district towns (sub-tertiary road 1), communes to each other (sub-tertiary road 2), communes to villages or villages to villages (sub-tertiary road 3) or tertiary links to primary or secondary roads.

Special Roads: Special-purpose roads which serve individual economic activities within a limited area, like mining or forestry, or which are primarily required for national defence.

TRANSPORT PLANNING PROBLEMS

Rural transport improvement in many countries is a mixed success story. The wrong facilities are frequently provided in the wrong place using the wrong technology. The underlying causes are often weak local government and community institutions:

13.3 Symptoms of poor transport planning

- **Symptom 1:** Unclear responsibilities for road construction and maintenance.
- **Symptom 2:** Disintegration of the planning system.
- **Symptom 3:** Insufficient and uncertain maintenance funding.
- **Symptom 4:** inadequate local capacity.
- **Symptom 5:** Inappropriate design standards and methods - applying to policy and programme development and to the technology used.

Source: **Calvo, C. M.** (1998). *Options for Managing and Financing Rural Transport Infrastructure.* World Bank Technical Paper No. 411. World Bank, Washington, D. C.

WHAT ARE THE REASONS FOR ROAD IMPROVEMENTS?

So, why invest in rural transport improvements? The reasons include:

- Demand for improvements by local communities because of their remote location and the poor condition of existing roads.
- Population increases from migration and natural growth, which overwhelm the existing road capacity.
- Changes in the location and nature of workplaces and social facilities.
- Changing transportation patterns, through increased traffic growth and congestion, shifts in transport mode (i.e. the proportion of different types of vehicles) and changes in the capacity and size of public transport or delivery and distribution vehicles.
- New regional and rural development policies.
- Changes caused by new legislation and greater public awareness.

These factors all need to be considered when identifying the best approach to modifying the rural transport system. Local communities and decision makers will need to be involved at the outset - so the project is realistic from the beginning.

WHO IS RESPONSIBLE FOR RURAL ROADS?

The primary road system is the responsibility of the Ministry of Public Works and Transport. Secondary roads are constructed and maintained by the Provincial Public Works Department (PWD). The Provincial Department of Rural Development (PDRD) is responsible for tertiary roads. The PWD roads are predominately black top and water bound macadam, with only a small proportion of laterite or earth roads. Those maintained by PDRD are mainly earth roads with some laterite surfaced roads.

Sub-tertiary roads one and two are the responsibility of the local communes that the road connects. Sub-tertiary roads three, including paths and farm tracks, are the responsibility of village communities.

role of decision makers in road prioritising

Decision-makers are not likely to be involved in detailed prioritising, but they will give approval to a proposal prepared by technicians. Therefore, decision-makers need guidance on the correct preliminary steps. If this process is not followed in a rational sequence, the road may not be socially or economically viable.

basic planning issues in the initial screening of road proposals

The critical time in the design process is between the idea for a road improvement and the detailed feasibility studies. At this stage the engineer needs to consider the following basic planning issues:

- Further information needed on how the road will function.
- The need for a dialogue with road users to identify the specific requirements of adjacent communities, market traders and transporters.
- The cost implications of the road improvements.
- The expected environmental and social consequences (improved access to social facilities, increased traffic, dust and noise pollution, etc.).
- Possible ways of involving communities and road users in providing funds for road maintenance.

The factors to be considered in initial screening are:

13.4 Factors in initial screening of rural road improvements

- Serving local access needs, particularly for agricultural producers taking goods to market.
- Minimising land acquisition requirements.
- Terrain – the flatter the vertical alignment the better.
- Impact of potential flooding hazards.
- Construction suitability (geotechnical constraints) and the use of labour.
- The availability of surfacing materials.
- Any potential environmental impact.
- Social and economic viability.

rural development context – relationship to agriculture

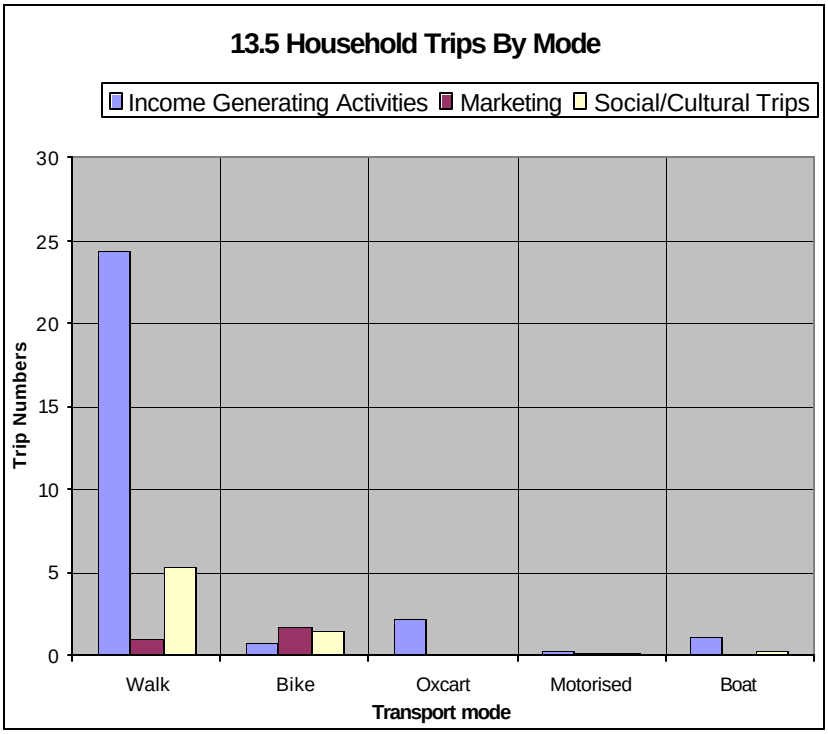
The best way to gain an understanding of access issues is to start with the agricultural production area - to understand the farmers' concerns - including their relationships to their suppliers, transporters and buyers.

trade links and market catchment areas

In designing a road, it is also necessary to understand the trade links in the agricultural marketing system. These are the routes used by farmers and transporters and include the mode of transport used, length of journey, time and cost of transport. From these, the engineer can determine the catchment area from which the products will come. Remember that some products will be consumed locally (including on the farm itself). The surplus will go a nearby village, some to a provincial or district town, some to the capital city and some may be exported to other countries by road or, in the case of high value products, by air.

OTHER TYPES OF RURAL TRANSPORT

This section has so far concentrated on roads and the motorised forms of transport that use them. However, if one was to look at the dominant modes of movement in rural areas, then trips by motorised means make up a very small proportion. From the diagram below it is apparent that the mode also varies substantially with the trip purpose.



The graph is for travel in Puok District, Siem Reap Province, but is typical of rural Cambodia. Overall, around 91 per cent of trips made in rural areas are by foot – the most common journey is to the farm holding. The second most important transport mode (around 4%) is bicycle, which is particularly important for trips to market. The oxcart is the next most important (2.4%), followed by boat use (1.6%), most of which is by non-motorised boat. Boats are predominately used for fishing. Only 0.8 per cent of trips are made by motorised vehicle and the vast majority of these are made using motorbikes, rather than by remorque, koyun, bus or car.

Roads are only one of the transport systems that can be improved. Other infrastructure, like bridges and jetties are equally important. These can include water transport, animal power, school buses and intermediate forms of transport.

FURTHER READING

The student should refer to the following documents:

1 **Beenhakker, H., Carapetis, L. and Hertel, S.,** (1987). *Rural Transport Services: a Guide to Planning and Implementation*. Intermediate Technology Publications, London.

2 **Calvo, C.M.,** (1998). *Options for Managing and Financing Rural Transport Infrastructure.* World Bank Technical Paper No. 411. World Bank, Washington, D. C.

3 **Dawson, J. and Howe, J.,** (1993). *Roads are not enough. New perspectives on rural transport planning in developing counties*. Intermediate Technology Publications, London.

4 **Ellis, S. D.,** (1997). *Key issues in rural transport in developing countries.* TRL Report 260. Overseas Centre, Transport Research Laboratory, Crowthorne, Berkshire, UK.

5 **Ministry of Rural Development,** (1999). *Policy for Rural Roads.* MRD, Phnom Penh.

6 **Rozemuller, H. et al.,** (2000). *Traffic Characteristics around Puok Market.* ILO SE Series No. 1, ILO. Phnom Penh.

7 **SMEC International PTY Ltd.,** (1997). *Project preparation and technical assistance for transport network improvement project: Cambodia: Final Report, Volume II Economic Evaluation and Review of TRS*. Prepared for Asian Development Bank under TA No. 2722-CAM.

8 **SweRoad,** (1995). *The Transport Rehabilitation Study*. Prepared for SIDA/UNDP and Ministry of Public Works and Transport. Phnom Penh.

13.6 Questions for students:

What are the reasons for undertaking road improvements?
What are rural roads?
Who constructs and maintains rural roads?
What issues should the rural engineer consider in the initial screening of road proposals?
What transport systems are used in rural areas?
What is the most important mode of travel in rural areas?

SECTION 14: CHOOSING RURAL TRANSPORT PLANNING OPTIONS

contents

14.1 Issues covered in this section

Choosing transport systems.

Overall approach to prioritising rural roads.

Range of assessment techniques.

Assessment technique choice.

CHOOSING TRANSPORT SYSTEMS

This section considers how to choose the most appropriate rural transport options. There is a clear link between rural development policies, infrastructure planning and economic viability. The key issues that need to be considered when assessing road infrastructure investments are:

basic questions for assessing road improvements

- What road improvements are needed?
- What technical, financial and social factors need to be considered?
- What preliminary work is needed to make informed decisions?
- Which method should be used to select roads for improvement?
- Who should be involved in the planning process (communities, road users, farmers, traders or government officials)?
- What information is needed to brief technical specialists and/or consultants to prepare surveys, feasibility studies and detailed designs for the investment?

Therefore, what criteria should be used for screening, prioritising and evaluating road improvements? The following basic questions will help to develop a clear justification for a road improvement:

14.2 Justifying roa d improvements

- Is the need for the road improvement clear?
- How will the road fit into the existing road network?
- Have alternative construction methods been considered?
- How does the road improvement fit into the overall policy for the provincial or district development?
- What is the community's reaction to the proposal?
- Have environmental consequences been considered?
- Have the implications of increased traffic levels been considered?
- Is there a technical, social and economic rationale for the road improvement?
- Is there a possibility of cost recovery for maintenance, i.e. Will the road improvement be economically sustainable?
- Finally, are the next steps on how to proceed with the road development clear?

OVERALL APPROACH TO PRIORITISING RURAL ROADS

In common with much of the developing world, mobility in rural Cambodia is hampered by the lack of all forms of transport and by poor roads, which discourage the use of personal transport.

Before initiating the process of improving the road system, it will be necessary to review what information is available and

what approach should be used to select roads for improvement. To resolve many of the issues, some basic surveys and studies will be required. In this case, it will be necessary to decide:

How to collect the information.

Who will be responsible?

What should be the timetable for collection?

Whether additional financial resources will be needed to undertake the surveys.

Recently, rural transport planning techniques have evolved and current approaches are based on determining and meeting people's needs.

14.3 Current approaches to rural transport planning

There have been radical changes in rural transport planning theory and policy over the last few years. Current thinking includes the following:

- Emphasising poorer households and recognising that poor access to goods and services (and therefore time wasted) is a fundamental constraint to development.
- Recognising that in the poorest rural areas, household travel is dominated by local trips for subsistence activities – farm trips, collecting water and firewood, trips to primary schools and health clinics, going to rice processing mills and carrying loads to markets.
- Recognising the importance of improved transport to all members of the household, in particular female members.
- Emphasising alternative assessment techniques (like least-cost planning) that recognise a wider range of socially based road-user benefits than traditional cost-benefit analysis.
- An integrated approach to rural transport at the local level, recognising that accessibility should be considered in a wide range of infrastructure and other development activities.
- An approach lead by need, concentrating on access factors, rather than road construction. This has led to decentralised participatory planning approaches.

benefits and objectives of road development

The benefits of rural infrastructure improvements are interrelated. Road improvements provide support to other rural development activities like:

- New and expanded small-scale irrigation areas.
- Augmented potable water supplies.
- Soil conservation and drainage schemes.
- Improved marketing infrastructure.

These activities all aim to increase access to opportunities to improve rural living standards and income. The typical overall objectives of a road improvement would be to:

- Provide better road access, so that agricultural surpluses can reach collection centres and markets more rapidly, while reducing damage to perishable crops.
- Reduce operating costs for vehicle users.

  Provide greater opportunities for social and educational

journeys and provide more direct and cost-efficient access to government services, like schools and health facilities.

basic infrastructure standards

Basic planning/construction standards need to be defined to develop and cost a programme of road rehabilitation works. Possible standards could be:

14.4 Minimum Rural Road Geometric Design Standards

	Secondary	Tertiary	Sub-tertiary 1/2	Sub-tertiary 3
Motorised traffic flow (ADT)	1,000-5,000	100-400	20-100	<20
No. of lanes	2	2	1	1
Lane width – m	3	2.5	4	2.5
Carriageway – m	6	5	4	2.5
Shoulder – m	1.5	0.5	0.5	0.5
Roadway – m	9	6	5	3.5
Minimum right of way - m	40	30	20	15

Source: Road Geometric Design, Public Works Research Centre, 1997. MRD/ILO, 1997. ***TRL Overseas Road Note*** *6. 1988.*

rural road development policy

There is substantial variation in the density and condition of road networks in the various provinces of Cambodia. Rural road development policy is described in the "Policy for Rural Roads" published by the Ministry of Rural Development (December 1999). However, there is no explicit policy instrument in Cambodia related to minimum road standards. In India, for example, there is a Minimum Needs Programme, implemented under the Rural Development Department, which aims to link all villages with a population of 1,500 persons with all-weather roads.

planning and design alternatives

Usually the basic design approach to selecting rural roads for improvement is not immediately obvious. Several alternatives will need to be evaluated to decide which one is preferable.

The choice between simply upgrading a road to an existing standard and constructing the road to a new standard should be made carefully. It is necessary to approach the problem by thinking clearly about the road's function: how can this be achieved at the lowest cost, using the simplest technology (i.e. labour based rather than equipment-based construction)?

The choice of options should also consider possible socio-economic changes in the area and any potential environmental impact (like dust pollution and noise impact). Many options are likely to be available and there is likely to be more than one solution. The range of options to be evaluated may include:

- Selecting the most appropriate options from a list of alternative routes.
- Choosing whether to improve roads to an existing standard or upgrade them to a new, higher, standard (e.g. upgrading from earthen roads to laterite surfacing).

- Evaluating whether users would be willing to pay charges for road maintenanc e.

accessibility criteria

The benefits from road developments depend upon the initial condition of the road. Information on the existing conditions of rural roads in Cambodia can be used to categorise rural roads. The possible categories of road conditions likely to be encountered are shown below. These are defined in terms of accessibility at different times of the year. The International Roughness Index (IRI) is a method for estimating the condition of a road pavement based on measuring and calibrating its roughness, quantified in metres per kilometre.

14.5 Road Accessibility Criteria

Level 0	No existing road or track - impassable to most traffic all year round (IRI 18 or higher).
Level 1	Impassable to most traffic in the wet season, difficult but passable all year round (IRI between 10 and 15).
Level 2	Passable all year round except for structures, the need for drainage or spot improvements in places (IRI in the range 10 to 15).
Level 3	Difficult but passable all year round (IRI in the range 10 to 15).
Level 4	Passable all year round in comfort at acceptable speeds (IRI 7) - average speed of about 60 km/hour.

level of service used in road design

To select an appropriate assessment technique it is necessary to consider the level of service expected from the improved road. Broadly, there are three levels of service used in road design:

- **Full access -** higher travel speeds and low roughness, generally applying to higher level roads in the road hierarchy.
- **Partial access –** seasonal/temporary access for special uses.
- **Basic access -** lower travel speeds and low traffic flows, generally applying to lower/local levels in the road hierarchy.

To achieve full access it would be necessary to rehabilitate a road up to accessibility level four, broadly equiv alent to IRI 7. Partial access roughly corresponds with level three and basic access with level two. To achieve level two the roads should be passable in the dry season but often inaccessible or difficult for most vehicles (possibly excluding four-wheel drive vehicles) to use in some parts of the wet season.

RANGE OF ASSESSMENT TECHNIQUES

The most effective use of resources depends upon an effective assessment approach. Therefore, engineers need to assess options and select the most appropriate solution. It is important to remember that any technique must include a role for all the concerned parties, not only the decision-makers and their technical advisors. For this reason, assessment techniques need to be systematic, quick, simple and inexpensive to use. They also need to be comprehensive enough to consider all the main factors relevant to decision making.

choice of assessment techniques

The most commonly used methods for assessing rural roads are:

- **Sufficiency or adequacy ratings:** this is a weighting technique, applicable only to road improvements. It considers the structural adequacy of the road (sub-grade, base, surface and drainage), safety elements (widths and sight lines) and service factors (alignment, passing distance and riding quality of the surface).
- **Conventional economic cost-benefit analysis:** this either quantifies road user benefits (the consumer surplus approach) and/or increases agricultural output (the producer surplus approach).
- **Screening and ranking techniques:** these compound ranking systems are a development of sufficiency technique, expanded to include multiple criteria, like social and economic factors. An example of the technique as applied to rural roads is shown below:

14.6 Road ranking using a points and weighting system

The following criteria have been used to rank rural roads:

- Zone of influence of road (actual and potential agricultural production and population) - maximum 30 points.
- Degree of isolation of the community - maximum 15 points.
- Demand for traffic services (expected traffic volumes and generated traffic) - maximum 10 points.
- Synergy effect (existing and planned projects) - maximum 5 points.
- Presence of local initiatives (intent and level of participation) - maximum 20 points.
- Government implementation priorities - maximum 10 points.
- Technical feasibility and construction costs - maximum 10 points.

limitations of assessment techniques

Many of the benefits of rural road improvements are difficult to measure and this makes it difficult to select an appropriate, inexpensive and user-friendly assessment technique. There are limitations to some assessment techniques:

- Sufficiency rating – a technique specific to engineering, which does not consider costs and uses subjective values for weightings. It is not generally applied to road planning, although it may be used to evaluate alternative technical solutions for the same road.
- The producer surplus approach to economic analysis requires a great deal of locally collected household-level crop production and marketing information. This is expensive to collect and because the surveys are specialised, limits the involvement of local planning staff. There are other significant problems. Firstly, in associating the entire total increase in production solely to road investments; secondly, in double-counting benefits; and thirdly, in ignoring the other benefits to the community.

The consumer surplus approach, although simpler to apply, concentrates on the impact of generated traffic. As it focuses on transport and user cost savings from lower vehicle operating costs the technique is not applicable to roads with very low traffic

volumes and may exclude broader social benefits.

Of the two cost benefit techniques, the consumer surplus approach to is likely to be the more useful for assessing rural roads.

Ranking systems (assigning points and weights) can be the most transparent technique. These are able to include non-economic equity and social criteria and can target local concerns. The IRAP procedure explained in later sections essentially uses this approach. There are problems, however, in the interpretation of the criteria used for the weightings in this technique. Refinements to the technique can be made by using statistical techniques (e.g. regression analysis) to define the weighting and by incorporating cost-effectiveness criteria (e.g. least cost per population served).

conclusions on assessment

1. The general view is that rural roads with an average daily traffic (ADT) of less than 50 motorised vehicles per day are not suitable for applying standard economic cost-benefit analysis techniques.

2. Assessments by the World Bank tend to indicate that increases in vehicle flows and projected agricultural output are often exaggerated (i.e. in Thailand only a third of trips on feeder roads are agriculturally related).

3. Unless the road density is very low, there is a great deal of evidence to suggest that the extension of rural roads in existing populated areas has little impact on the production and marketing of agricultural products.

4. This argument does not apply in the case of unpopulated and previously inaccessible areas - where opening up an area with a new road can have a major impact.

5. The impact of road improvements on increasing the delivery and quality of other services (like health and education) is highly significant and often underestimated.

ASSESSMENT TECHNIQUE CHOICE

Following is an overall approach to choosing an assessment technique:

14.7 Choice of an assessment technique

***FULL ACCESS* - Secondary roads:** Use full, traditional economic cost-benefit analysis technique, undertaken by specialised consultants.

***FULL ACCESS* - Tertiary roads with traffic levels of >50 ADT:** Use standard economic cost-benefit analysis technique - using a modified consumer surplus approach, combined if possible with IRAP procedure for initial screening of alternatives.

***PARTIAL ACCESS* - Specialised roads serving high-production agricultural or forestry areas:** Use standard economic cost-benefit analysis technique - using farm household level surveys (or industry data) and the producer surplus approach, combined if possible with IRAP procedure for the initial screening of alternatives.

***BASIC ACCESS* - Local roads with traffic levels of <50 ADT:** Use the IRAP planning procedure, a multi-criterion ranking system and cost-effectiveness technique, emphasising non-economic objectives and the targeting of special activities or groups.

***FULL/BASIC ACCESS* – Tertiary or local roads targeted for labour-based technology:** Use a modified consumer surplus approach and/or IRAP, but add a multi-criterion ranking system considering local wage levels and seasonal labour availability.

application of an economic model

The application of an economic model to a typical tertiary road, using the consumer surplus approach, has been demonstrated in section seven.

FURTHER READING

The student should refer to the following documents:

1 **Bovill, D.,** (1978). *Rural Road Appraisal Methods for Developing Countries*. Supplementary Report No. 395, Overseas Centre, Transport and R oad Research Laboratory, Crowthorne, Berkshire, UK.

2 **Tracey-White, J. and Vaidya, K.,** (1998). *Planning framework for sub-project screening and selection.* Consultancy Services for Implementation of Rural Infrastructure Improvement Project ADB Loan No. 1385-CAM (SF), BCEOM and IT Transport Ltd./ARD for ADB/Ministry of Rural Development, Phnom Penh.

3 **TRL,** (1988). *A guide to road project appraisal.* Overseas Road Note 5. Overseas Unit, Transport Research Laboratory, Crowthorne, Berkshire, UK.

4 **TRL,** (1988). *A guide to geometric design.* Overseas Road Note 6. Overseas Unit, Transport Research Laboratory, Crowthorne, Berkshire, UK.

5 **World Bank,** (1998). *Design and Evaluation of Rural Transport Infrastructure.* Transport Division, Discussion Paper. World Bank, Washington, D. C.

14.8 Questions for students:

What basic questions should be asked before undertaking road improvements?
How have ideas on rural transport changed during the last few years?
What are the potential benefits of road improvements?
What ar e the possible techniques for evaluating road improvement options?

SECTION 15: INTRODUCTION TO INTEGRATED RURAL ACCESSIBILITY PLANNING (IRAP)

contents

15.1 Issues covered in this section

- Overview – introduction and objectives of IRAP.
- Rationale for using IRAP.
- Application of IRAP.
- IRAP accessibility indicators.
- When is it appropriate to use IRAP?
- Applying IRAP to the development process.
- The rural engineer's role.

OVERVIEW

The following three sections describe an approach to local planning based on accessibility. This technique can also be used as a complementary tool to the road selection and ranking method using an economic model described in previous sections.

objectives of IRAP

Integrated Rural Accessibility Planning (IRAP) is a local level-planning tool that approaches infrastructure provision and management through the concept of accessibility. The IRAP technique was introduced in Cambodia in 1999. It is a simple and easily applied participatory planning method designed for use at local level. It analyses rural village access to Basic Minimum Needs, like potable water and to social services, like schools and health centres. It achieves this by assessing the existing infrastructure assets and the difficulty faced in accessing these facilities. Data collection and processing focuses on the needs of the MRD. Data is collected through a participatory planning process that results in the elaboration of local area plans. IRAP quantifies the present accessibility situation, the value of existing key local assets and possible interventions that will have the greatest impact on local accessibility. The IRAP process recognises the need to manage rural assets so that investments increase the overall asset value. The plans prioritise investments and include cost estimates for maintenance and construction.

capacity building

IRAP is also a capacity building process, involving a series of training modules with local planning staff. IRAP outputs are intended to support decentralised planning systems that reflect the needs of local communities. The basic principles of IRAP are:

15.2 Summary of IRAP in Cambodia

- IRAP is a planning tool and a capacity building process, involving a series of training programmes with government planning staff and local enumerators.
- The concepts of IRAP and data collection procedures are explained at training sessions.
- Government counterpart staff (including line departments) are trained as trainers and guided through a process in which data is processed.
- Appropriate planning interventions are identified and prioritised in communes and districts.
- IRAP outputs support a decentralised planning system where local needs are incorporated into district and provincial investment plans.

IRAP RATIONALE

IRAP is based on the concept that the lack of access to goods and services is one of the fundamental constraints to development and that improving access is a major tool in poverty alleviation.

the ILO and IRAP

Over the last six years, the ILO, together with government agencies, has been actively involved in Africa and Asia in the development of a planning framework that addresses access issues. The result of this work is Integrated Rural Accessibility Planning. IRAP has become an official rural planning methodology in the Philippines and has been used in over half of the provinces in the Lao PDR.

IRAP in Cambodia

As part of the second Socio-Economic Development Plan, IRAP is now being implemented in Cambodia, starting in Siem Reap Province. The MRD, through its provincial and district level offices, is mainstreaming IRAP throughout the country. Applying IRAP:

- Provides a sectoral focus for MRD activities.
- Provides a community-level participatory planning tool.
- Provides a comprehensive area planning tool.

problems addressed - lack of access

Transport is particularly important in rural Cambodia. It provides the population with access to goods and services and forms a platform for economic and social development. Rural households need to travel to meet basic needs, but many are isolated, without all season access. This includes access to potable water supplies, to fields where crops are grown, to schools for children's education, to basic health facilities and to markets to trade goods.

APPLICATION OF IRAP

In Cambodia IRAP is a local planning process. IRAP starts with the access needs of rural households. There are two levels of need:

access issues considered by IRAP

- ***Within the settlement area*** to destinations usually within walking distance for most households:
  - ⇒ Potable water supplies.
  - ⇒ Agricultural production land and irrigation facilities.
  - ⇒ Firewood sources.

⇒ Road infrastructure and transport stops or routes leading outside the settlement.

⇒ Cultural and social facilities like primary schools (depending on the settlement size).

- ***Outside the settlement area*** to destinations that usually require a wide range of public and private transport modes:

⇒ Markets to sell surplus produce.

⇒ Markets to buy household needs.

⇒ Rice mills.

⇒ Elementary education facilities.

⇒ Primary health care facilities.

⇒ Other major cultural and social facilities.

types of infrastructure considered by IRAP

IRAP is an integrated tool that considers all household access needs and the full range of possible interventions to improve access depending on local conditions. These interventions might include:

- Construction and maintenance of the tertiary road network.
- Upgrading tracks, trails and waterways.
- Improving transport services by promoting simple, improved and low-cost vehicles for transporting produce to market or taking children to school.
- Non-transport interventions, like improving access to water supply, schools, health centres, credit and post-harvest facilities.

IRAP ACCESSIBILITY INDICATORS

An essential element of the IRAP process is the use of indicators. The indicators are calculated at village and commune level. They quantify the difficulty of access to specific goods and services, usually in terms of time wasted (essentially multiplying the population of the village by the average time to reach a facility). The indicators can also be:

- Used to target specific areas (like improved collection of agricultural produce).
- Used to target specific groups (like poorer households).
- Gender sensitive (such as reducing time spent by women collecting water).
- Environmentally sensitive (avoiding routes passing through forested areas).
- Used for evaluation by including cost and economic factors (using a cost-effectiveness approach).

WHEN IS IRAP APPROPRIATE?

IRAP is generally appropriate for rural development planning, involving community participation and decentralisation. In Cambodia, IRAP is being used for rural road development

planning. IRAP interventions can be used to:

improve mobility

- Bring people more easily to goods and services they require. This can apply within a settlement area or can be used to develop a wider (commune, district or province) transport plan.

bring goods and services closer to people

- Choose appropriate siting and distribution of services. Within a settlement area this would apply to the relocation of potable water supplies to reduce walking distances. Outside the settlement area, it could apply to planning the location of new health centres or primary schools.

level of detail

The application of IRAP within a settlement area requires the collection of very detailed household data. This lengthy process is only justified if there is a budget available for implementing local proposals. To apply IRAP for general rural planning purposes, like selecting transport interventions outside settlement areas, data collection can be simplified to commune level.

lessons learned from IRAP in other countries

An evaluation of IRAP programmes in other countries points to the need to learn the following lessons:

- To ensure IRAP supports decentralisation policies and existing community level participatory planning.
- Have a clear institutional position in terms of its responsibilities to other government departments and sectors.
- Avoid duplication in primary and secondary data collection and make maximum use of existing information. Assess data reliability by correlating IRAP data with information from the census and other sources.
- Be compatible with national policy to ensure these policies are fully considered in the IRAP process.
- Consider how social services planning, like health and education, might be integrated into IRAP.
- Ensure sustainability by transferring responsibility for IRAP to local government as rapidly as possible. Local government technical staff invited for IRAP training should be fully involved with planning and setting development priorities.
- Make maximum use of the community's intuitive understanding of development and not bypass national and local consensus building processes.
- Ensure that planning does not overtake project funding and implementation capacity.
- Ensure the timing of the IRAP program is adjusted to fit into the government's annual project development cycle.
- Avoid concentrating data analysis and mapping on micro-

projects, not constituting the core of development efforts.

- Avoid introducing complicated databases and Geographic Information Systems – these limit capacity building, ownership, control and sustainability.
- Link IRAP to current monitoring and evaluation systems.

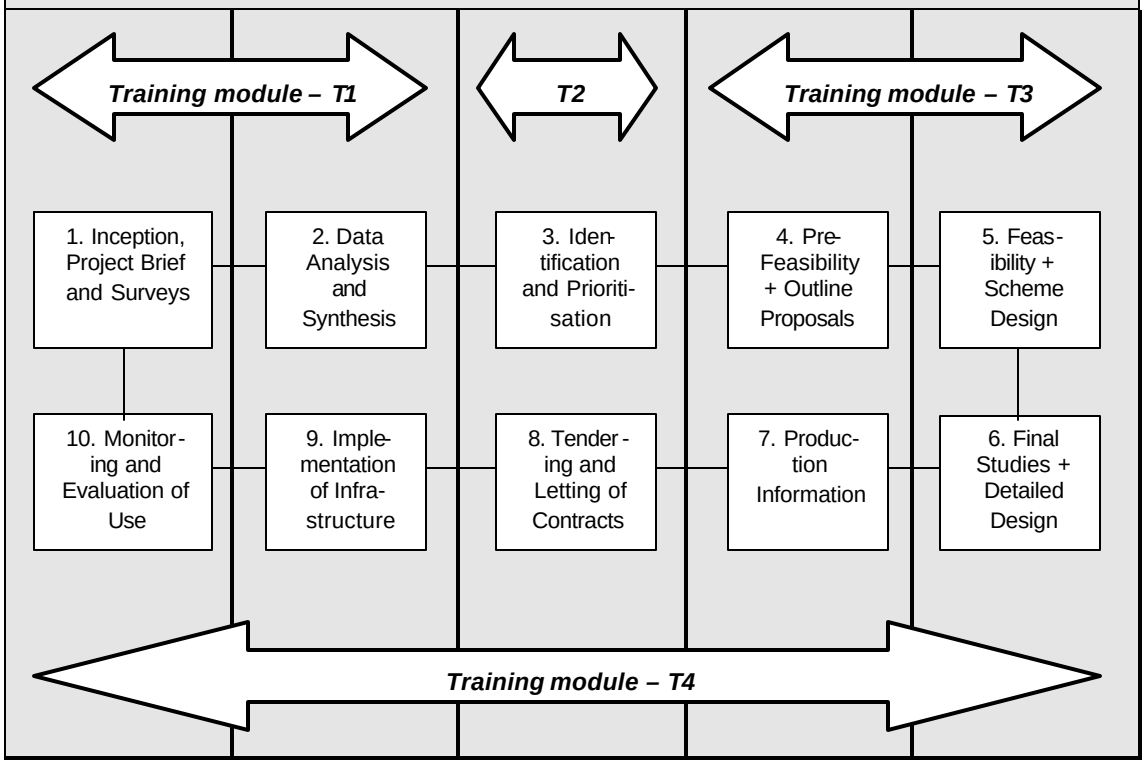
APPLYING IRAP TO THE DEVELOPMENT PROCESS

The IRAP procedure is focussed around the use of participatory workshops to gather data and develop plans with the local communities. The workshops occur at both commune and district levels. The steps in the IRAP procedure are organised around four training modules (T1 – T4).

project planning cycle

The training modules have a clear relationship to the overall planning cycle as presented in the earlier section on the rural development planning framework. This relationship is shown in the following diagram:

15.3 Relationship of IRAP training modules to the project cycle



summary of the overall IRAP process:

Details of the training modules are given in a later section. However, in summary, the IRAP process normally has the steps listed below. These steps in the IRAP process mirror the stages in the planning process introduced in Section three.

Step 1: data collection

- **Primary Data Collection:** an IRAP team and local enumerators collect village level information on access, using

data supplied by key informants at a commune workshop.

Step 2: data analysis

- **Assessment of Accessibility:** the data is analysed for each settlement and accessibility indicators are calculated. The commune data is compiled into a district accessibility profile.

Step 3: identification and prioritisation

- **Identification and Prioritisation:** the accessibility indicators for all the settlements are compared and used to identify and prioritise the locations (transport routes or other infrastructure) for possible interventions.

Step 4: district accessibility action plan preparation

- **Design of Appropriate Interventions:** a more detailed planning and costing exercise is undertaken in workshops to define suitable development actions.
- **Planning and Intervention:** the chosen interventions are designed in detail to develop a local action plan and programme.

Step 5: design and project preparation

- **Finalised plan:** the links between the plan and the overall provincial development priorities is agreed before final submission to the PDRC.

Step 6 - 9: decision making, final design and implementation

- **Approval, Funding and Implementation:** the local action plan and programme are submitted for approval and funding. The design of interventions can then be finalised, tender documents prepared and individual projects within the plan implemented.

Step 10: construction evaluation and impact assessment

- **Implementation and Monitoring:** regular records are kept of the progress of the works undertaken and of the problems encountered - which are used to design new programmes.

THE RURAL ENGINEER'S ROLE

When IRAP is used as a planning tool for defining rural infrastructure and transport interventions two possibilities exist:

- The IRAP process may be underway or in progress using local government staff.
- The IRAP process has not yet been started.

If the process has not yet started, the rural engineer will need to apply the IRAP method by following the steps above. In either case, the rural engineer may be called upon to assist in the process.

FURTHER READING

The student should refer to the following documents:

1 **Dennis, R.,** (1998). *Rural Transport and Accessibility.* RATP. No. 1, ILO, Geneva.

2 **Dixon-Fyle, K.,** (1998). *Accessibility Planning and Local Development.* RATP. No. 2, ILO, Geneva.

3 **Edmonds, G.,** (1998). *Wasted time: the price of poor access.* RATP. No. 3, ILO, Geneva.

4 **Edmonds, G., Donnges, C. and Palarca, N.,** (1994). *Guidelines on Integrated Rural Accessibility Planning: Planning for Peoples' Needs*, ILO/DIGL, Manila.

5 **Howe, J. and Richards, P.,** (1984). *Rural roads and poverty alleviation*. Intermediate Technology Publications, London.

15.4 Questions for students:

What is the basic assumption behind using the IRAP technique?
What are the typical circumstances when you might use IRAP?
What is the purpose of using indicators in the IRAP process?
What are the normal outputs from using the IRAP process?

SECTION 16: APPLYING INTEGRATED RURAL AC CESSIBILITY PLANNING

contents

16.1 Issues covered in this section

- Training Module T1 – data gathering and analysis.
- Training Module T2 – prioritisation.
- Training Module T3 - district Accessibility Action Plan preparation.
- Training Module T4 – approval, implementation and monitoring.
- Applying IRAP to planning rural road networks.
- Applying IRAP to basic needs (firewood, water supply, etc.).
- Applying IRAP to social services planning (health and education).
- Asset valuations and their use in maintenance planning.
- Examples of IRAP outputs – case studies from Siem Reap Province.

This section explains in detail the four training modules used in the IRAP process.

TRAINING MODULE T1

The first steps in the IRAP process are the gathering and processing of the basic data on the communities. The steps in the process are as follows:

16.2 Training Module T1

Data Gathering:

- Introductory workshop - district workshop 1.
- Manual/GIS base maps.
- Rural infrastructure inventory.
  Commune level data gathering workshop - commune workshop 1.
- GPS verification.
  GPS map revision.
  Rural infrastructure assessment map (dry/wet season condition).
  Initial Asset Assessment (IAA) valuation.

Data Analysis:

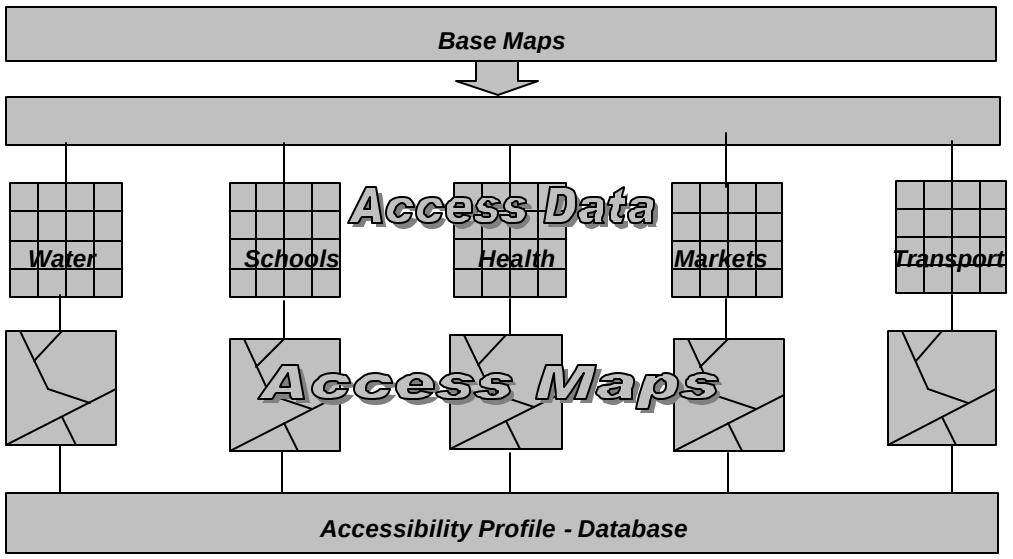
- Data management in provincial office.
- District accessibility profile.
- Prepare indicators.
- Prepare report on district accessibility profile, indicators and weighting.

Data gathering begins at a commune workshop that usually takes from 1.5 to two days. The IRAP team goes to the field with prepared base maps showing transport routes and other infrastructure. These maps can be prepared manually or using GIS. The team generally collects commune level data on accessibility for each village according to the following areas:

- Transport.
- Potable water.
- Health facilities.
- Education facilities.
- Access to employment opportunities.
- Market facilities.

Details of the commune data gathering process are as follows:

16.3 Training Module T1 – Commune Data Gathering Process



Key informants normally provide data at the commune workshop. These include:

- Commune and village chiefs.
- School principals and teachers.
- Local NGO representatives.
- Local grassroots organisation representatives.
- Women's groups.

The information gathered at the workshops concentrates on the availability of services and access to them. A typical example of data collected on education facilities for each village follows:

16.4 Typical data collected – education facilities

Asset Data – by facility:

- Number of classrooms.
- Number of grades.
- Building material of the walls and roof.
- Existence of sanitation facilities.

Accessibility Data – by village:

- Children in age group 6 – 12.
- Children going to school in age group 6-12.
- Is there a primary school in the village?
- Number of grades.
- Number of students.
- Number of teachers.
- Where do pupils go to other primary schools?
- Travel time in the wet season by bicycle.
- Travel mode.
- Where do students go to secondary school?
- Number of students.
- Travel mode.
- Travel time in the wet season by bicycle.
- Travel cost if a motodup is used.

manual and GIS mapping

Manual and GIS mapping are an integral part of the IRAP procedure. These allow the engineer and the community to obtain a clear picture of access conditions within a given area. It can help to identify and prioritise access problems, plan interventions and guide the selection of the best development alternative. Maps can also be used to communicate information and recommendations to a community. The accessibility mapping procedure is described in detail in later sections.

checking the base map

Base maps are checked with the workshop participants – as travel routes and even village locations can change. At a later stage, locations can be checked using a GPS. The GPS readings can be used to locate new roads and other new features.

rural infrastructure assessment map

After this field verification, a rural infrastructure inventory is compiled, leading to rural infrastructure assessment maps (for dry/wet season conditions) – these integrate the accessibility profile information collected at the workshop.

initial asset valuation

Using the information collected on the presence and condition of existing assets (roads, schools, etc.) an Initial Asset Assessment (IAA) valuation is drawn up. This valuation places a financial value on all existing infrastructure assets in the communes. An example from Banteay Srei District, Siem Reap Province is as follows:

16.5 Knar Sanday Commune Infrastructure Asset Replacement Cost (US$)

Village name	Water replacement value	School replacement value	Health centre replacement value	Total asset replacement value
Banteay Srei	12,130	40,000	25,000	77,130
Khnar	22,721	10,000	-	32,721
Prei	7,944	25,000	-	32,944
Sanday	15,242	-	-	15,242
Toul Krolang	17,160	-	-	17,160
Ko Koschroum	14,929	-	-	14,929
Commune total	90,126	75,000	25,000	190,126

data analysis Data is normally analysed using spreadsheets, although a database would be equally appropriate. The IRAP process can generate a wide range of tabulations from data collected in the field. An example of tabular output follows:

16.6 Knar Sanday Commune - IRAP Transport Data

Village name	Population	Travel time to all-weather road (minutes)	Ranking of access	Classification of access
Banteay Srei	898	5	11	1
Sanday	564	5	12	1
Toul Krolang	1774	5	13	1
Ko Koschroum	1085	5	14	2
Khnar	863	10	23	2
Prei	952	15	25	2
Commune Total		10.76		

preparing indicators To undertake this type of analysis IRAP has developed a set of indicators, which combine the data collected on each sector into a single figure representing the accessibility level to a service for each village in a commune. By comparing these single indicators, it is possible for engineers and communities to understand the differences in access to services.

The indicators use the overall population of the villages as a weighting factor. The difference in the values for each village is the sum of rated components in each indicator (like travel time to school, number of classrooms, attendance rate, etc.) multiplied by the population weighting.

It is also possible to include in the indicators an element of basic minimum needs by including maximum acceptable travel time (based on a nationally determined BMN standard). This introduces a different approach to evaluating service provision. The BMN standards are usually related to the service population required to support services or facilities. This is usually expressed as either the population served or it can be defined in per capita terms (x number of facilities per person). In some cases, the level of service is defined by the type of settlement it will be located in (like a secondary school in a district centre). Alternatively, the standard could be expressed by distance, like the maximum walking distance to potable water source.

IRAP data can also be presented simply in an unaltered form to

allow direct comparisons between sectors of the total number of trips, the total time lost and the average time taken per trip. For example:

16.7 Knar Sanday Commune – Travel Times (average minutes per trip)

Village name	Water collection trips	Education trips	Health trips	Marketing trips
Banteay Srei	10 min	0	20 min	5 min
Sanday	10 min	20 min	30 min	20 min
Toul Krolang	10 min	0	20 min	30 min
Ko Koschroum	10 min	20 min	30 min	60 min
Khnar	10 min	10 min	20 min	10 min
Prei	10 min	10 min	20 min	10 min
Average	9.10 min	25.89 min	39.92 min	41.49 min

district accessibility profile report

The final outcome of T1 is a report on district accessibility – which combines the individual commune profiles into a single document covering the whole district.

TRAINING MODULE T2

The purpose of training module T2 is to prioritise the possible interventions that could arise out of analysing the IRAP data. The main steps in the process are as follows:

16.8 Training Module T2

- District workshop on assets and accessibility situation - district workshop 2.
- Commune level workshop - problems and prioritisation - commune workshop 2.
- Planning prioritisation.
- District workshop on prioritisation - district workshop 3.
- Priority mapping.

district workshop on assets and accessibility

The process starts with a district workshop, attended by the commune representatives. The whole asset and accessibility situation of the district is reviewed and the possible needs of particular communes are identified. An overall priority is established for each sector at this time.

problems and prioritisation

This is followed by workshops in each commune where problems and priorities are discussed in detail. The participants openly discuss the issues, which are presented in map and tabular form. At the end of the meeting, each commune should have a clear idea of the priorities in its area.

planning and district workshop on prioritisation

The proposals are then combined into a single document and plan, which is used as the basis for the final district workshop where the priorities are discussed in detail.

priority mapping

This plan leads to a priority map for the whole district showing all the possible interventions that the communes have identified. Some filtering out of unlikely projects occurs at this stage.

TRAINING MODULE T3

This training module takes the priority mapping and develops it into a costed action plan for the district.

16.9 Training Module T3

Pre-Feasibility:

- Workshop sectoral analysis/investment planning - district workshop 4.
- District Accessibility Action Plan preparation (AAP).
- Workshop to present and approve draft AAP - district workshop 5.
- Costing of plan interventions.
- Finalise AAP (in English and Khmer).

Feasibility:

- Official presentation of plan for approval (at district level) – district workshop 6.
- Inter-sectoral/inter-district co-ordination (as part of workshop 6).

sector analysis

A district workshop is used to review the individual sector needs, including investment requirements. Conflicts with other sector plans are resolved and a final prioritised list of infrastructure interventions is agreed upon.

district accessibility action plan and costing

This final list forms the basis for preparing the district accessibility action plan. The plan is also fully costed document.

official presentation of plan

The last step in T3 is the presentation of the plan to the District Development Committee – it should represent their plan.

TRAINING MODULE T4

The final stage in the process is to co-ordinate the district proposals into an overall provincial plan. This is to obtain approval and funding, to implement and to monitor and then to evaluate the results.

16.10 Training Module T4

Prepare transport sector plans at district and provincial levels.

Facilitate co-operation with possible financing sources, including donors.

Submission by PDRD to PRDC for final plan approval (at provincial level).

PDIP preparation by sector (at provincial level).

Intervention implementation (by others).

Repeat IRAP cycle and compare with previous results.

District level impact assessment workshop - district workshop 7.

Final monitoring and evaluation.

provincial sector plans

If there are sufficient district plans, these need to be combined into an overall provincial plan, requiring co-ordination between sectors and districts. Priorities within and between districts will need to be resolved – which may depend on available financing.

financing sources

Financing sources will need to be found to implement the district accessibility action plans. The possible sources of funding have been outlined in previous sections.

final plan approval and sector PDIP preparation

The plan needs to be submitted for approval at provincial level through the PRDC. If the main items of the plan are approved then it should become part of the Provincial Development Investment Programme. Individual sub-projects in the plan will then become part of the project development the three year rolling investment programme.

implementation and impact assessment

Implementation of plans and an impact assessment complete the development cycle. The IRAP cycle then needs to be repeated to learn from past mistakes and to inform new design activities.

monitoring and evaluation

One important use of IRAP is how it can be used to create baseline data for monitoring and evaluation (described in later sections). It can be used to check that planned interventions achieved their targets. For example, a target of a ten per cent reduction in distance to water sources could be tested.

APPLYING IRAP TO PLANNING RURAL ROAD NETWORKS

The most obvious application of IRAP is in planning rural road networks, including preparing provincial and district transport sector plans. The most basic data collected during IRAP is a simple village access rating for the wet and dry seasons based on the following classification:

1. *All weather road.*
2. *Dry weather road.*
3. *No access.*

The IRAP process and the analysis of travel time using indicators provide a main input to the District Accessibility Plan. In the plan the following transport characteristics are shown:

- Road classification (primary, secondary, tertiary, etc).
- Road use – the number of villages using a road.
- The accessibility of the villages along the road – defined in four classes.
- The population and density of the catchment area of the road.
- Priority roads needing improvement - ranked according to their local importance.

The IRAP methodology develops priorities in selecting roads for improvement. This can be used with an economic analysis. This applies to rural roads linking settlements (not necessarily to local paths). The technique offered by the road evaluation and appraisal model (CREAM) is the best approach to the analysis of routes with more than 50 ADT. However, IRAP can be used to prioritise routes with lower flows and can also help with the calibration of the model for higher flow routes – by incorporating information on journey length and time.

APPLYING IRAP TO PLANNING BASIC NEEDS

IRAP can also be used to plan access improvements to basic needs like village water supplies. Data on trip length and frequency can also be incorporated into an economic analysis.

APPLYING IRAP TO SOCIAL SERVICE PLANNING

Constructing social services (schools and health facilities) is normally outside the scope of work of rural engineers. However, the IRAP planning procedure can be used to inform different departments about the location of social services and to justify rural transport interventions targeted at improving social service distribution and accessibility to social services.

ASSET VALUATIONS

The asset valuations prepared during the IRAP process are a useful tool that can assist the commune authorities to budget for future maintenance. A basic minimum needs per capita (or asset deficiency) method maybe the best approach, but this would need to relate to the capacity of the community to maintain the improved facilities.

IRAP OUTPUTS

Examples of typical IRAP map outputs are given on the next page.

FURTHER READING

The student should refer to the following documents:

1 **ILO,** (2001). *Chi Kraeng District Accessibility Action Plan.* ILO Sub-Office, Siem Reap.

2 **ILO,** (1999). *Puok District Accessibility Profile*. ILO Sub-Office, Siem Reap.

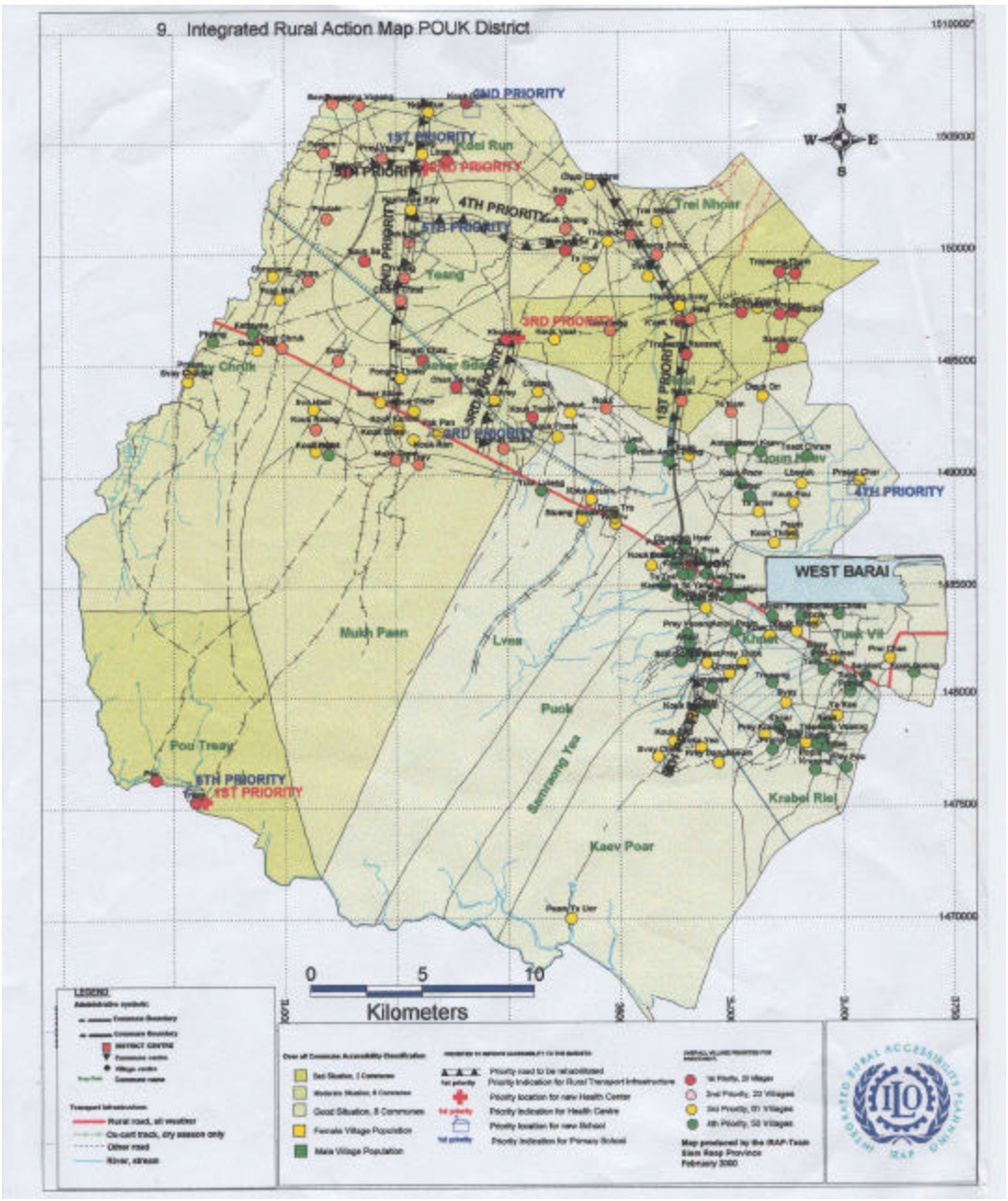
3 **ILO,** (2000). *Puok District Accessibility Action Plan*. ILO Sub-Office, Siem Reap.

4 **ILO,** (1999 draft). *GPS Manual*. ILO Sub-Office, Siem Reap.

5 **ILO,** (1999 draft). *GIS Manuals*. ILO Sub-Office, Siem Reap.

16.11 Questions for students:

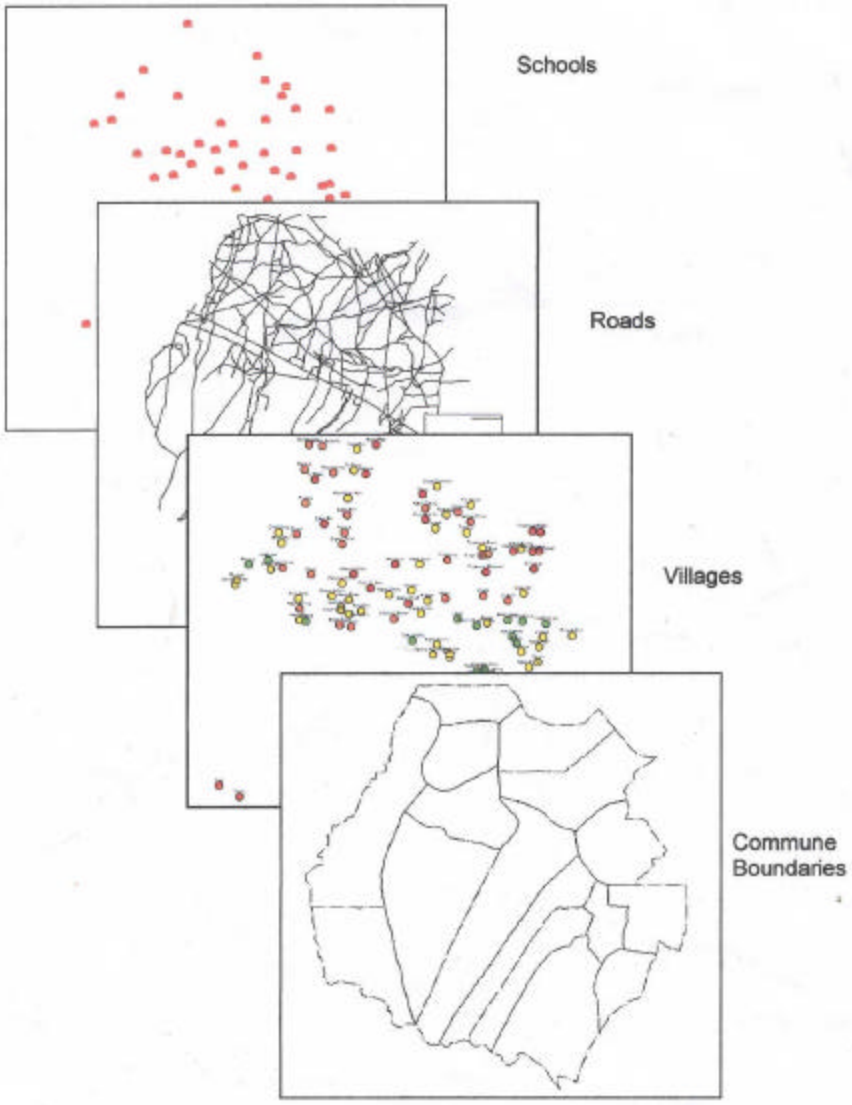
What are the purposes of the four training modules used in IRAP?
What are the main outputs of the IRAP process?
How can IRAP be used to design a rural road programme?
How can IRAP be used to design local infrastructure interventions – like water supply?


9. Integrated Rural Action Map POUK District
2ND PRIORITY
1ST PRIORITY
Kdei Run
3RD PRIORITY
4TH PRIORITY
5TH PRIORITY
Trei Nhpar
Teang
3RD PRIORITY
1ST PRIORITY
4TH PRIORITY
WEST BARAI
Mukh Paen
Lvea
Puok
Pou Treay
6TH PRIORITY
1ST PRIORITY
Sandaeng Yea
Krabei Riel
Kaev Poar
N
W
E
S
0 5 10
Kilometers
LEGEND
Rural road, all weather
Other road
River, stream
Priority road to be rehabilitated
Priority location for new Health Center
Priority location for new School
Priority location for Primary School
Map produced by the IRAP-Team
Siem Reap Province
February 2000

16.12

16.13

8. GIS Accessibility Profile for Education Facilities



SECTION 17: CLASSROOM EXERCISE IN ANALYSING ACCESSIBILITY DATA

contents

17.1 Issues covered in this section

- Introduction.
- Collecting time budget and accessibility data from family members on water supply.
- Compiling data in the classroom in a standard format.
- Comparing the results of student surveys.

INTRODUCTION

The purpose of this section is to practice collecting and handling accessibility data. Each student should collect data and bring it to class. The area selected should be an area that the student knows well. It could be the home or a village or urban area close to where the student lives. The area chosen should not be too large. A small sample of families should be surveyed to discover their accessibility and how they use the facilities.

The steps to follow for this exercise are:

- Collect the data for a defined area.
- Compile the data into a simple spreadsheet in the classroom.
- Analyse the data and draw some conclusions.
- Give a five minute presentation on the survey.
- Compare the results from the individual surveys, with the help of the lecturer.

17.2 Data to be collected on access to drinking water

General Data:

- Number of families in the area.
- Number of ring wells in the area.
- Number of pump wells in the area.
- Number of hand dug wells in the area.
- Number of ponds in the area.
- Other sources (rainwater, outdoor standpipes, internal taps, etc.).
- Are all these sources good quality?

Family Accessibility Data:

- Total time (minutes per day) spent to get drinking water in dry season.
- Total time (minutes per day) spent to get drinking water in wet season.
- Number of trips per day in dry season.
- Number of trips per day in wet season.
- Who collects the water (percentage by gender and age)?
- Number of months in the year with water shortage.

17.3 Presenting data on access to drinking water

A. General Data

Name of student:

Name of village surveyed:

Number of families in the area:

Total Population:

B. Water Supply Facilities	Number of facilities	% of families using	Good or bad quality?
Ring wells			
Pump wells			
Hand dug wells			
Ponds			
Other sources - specify			

C. Family Data Collected:		Family 1	Family 2	Family 3	Family 4 etc.	Average
Total time (minutes per day) spent in dry season						
Total time (minutes per day) spent in wet season						
Trips per day in dry season						
Trips per day in wet season						
Who collects:	Adult male	%	%	%	%	%
	Adult female	%	%	%	%	%
	Child male	%	%	%	%	%
	Child female	%	%	%	%	%
Months in year with water shortages						

D. Family Data Analysed:		Family 1	Family 2	Family 3	Family 4 etc.	Average
Average time (minutes per trip) spent in dry season						
Average time (minutes per trip) spent in wet season						
Total time spent in year collecting drinking water						
Total time:	Adult male					
	Adult female					
	Child male					
	Child female					

E. Conclusions:

Adequacy of facilities:

Quality of water:

Who collects the water:

Time wasted in collection:

Improvements needed:

SECTION 18: THE RURAL ECONOMY

contents

18.1 Issues covered in this section

Overall agricultural strategy.

Rural land use and production – farming systems, landholding size, land rights, production levels and agricultural labour.

Water resources – choice of small-scale irrigation systems and organising Water Users' Groups.

Support services.

Inputs and outputs – input supply, rural credit, post-harvest handling, transport, marketing and storage.

Non-farm employment - handicrafts and income generating activities.

Rural engineer's role in providing rural infrastructure.

OVERALL AGRICULTURAL STRATEGY

This section gives an overview of the rural economy in Cambodia and how it affects the activities of rural engineers. Agriculture is the most important sector of the Cambodian economy, accounting for 47 per cent of the gross domestic product. Sustainable agricultural development is therefore the key to developing the rural economy. It is the root of approaches to addressing rural poverty through improving living standards, food security and health. Over 85 per cent of Cambodia's population live and work in rural areas and 75 per cent of all poor households have a farmer as the family head. Potential areas for agricultural growth are:

- Small-scale private irrigation schemes using shallow tube wells and low-lift pumps.
- Improving rice productivity.
- Improved farming systems, including crop diversification and intensification.
- Expanding and improving livestock productivity.
- Improving rice and fish farming and aquaculture.
- Community based agro-forestry.

RURAL LAND USE AND AGRICULTURAL PRODUCTION

Cambodia has around four million hectares cultivated under the main agricultural crops, of which around 50 per cent are used for rice. These are mostly located in lowland areas, underlain by shallow aquifers or criss-crossed by waterways.

farming systems

The main farming systems are rice-based (rainfed lowland, dry season flood recession rice, deep water floating rice and dry season lowland irrigated rice). There are also many families practising diversified multiple crop production. Other crops include subsidiary food crops like cassava, sweet potato, soybean, mung bean and maize. Major cash crops include rubber, sugar palm (for local consumption) and recently white pepper and coffee. However, irrigation of crops other than rice is mostly confined to home gardens. Many families also supplement their incomes with fishing, animal husbandry and

non-farm work.

There are four main types of farm households in Cambodia:

18.2 Types of farm households

Rice farmers, predominately subsistence level producers, with rainfed plots, supplementing their income with sugar palm tapping, or those growing floating or flood recession rice.

Commercial non-rice *chamcar* farmers producing tobacco, fruits and vegetables on riverbanks and levees.

Upland *chamcar loeu* farmers growing permanent or seasonal crops like soybean and mung bean.

Ethnic shifting cultivators, growing upland rice, maize and root crops.

livestock Livestock is an integral part of most production systems and is a major source of farm income. The livestock population is made up of around 2.5 million cattle, 800,000 buffabes, 2.1 million pigs and 10.7 million poultry. Unlike neighbouring countries, pig and poultry production in Cambodia is by household producers.

In addition there are 1.7 million draught animals (mostly oxen) providing power for tillage, manure for improving soil fertility and haulage for transporting farm produce, both from field to farm and to market. Most farmers rely on crop residues for animal feed. Around 30 per cent of families do not own draught animals and hire them to cultivate their land, often in exchange for labour.

fisheries Fish are caught from marine and aquaculture sources. However, the major source is inland waters, like the Tonle Sap, its adjoining river system and flooded rice fields. There are some 200 species of fish found in Cambodian inland waterways, of which 36 are of economic importance. The dominant fish groups are carp, catfish and murrel. There is evidence of declining fish stocks due to over fishing and the expanded use of floodplain land for agriculture.

size of land holdings The average land holding per person in Cambodia is 0.33 hectares. Farm sizes average around one hectare, but are less than 0.75 hectares in some areas. Land holdings in poorer villages tend to be larger than in richer villages, but this is because the land is less fertile and has less irrigation. Irrigation rates are 60 per cent in poorer villages compared to 76 per cent in richer villages.

land title Although the majority of rural Cambodia has had access to land title since the 1992 Land Law – implementation has been slow. Land disputes are common and often centre on land measurement and the location of boundaries. Around 14 per cent of rural households are landless and access to land is a particular problem for some groups like returnees. Accelerated land title and distribution programmes are needed to solve these

problems – a new land law is currently being prepared. The responsibility for land title lies with the Ministry of Land Management, Urban Planning and Construction.

WATER RESOURCES

The Government's main priority in agriculture is to facilitate the expanded provision of water facilities and infrastructure. Small-scale irrigation improvements need to combine with the development of agricultural services like extension and the improved delivery of inputs and credit.

small-scale irrigation

The most important role of the engineer in water resources will be to provide practical advice on the choice of small-scale irrigation systems. The most cost effective and easy to construct options, suitable for private and NGO installation, are:

18.3 Suitable irrigation systems

Shallow tube wells in areas with suitable ground water conditions (like Takeo, Kandal, Prey Veng, Svay Rieng, Kampong Cham, Kampong Thom, Siem Reap, Battambang, Banteay Meanchey, Pursat, Kampong Chhnang and Kampot).

Motorised pumps, usually three to eight horsepower for pumping from rivers and ponds (preferably multi-purpose engines that can be used for powering boats, tillers, trailers and threshers).

Hand and treadle pumps for home garden irrigation and for other domestic uses (like water for livestock).

Small storage reservoirs and colmatage canals – cut to bring silt laden floodwaters to the low-lying land behind the levees of the Mekong and Bassac rivers.

planning systems

To promote these systems a planning process is required. This could form part of the IRAP process described previously or may need an area-specific action plan to be drawn up in collaboration with communities, involving:

- Identifying target or priority communities.
- Base mapping (topography, drainage system, shallow aquifer properties, existing irrigation pattern, etc.).
- Participatory rapid appraisal to define where irrigation improvements would be feasible.
- Consultation and dialogue with target communities and local development committees to agree on responsibilities for operation and maintenance.
- Forming self-help groups to install pumps and implement small-scale irrigation projects.
- Extension, demonstration and training activities (e.g. in pump repair, farm water management, etc.).
- Pilot implementation of new and improved technologies.

Water Users' Groups

Water management is a major issue, particularly for small-scale irrigation. For water harvesting and minor irrigation schemes, communities normally need to establish Water Users' Groups to manage and maintain facilities. Emphasis needs to be placed on simple facilities that are within the capacity of farmers,

communities and NGOs to maintain. Once members of a group understand the basic principles of water distribution, a field participatory mapping/surveying exercise should be undertaken with each group so that the irrigable area for each group member can be defined.

Observations of Water Users' Groups suggest that they can be effective for managing irrigation systems. However, there is also a need to clarify how the distribution of water is allocated and prioritised. The Ministry of Water Resources and Meteorology has issued a decree on this issue and its guidance should be sought when setting up new Water Users' Groups.

medium-scale irrigation

The opportunities for medium and large-scale irrigation schemes are limited – most are unlikely to be economically feasible. Rehabilitation and extension of existing schemes is sometimes feasible, but only when farmers are fully committed and willing to take most of the responsibility for operation and maintenance.

SUPPORT SERVICES

Extension is a term used in agriculture to describe the services, usually provided by government, that assist farmers to obtain higher yields, greater crop diversification and better marketing of their crops. The scope of extension service may include:

- Introducing new and improved irrigation technology.
- Improving land preparation techniques.
- New varieties of crops and livestock breeds.
- Improving fertiliser and compost application.
- Demonstrating integrated pest management.
- Improving post-harvest handling and storage.
- Appropriate planting periods for meeting market demand and calculating marketing margins.

The extension system in Cambodia is the responsibility of the Office of Technical Extension of the Ministry of Agriculture. This system is in a transition period and different options (some from the government and others by NGOs) are being tried.

alternative approaches to extension

The Food and Agriculture Organization of the United Nations (FAO) has promoted a new approach based on learning by doing. This is implemented through Integrated Farmers Field Schools. Activities include: soil fertility management (composting, crop rotation and mineral fertiliser application); pest insect management and control; hydraulic construction and canal rehabilitation; pump demonstrations; small animal vaccination and husbandry; and fishpond preparation. The programme has demonstrated dramatic levels of economic benefit and can be implemented at a very low cost.

input supply

Less than ten per cent of villages in Cambodia have a shop that sells manure, fertiliser and agro-chemicals. Most seeds are produced on farms, although commercially produced seed is

becoming more available.

INPUTS AND OUTPUTS

The private sector plays an increasingly important role in Cambodia, providing improved post-harvest handling services, including agro-processing and marketing.

post-harvest handling

The purpose of improving post-harvest handling and processing is to minimise post-harvest losses to ensure that higher quality produce reaches the consumer, so the farmer will obtain better prices. Losses in rice mills are around six to eight per cent. Market level losses can be high, but probably average around five per cent.

storage

Storage is needed to maintain crops at a constant condition for later consumption or marketing. One of the main reasons for this is to obtain better prices at non-peak harvesting times (called arbitrage). This is appropriate for cereals and oil crops, but not for highly perishable crops like fruits and vegetables. Only potatoes and semi-dry produce like onion or garlic can be stored for any length of time.

produce marketing

An efficient and adequate marketing system is a precondition for agricultural diversification, providing better prices to producers and competitively priced produce to consumers. This is usually addressed in two ways: by providing improved market infrastructure (both urban and rural) and by improving rural access roads. In the case of markets, it is usual to place the main emphasis on improving fresh produce marketing (fruit, vegetables, meat and fish), focusing mainly on rural assembly markets. Marketing infrastructure is briefly considered in a later section.

access to markets

Some 14 per cent of villages in Cambodia have permanent markets. The distance from the village to a market varies widely between different income groups: around eight kilometres for poorer villages and less than three kilometres for richer villages. The typical pattern of markets is:

marketing channels

a) Primary Markets: In primary markets, trade is characterised by direct sales of small quantities of produce by farmers to village traders and retail sales to rural consumers. Rural markets form part of a trade network, normally arranged on a periodic basis on specific weekdays and commonly organised at a central place in a village, district centre or beside the village access road. Occasionally, provincial and district markets also serve this function, while providing an assembly function (assembling produce in larger quantities for onward sale to outside buyers).

b) Assembly Markets: Larger rural markets occur where greater quantities of produce are traded, either by the producers themselves or by traders. These assembly markets (often combined with local rural markets) are normally situated on

main highways, near ferries and other local transport. Traders or collection agents collect produce on behalf of urban wholesalers.

marketing groups

Alternatives to formal markets are community marketing groups, who organise transport facilities, manage and maintain collection centres and small packinghouses. To improve capacity these groups need specific training in group marketing methods.

marketing margins

An analysis of marketing channels can be used to examine what margins are incurred at different stages in the process. Margins are the additional costs that are added to the farm gate price by transporters and traders - up to the point when the product reaches the consumer.

NON-FARM EMPLOYMENT

Non-farm employment is needed to diversify income sources and raise incomes for the rural poor. Trade is the most important primary economic activity (18% of households) after agriculture and is an important secondary income source. The most important secondary non-farm employment is crafts/artisanship (18% of families).

richer and poorer villages contrasted

These figures tend to disguise large differences between richer and poorer villages. For example, over 50 per cent of families in richer villages engage in trade, while less than five per cent of the poorest villages engage in trade. In the richest villages less than 21 per cent are involved in agriculture compared to more than 92 per cent in the poorer villages.

promotion of income generating activities

One of the essential elements of non-farm employment is promoting rural income generation. This may require land allocation or providing basic infrastructure, like road access or water supply. In many cases, enterprises may be household based. The enterprises that might be established in rural areas, like commune and district centres, are:

18.4 Typical micro and small-scale rural enterprises

- Retailing in rural markets.
- Blacksmithing and vehicle maintenance and repair.
- Weaving and textile manufacture and other handicrafts.
- Wood carving and making wood products.
- Rice and other grain milling.
- Manufacturing construction materials, like bricks and tiles.
- Sugar making and other small scale food processing.

other employment opportunities

Rural areas close to urban areas often have opportunities for unskilled employment in the construction sector or in the hospitality sector. In remote areas, there are fewer opportunities and employment in labour-based construction plays an important role. Some employment opportunities are found in rural industry, quarrying, forestry and fisheries.

THE RURAL ENGINEER'S ROLE

The most obvious role of the engineer in rural areas will be in implementing rural road and water supply systems. Other

activities that directly involve the rural engineer could be:

18.5 Role of rural engineer

Assisting agricultural extension staff by providing technical advice on construction and planning issues.

Ensuring that land titling is carried out.

Undertaking measured (geodetic) and topographic surveys of sites for public facilities.

Designing and implementing small-scale irrigation schemes.

Helping to establish Water Users' Groups, including helping with field participatory mapping/surveying.

Designing and implementing other rural infrastructure, like markets and stores.

Advising when labour-based technology would be appropriate for rural infrastructure and for other rural-based activities, like soil conservation and agro-forestry.

Ensuring that sites are available in the right place and suitable infrastructure (like water supply) is provided for establishing small-scale enterprises.

Advising on physical planning aspects of rural development – balancing the settlement and access needs of the communities with agricultural land suitability (see illustration at the end of the section).

data on the rural economy

Considerable rural economic data are used in the design of rural infrastructure (e.g. production data are used for sizing stores or markets and agro-climatic data are used for designing irrigation systems). Thus, rural engineers need to have access to the latest published agricultural census data for their own areas.

FURTHER READING

The student should refer to the following documents:

1. **ESCAP,** (Volume 2, 1990), *Guidelines for Rural Centre Planning – Rural Industrialisation and Organisational Framework for RCP.* United Nations, New York.
2. **FAO,** (1994). Cambodia: Agricultural Development Options Review. FAO Investment Centre, Rome.
3. **FAO,** (1999). Cambodia: Agricultural Strategies and Policy Framework for Sustainable Food Security and Poverty Alleviation. MoAFF/UNDP/FAO, Phnom Penh.
4. **Hudson, N.,** (1981). *Soil Conservation.* Batsford, London.
5. **Hudson, N. and R. Cheatle,** (Editors) (1993). *Working with Farmers for Better Land Husbandry.* Intermediate Technology Publications, London.
6. **Kingdom of Cambodia,** (2000). *Interim Poverty Reduction Strategy Paper.* Phnom Penh.
7. **Price Gittinger, J.,** (1972). *Economic analysis of agricultural projects.* The John Hopkins University Press, Baltimore.
8. **Rozemuller, H.,** (1998). *From Pig Rearing to Stock Marketing: Rice Milling, a Broad Spectrum of Entrepreneurial Activities.* Occasional Paper Series No. 1, Centre for Advanced Studies, Phnom Penh.
9. **Tracey-White, J.,** (1995). *Retail markets: planning guide.* FAO Agricultural Services Bulletin No. 121, FAO, Rome.

18.6 Questions for students:

What are the main goals set by the Government for agricultural growth?

What important factors should be considered when designing small-scale irrigation schemes?

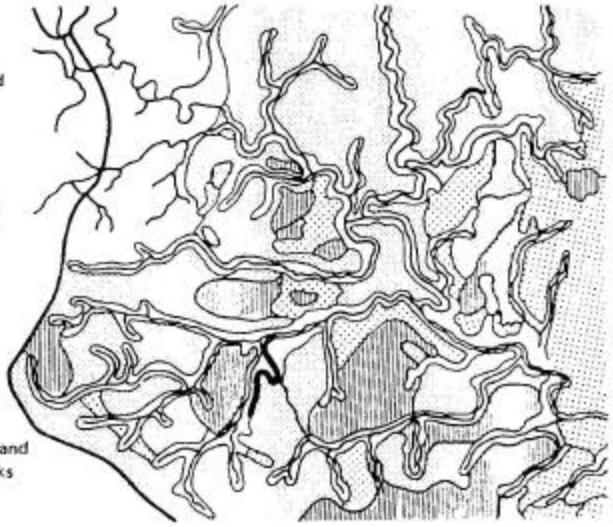
What can be done to improve rural marketing and post-harvest handling?

18.7 Land Suitability Analysis

A AGRICULTURE

LEGEND

DESCRIPTION OF LAND UNIT	SUITABLE LAND USE
Swamp	Lowland rice and fishponds
Nearly level lowland, deep and moderately deep soil	Lowland rice
Nearly level upland, deep and moderately deep soil	Seasonal upland crops in suitable rotation
Steep slopes, moderately deep soil	Fruit trees
Undulating upland, deep and moderately deep soil	Tree crops or seasonal upland crops in suitable rotation with contour farming and few contour banks



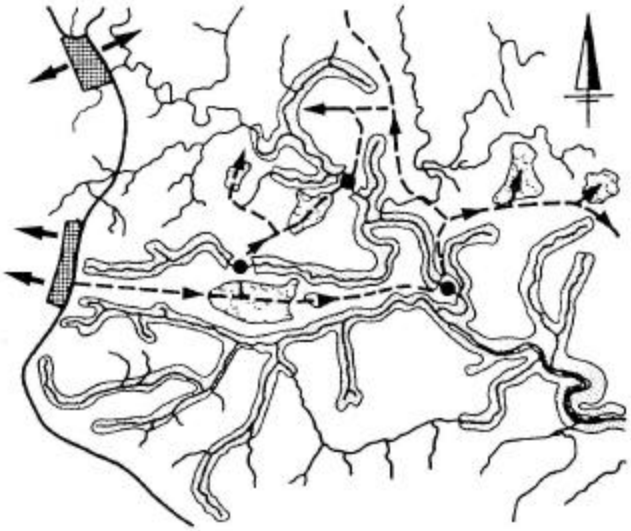
B SETTLEMENTS

LEGEND

- Streams
- Restraints to development/ potential boundaries
- Existing road
- Potential road locations
- Potential bridge positions
- Expansion of existing villages
- Ideal houseplot locations

500 0 500 1000 1500m

Source: Tracey-White, (1977)



SECTION 19: LABOUR AND RURAL DEVELOPMENT

contents

19.1 Issues covered in this section

- Labour standards, links to LBAT, ILO and government mandates.
- Choice of development technology.
- Targeting of development.
- Government versus community works.
- Rural engineer's role.

LABOUR USE AND STANDARDS

As mentioned in earlier sections, the government's rural development policy encourages the use of Labour-Based Appropriate Technology (LBAT). This is:

> *A construction technology where labour, supported by light or medium-sized equipment, is used as a cost-effective method (compared to equipment-based methods) of providing or maintaining infrastructure to a specified standard.*

One issue to address when using labour-based methods is how labour is employed. Although LBAT may be useful in the short-term for emergency projects, its main purpose is as a long-term construction strategy. Besides alleviating poverty through the generation of long-term employment, the benefits of a labour-based programme of rural development are:

19.2 Specific Benefits of Labour-based Technology

- Greater utilisation of under-employed labour resources.
- Achieving national development objectives to create social and economic infrastructure.
- More appropriate and cost effective use of local materials.
- Short and long-term additional benefits (additional job creation) for the local economy in general and the construction sector.
- Consistency with the government's decentralisation and local financial autonomy policies and with the community-based development process.
- Increased job skills and self-esteem.

contract conditions

Therefore, when preparing contract conditions, the engineer will need to ensure that employment methods used by the contractors are fair and conform to government standards. The legal and institutional issues that need to be considered when using LBAT include the following:

- Forms of agreements/memorandums with communities, including the potential financial and labour contributions the communities might make to projects.
- Labour standards and working hours.
- Wages and payments, including methods of recruitment (advertisements, auctions, etc.), wage setting (minimum versus economic wage) and productivity agreements.
- Monitoring of attendance and payments, including remuneration in kind.

- Quality monitoring of labour-based work and compliance with minimum technical standards.
- Social security and insurance.
- Occupational health and safety requirements.

ILO conventions

The Government is also in the process of ratifying the ILO Fundamental Human Rights conventions. The relevant ILO conventions are as follows:

19.3 ILO Mandates

Convention No. 29, 1930: Forced Labour.

Convention No. 105, 1930: Abolition of Forced Labour.

Convention No. 87, 1948: Freedom of Association and Protection of Rights to Organise.

Convention No. 98, 1949: Right to Organise and Collective Bargaining.

Convention No. 100, 1951: Equal Remuneration.

Convention No. 111, 1958: Discrimination (Employment and Occupation).

Convention No. 138, 1973: Minimum Age.

CHOICE OF DEVELOPMENT TECHNOLOGY

One of the main objectives of a project should be to generate employment through appropriate and cost-effective technologies. This will need to be based on an integrated, multi-disciplinary approach to infrastructure planning and design. Central to the technical orientation should be a strong focus on using local materials and traditional technologies.

The range of technical options is likely to be extensive. It is important to consider the range of choices available, based on local physical and socio-economic conditions. Targets and cost estimates should be tentative and then be adjusted based on implementation experience. In summary, the basic issues when choosing appropriate technologies are:

appropriate technology

19.4 Basic Issues in Choosing Appropriate Technology

- Is the project a local or central government initiative?
- Is the project constructing social or economic infrastructure?
- Has a participatory planning process been used for project design?
- Is the community willing to contribute to the development of economic infrastructure?
- Is the technology to be used:

- Equipment based (heavy or medium-scale)?
- Labour-based (with appropriate tools and equipment)?
- Labour-intensive (with hand tools and light equipment)?
- A combination of the above?

- Is the project construction or maintenance?
- Will the material used effect the choice of technology?

changing attitudes

Although a reorientation towards labour-based technology is not technically complex, it represents a considerable change in

approach for field staff. The approach may not be universally accepted and it may be necessary to motivate supervising engineers and communities. Mechanisms for recognising and rewarding project engineers and communities for using LBAT may be needed.

technology for community based projects

The intended beneficiaries of community-based projects will need to be fully involved in project planning and implementation. The choice of technology should depend on the community rather than the implementing agencies. The close correlation often seen between project targets and achievements suggests that field operations are often target driven and do not always respond to community needs. It is important to achieve a satisfactory level of community participation in all aspects of the project - in selecting technologies, in their execution and in the long-term management and sustainability of the assets.

labour-based activities

Activities that could be appropriate for labour-based technology are:

19.5 Rural Development Activities Suitable for LBAT

Medium labour content

- Social infrastructure – constructing and maintaining schools and clinics.
- Government offices, parks, playing fields, cemeteries, etc.
- Economic infrastructure – construction and maintenance of markets and workshops, etc.
- Low-cost housing and land development.
- Water supply, sanitation systems and septic tank cleaning.
- Constructing dams, irrigation structures and channels.
- Channel dredging, jetties and rural airstrips.

High labour content

- Natural resource management – agriculture, rice terrace formation, horticulture, nurseries, agro-forestry, enrichment and plantation forestry, firebreaks.
- Watershed protection and soil conservation – vegetative/shrub barriers in contour trenches, moisture conservation, pasture land, afforestation, stream bank protection, drainage line treatments and gully checking/stabilisation.
- Cultural and historic site management – archaeological digs, site clearing, restoration works, national park clean-ups and trail construction.
- Irrigation maintenance and operation.
- Tertiary road construction, routine maintenance and street marking.
- Human settlements – constructing local roads, paths and bridges.
- Solid waste management – street cleaning, waste transport/disposal.
- Main drainage and flood control measures.
- Cable and pipe laying – electricity and telecommunications.
- Mining operations.

level of technology

The level of technology depends on the type of work and the sophistication of the construction method - usually expressed as high, medium and low. Another form of classification is based on the consumer demanding the construction product:

- ***International/national modern*** – like urban commercial buildings, usually private sector financed and often internationally funded.

- ***National public sector modern*** – like primary road construction using heavy machinery, using a combination of local finance and international loan funds.
- ***National private sector conventional*** – typified by house construction in wealthier suburbs and smaller-scale commercial office and shopping developments. Financing is usually from national loan and saving sources.
- ***National public sector conventional*** – typically these would be urban government buildings and locally built urban and rural civil engineering projects, like water supply, rural roads and canal structures, including the maintenance of roads and other government infrastructure. Financing is usually from national sources, with a small proportion coming from international loan or grant funds.
- ***Local Private Sector*** – Like the majority of low income housing, either self-built or group-built in rural areas, or in urban areas constructed by petty contractors. Financing is normally from personal savings.

The major areas normally targeted by labour-based technology are the national public sector conventional and local private sector projects.

limitations of LBAT programmes

Other countries using LBAT have encountered these limitations:

- LBAT programmes linked to a single sector or project (i.e. low-cost roads) are often treated with suspicion and seen as isolated and non-institutionalised experiments.
- When LBAT has been used to create employment, crude targets have been used to generate apparent temporary jobs (i.e. the expected percentage of labour for a particular type of infrastructure).
- Many professionals have varying attitudes to LBAT. Engineers can be very positive or very negative to the approach. Economists have been lukewarm, often being non-committal to estimating the multiplier effects of LBAT. Planners and sociologists have generally been in favour but raised difficult questions – particularly about the selection and targeting of projects and the forced versus voluntary labour questions.

TARGETING OF DEVELOPMENT

The choice of technology basically depends on:

- The type of works.
- The contractor's preference.
- Institutional factors, like the grading or class of contractor (based on technical competence, capitalisation/financial performance and availability of resources), legal requirements and government procurement procedures.
- Preferences or policies of the client, for selecting, pre-qualifying or targeting particular contractors.

When choosing technology it is recommended that the engineer

diagnose each project at the design stage using local costs for all components and an optimal use of labour, equipment and tools. The purpose of labour-based technology is to create good quality infrastructure that would benefit from being executed using this technology. The screening and targeting of labour-based projects needs to balance social, economic and technical factors.

The three main questions relating to LBAT are:

Is the project needed?

Is it in the right location?

Is it an appropriate project for labour-based techniques?

targeting and screening of labour-based projects

The engineer will need to consider whether:

- Labour-based standards will be appropriate and acceptable.
- There is underemployment and whether labour would be available at competitive wage rates to undertake works without disrupting the local economy (in many cases this will be restricted to the dry season only).
- There is a gender difference in the time available and whether part-time employment should be offered.
- Special training will be needed for the contractors and the skilled/unskilled labour.
- The project will create overall benefits in employment and income generation.

who to work with in project design?

To make these judgements, the engineer needs to work with local communities. They may also require the assistance of social scientists to design appropriate methods (agreements, training, etc.) for adopting a labour-based approach. One example is targeted procurement methods:

targeted procurement

19.6 Targeted procurement

A targeted procurement system rewards those tenderers who meet or exceed certain specified socio-economic targets – points are awarded in the tender review to those who will make the optimum economic use of one or more of the following criteria in fulfilling the contract:

- Local labour.
- Targeted groups of workers.
- Local resources (including local artisans and materials).
- Certain categories of small, micro and medium-sized enterprises.

Market forces dictate whether contractors will be able to meet socio-economic objectives in the most cost-effective manner. Although these target groups receive a price preference, they still have to submit a competitive tender to be awarded the contract.

COMMUNITY WORKS

There is a clear difference between government and community works. With government works, it is possible for the government to decide solutions independently, which is not possible with works executed through local communities. With

community works it is important to consider the following factors in programme design:

- The programme must have public and political support before it is implemented.
- Careful project selection and design is critical.
- To foster responsibility for project components and ownership of the assets, community participation is necessary. This requires transparency and access to information.
- Encouragement needs to be given to women, through institutionalising women's groups, by training and by promoting community campaigns – with open advertisements clearly stating that women can participate in programmes.
- Promotion of leadership skills is important to motivate labour.
- Decentralisation and promotion of projects requires appropriately trained community facilitators (social workers, planners and engineers) with good communication skills to ensure an effective interface between government and the community.
- Involving the private sector in community projects will help to establish and support local businesses.
- Labour-based technology needs to be supported by appropriate contract documentation and payment procedures.
- Effective financial monitoring needs to be put in place, particularly when communities make a capital contribution.
- Quality monitoring should be encouraged through appropriate training in labour-based technology and good engineering practice.
- For the labour-based approach to remain efficient and competitive with employment-based methods, labour needs to be engaged through fair and reasonable working conditions and under labour-productivity and performance agreements.
- Programme sustainability and long-term maintenance will depend on a constant flow of funds, either from government or the community – requiring that the project/asset ownership and the financing be institutionalised.

THE RURAL ENGINEER'S ROLE

The role of the engineer will be to decide whether labour-based technology will be appropriate in a particular circumstance. An essential step in the process is to make estimates of labour availability for executing a project, and decide if this is sufficient. Absenteeism, holidays and weather conditions will influence the size of the labour force. The attractiveness of the employment opportunity will depend on the availability of alternative better-paid work opportunities and social attitudes to the work. The following example shows how to forecast the effective labour force that would be needed and the working days needed to execute a project:

19.7 Estimating labour availability for 1 kilometre of rural road

Forecast of available days:

- Total time (40 week working season x 6 day working week less 12 days local holidays) = 228 days
- Lost time (15 days forecasted bad weather + 3 days labour disputes) = 18 days
- Available overall time (total time less lost time) = **210 effective working days**

Forecast of effective labour force factor *(% of nominal labour expected to be present):*

- Recruitment/run down factor: 50% absent over 1st four and last two weeks (0.5 x 6/40) = 0.075
- Harvesting factor: 75% absent over four week harvesting season (0.75 x 4/40) = 0.075
- Turn-over/absentee factor due to illness: 15% over working season (0.15 x 40/40) = 0.15
- Overall reduction factor: recruitment/run down + harvesting + turn-over/absentee = 0.30
- Effective labour force factor: net of reduction factor (1.00 – 0.30) **= 0.70**

Worked Example:

- Number of worker days required per kilometre for rural paved road construction = 5,000 days
- Number of workers needed = 5,000/210 effective days x 0.7 labour force factor = **34 workers**

choosing a contracting method Technology choice is determined by the construction process, which depends upon the contracting method, including using community labour and a machinery versus labour-based approach.

choosing materials Decisions made about the material component of construction are also important. If imported materials are used, then the opportunity to create local employment in manufacturing the materials is lost. Another factor that can maximise employment is to choose materials and components that can be manufactured or assembled on site – like locally made paving blocks.

FURTHER READING

The student should refer to the following documents:

1 **Beenhakker, H., Carapetis, L. and Hertel, S.,** (1987). *Rural Transport Services: a Guide to Planning and Implementation*. Intermediate Technology Publications, London.

2 **Bentall, P., A. Beusch and J. de Veen,** (1999). *Guide on Capacity Building in the Construction Sector*. ILO, Geneva.

3 **DBSA, (1992).** *Socio-Economic Enhancement of Development Projects*. Development Bank of South Africa, Transvaal.

4 **ILO,** (2000). *Employment-Intensive Investment in Infrastructure: Jobs to Build Society.* ILO, Geneva.

5 **Tajgman, D. and J. de Veen,** (1998). *Guide of Employment Infrastructure Programmes: Labour Policies and Practices.* ILO, Geneva.

6 **Watermeyer, R. et al.,** (2000). *An Introduction to Targeted Procurement.* Strategic Procurement Systems, Johannesburg, Republic of South Africa.

19.8 Questions for students:

What do you understand by labour-based technology?
What are the reasons for using labour-based technology?
What construction works are appropriate for labour-based technology?
How are government works different to community works?
How can the rural engineer estimate labour availability?

SECTION 20: RURAL INFRASTRUCTURE

contents

20.1 Issues covered in this section

- The role of rural engineers in providing rural infrastructure.
- Human settlements.
- Rural building types.
- Rural markets.
- Water supply standards.
- Sanitation standards.
- Maintenance and management.

THE RURAL ENGINEER'S ROLE

This section focuses on the background to planning rural buildings and sanitation facilities. Most sanitation construction in rural areas is undertaken privately by rural families. The rural engineer is generally not involved. However, there are many cases when the rural engineer may need to provide advice and become involved with the design and implementation of rural infrastructure:

20.2 Role of rural engineers

- When road widening is essential for safety reasons and the layout of human settlements needs to be adjusted.
- When land acquisition is essential, like areas flooded by an irrigation project.
- When asked to provide advice on the location of a new government facility, like a primary school or health centre.
- Where new rural buildings or services are needed as part of a government facility, like a market, agricultural research centre, plant nursery or extension demonstration plot.
- Where engineers become involved with the location of government facilities, like new water supply and distribution systems.
- Where a specific health problem or epidemic has been identified and new drainage or sanitation facilities are needed.
- Emergency situations, where buildings or sanitation facilities have been damaged by flood or fire and require urgent replacement.

HUMAN SETTLEMENTS

The villages and small towns of rural Cambodia are generally linear, closely following the road network. This can present a significant problem for rural engineers, particularly when road improvements are planned.

farm dwellings

Farm dwellings are often located close to roads, making it difficult to achieve an adequate road reserve. In exceptional circumstances, the relocation of farm dwellings may be required. If this were required, a participatory planning methodology would be appropriate to involve the community.

construction methods

Rural construction should use locally available resources where possible. This may require the rural engineer to undertake a rapid appraisal of where resources are available and at what cost. Traditional building crafts are normally used, particularly for walling, roofing, plastering, carpentry and joinery components. These traditional building methods are highly

flexible, but may not always be possible because of the lack of skilled craftsmen. In that case, some prefabrication may be needed.

building location

Fire spread through wind-borne embers and radiation is common in rural areas, particularly in the dry season. Given the flammable materials used in traditional construction, the minimum distance between rural buildings should be 6-8 metres, preferably 15-20 metres. The location of rural buildings, particularly dwellings, should be downwind from odours, dust and flies.

RURAL BUILDING TYPES

The building activities that the rural engineer could be involved with are detailed below:

crop handling, conditioning and storage

Reducing post-harvest losses is an area where substantial gains can be made at a relatively low cost. These gains can be made at every stage from harvesting through to the point of sale. Crops not harvested rapidly deteriorate through breakage and attacks by insects, mould, birds and rodents. Storage is an important element of rural infrastructure at farm level for family consumption and for marketing to obtain cash income.

The most critical physiological factors in crop storage are the moisture content and temperature. The main ambient (naturally-ventilated) drying and storage structures are:

crop drying and storage structures

- Open drying slabs, often used to dry chillies and cassava.
- Traditional rice barns and bins.
- Open stores and cribs, used for drying and temporary storage of crops like maize, ginger, onions and garlic.
- Underground pits – typically used for storing potatoes and apples.
- Modern grain silos (constructed of brick, reinforced concrete or steel sheeting).
- Bag storage in buildings, usually for grains.

The first two are more appropriate at farm level, whilst the others are normally associated with farmer groups or with market trader's premises. Conditioned storage, like ventilated or cooled stores, is not normally constructed in rural areas – except by wholesalers at markets in major towns or in packing houses (managed by a local production group).

perishable crops

Highly perishable crops with high moisture content (70-95%), like fruits and vegetables, have very short storage lives. To reduce losses (from rot and bruising) the normal approach is to improve the way they are handled – improving grading, packing and transport of produce. Road rehabilitation, improving the link between farm and market, is often a major factor in achieving these improvements.

livestock support services Government support to the livestock and animal feed sector normally concentrates on:

- Constructing and providing equipment and supplies to veterinary hospitals and dispensaries.
- Providing artificial insemination supplies and general livestock related equipment to livestock agents and veterinarians.

animal housing The humane treatment of animals is important to maximise livestock benefits – whether for meat, milk, hide, draught power or manure. Constructing livestock shelters and livestock stalls (mangers) is normally the farmer's responsibility. The rural engineer may become involved where improved breeds are being introduced. In these cases some basic space standards for animal husbandry should be observed:

- Cattle need comfortable climatic conditions, requiring shade of 2.5 to 3m^2 per head. If enclosed paved yards are used, the space per animal should be a minimum of 4-5m^2.
- Space for the bedding of livestock (or zero grazing stalls) varies from 1.5m^2 for calves, 3m^2 for young stock and 5m^2 for large milking cows.
- Adequate space should be provided between stalls – a minimum of two metres is desirable.
- Bullpens need to include a resting area of 12 to 15m^2 and an exercise area of 20 to 30m^2.
- To reduce mortality, calf penning requires particular attention, usually using an elevated slatted floor.
- Clean water supplies – allowing 60-70 centimetres of trough per cow – with one trough for each herd of 50 animals.
- Pig housing at medium density of 0.45m^2 per pig for weaning/growing and 0.6m^2 per pig for porkers.
- Poultry (chicken and ducks) - non-intensive housing at 6-8 breeding or laying birds per m^2.

animal slaughter Providing slaughter slabs can improve health aspects of the meat trade. A simple concrete slab with a gantry hoist and water supply at rural markets is a common improvement.

other infrastructure Other infrastructure commonly found in rural areas, perhaps at agricultural and livestock research stations or horticultural, agro-forestry or plant nurseries, are:

- Cattle dips and dipping tanks.
- Farm workshops and implement storage.
- Fuel and chemical storage.
- Greenhouses and shade structures.

RURAL MARKETS

The basic producer markets at village level are the rural markets. Here trade is characterised by direct sales of small quantities of produce by producers to village traders or retail sales to rural consumers. Rural markets are arranged on a periodic basis, on specific weekdays and are commonly organised at a central place in a village or commune centre or beside the village access road. In some cases district markets also serve this function.

The density of markets in Cambodia is low and the average distance of farmers to market facilities is higher than most countries in the region. Market developments and improvements provide support to existing trends and changes taking place in horticultural production.

Typically, small-scale rural markets achieve an annual turnover in the range of 5-20 tons per square metre per annum. The total site area required to accommodate the sales space needs to be the equivalent of one to four tons per square metre per annum. This means that the building area should ideally be around 20 per cent of the total site and should not exceed 40 per cent. These standards are based on empirical data on the relationship between space requirements and annual turnover. The standards include space for sales and general internal circulation plus an allowance for daily or seasonal fluctuations in space requirements. The figures also assume an average mix of produce, with fruit and vegetable sales predominating. If a market specialises in a particular commodity, some adjustment may be necessary. An appropriate range of values that can be used for calculation are:

20.3 Space standards in rural markets

Type of market	*Annual throughput*
• Rural fruit and vegetable open market	5 tons per m^2
• Rural fruit and vegetable all-year assembly market	15-20 tons per m^2
• Small town fruit and vegetable open market	5-10 tons per m^2

WATER SUPPLY STANDARDS

Safe and accessible water is vital to health. There are broadly four types of water related infections:

categories of infectious diseases

- Water-borne infections, i.e. gastro-enteritis – requiring improved water quality from improved sources.
- Water-washed infections i.e. skin rashes - requiring improved water quality and better hygiene standards.
- Water-based (skin penetrating) infections i.e. bilharzia – requiring reduced contact with contaminated sources.
- Water-related infections via insects i.e. malaria – requiring improved surface water management and eradication of breeding sites.

national situation

In rural Cambodia less than two per cent of households have a piped water supply to their dwelling or a nearby public tap.

Over 30 per cent rely on pond, river or stream sources, 18 per cent rely on unprotected dug wells and 24 per cent on protected dug wells. The government's aim is to install tube wells for 19 per cent of families. Long-term objectives could involve:

- Reducing the distance to rural pumps by 10%.
- Increasing the time water is available during the day.

benefits of improved water supply

Low-income groups are particularly at risk from poor water supplies. They have high levels of infection due to water-washed and non-waterborne faecal infections. In these cases the engineer can play a positive role in reducing disease transmission. The benefits from water supply programmes and the related health improvements are a mixture of humanitarian and socio-economic gains. The engineer must always balance the need to help the most deficient areas first against the gradual overall improvement of supply to the whole rural population.

water demand

There are three main types of rural water needs:

- Clean (potable) water for human consumption, including drinking, cooking, washing and bathing.
- Reasonably clean water for livestock consumption.
- Water for irrigation purposes.

The demand for potable water varies substantially with the location of the supply. Walking distances to communal supplies of 0.5 – 2 kilometres are common, but plans for more populated areas should try to reduce this to 250 metres or preferably 100 metres. Typical consumption figures are:

20.4 Domestic water consumption per person

• Water source several kilometres from dwelling	2-4 litres per day
• Water source up to 1 kilometre from dwelling	4-8 litres per day
• Water source next to dwelling	10-20 litres per day
• Water source in traditional dwelling	60-100 litres per day
• Water source in modern dwelling	100-250 litres per day

minimum needs

The RGC's Socio-Economic Development Plan II has set the minimum water requirement per person at two litres per day. This standard is not always attainable for remote villages, is not fully adequate for human consumption and does not allow for livestock use or water shortages during drought periods or when pipework is damaged (typically in the wet season). Therefore, villagers (particularly women and children) spend considerable time collecting water from alternative sources.

water for livestock

Livestock water demand can also be substantial and is particularly critical when zero grazing is used and the animals are penned or grazed close to the farmstead. Typical consumption values are:

20.5 Livestock water consumption per head	
• Improved dairy cattle	70 litres per day
• Improved beef cattle	50 litres per day
• Unimproved cattle	20 litres per day
• Sheep	5 litres per day
• Goats	3 litres per day
• Livestock dipping	3 litres per week

pond protection It is essential that drinking water ponds be protected from contamination. Fencing and protective walls should be installed.

SANITATION STANDARDS

Almost 84 per cent of households in rural Cambodia do not have any form of toilet facilities. In Phnom Penh, the proportion is 12 per cent and in other urban areas 61 per cent. The most practical approaches to rural sanitation are pit latrines and septic tanks (both contributing around 5% to rural sanitation).

Pit latrines normally consist of a squatting slab over a pit in the ground covered by a structure. A simple pit latrine creates insect and odour problems. Alternative designs like the ventilated improved pit and composting toilets have been developed to avoid these problems. The minimum distances for latrines are:

20.6 Location of pit latrines – minimum distance	
• Distance downhill from a well – moderate water table	20 metres
• Distance downhill from a well – very high water table	200 metres
• Distance downhill from dwelling or kitchen	10 metres

septic tanks Septic tanks with an underground tank are preferable to pit latrines although they are more expensive. They require a direct water connection and regular de-sludging every one to five years.

drainage Drainage in rural areas is generally directly into streams, ponds and open water areas. These areas can be become highly polluted when sullage water (from excreta disposal) and garbage are disposed of in a watercourse. Poor drainage is a major source of disease, particularly from mosquito breeding.

garbage disposal Garbage in rural areas is usually dumped nearby. As most garbage is organic matter, it does not create major problems. Where a facility, like a market or school is provided, some form of communal garbage collection and disposal will be needed. There are three main options:

- Composting.
- Biogas production.
- Disposal through burying or sanitary landfill.

overall site planning

The illustration at the end of this section shows a typical rural settlement layout where the issues of housing, fire spread, ventilation, sanitation and water supply are integrated.

MAINTENANCE AND MANAGEMENT

Key factors in improving water and sanitation standards are integrating infrastructure programmes with other health sector investments and with training programmes focussing on improved personal and domestic hygiene. The long-term maintenance and management of the facilities is also important. Options include setting up local management groups.

risks with infrastructure provision

The main risk associated with providing rural infrastructure is implementing maintenance programmes. The upkeep of water structures is likely to be easy to arrange. Farmers have a financial interest in the continued operation of the facilities and Water Users' Groups are easy to initiate. When water user groups are synonymous with other groups like marketing groups, they are more likely to be sustainable.

FURTHER READING

The student should refer to the following documents:

1 **ESCAP,** (Volume 1, 1979), *Guidelines for R ural Centre Planning.* United Nations, New York.

2 **FAO,** (1988), *Farm Structures in Tropical Climates* FAO/Sida Rural Structures Programme, FAO, Rome.

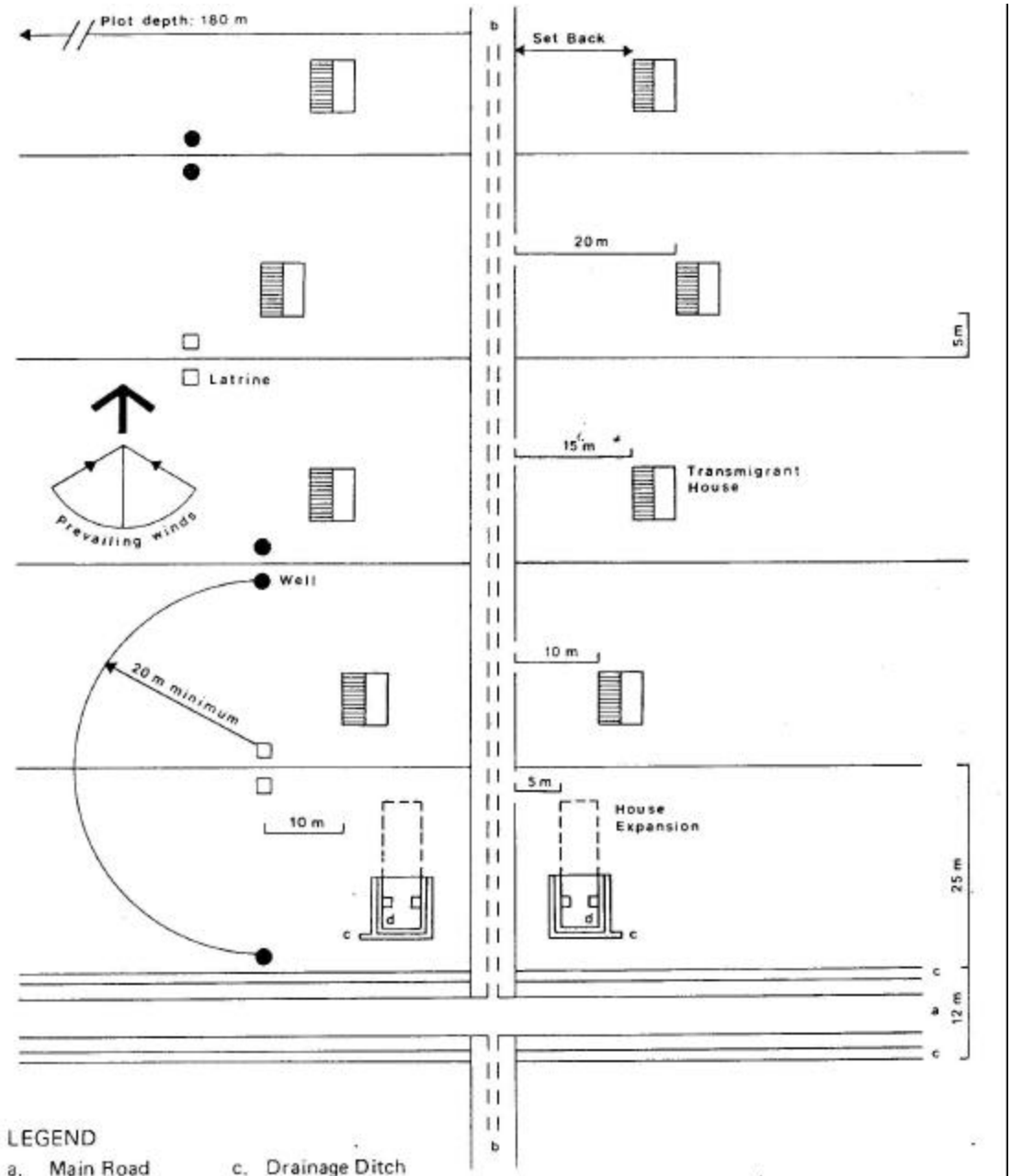
3 **Hudson, N.,** (1975). *Field Engineering for Agricultural Development.* Clarendon Press, Oxford.

4 **Stern, P.,** (1983). *Field Engineering*. Intermediate Technology Publications, London.

20.7 Questions for students:

What is the preferred technology for rural buildings?
What are some important factors in housing animals?
How should the provision of rural markets be improved?
What standards are applicable for rural water supply?
When should minimum sanitation standards be applied?
What surveys might be needed for rural water supply and sanitation?

20.8 Example Layout of a Rural Settlement



Source: Tracey-White, (1977)

SECTION 21: ENVIRONMENTAL AND SOCIAL IMPACT

contents

21.1 Issues covered in this section

- Environmental and social issues.
- Environmental management policies in Cambodia.
- Environmental impact assessment.
- Preparing an impact statement.
- The rural engineer's role.

ENVIRONMENTAL AND SOCIAL ISSUES

This section considers the environmental issues relevant to rural development programmes.

why consider these issues?

Environment and social issues need to be considered early in project design. This is to ensure that positive impacts are maximised and negative impacts are either prevented or reduced to a minimum. The general environment and social issues are:

what is the environment?

- Biological resources like animals and plants living on the land, in water and in the atmosphere.
- Natural physical environment, like water resources, forests, land and air, settlement patterns and land use.
- Socio-economic resources, like the population and its traditions, culture, community organisation, health and means of livelihood.
- Physical resources like buildings and other infrastructure.

environmental and social impacts

Well designed development projects should not have a negative effect (or impact) on the environment or the local population. There may even be environmental gains. Most rural development activities are primarily targeted at poverty alleviation and should focus on improved and sustainable resource management.

Negative impacts usually relate to the development of individual sites and their immediate surroundings, rather than to a wider area. Roads and irrigation areas are slightly different as they can have external (downstream and upstream) impacts. Any negative impact can be reduced, but at a cost. It is better if the potential impact is recognised at the start and accommodated.

The Ministry of Environment (MoE) should be consulted at an early stage of the project to integrate social considerations into project design.

ENVIRONMENTAL MANAGEMENT POLICIES IN CAMBODIA

Environmental policy in Cambodia is governed by a number of key documents. These include:

- Law, January 1996. *Establishment of the Ministry of Environment.*

- Law, October 1996. *Adoption of Wetlands Convention.*
- Law, October 1996. *Adoption of UN Convention on climate change.*
- Law, December 1996. *Protection of the environment and management of natural resources.*
- Sub-decree No. 72, August 1999. *Environmental impact assessment process.*
- *Cambodia – National Environmental Action Plan 1998-2002*. (MoE).

These basic laws provide a focus for the protection of the environment and compliance with these laws needs to be assured. Responsibility for evaluating environmental matters comes under the Ministry of Environment – which examines proposals submitted by private and public sector developers and makes recommendations to the Royal Government.

ENVIRONMENTAL IMPACT ASSESSMENT

Considering environmental and social issues is an integral part of the development management process discussed in earlier sections. A key part of this is assessing the impact of a development activity:

21.2 What is environmental impact assessment?

An Environmental Impact Assessment (EIA) is a process for predicting and evaluating the likely effects that a development activity could have on the natural and human environment. An EIA is undertaken before the activity starts to avoid adverse and costly changes as the result of human actions.

when is an environmental assessment required?

The first step is to decide whether a detailed assessment is needed. The Annex to Sub-decree No. 72, August 1999 (environmental impact assessment process) provides a list of potential development projects that require an Initial Environmental Impact Assessment (IEIA) or an Environmental Impact Assessment (EIA). These categories are:

B. Industrial Uses – most activities.

C. Agriculture – large-scale developments.

D. Tourism – most activities.

E. Infrastructure – large-scale developments.

The categories the rural engineer is likely to encounter are:

21.3 Projects requiring an IEIA or EIA

- Rice mills with a throughput over 3,000 tons per year.
- Animal feed processing over 10,000 tons per year.
- Timber saw mills over 50,000 m^3 of logs per year.
- Logging operations over 500 hectares.
- All mining operations.
- All port (including fisheries), airport and railway construction.
- Waste water treatment plants.
- Irrigation areas and drainage systems over 5,000 hectares.
- Construction of road bridges over 30 tons.
- Road construction over 100 kilometres.
- Buildings over 12 metres in height or 8,000 m^2 in floor area.

what are the steps involved?

The main steps in the EIA process are:

- **Screening**, to determine if a full-scale EIA is needed.
- **Scoping**, to describe the current environmental situation and define the focus of the EIA study.
- The **EIA Study** or Statement, including an in-depth analysis and prediction of impacts, presentation and ranking of alternative plans, development of management/mitigation measures and presentation of proposals for monitoring and evaluation.
- **Review**, to ensure that the EIA proposals comply with standards and legislation and to consider the views of local population and stakeholders.
- **Decision making** and follow-up to the EIA.

environmental requirements of funding agencies

Lending agencies and donors often have stricter criteria for environmental assessment than the Royal Government. The World Bank, for example, designates roads as Category A projects. This means that the funding agency may require:

- An environmental assessment and formal documentation demonstrating that there are no unresolved planning issues, i.e. provide proof that there is no conflict with a local structure plan or land use zoning plan.
- Environmental impact mitigation measures to be incorporated into the project design. These will need to be fully considered at the time of project appraisal (usually corresponding to the feasibility stage).

Bilateral agencies, like Sida, have introduced regulations requiring an environmental assessment, irrespective of the project scale. This means that the screening stage described above is omitted and some form of assessment must be made. However, if the project is likely to have only a minor or insignificant effect on the environment a simplified procedure

can be used.

PREPARING AN IMPACT STATEMENT

The EIA is usually prepared by the owner of the facility and reviewed by the Government. Rural engineers should be able to carry out an IEIA. A full EIA may need a specialised agency or private consultant. EIA guidelines are provided under the MoE declaration of March 2000. The contents of an EIA study are:

21.4 Contents of an IEIA or EIA

- Project summary.
- Introduction.
- Purpose of the project.
- Project description (including mapping).
- Description of environmental resources.
- Public participation.
- Environmental Impact Analysis.
- Environmental impact mitigation measures.
- Economic analysis and environmental value.
- Environmental management plan.
- Institutional capacity.
- Conclusion and suggestions.
- Technical annexes and references .

THE RURAL ENGINEER'S ROLE

Even when no significant environmental problems are predicted, a review of environmental impact needs to be undertaken – as engineering good practice. At the identification and pre-feasibility stages, this is usually only a general review, which can be followed-up more thoroughly at the feasibility study stage.

environmental issues to consider

The following environmental and social impact issues may need special attention from rural engineers:

- Land acquisition, re-location and resettlement impact.
- Natural environment, heritage and ecological/landscape impact and conservation implications.
- Groundwater and soil pollution, noise and air/dust pollution.
- Potential flooding and water table problems caused by increased surface water run-off from rural roads if a comprehensive drainage system and outfall is not implemented.
- Localised traffic congestion and potentially increased accident rates if rural road and junction improvements or traffic management measures are not implemented.
- Handling, storage, transport and disposal of materials.
- Occupational (workplace) health and safety implications.
- Provision for emerge ncy, security and safety plans.
- Dust, glare and noise impact on surrounding land uses, particularly if screening and tree planting proposals are not carefully integrated into the development programme.
- Inadequate provision for recurrent maintenance of buildings and equipment.

- Lack of emergency and safety plans, poor handling of fuels and high energy use.
- Poorly implemented solid waste management measures, for example at markets, resulting in a build up of refuse and rodent or insect infestation.

road construction - environmental and social mitigation measures

Notwithstanding the official requirements for EIA, it is always advisable that mitigation measures are adopted in the design and implementation of rural roads. Typical environmental mitigation requirements include:

- Existing horizontal and vertical alignments should be followed to reduce earthworks and land acquisition to widen the right-of-way.
- If land-take is needed (in exceptional circumstances) full compensation payments should be made. When land is contributed, Memorandums of Understandings should be drawn up with the local communities.
- Best practice soil and water conservation measures should be followed for storage and reuse of stripped topsoil, slope treatment and surface water drainage control - to reduce possible erosion and siltation risks.
- There should be minimum interference with the existing hydrology regimes beside the roads to minimise detrimental affects.
- Provision should be made for the full reinstatement or rebuilding of earthworks or gravel extraction areas that provide material for road surfacing.
- An independent system for technical monitoring of rural roads should be established (included under the monitoring and evaluation system).

Good practice for environmental impact of a road project is:

21.5 Environmental and social impacts of a road project

Component	Environmental and socio-economic impacts
Land	Limited land acquisition and no land ownership conflicts.
	No forestry impact or loss of natural habitat.
	No land-use conflicts.
	No additional soil pollution.
Labour	Benefits to local construction industry.
	Use of local labour.
	No requirement for additional labour accommodation.
Health	Unchanged hydrological and drainage conditions.
	No water table contamination.
	Road safety measures considered and incorporated in design.
Waste	No hazardous waste.
	Limited construction waste.
	No additional waste to dispose of after construction.
Construction	Use of renewable resources and recycling.
	Maximum use of local materials.
Energy use	Minimal resource depletion.
Air pollution	Limited impact.
	Minimum dust pollution.
Noise pollution	Limited impact.
Heritage	No change.

water - environmental and social mitigation measures

For water harvesting, minor irrigation and potable water supply projects, the rural engineer will need to ensure that:

- Provision is made for the handling and treatment of any organic or toxic effluents.
- Water that might be used for drinking meets minimum potable water quality standards.
- Agreements are in place for water sharing with up and downstream communities.
- Any land required for public channels, wells and other structures is covered by Memoranda of Understanding with local communities.
- To reduce pollution risk, structures should be a minimum 20 metres from any village or road.

marketing infrastructure - environmental and social mitigation measures

Market infrastructure improvements should not be on private land. They should be on publicly owned land or village common land (with the explicit agreement of the village communities through a Memorandum of Understanding). Provision should be made for appropriate solid waste management mechanisms - locating sanitary landfill disposal sites and arranging for waste hauling.

FURTHER READING

The student should refer to the following documents:

1 **DHI Water and Environment,** (1998). *Training Notes for Environmental Management – Part 2. Manual for Environmental Impact Assessment.* Danida/MoE, Phnom Penh.

2 **Ministry of Environment,** (1998). *Environment: Concepts and Issues – A Focus on Cambodia*. Editor, Noelle O'Brien. UNDP/ETAP, MoE, Phnom Penh.

3 **Ministry of Environment,** (2000). *Cambodia – National Environmental Action Plan 1998-2002*. MoE, Phnom Penh.

4 **Ministry of Environment,** (2000). *Seminar on Environmental Impact Assessment* JICA/MoE, Phnom Penh.

5 **Sida,** (1998). *Guidelines for Environmental Impact Assessments in International Co-operation.* Sida, Stockholm.

6 **Sida,** (2000). *The Country Strategies - Guidelines for the Strategic Environmental Analysis.* Sida, Stockholm.

7 **UNDP,** (1992). *Handbook and guidelines for environmental management and sustainable development.* Environment and Natural Resources Group, United Nations Development Programme, New York.

21.6 Questions for students:

What is the purpose of undertaking an environmental impact assessment?
What developments require an EIA?
What are the main steps in preparing an EIA?
What actions can the rural engineer take to minimise environmental impact of developments?

SECTION 22: MONITORING AND EVALUATION

contents

22.1 Issues covered in this section

- What is monitoring and evaluation?
- Need for monitoring and evaluation.
- Monitoring and evaluation indicators.
- How to conduct monitoring.
- The rural engineer's role.
- Performance indicators.
- Feedback – w hat to do with the results.

WHAT IS MONITORING AND EVALUATION?

Monitoring and evaluation is an essential component of a project and is the last stage in the implementation cycle described in Section three. The stages of the process are:

definitions

- ***Monitoring*** is the process of collecting physical, environmental and socio-economic data as part of ongoing project management - to check if activities are performed or implemented.
- ***Supervision*** is part of the monitoring process and is the periodic management of a project (by a rural engineer) to verify that construction activities are being implemented according to contract requirements.
- ***Evaluation*** is a process to determine the physical, environmental, social and economic impact and effectiveness of a project and to use the lessons learned to design new projects.

purpose and parties involved

The overall purpose of monitoring and evaluation is to assess the social and economic impact of a project, whether resources have been correctly used and to inform future project design. The parties involved are the client (e.g. provincial government or local community), the supervising rural engineer (and sometimes other technical staff concerned with monitoring) and the contractor building the works.

NEED FOR MONITORING AND EVALUATION

Risks arise when projects are over ambitious, top-down in approach and unable to deliver the inputs included in the project design. The purpose of monitoring and evaluation is to ensure that this does not happen – or is at least minimised. Before deciding what to monitor it is necessary to define the benefits that might arise from a project. Beneficiaries of a rural development project should include:

project beneficiaries

22.2 Who benefits from a project?

- Users of the infrastructure – the ultimate beneficiaries.
- Construction labour forces (skilled/unskilled and community labour) directly employed in the project.
- Females, youth and handicapped, who are given the opportunity for employment – this can be required in contract specifications.
- Professional beneficiaries - multiple skills acquisition by engineers.

overall project benefits

Other benefits of rural development projects include:

- Quantifiable economic benefits – like increased revenues and indirect employment (secondary jobs).
- Ongoing (external) benefits for local enterprises using appropriate technologies, like tile and brick making and the manufacturing of light tools and equipment.
- Increased available land from soil conservation and irrigation works.
- Non quantifiable environmental and social benefits, like increased self esteem, skills acquisition, reduced crime rates etc.

approach to monitoring

For most rural construction programmes at provincial and local level, elaborate monitoring is neither necessary nor appropriate. If simple procedures for targeting and screening projects are used, then detailed household level information is not needed

environmental impact monitoring

A special aspect of monitoring and evaluation is to monitor and evaluate the impact of the project on the environment – comparing the actual measured (real) impact against what was predicted during the environmental impact study. This should be included in the original project design and be integrated into the monitoring framework.

MONITORING AND EVALUATION INDICATORS

Regular monitoring is essential to allow economic evaluation to be undertaken after construction. Following are some typical indicators for monitoring and evaluation:

22.3 Monitoring indicators

- Physical outputs: facilities provided like the number of wells, area developed or length of road rehabilitated during implementation.
- Cost monitoring: actual expenditure compared to budget estimate.
- Employment benefits: temporary and permanent jobs created.
- Development of the construction industry: labour trained.
- Environmental impact: change compared to the EIA predictions.
- Gender specific impacts: i.e. female participation levels.
- Economic and social benefits: comparison with feasibility projections.
- Performance indicators: changes in agricultural yields, traffic levels, take up of technical innovations, number of users of facilities, etc.

These indicators are usually linked to the logical framework analysis, which should have already defined how a range of objectively measurable indicators will be verified.

HOW TO CONDUCT MONITORING

Monitoring should happen as directly as possible and should only include indicators of project effectiveness. The following points should be considered when designing a monitoring programme:

setting-up the monitoring and evaluation system

- Decide whom the monitoring is for and collect the minimum data required.
- Remember that donors and lending agencies may have their

own special monitoring needs and formats.

- Define who is responsible for monitoring (rural engineer, contractors, communities, etc.) and whether a contract is necessary with an NGO, consultant or academic body.
- Remember that the evaluation may need to be carried out by a separate organisation.
- Estimate if the monitoring needs a special budget.
- Define the guidance and training required to undertake the monitoring.

decide what and how to monitor

- Specify what factors are to be monitored, what indicators would be used and how to measure them.
- Decide if everything is to be measured or whether it is possible to take sample measurements.
- Establish a timetable for monitoring (before construction, during construction, one year after, etc.).

baseline surveys

- Establish whether benchmark surveys and rapid rural assessment are required to provide a baseline for monitoring.
- Ensure that baseline information is in place before project implementation starts.

monitoring formats

- Use standard techniques for measuring change, like traffic counts, including a standard format for data collection.
- Standardise monthly reporting of progress and problems during implementation.
- Ensure that the formats used allow quarterly and annual monitoring reports to be produced.
- Review how monitoring activities might be integrated with standard provincial and national monitoring and management systems.

THE RURAL ENGINEER'S ROLE

Most of the monitoring process will need to be undertaken by rural engineers as part of their administrative duties. Monitoring information should come from measuring the contractor's work. These data will usually be provided by the contractor and be checked by the rural engineer. However, there are other indicators that need other disciplines, particularly socio-economists.

physical output

The most basic form of monitoring is to record whether the magnitudes of outputs (length of road or irrigation channel, area of building) match the original project design.

cost monitoring

For infrastructure projects it is important to monitor:

- Actual expenditure and outputs against contract or established unit costs for standard items.
- For labour-based construction, basic cost parameters, like productivity norms and labour constants.

employment benefits

When specific target groups are intended to benefit from the labour-based job opportunities this should be monitored. These

might include:

- Female headed households.
- Internally displaced persons.
- Landless households with disabled members.
- Voluntary migrants.

Appropriate indicators to measure these might include:

- Direct and indirect employment benefits (numbers employed and wage levels).
- Specific attention to the project implications for women.

development of the construction industry

Monitoring activities should follow-up any training given to the construction labour force and whether this has made an impact on the local construction and manufacturing industry.

environmental impact

The environmental impact assessment study or statement discussed in the previous section will provide a basis for monitoring the impact of a project. The EIA will usually specify what indicators (or parameters) should be used. Environmental monitoring frequently requires sophisticated measurement tools, as what is being measured is often an indirect or cumulative impact, like the impact of an irrigation area on a natural landscape downstream.

One of the most difficult aspects of environmental monitoring is to ensure that what is measured during monitoring is the direct result of the project and not the double counting of benefits from other projects or external activities. The geographical scale of monitoring is critical. Mitigation measures included in project design or the EIA need to be monitored to ensure they are effective.

gender

Monitoring gender issues often focuses on female participation in project activities. This could be whether:

- Gender factors have been incorporated in project planning.
- Females have attended training courses provided by the project.
- Opportunities have been provided for female employment, in project activities or on labour-based programmes.

To monitor these aspects information needs to be collected and analysed in a way that makes gender separation possible.

economic and social benefits

The economic and social impact of a project is often the most difficult to monitor. This is where the rural engineer may require outside assistance – e.g. when recalculating project viability (internal rate of return).

PERFORMANCE INDICATORS

Evaluating economic and social benefits requires close monitoring of project performance (like changes in agricultural yields, traffic levels, take up of technical innovations,

participation levels, number of users of facilities, etc.). These factors are usually specified in the original project design – often in the logical framework described previously. These are usually called measurable indicators.

monitoring the impact of improved access

Minor works to individual rural roads generally do not require monitoring - except to ensure they have met physical and cost targets. However, network road rehabilitation improvement programmes require additional monitoring as follows:

22.4 Monitoring road improvements

Measures of effectiveness should include whether:

- Anticipated traffic growth has occurred (average daily traffic levels before and after construction).
- Improvements have resulted in lower vehicle operating costs.
- There has been a change in the origin and destination of traffic (including whether works have resulted in greater use of education, health and other socio-economic facilities).
- There has been a change in journey frequency, like more visits to markets by female family members.
- Different transport modes are now being used (like switching from bicycles to motorbikes).

monitoring labour-based programmes

The impact of labour-based construction methods should also be measured. The direct effect is employment creation (days of labour contributed) and contractor training as discussed above. However, surveys could establish whether there has been positive impact on the local economy (like selling haulage baskets and snacks to the labour force).

monitoring the impact of land development activities

Analysing a complex irrigation system involves detailed and time consuming survey work. However, small-scale irrigation developments can be assessed simply – by comparing conditions before the project to conditions after implementation. It is unlikely that all changes can be quantified, so a partial analysis is needed. It is valuable to begin analysis with discussions with key informants. However, the main focus should be on measuring the direct impact at farm level. Impact measures might include:

22.5 Monitoring irrigation schemes

Measures of effectiveness should include:

- Changes in the area under cultivation.
- Changes in productivity (increase/decrease in crop yield).
- Changes in farm income (increase/decrease in returns).
- Variations in agricultural practices, including crop diversification.
- New community organisations like Water Users' Groups.

monitoring the impact of market developments

Individual small-scale market improvements can be monitored using simple physical indicators, like the area improved, number of stalls created and total number of traders. For larger programmes, expanded trading activities could be also be monitored:

22.6 Monitoring marketing improvement schemes

Measures of effectiveness should include:

- Increased trade, measured by market turnover (tons).
- Reductions in the percentage of post-harvest losses.
- Increased use of market facilities by farmers and traders.
- Better prices for market users.
- Increased market revenues.
- Improved market maintenance and management.

FEEDBACK - WHAT TO DO WITH THE RESULTS

Monitoring should be used as a management tool. Monitoring results are valuable for engineers, for making value engineering assessments, for adding to databases and for updating base maps. However, the evaluation is a separate exercise, to assess the overall impact of a project. Monitoring is normally an internal function of a project, whilst evaluation is often undertaken by an external agency.

There are four broad stages of evaluation - depending on the scale of a project they may not all be needed:

- ***Ongoing feedback*** during project implementation so project design can be adjusted to enable it to reach its targets. When projects have been designed to target a specific group it will be essential to use this approach – sometimes this means that PRA methods are repeated and the recipient community is fully involved with the monitoring.
- ***Intermediate stage evaluation*** when the project progress is reviewed (often at mid-term) to see if policies incorporated in the project design need revision.
- ***Project completion (terminal) evaluation*** to ensure that the funds have been expended as planned – for example, whether funds for female participants have been used.
- ***After implementation (ex-post) evaluation*** to see if long-term results have been achieved and discover what lessons can be learned – typically needed where a project has specific economic, environmental, social or economic objectives that take time to develop.

using monitoring data

The main role of the rural engineer in the monitoring process will be the supervision of construction contracts. The regular reporting that goes with this process also forms the basis for other monitoring – like recording the jobs created, the rate of female employment, etc.

Data on other monitoring criteria may not come directly from the construction supervision process and will need to be collected separately - either by the engineer or by a government department or research agency. It is often appropriate for the beneficiary community to collect its own data.

simple evaluation methods

Evaluation can be a complex process and overall evaluation is often undertaken by an external agency. The rural engineer may need help to prepare documentation for the evaluation -

particularly if an economic analysis is required. For complex projects, the rural engineer will probably be given a standard format for recording data. For smaller projects the engineer can undertake the evaluation - the easiest way is to use a simple tabular comparison as follows:

22.7 Typical evaluation of a marketing improvement scheme

Monitoring indicator	*Unit*	*Existing*	*Logical framework*	*Actual*	*Achievement*
Financial performance	*$ year*				
Turnover	*Tons/year*				
Number of traders	*No.*				
Increased female use	*+/-*				
Average post-harvest loss	*%*				
Use of special facilities	*%*				
Increased prices	*%*				
Increased revenues	*%*				
Better maintenance	*+/-*				
Improved waste handling	*+/-*				
Indirect employment	*+/-*				
Environment improvement	*+/-*				

FURTHER READING

The student should refer to the following documents:

1 **ACC Task Force on Rural Development,** (1985). *Monitoring and Evaluation – Guiding Principles.* IFAD Publications, Rome.

2 **Vaidya, Kirit,** (2000*). Benefit Monitoring and Evaluation: Progress, Mid-Term Results and Plan*. IT Transport Ltd., Prepared for ADB/Ministry of Rural Development, Phnom Penh.

3 **Rosenboom, Jan William,** (1999). *Training Manual: Project monitoring and evaluation.* UNDP/CARERE, Phnom Penh.

4 **UNDP,** (1997*). Results-Oriented Monitoring and Evaluation*. OESP Handbook Series, UNDP, New York.

22.8 Questions for students:

What is the purpose of monitoring and evaluation?
What are the typical indicators used to monitor rural development works?
Is monitoring and evaluation always necessary?
What is the rural engineer's role in monitoring and evaluation?
How is monitoring data used to influence project design?
How would you prepare an evaluation for a simple project?

SECTION 23: SUMMARY OF THE RURAL DEVELOPMENT PROCESS

Contents

23.1 Issues covered in this section

Summary of the sections.

Check list of basic steps in the planning process.

Postscript.

SUMMARY OF THE SECTIONS

The following summary has two purposes:

To give students an overview of the subject as a quick reference for their future careers as rural engineers.

To revise the series before the examination.

SECTION 1: introduction to rural development principles

Section one started by defining development and then examining the reasons for adopting an integrated approach to rural development and how this is reflected in Cambodian policies for rural development. It then described some development concepts and how they relate to national legislation, development standards and other norms, like road safety. The section concluded with an overview of the engineer's role in rural development:

> *The engineer is a servant of society – rural people are the clients. To work effectively and facilitate development the engineer will need to learn how to work with the rural population and other professionals, particularly socio-economists.*

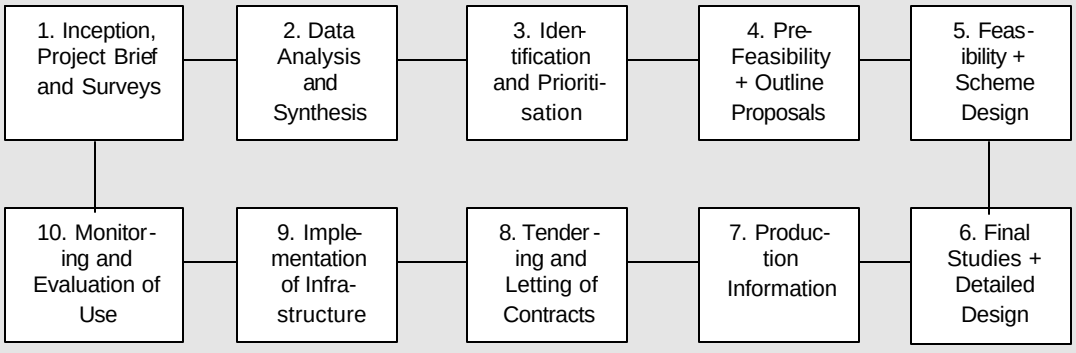
SECTION 2: Ministry of Rural Development - the policy and programmes

Section two described the mandate and organisational structure of the Ministry of Rural Development (MRD). It then described how the MRD's rural development policies reflect the Five-Year Socio-Economic Plan prepared for the Royal Government by the Ministry of Planning. The section concluded with a description of the current MRD rural development programmes.

SECTION 3: the planning process as the framework for development

Section three introduced the idea of planning as a process and the role of all the stakeholders, with particular stress on community participation. The ideas of the planning context, time scale and the regional development framework, like growth poles, central places and the hierarchy of settlements were discussed. Implementation methods were described, as well as how planning initiatives by local communities can be facilitated. The section finished with a definition of the stages in the development cycle:

23.2 The Development Cycle



SECTION 4: rural society Section four presented the background to rural society in Cambodia, based on anthropological research. It introduced the idea of a poverty alleviation focus, the vulnerable groups in society and how they can be identified. Quality of life indicators were then used to contrast rural and urban Cambodia. The section ended with a description of the role of the various actors and institutions, including grassroots organisations, in the development process.

SECTION 5: socio-economic development issues Section five described in detail some of the key socio-economic issues in development. Participatory planning was discussed, together with the role of communities in rural development. The importance of mainstreaming gender was highlighted with the difficult issues of land tenure, access to rural employment and the use of the family's time. The management of infrastructure, like roads, markets and irrigation was then discussed. The section concluded with a review of road safety.

SECTION 6: project economics and financing Section six started with a general background to economics and why an assessment of a project is needed, in which the costs and benefits can be represented in financial and economic terms. Methods of estimating intervention costs were described, including capital and recurrent costs. The principles of economic analysis were then explained and the section concluded with a review of implementation and financing risks and arrangements.

SECTION 7: economic analysis as a planning tool Section seven described the benefits that might be expected from a project and gave alternative approaches to project analysis. It continued with a description of how evaluation using economic analysis is undertaken. The section finished with detail of how to use an economic model to assess a project's viability and gave an example of a simple model.

SECTION 8: survey and planning techniques Section eight started with an outline of the basic socio-economic parameters that influence engineering design. It continued with a description of what is meant by primary data collection and then detailed how to undertake a social assessment, like a rapid rural appraisal. The section then described logical frameworks, coefficients and other indicators used in the planning process. The section finished by explaining the steps the engineer needs to follow in setting up surveys.

SECTION 9: mapping and presentation Section nine started with a definition of the purpose of mapping and then described in some detail the methodology for preparing participatory mapping and the use of manual mapping methods. The application of GPS and other methods to verify data were then explained, followed by methods of interpreting maps, using layers, thematic maps and geographical information systems. The section concluded with a description of the need to adopt standard mapping presentation techniques.

SECTION 10 - 12: integrated rural development field trip The students made a short field trip to a rural area close to Phnom Penh, concentrating on the conditions in a single commune area. The students then wrote a brief report presenting the results of the observations made during the field

trip.

SECTION 13: introduction to rural transport planning

Section 13 started with a definition of rural roads and a description of typical rural transport planning problems, followed by an explanation of the reasons for undertaking road improvements. This was followed by a discussion of who has the responsibility for implementation and maintenance. The section concluded with a description of other types of transport facilities, like bridges, water transport and animal power.

SECTION 14: choosing rural transport planning options

Section 14 described approaches to evaluating transport systems and to prioritising rural road improvements, using a range of different assessment techniques. An appropriate technique was then described in some detail. The section ended with a broad summary of transport planning issues.

SECTION 15: introduction to integrated rural accessibility planning (IRAP)

Section 15 started with an overview of the objectives of integrated rural accessibility planning (IRAP) and the rationale for using the technique. It then described when IRAP could appropriately be applied. Typical accessibility indicators were explained, as well as the outputs that would result from using IRAP and the rural engineer's role in the IRAP process.

SECTION 16: Applying integrated rural accessibility planning

Section 16 was a more detailed explanation of IRAP, defining the four basic training modules used in applying the IRAP process:

- T1 – Data gathering and analysis.
- T2 – Prioritisation.
- T3 – District Accessibility Action Plan preparation.
- T4 – Approval, implementation and monitoring.

An explanation was then given of applying IRAP to the planning of rural road networks, basic needs (firewood, water supply, etc.) and social services (health and education). The concept of asset valuations was described, together with its use in maintenance planning. The section concluded with a presentation of IRAP map outputs, using case studies from Siem Reap Province.

SECTION 17: classroom exercise in analysing accessibility data

Section 17 was a practical exercise in collecting time budget and accessibility data from the student's family members on water supply. In the classroom, this was followed by individual compilation of data in a standard format. The section ended with a comparison of the results of the student's surveys.

SECTION 18: the rural economy

Section 18 gave an overview of the agricultural strategy adopted in Cambodia, followed by a description of rural land use and production: farming systems, production levels, landholding size, land rights and agricultural labour. Water resources management was then described, including small-scale irrigation systems and Water Users' Groups. The purpose of extension services was then explained as well as input supply, rural credit, post-harvest handling, transport, marketing and storage. The importance of non-farm employment was then highlighted, like handicrafts and income generating activities. The section concluded by defining the engineer's role in facilitating rural infrastructure.

SECTION 19: labour and rural development

Section 19 started with a description of the use of labour standards, the link to labour-based technology and the mandates of the International Labour Organisation and the government. The methods for choosing development technology options were then outlined and how to target development using targeted procurement methods. The section concluded with an explanation of government versus community works and the rural engineer's role in estimating labour requirements.

SECTION 20: rural infrastructure

Section 20 first defined the purpose and role of rural engineers in providing rural infrastructure. Human settlement layouts and the main factors in designing typical rural buildings types were explained and the section then described factors in designing rural markets. The section ended with a review of water supply and sanitation standards, followed by a description of the maintenance and management issues related to rural infrastructure.

SECTION 21: environmental and social impact

Section 21 started with a review of environmental and social impact issues and the basis of environmental management policies in Cambodia. This was followed by a description of the environmental impact assessment process, including when it should be applied and how to prepare an impact statement. The section concluded with an explanation of how the rural engineer could reduce environmental impact through the design of appropriate conservation and mitigation measures.

SECTION 22: monitoring and evaluation

Section 22 defined why monitoring and evaluation are necessary and what indicators could be used to measure and evaluate the impact of development. It then described how the rural engineer should undertake the monitoring and what to do with the results.

CHECK LIST OF BASIC STEPS

When advising on development programme design, the rural engineer should include an assessment of economic, social and environmental conditions. The following is a checklist of the basic steps in the planning process. These need to be considered during project identification, design and implementation:

surveys and project identification

- Use community participation (like IRAP, PRA and participatory mapping methods) to undertake initial social (and physical) surveys. Public awareness campaigns and social impact analysis should also be used in project design. Remember to define indicators that will enable special communities to be targeted.
- Evaluate physical and engineering conditions of the existing infrastructure. For rural roads assess existing traffic flows and define the area of influence - rural population served by the road (ideally it should not be less than 70 families per kilometre).

environmental impact

- Undertake an initial screening and examination of potential project components (scoping) to identify whether a full environmental impact assessment (EIA) is required. Undertake an EIA if needed.

- Ensure that appropriate prevention, management and mitigation measures are included in the project specifications and contract arrangements (e.g. shallow borrow pits with minimum impact for road construction, etc.).

approach to project design

- Ensure that gender awareness is incorporated in project planning - 50 per cent of opportunities for administrative, labour-based employment and supervision posts should be available for female candidates. Female candidates should not be placed at any disadvantage when seeking these posts.
- For training programmes, include an environmental monitoring and assessment component, with a target of up to 50 per cent female participation in the programmes.
- Include provision for monitoring and evaluation.

design alternatives

- Clearly set out design rationale (LFA) and alternatives.

costs

- Carefully estimate the development costs – the initial investment as well as recurrent and maintenance costs.

evaluation methods

- Choose an evaluation technique, either full economic analysis, cost-effectiveness and screening, decision tree or ranking techniques. Testing viability can be done simply (e.g. ranking alternative market designs) or, for larger-scale road interventions, by a full economic analysis, looking at project benefits to the overall economy.

local access roads - IRAP

- For identification of local access roads, with less than 50 vehicles per day, use the simple ranking method within IRAP to evaluate alternatives.

tertiary roads and rate of return

- For a pre-feasibility study of tertiary roads, generally with more than 50 vehicles per day, use a simple economic analysis like the CREAM model to test the selected alternatives. The economic internal rate of return of tertiary roads should ideally not be less than 15 per cent.

feedback

- Undertake monitoring during project implementation, evaluate results and learn lessons for future projects.

POSTSCRIPT

It is worth repeating some of the main points of each section:

23.3 Main points to remember in rural development

Carefully consider government **policies and standards**.

Optimise the use of physical and human **resources**.

Fully **involve people** in the planning process.

Base project design on the **use of facts**, not opinions.

Ensure that projects are economically **viable and sustainable**.

Integrate social, environmental and gender factors in planning.

Present **ideas** clearly, using communication skills and different media.

Maximise the use of **indigenous** engineering and **cultural** knowledge.

SECTION 24: WRITTEN EXAMINATION

SAMPLE EXAM PAPER

The student should answer nine questions, choosing one question from each of the nine groups. The time set for the examination is **90 minutes** and the student should spend about 10 minutes answering each question.

1. RURAL DEVELOPMENT PRINCIPLES, POLICIES AND PROGRAMMES

a) *What are the main objectives of rural development and what are typical examples of integrated rural development?*

b) *Why is it necessary for the rural engineer to understand the legal background to development?*

c) *What is the overall mandate and main programmes of the Ministry of Rural Development and how is the Ministry organised at national and provincial levels?*

2. PLANNING PROCESS

a) *How does the Government believe local communities can be mobilised for development?*

b) *What are the main levels in the rural settlement hierarchy?*

c) *Why is the development process also referred to as a cycle and what are examples of steps in the process?*

3. RURAL SOCIETY AND SOCIO-ECONOMIC DEVELOPMENT ISSUES

a) *Who are the vulnerable groups in society and how is it possible to identify them?*

b) *What issues could arise in arranging labour-based contracting?*

c) *What are the basic principles of mainstreaming gender in rural development?*

4. PROJECT ECONOMICS AND FINANCING

a) *What is the purpose of applying economic principles to understand projects?*

b) *What are the possible sources of financing for a rural development project?*

c) *How would you quantify the benefits from a water supply project?*

5. SURVEY, PLANNING AND MAPPING TECHNIQUES

a) *Why would you use a social assessment and what is the difference between a RRA and PRA?*

b) *What is the purpose of using logical frameworks?*

c) *What are the main techniques that the rural engineer may need to use to map an irrigation system?*

6. RURAL TRANSPORT PLANNING

a) *What are rural roads and who constructs and maintains them?*

b) *What are the basic questions that should be asked before undertaking road improvements?*

c) *What are the possible techniques for evaluating the costs and benefits of road improvement options?*

7. INTEGRATED RURAL ACCESSIBILITY PLANNING

a) *When would you typically use IRAP?*

b) *What is the purpose of using indicators in the IRAP process?*

c) *What are the main outputs of the IRAP process?*

8. THE RURAL ECONOMY, USE OF LABOUR AND RURAL INFRASTRUCTURE

a) *What important factors should be considered in the designing of small-scale irrigation schemes?*

b) *What can be done to improve rural marketing and post-harvest handling?*

c) *What is labour-based technology and what are the reasons for using this approach?*

9. ENVIRONMENTAL AND SOCIAL IMPACT AND MONITORING AND EVALUATION

a) *What is the purpose of undertaking an environmental impact assessment and what developments might require an EIA?*

b) *What can the rural engineer do to minimise the negative environmental impact of development?*

c) *How is monitoring and evaluation data used to influence project design?*

FURTHER READING ON RURAL TRANSPORT PLANNING

Barwell, I., Edmonds, G., Howe, J. and de Veen, J., (1985). *Rural transport in developing countries*. Intermediate Technology Publications, London.

BCEOM, (1997*). Benefit Monitoring and Evaluation - Procedures for Project Evaluation*. Prepared for ADB/Ministry of Rural Development, Phnom Penh.

Beenhakker, H., Carapetis, L. and Hertel, S., (1987). *Rural Transport Services: a Guide to Planning and Implementation.* Intermediate Technology Publications, London.

Bovill, D., (1978). *Rural Road Appraisal Methods for Developing Countries*. Supplementary Report No. 395, Overseas Centre, Transport and Road Research Laboratory, Crowthorne, Berkshire, UK.

Calvo, C. M., (1998). *Options for Managing and Financing Rural Transport Infrastructure.* World Bank Technical Paper No. 411. World Bank, Washington, D. C.

Dawson, J. and Howe, J., (1993). *Roads are not enough. New perspectives on rural transport planning in developing counties*. Intermediate Technology Publications, London.

Dennis, R., (1998). *Rural Transport and Accessibility*. RATP. No. 1, ILO, Geneva.

Dixon-Fyle, K., (1998). *Accessibility Planning and Local Development*. RATP. No. 2, ILO, Geneva.

Edmonds, G., (1998). *Wasted time: the price of poor access*. RATP. No. 3, ILO, Geneva.

Edmonds, G., Donnges, C. and Palarca, N., (1994). *Guidelines on Integrated Rural Accessibility Planning: Planning for Peoples' Needs*, ILO/DIGL, Manila.

Ellis, S. D., (1997). *Key issues in rural transport in developing countries.* TRL Report 260. Overseas Centre, Transport Research Laboratory, Crowthorne, Berkshire, UK.

Hine, J., (1972). *Transport and Marketing Priorities to Improve Food security in Ghana and the rest of Africa.* Overseas Centre, Transport Research Laboratory, Crowthorne, Berkshire, UK.

Howe, J. and Richards, P., (1984). *Rural roads and poverty alleviation*. Intermediate Technology Publications, London.

Howe, J., (1996). *Transport for the poor or poor transport?* ILO, Geneva.

Ministry of Rural Development, (1999). *Policy for Rural Roads.* MRD, Phnom Penh.

National Institute of Statistics, (1996). *Demographic Survey of Cambodia 1996.* Sponsored by United Nations Population Fund. Ministry of Planning. Phnom Penh.

National Institute of Statistics, (1997). *Cambodia Human Development Report 1997.* Sponsored by United Nations Development Fund. Ministry of Planning. Phnom Penh.

Prescott, N. and Pradhan. **M.,** (1997). *A Poverty Profile of Cambodia.* World Bank Discussion Paper No. 373. World Bank, Washington, D. C.

Price Gittinger, J., (1972). *Economic analysis of agricultural projects.* The John Hopkins University Press, Baltimore.

SMEC International PTY Ltd., (1997). *Project preparation and technical assistance for transport network improvement project: Cambodia: Final Report, Volume II Economic Evaluation and Review of TRS*. Prepared for Asian Development Bank under TA No. 2722-CAM.

SweRoad, (1995). *The Transport Rehabilitation Study*. Prepared for SIDA/UNDP and Ministry of Public Works and Transport. Phnom Penh.

Tracey-White, J. and Vaidya, K., (1998). *Planning framework for sub-project screening and selection.* Consultancy Services for Implementation of Rural Infrastructure Improvement Project ADB Loan No. 1385-CAM (SF), BCEOM and IT Transport Ltd. ADB/Ministry of Rural Development, Phnom Penh

TRL, (1988). *A guide to road project appraisal.* Overseas Road Note 5. Overseas Unit, Transport Research Laboratory, Crowthorne, Berkshire, UK.

UNDP, (1992). *Handbook and guidelines for environmental management and sustainable development.* Environment and Natural Resources Group, United Nations Development Programme, New York.

World Bank, (1998). *Design and Evaluation of Rural Transport Infrastructure.* Transport Division, Discussion Paper. World Bank, Washington, D. C.