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Preparation of Rural Roads Training Modules (ESCAP)

Report on a Visit to Thailand

by

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on behalf of

The International Development Research Centre

Ottawa, Canada

March, 1987



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EXECUTIVE SUMMARY

This report describes the work of the communications expert on the Preparation of Rural Roads Training Modules in Bangkok from February 23 to March 14, 1987. The consultancy was conducted for the Transport, Communications and Tourism Division of the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP) on behalf of the International Development Research Centre of Canada.

The assignment was to develop a concept for the training modules by participation in an expert group meeting and subsequent work with the technical consultant and ESCAP staff.

Comments on the Videotapes

During the meeting of the experts from member countries, videotapes dealing with rural road construction and maintenance were screened. Some of the techniques and procedures could be used in tapes produced by ESCAP. In other cases, visual material could be used from existing presentations. There is a definite expressed need for more than visual materials to accomplish the training objectives of this project.

Information needed for Development of the Modules

Some information on the level of the trainees, the usage situation and the trainers was gleaned from the meeting. Additional information is needed because many countries which may use the materials were not represented. Additionally, ESCAP needs to know how many copies of materials will be needed.

A Description of the Modules

A module will consist of a trainees' guide, a trainer's guide and appropriate teaching aids. Each module will deal with a limited amount of content to allow the trainer to arrange present modules in various configurations. Modules will require active responses from trainees. They will be easy to translate into other languages. They will include specific objectives for learners and tests to measure the objectives.

The Instructional Design Model

The instructional design model consists of a five-step procedure to produce the training modules.

The first step in the model involves a determination of the need (1.1), and descriptions of the trainees (1.2), the trainer and the usage situation (1.3) and the identification of agencies which could produce materials (1.4).

In Step 2, the tasks which trainers must perform will be specified and then analyzed. This information will be used to write the behavioral objectives (2.2). The objectives will be analyzed to determine specific skills and underlying facts, concepts and principles which underlie them (2.3). The assembled material will be reviewed (2.4).

In Step 3, the information from the content expert will be used to select the teaching strategy (3.1) and the media (3.3); to design the tests (3.2) and to prepare an overall module plan (3.4).

In Step 4, the actual production of the modules, i.e. the writing of the trainer's and trainees' guides (4.1), the preparation of the script guidelines (4.2) and the preparation of a shooting script will take place. Then the materials will be reviewed (4.3). When the materials are acceptable, they will be prepared for implementation (4.4., 4.5).

In Step 5, the training workshops will be designed and introduced to trainers (5.1). The workshop will be evaluated (5.2). When they are satisfactory, the modules and associated materials will be released.

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SECTION ONE

NATURE OF THE CONSULTANCY

Dr. Richard F. Lewis was engaged by the International Development Research Centre (Canada) to supply technical consultancy services to the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). Dr. Lewis was retained for a period of 21 days from 22 February 1987 to 14 March 1987.

1.1 TERMS OF REFERENCE

The terms of reference for the assignment were as follows:

- a) to travel to Bangkok to participate in the February 23-25 meeting being convened by the Economic and Social Commission for Asia and the Pacific (ESCAP) on the Preparation of Rural Roads Training Modules;
- b) to meet and work with the Technical Expert, Dr. J. Howe, and ESCAP staff in the development of the project;
- c) to work with the ESCAP staff to identify the target groups to be reached with the proposed training course;
- d) to propose appropriate training methodologies and to prepare an outline and identify the types of training materials required;
- e) to assist ESCAP in reformulating the project budget if required; and
- f) to submit a detailed and satisfactory report of the work accomplished to the Director of the Information Sciences Division of the Centre by April 10, 1987.

1.2 ACTIVITIES DURING THE CONSULTANCY

- a) The consultant participated in the meeting of experts from member countries from February 25-27. After participating in the meeting, the consultant summarized the comments of participants with respect to the video materials which were shown. The consultant also prepared a short review of each presentation.

- b) The consultant summarized available information on the intended trainees, the usage situation and the trainers involved.
- c) The consultant developed an outline of the characteristics of the intended modules.
- d) The consultant developed a procedure for the design, production and evaluation of the modules.
- e) The consultant worked on the design of several modules with the technical consultant ensuring that both parties understood their task.
- f) In consultation with the technical consultant, the consultant developed an implementation plan for the project, including a revision of the budget.

SECTION TWO

COMMENTS ON THE VIDEOTAPES

At the meeting of the experts from participating countries, participants viewed videotapes dealing with road construction and maintenance. In this section, a brief description of each videotape is followed by a record of the participant comments and a summary statement. The section concludes with an overall summary of all comments.

2.1.1 INTERNATIONAL ROAD FEDERATION TAPES

The International Road Federation (IRF) has produced 24 video training aids for road maintenance, which are available in various video formats. Using broadcast quality equipment and standards, the IRF tapes are of excellent technical quality.

At the workshop, three tapes: "Common Maintenance Problems and Causes" (21 minutes), "Patching Unpaved Roads" (12 minutes) and "Cleaning of Lined Ditches, Culverts and Catch Basins" (16 minutes) were shown. The tapes were meant to be illustrative of the other tapes in the series.

The tapes follow a systematic procedure for performing the task. "Patching Unpaved Roads" presents a step-by-step procedure which should be followed. The steps are never presented as words on the screen. Instead, the procedure is explained orally with pictorial illustrations. The scenes are obviously North American using clean efficient-looking Western equipment.

The tapes follow the following instructional format: outline the procedure orally; describe each step in detail, while illustrating it with pictures; and summarize the steps mentioned at the outset. According to information available to the meeting, the tapes do not include any supplementary trainer's or trainees' guides. They are presumed to be completely self-sufficient units of instruction.

The introductory unit stresses that the modules deal with general principles, basic concepts and fundamental tasks. It also presents information on the proper use of tools and equipment, emphasizing safety concerns. It shows the consequences of ignoring maintenance and deals with the causes of problems. Cause-and-effect demonstrations illustrate the point. There is much technical terminology with few definitions. In addition, there is no overview. No text is ever shown on the screen (presumably to facilitate dubbing to different languages).

2.1.2 COMMENTS BY PARTICIPANTS

The technical quality was very impressive. The broadcast quality standard was a positive factor. It was suggested that the modules to be produced under the ESCAP initiative aspire to the same standard. Some participants doubted this standard could be achieved because of limited funds available. The step-by-step outline for performing a task was appreciated by participants. It was suggested that this approach might be a useful model for the tapes to be produced under the ESCAP initiative.

The visual excellence was also noted. It was suggested that the sequence of shots might even be used in the ESCAP tapes. After some discussion, the group felt that approaching IRF for permission to extract excerpts from the tapes would not be practical.

The emphasis on maintenance issues was appreciated because maintenance is often not given enough attention.

The participants liked the attention given to safe procedures such as the wearing of safety helmets when performing a task. Although the emphasis on safety was viewed as an ideal procedure, which may not be practical in developing countries, the modeling of correct behaviour was desirable.

The chief negative aspect was the emphasis on a machine-based approach. Although the tape on the patching of unpaved roads used appropriate procedures and technology, the use of a large dump truck to carry tools was criticized. In the unit on mechanical cleaning of unlined ditches, culverts and catch basins, the criticism was more emphatic.

2.1.3 SUMMARY AND CONCLUDING COMMENTS ON THE IRF VIDEOS

The approach and technical quality are excellent. However, the emphasis on machine-based solutions to problems was viewed as a major disadvantage. Another major disadvantage mentioned was the high cost (\$600 U.S. per tape). The price prohibited consideration by most agencies.

A major drawback of the tapes is the lack of any support material. Printed materials emphasizing and reinforcing material presented in the tapes are missing. In the module on patching roads, a handout which repeats the steps would seem to be a natural addition to the material.

The lack of any guidelines for someone presenting the tapes is also a drawback. Effective use of video-based training materials assumes active participation by the trainers. Because video based training materials are new, trainers need detailed guidance on their integration into a training program.

Unquestionably, the approaches used here can be used to guide the design of modules which ESCAP intends to produce. The approach of outlining a procedure describing it in detail and then summarizing it may be an excellent instructional strategy for certain types of content.

It is unlikely that the funding available for this project will allow units to achieve the level of technical quality in these tapes. Funding will simply not allow the shooting ratios and sophistication essential to producing material of this calibre.

2.2.1 THE INTERNATIONAL LABOUR ORGANIZATION (ILO) TAPE ON LABOUR BASED TECHNIQUES

The first tape was intended as a twenty-minute introduction to labour-based planning for engineers and planners. The tape used a modified case study approach, following a labourer as he went about his tasks, adding other information about aspects of labour-based techniques.

2.2.2 THE ILO TAPES ON PLANNING

The ILO has produced two pilot video programs dealing with the topic of planning for labour-based techniques. Both tapes used a model of a construction site in which felt figures were manipulated. The tapes also presented text on the screen. The first tape lasts 10 minutes; the second, 15 minutes. Shots of various printed forms used in planning were interspersed where necessary. The tapes did not use motion. Slides were projected and then photographed by the video camera. ILO personnel indicated that the intention was to replace some of the studio scenes with live footage but that time constraints had prevented this replacement from occurring before the meeting.

2.2.3 COMMENTS BY PARTICIPANTS

There was a perceived need among participants for more information on the planning process especially as it related to labour-based techniques.

Participants liked the use of the studio-based techniques. These techniques allow much finer control than is possible using real scenes.

Some participants felt that the medium was inappropriate. Production elements, particularly the sound-track were criticized. Some participants felt that some of the information provided was inaccurate. It was suggested that material on planning might be kept at a very general level to avoid inaccuracy.

2.2.4 SUMMARY

The use of a studio-based technique is an interesting and valid approach. The production technique allows controlled concepts and techniques to be quickly and inexpensively communicated once the original "set" is built.

The topics to be covered by such a unit must be carefully selected. Planning was not considered an appropriate topic for a video presentation.

2.3.1 MATERIALS PRESENTED BY THE CENTRAL ROAD RESEARCH INSTITUTE (CRR I, INDIA)

The CRR I presented two video-tapes: Water-Based Macadam and Lime Stabilised Bases. The tapes used live actors and outdoor test sites to illustrate their concepts. Using a narrative approach, the tapes described the procedure under consideration. The tapes presented a scientific and thorough presentation of the procedures.

The production quality of the material although not broadcast quality was excellent. Visual and audio elements of the tape were technically very good.

2.3.2 COMMENTS BY PARTICIPANTS

Participants felt that the tapes would be excellent for engineers and other senior staff people who had the background to appreciate the technical level of the content. The quality of the materials was appreciated.

The materials were seen as being too scientific, presenting procedures which would be performed only in test labs in most countries. There was a serious safety hazard illustrated (the use of the hand as a stopper when lime was being mixed). The materials appeared to integrate engineering and quality control; functions which appear to be separate in some countries.

2.3.3 SUMMARY

The CRR I videotapes appeared to have intended for an audience at a higher level than the target audience for the ESCAP materials. The CRR I and its co-operating producers are certainly capable of producing the quality desired by this project. However, more direction must be provided by ESCAP regarding the target audience.

2.4.1 SLIDE-TAPE UNITS PRODUCED IN THE PHILIPPINES

Two ten-minute slide-tape units were presented. Each program consisted of 80 slides presented using one projector and a synchronized sound track. The sound track included musical accompaniment. All pictures were of people in the actual situation with some graphics.

The first unit consisted of an overview of labour-based methods of road construction and maintenance. The unit appeared to be intended to persuade engineers to switch to labour-based techniques. It provided a skeleton outline of the various elements essential to labour-based techniques.

The second tape focused on pre-construction activities: project selection, site organization and management and the management of labour and construction planning. The unit provided very general details on aspects of these three topics.

No supplementary materials were presented although it was apparent that these materials were being used as part of a wider training course.

2.4.2 COMMENTS

There were few comments on these materials. One point raised was the problem of the reliability of slide presentation equipment which seems to have enormous potential for malfunction and loss of synchronization.

On the positive side, slides are easily edited. As a result, they lend themselves to adaptation for local or regional conditions.

2.4.3 SUMMARY

As general introductions to the topics, these units were acceptable. The photography and sound was very good, illustrating the points necessary. Used in the context of a complete course, excellent results could be achieved with

such materials. There is also the potential for transferring slide-sound presentations to video.

2.5.1 ON THE ROAD, A BLACK-AND-WHITE FILM

This black-and-white film was produced about 20 years ago in Guyana. The tape was presented by the Transport Road Research Laboratory (U.K.). It showed a road crew who first "do everything wrong" and then "do it right".

The first part of the film shows all the wrong ways of doing repair. The second part repeats the same scenes showing the right ways to perform the procedures.

2.5.2 REACTIONS

Some participants thought that the humorous aspect of the film, showing the wrong way would help communicate the importance of efficiency and safety in work habits. Participants mentioned that the right way should follow the wrong one, thus clearly pointing out the contrast. It was also suggested that the 'bad' practices be clearly identified as such.

2.5.3 SUMMARY

Although the overall response of the participants was positive, this technique is very difficult to use correctly. Producers would be unwise to experiment with wrong way examples of procedures. Learners may become confused with respect to the wrong and right way of doing something. Research tells us that we look for information which confirms our belief. Without careful guidance, a film of this nature may reinforce inappropriate beliefs and information about procedures.

2.6.1 THE ILO/DWP THAILAND FILM ON LABOUR-BASED TECHNIQUES

The objective of this 60-minute film was to advocate the use of labour-based techniques and to provide detailed information on the steps in initiating a labour-based approach to road-building. All scenes were shot at the Lampung site where roads are being built. The film showed many of the techniques in action. The approach was a simple narrative describing visual scenes. There was a music sound track throughout, accompanying the narration. When procedures were mentioned, they were presented as words on the screen within a chart.

2.6.2 COMMENTS BY PARTICIPANTS

The approach used here was mentioned as a potential approach which the new modules could follow. The illustration of the various procedures was seen as a positive feature. It was unclear whether the film was a promotional film advocating labour-based techniques or a training film on the use of the various techniques in labour-based planning.

The pace was viewed as too slow with much time in which there was no screen action and no auditory message. The length (one hour) appeared to be a problem. It was suggested that perhaps the film could be disassembled and then expanded into several pieces of material.

The printed material presented on the screen was ineffective. It was impossible to read the material on the screen. The music was viewed as intrusive. It was suggested that the music should be presented only at the beginning and the end but not during the whole video.

2.6.3 SUMMARY ON THE ILO/THAILAND FILM

It was unclear whether the film was promotional or intended for direct training. The attempt to achieve both objectives would probably cause difficulty in achieving either objective.

The video was probably too long for the content and the approach used. An illustrated lecture such as this cannot sustain itself for one hour. There were long presentations of uninterrupted visual material without accompanying narration. Editing could have improved the video.

There were sometimes conflicts between the message being presented aurally and visually. This cross-modal conflict could confuse the viewer by presenting conflicting aural and visual information. The sound-track could have been improved. The level of the music often overshadowed the voice. In addition, some portions of the voice track exhibited a muddy quality.

The choice of content and some filming was generally acceptable. In other cases, however, composition and framing was inappropriately done. The printed material presented on screen was far too small to be read from a normal viewing distance.

There were some excellent visual recordings of procedures. These elements could be edited for use in later modules, because they illustrate techniques being used in the field.

2.7 SUMMARY COMMENTS ON THE VISUAL MATERIALS

The materials shown at the meeting varied in production quality, instructional approach and content sophistication. Some tapes, especially the IRF videos, were of broadcast quality. Other materials such as the CRRRI materials, the ILO tapes and the ILO planning materials were intentionally below broadcast quality standards. However, agencies presenting materials made it clear that broadcast quality standards could be achieved if desired.

The instructional approaches used included humor, a lecture-type approach and demonstrations. Some materials displayed were at a level of sophistication which was above that of the intended audience. Most of the materials lacked any support material which would help a potential trainer and the trainees to use the video units effectively.

In the tapes, different production sites and techniques were used. The use of studio-based techniques appeared to be useful for performing certain tasks. In addition, studio-based techniques allowed finer control over production than other techniques. However, studio-based techniques could not show real people in real terrain, thus limiting their use.

The level of the information presented in the various materials appeared to be an important consideration. Senior engineers need a certain type of information. Rural roads staff may need less sophisticated information to perform their tasks effectively.

Some of the materials shown were slide-tape units (including the two ILO planning tapes). These materials demonstrated that the slide-tape medium could be effective for certain types of content. However, the reliability of the presentation equipment could hamper wide use of this technology. On the other hand, slide-tape units are easy to transfer to videotape.

The length of any video modules produced would have to be kept short. The hour-long video produced by the ILO and the DWP in Thailand demonstrated that a shorter format would be more acceptable.

At the conclusion of the meeting, there seemed to be general agreement that many different media should be used for performing the task. The medium selected should depend on the type of content being communicated. There also seemed to be agreement on the need for printed information to accompany the visual materials.

SECTION THREE

INFORMATION NEEDED FOR MODULE DEVELOPMENT

At the meeting of experts from member countries, information was sought on the trainees, the trainers and the usage situation.

3.1.1 THE TARGET AUDIENCE

The target audience was identified as the supervisor or overseer directly involved in rural road construction or maintenance by labour-based means (with appropriate machine based technology being used where necessary). Various countries differed on the nature of such a person.

In India, this person has a certificate in civil engineering (above high school but below college level).

In the Philippines, the foreman is the target. An undergraduate education is presumed but the person often has very little experience.

In Africa, the trainee has practical experience without much education.

In Thailand, a technical school background is presumed.

There was a suggestion that the job function being performed was the most important point to be considered. Educational level was not thought to be as important as job function.

3.1.2 SUMMARY

The information above is contradictory and demonstrates differences in various countries. At best the following generalizations can be made:

1. The trainee is literate in at least the lingua franca.

2. The trainee may or may not have significant (or any) experience on this type of project, depending on the function being performed.

3. The trainee may be predisposed towards machine-based methods as opposed to labour-based methods. The trainee may have to be persuaded to use labour-based methods.

4. The trainee is likely to be motivated to learn the techniques and practical information but not necessarily the scientific supporting information or other background information.

5. The construction and maintenance roles are performed by different people. Therefore, the modules must be adaptable to both audiences.

6. In some cases, the trainees may not plan a project but may carry it out.

3.2.1 THE TRAINER

The need for a trainer was discussed. Most participants felt that a trainer was needed. The tapes are to be viewed as an adjunct to any training which is taking place. It was suggested that explicit instructions on the use of the visual materials would have to be provided.

3.3.1 USAGE SITUATION

The way in which the training is delivered to the intended trainees must be studied so that the modules can be designed for the best use.

The SITE of the training appears to vary. In some jurisdictions, training is done on-site while on others, training takes place at a national or regional level. The decision on where training takes place appears to be based on the level of the task to be performed.

The AVAILABLE RESOURCES on-site would appear to vary as a function of the site in which the training is to occur. It appears that appropriate video equipment can be transported to the site, where necessary, although this may involve the use of a vehicle carrying the generator and the equipment. From the description provided by the participants, sophisticated technologies would appear to be difficult to transport to isolated rural areas.

3.3.2 SUMMARY

It appears that trainers will be used in most countries. The trainers will need specific guidelines for using the materials.

Any materials which are created must be adaptable to a wide variety of situations because of the range of terrain, differences in construction and maintenance techniques, and the organizational differences.

3.4 THE FORM OF THE PROPOSED TRAINING

At the opening of the meeting, it was suggested that a series of video tapes should be produced. There was no specific mention of the need for any other materials to accompany the tapes. The task of the meeting appeared to be to decide on the content and then to contract the work to member countries.

Comments during the meeting indicated the need for resources which could be tailored to a wide variety of situations with different requirements and types of equipment.

By the end of the meeting, participants reacted favourably to the idea that the content and form of the modules should reflect the learning needs. It seemed clear that the selection of the medium should come only after an analysis of the instructional task to be performed.

SECTION FOUR

A DESCRIPTION OF THE MODULES

4.0 BACKGROUND FACTORS WHICH WILL AFFECT THE MODULES

The aim of the overall project is to introduce and/or reinforce the point that rural road construction and maintenance can be performed using labour-based equipment-supported methods. Much of the information to be communicated will be new or contradictory to the audience.

The four main topic areas are: planning and administration, tools and techniques, basic science information, and quality control.

In each country there appear to be many differences in how projects are administered, where training takes place, and the level of the trainee. Most countries want to present information which is directly relevant to their situation. Regional differences within countries with respect to terrain and construction techniques further complicate the problem. There is also a sense that trainees would respond better to on-screen workers who look like them.

Trainers appear to be diverse group. Most are likely to be engineers with little direct instructional experience. Trainers routinely adapt materials to suit their needs. As a result, materials which are adaptable are more widely used. Materials which cannot be adapted or which appear irrelevant are ignored.

4.1 CHARACTERISTICS OF THE MODULES

The objective of this project is to produce a series of modules which will improve the training of supervisors who build rural roads. The modules which are produced must be of the best possible quality. They must use the full potential of communication technologies to teach people effectively and efficiently. A systematically designed module will increase the trainee's effectiveness while reducing the preparation and instruction time.

To be effective, the modules should possess the characteristics which are described below.

1. Each module must deal with ONE SPECIFIC TOPIC which is the largest unit that could be used by an agency. For example, the use of a certain compacting technique which is usable in a certain terrain but not in others. These

specific topics can be used alone or can be combined with others as the need arises.

2. Each module should contain a detailed TRAINER'S GUIDE, the MATERIAL presenting the information and a TRAINEES' GUIDE.

The trainer's guide should include complete instructions for using the module. It should list equipment requirements, time schedules, full task descriptions, scripts for any materials presented, lecture notes, suggested teaching activities and background information.

The materials for presenting the information may include audio-visual messages, printed handouts, a set of actual tools, equipment or models portraying various processes and techniques.

The trainee's guide will accompany the trainee to the work-site. It will provide summaries of key points and leave room for augmentation by the trainee. The guide may also include exercises to be performed as part of the instruction.

3. Each module should contain a list of BEHAVIORAL OBJECTIVES (skills, knowledge and attitudes) which the trainee should achieve upon successful completion of the module. Such objectives will allow trainees to be evaluated and can be seen as similar to standards for building roads.

4. Within reason, the trainer should be able to CUSTOMIZE the contents of the module to suit a particular group of trainees. Several paths through the module should be provided to ensure that the trainee receives the instruction which is most appropriate to his/her needs. The trainer should be able to adapt the module to personal preference for teaching. For instance, the module should allow the trainer to use an overhead projector or handouts or both. It may allow the instructor to teach only procedures or to teach procedures and underlying concepts and principles.

5. Each module should use the BEST MEDIUM (slides, video, pictures, audio tape, overheads) or combination of media to achieve the learning objective most efficiently.

Where motion is needed e.g. levelling a road bed with two workers to achieve the appropriate camber, video will be used. Where discrete steps can be identified, still pictures will be adequate, e.g., planning a project. Illustrations will be used where use of a photograph will not clearly highlight the feature of interest. If

individual learning activities are required, illustrated manuals combined with audio-taped instruction can be used.

6. Each module should include TESTS which allow the trainer or the trainee to determine whether the objectives have been achieved.

An added feature would be to include a test to determine whether pre-requisite skills (those which are needed as a foundation for the instruction) are present. If they are not present, the trainer may have to teach them. For example, a module on building earth roads will probably assume knowledge of compaction. If the trainees do not possess the required information or skills, the instruction on earth roads may be ineffective.

The post tests are intended to determine whether the trainee can perform the skills which the module tried to teach. If the trainee cannot perform the test procedures, remedial work may be required. Ensuring that the material has been learned is vital to a sound instructional program.

7. A module should require ACTIVE RESPONSES from the trainee.

Much learning theory and research suggests that active responses from the trainees result in more efficient training. Trainees must respond to instruction in order to achieve objectives. The modules must contain provisions for active trainee response. Trainees may complete exercises on paper, work with models or solve problems as a group as they achieve objectives. Research and sound practice suggests that it is possible to change certain attitudes by employing group discussions.

8. The module should allow for EASY TRANSLATION (by the trainer or national body) to the local language(s).

The modules have to be designed so that translation can be done easily. Visual material should avoid the use of any on-screen lettering.

The scale of intended use may govern whether translation takes place at a local or national level. If a few courses are intended, on-the-spot translation may suffice. If many courses are planned, a national or sub-national translation may be required.

The modules must be designed so that key points which need to be translated in the trainee's package or on sound tracks will be clearly identified.

SECTION FIVE

A MODEL OF THE INSTRUCTIONAL DESIGN PROCESS FOR PRODUCING THE MODULES

In order to produce instruction which will achieve the objectives of this project, a systematic instructional design procedure needs to be followed. In any instructional situation, outcomes are never certain. Variations in the trainer, the trainees and the usage situation create conditions which may inhibit the achievement of objectives. The use of a systematic design procedure increases the likelihood of the objectives being achieved. In this case, systematic instructional design will mean that rural road supervisors will be more likely to succeed in building and maintaining rural roads.

The instructional design model outlines a procedure to produce the training modules. The model is presented graphically as a flowchart in Figure 1. The description of the process is presented below.

The model is based on the latest literature in the field of designing training materials. It is built upon the work of Derek Rowntree and Alex Romizowski (U.K.) and many U.S. researchers (Kemp, Gerlach and Ely, Gagne and Briggs, Wittich and Schuler and Davis, Alexander and Yelon). The model has many common elements with the one used by Sukhothai Thammathirat Open University in Bangkok.

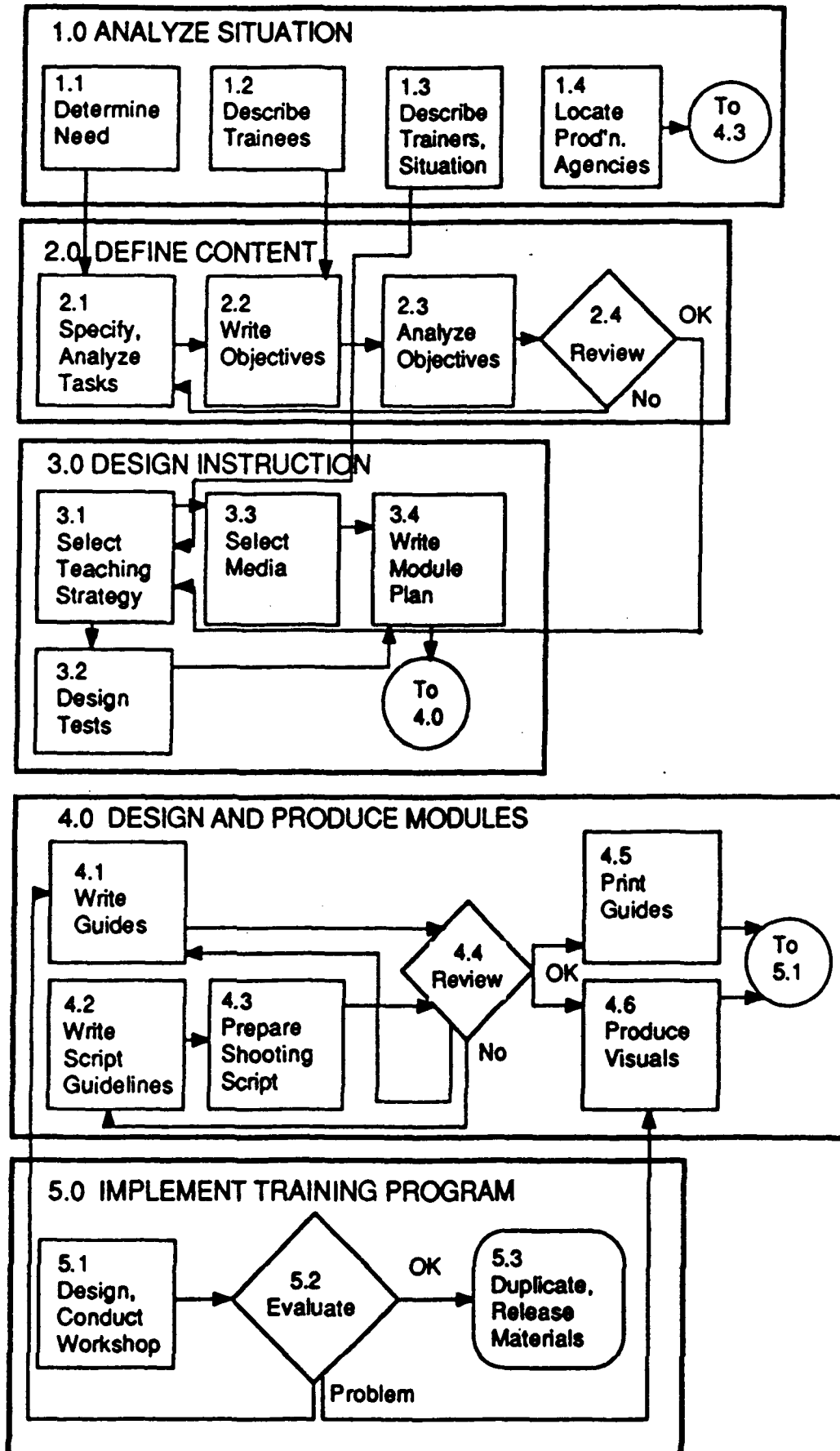
The model has five steps:

1. Analyze the Situation.
2. Define the Content.
3. Design the Instruction.
4. Produce the Modules.
5. Implement the Training Program.

These steps are presented in more detail below. A model like this is used to increase efficiency and reduce cost. The control mechanisms (in which a product is designed and then reviewed before the process is continued) increase the likelihood that the desired objectives will be achieved.

Figure One

A Model for Producing Training Modules



THE STEPS IN THE MODEL

1.0 ANALYZE SITUATION

The first step in the model involves a determination of the need (1.1), and descriptions of the trainees (1.2), the trainer and the usage situation (1.3) and the location of agencies which could produce materials (1.4). The four sub-steps in this step have been partially performed as a result of the meeting. Each of these steps is described below. The information collected here is used as the basis for the following steps.

1.1 Determine the Need for the Instruction

The need for the training material has been documented in the proposals and by experts working in the field. In addition, the three-day meeting of ESCAP officials; experts from member countries; other experts (from ILO the TRRL) and the content expert, Dr. John Howe, have concurred in the need to develop instruction for road construction and maintenance.

There may still be some need to consult with participant countries to determine the need for material on the selected topics. At the meeting, some participants indicated that certain topics were priorities while others were less important. By considering this information, the ESCAP officials may be able to better determine which materials should be produced first and what needs to be included in each module.

1.2 Describe Trainees

The educational level and job experience of the trainees should be specified in detail. The job functions they will perform should also be specified. The description of the trainees will be used as a basis for the instructional design.

At the February meeting on the project, the participants provided information about the intended trainees. The resulting description has been presented above. The current description must be much more specific for it to be useful in the design of materials. Members of this group of trainees will participate in a formative evaluation of the draft materials.

Countries which are represented at the meeting and countries which were not should be consulted with respect to this point. A systematic questionnaire which also includes

information about the usage situation and the trainers should be designed by an expert. The questionnaire can then be administered by ESCAP staff.

1.3 Describe Usage Situation

The situation in which the training will take place must be described. The first set of factors to be considered deal with the site of the training. Will the training be done locally, sub-nationally, nationally or regionally? Will the training take place in close proximity to a rural road construction site? Will it be possible to perform maintenance activities?

Another set of factors deals with the classroom activities. What media will be available? How many trainees will be taught at one time? How many trainers will be involved? Will support staff be available? In what time blocks will instruction be delivered? Will the course take place as a single offering or as a continuing series? Will trainers use individual modules?

The capabilities and experience of the trainer must be carefully surveyed to determine how instruction is to be designed. The trainer can be viewed as the filter through which the material must pass to the trainees. Information will be needed on the following points: rural road building experience, other road-building experience and teaching experience.

This information needs to be systematically collected and analyzed so that it can be used in later phases of the design. A clear description of the usage situation and the trainer will allow the instructional design process to be more effective increasing the likelihood of success in the project.

1.4 Locate Production Agencies

Production agencies in member countries will have to be contacted to determine their interest in producing the visual materials which are required. This information can probably be collected along with the information on the trainers, the trainees and the usage situation. The information will be used in Step 4.3 when shooting scripts need to be prepared.

2.0 DEFINE CONTENT

The tasks which trainers must perform will be specified and then analyzed. This information will be used to write the

behavioral objectives (2.2). The objectives will be analyzed to determine specific skills and underlying facts, concepts and principles which underlie them (2.3). The assembled material will be reviewed (2.4)

2.1 Specify, Analyze Tasks

A content expert will scrutinize relevant materials on the topic including the current "theory" and practice. The expert will also scrutinize current teaching materials on the topic. In the review and analysis, the project needs (1.1) will guide the selection of the appropriate content. The output of this step will be used to write the objectives (2.2).

2.2 Write the Behavioral Objectives

Behavioral objectives state how the learner will be different (in measurable, observable terms) after instruction. The objectives will be based on the tasks (2.1) and on the characteristics of the trainees (1.2). The objectives will be analyzed (2.3) and will also be used to design the tests (3.2) which will measure learning.

2.3 Analyze the Objectives

Each objective must be analyzed to determine skills, facts, concepts, principles and procedures which must be mastered in order that the behavior specified in the objective can be performed.

Each sub-objective assumes that certain knowledge, skills or attitudes exist before instruction takes place. Based on the description of the trainees (1.2) and the objectives (2.2), all pre-requisite skills must be specified. For instance, a pre-requisite for most modules is an attitude that labour-based road construction can work as well or better than conventional construction. The pre-requisite description will be included in the trainees' guide and the trainer's guide (4.1), so that all parties will clearly understand the pre-requisite skills required.

2.5 Review the Task Descriptions, Objectives and Analysis

The materials will be sent to ESCAP to be reviewed by the staff and then sent to the communications expert. The review will determine whether the needs (1.1) and the trainees (1.2) have been considered. If changes are needed they will be returned to the content expert (2.2). When the material is acceptable, it will be used to design the instruction (3.0).

3.0 DESIGN THE INSTRUCTION

In this step, the information from the content expert will be used to select the teaching strategy (3.1) and the media (3.3); to design the tests (3.2) and to prepare an overall module plan (3.4).

3.1 Select the Teaching Strategy

A teaching strategy dictates how instruction will be sequenced and the format in which it will be presented. Several formats are available. In the command format, information is delivered as it would be in a standard lecture. Information flow is generally one-way. The trainer lectures and the students write notes. The students are told the information. In the inquiry format, problem-solving is encouraged. Lectures and other information sources are used to solve particular problems. In solving the problem, the trainee learns the required content. The selection of a teaching strategy will affect the selection of the appropriate media (3.3).

3.2 Design Tests

The information from Step 2 will be used to design the tests which will indicate that satisfactory performance has been achieved. Tests can be performance tests, paper and pencil measures or attitude scales. Other unobtrusive measures like observation and behavior analysis can also be used.

3.3 Select Media

Information can be communicated using words, illustrations, pictures or sounds. Pictures or illustrations can use motion. Information can be presented using printed sheets, manuals, illustrated books, slides or photographs, overhead transparencies, audio tape and videotape.

The instructional designer will decide which medium or combination of media could achieve the objective most efficiently. The lowest cost medium which can achieve an objective will be selected.

The selection of the medium (media) depends on the content, and teaching strategy (3.2), the trainees (1.2), the trainers and the usage situation (1.3). The preferences, requirements and constraints identified in Step 1 will govern the media selection. Once the media are

selected, work can progress on the preparation of the trainees' and trainer's guides (4.1) and the preparation of script guidelines (4.3).

4.0 PRODUCE THE MODULES

In this step the actual production of the modules, i.e. the writing of the trainer's and trainees' guides (4.1), the preparation of the script guidelines (4.2) and the preparation of shooting scripts (4.3) will take place. This material will be reviewed (4.4) before guides are printed (4.5) or visuals are produced (4.6).

4.1 Write Trainees' and Trainer's Guides

The trainees' guide will be used by each trainee in the course. The trainee should keep the guide after leaving the course. The guide may also contain materials for use in the training course, e.g., planning forms which are completed as part of a planning exercise.

The trainer's guide will contain detailed information on the contents of the module and the procedures required to deliver the instruction. Appropriate references will be made to the trainees' guide and the media scripts.

Both guides will be prepared by the content expert. Once they are complete, they will be reviewed (4.4).

4.2 Write Media Script Guidelines

If media are to be used, script guidelines (details of the audio and visual elements) will be produced. The information in the scripts will be based on Steps 2 and 3. The media script guidelines must be closely related to the trainees' and trainer's guides (4.1). The media script guidelines will be used to prepare shooting scripts (4.3).

4.3 Prepare a Shooting Script

An agency from the participating country will supervise the preparation of a shooting script. This script will contain complete audio and visual information. The communications consultant will assist in this process. The script will be evaluated (4.4) before it is released for production.

4.4 Review the Shooting Script and Guides

The guides and the shooting scripts will be reviewed. The review may include a content review by an expert (or group), and an evaluation at the national level. This review will determine the accuracy of the technical material. Once the materials are acceptable, they will be produced (4.5, 4.6).

4.5 Print Guides

ESCAP will supervise the preparation of a master copy of the guides for the trainees and the trainers.

4.6 Produce Visuals

The visual materials will be produced by the member country. It would be desirable to involve the communications consultant in this activity.

5.0 IMPLEMENT THE TRAINING PROGRAM

In this step, a training workshop will be designed and conducted (5.1). The workshop will be evaluated to determine the need for changes to the materials (5.2). When changes have been made, the materials will be released (5.3).

5.1 Design and Conduct Training Workshop

The training workshop will be conducted in one member country. The workshop will introduce the trainers to the course and will provide guidance on teaching. Instructional materials may have to be designed for this workshop. The investment in materials and effort will depend on how many workshops will be offered.

5.2 Evaluate the Materials

The guides and visual materials will be evaluated during the workshop. The evaluation will locate any potential problems with the materials and provide guidance for modification. If there are problems the guides will be revised (4.1) and/or the visual materials will be modified (4.6). When materials are acceptable, they will be duplicated and released (5.3).

SECTION SIX

IMPLEMENTATION PLAN FOR PRODUCTION OF THE MODULES

6.1 The implementation plan described below is similar in substance to the plan in the report of the technical consultant (TC). In the text below CE refers to the communication expert.

6.1.1 Further analysis of the design situation by questionnaire survey (CE).

Additional information on the trainees, the trainers and the usage situation should be obtained using a questionnaire designed by the CE and administered by ESCAP staff. The results will be summarized and used in the design process by the CE.

6.1.2 Drafting of objectives and technical content of the modules, and specification of pre-requisite learning. (TC)

The tasks in this step are described in detail in Annex 7 of the TC's report. These could be used as part of the terms of reference for the technical consultant.

6.1.3 Review of technical content by ESCAP.

ESCAP should require that the TC produces the drafts of the technical contents in batches. This will enable a continual review process by the CE and ESCAP and speed-up the overall production process.

6.1.4 Preparation of tests of technical content, selection of instructional strategy, selection of media and specification of visual material required (CE).

The CE will design tests based on the objectives and content from the TC. The CE will design an instructional strategy describing what will be taught, how it will be taught, in which order and using which media. The result of this process will be an overall plan for each module, which provides guidelines for the preparation of the trainer's and trainees' guides. The CE will prepare specific guidelines for the visual materials required.

6.1.5 Consultation between CE and TC on integration of trainees' and trainer's guides, and production script guidelines.

It is considered essential that the CE and TC should have a joint consultation on the trainees' and trainer's guides, and production of the visual material script guidelines. An allowance has been made in the associate resource estimates for a nominal travel cost and DSA allowance for one consultant for one week.

6.1.6 Drafting of trainees' and trainer's guides (TC).

The main drafting of the trainees' and trainer's guides should be done in one period. However, arrangements could be made to release materials to ESCAP in batches to speed-up the overall production process.

6.1.7 Drafting of production script guidelines (CE).

This procedure will take place in batches as in 6.1.6.

6.1.8 Review of trainees' and trainer's guide, and shooting script guidelines (CE/ESCAP).

It is preferable that the CE and ESCAP jointly carry out a short review of the final trainees' and trainer's guides, and the shooting script guidelines.

6.1.9 Assignment of visual material production guidelines to member countries for the detailing of shooting scripts (ESCAP).

ESCAP should initiate negotiations on the assignment of visual material production guidelines to member countries as soon as possible. Actual assignment will not be possible until the draft guides and visual material production guidelines are available.

6.1.10. Production of shooting scripts by member countries in consultation with CE.

The time allowed for this activity assumes that production would take place in three member countries and by the ILO. For estimation purposes it is assumed that each individual script requires one month's work.

6.1.11 Printing of draft copies of the trainees' and trainer's guides and reproduction of visual material (ESCAP).

The cost of printing trainees' and trainer's guides, and the reproduction of visual material have not been included in the estimate of resources, since this requires a decision concerning the scale and conditions of distribution by ESCAP. However, in addition to the printing and reproduction costs it is important to allow for the actual costs of distribution.

6.1.12 Meeting to review guides and draft shooting scripts by expert group from member countries and organizations associated with the project such as CRRI, ILO and TRRL.

Ideally, the draft materials should be circulated to the participants well in advance of the meeting. The purpose of the meeting is to finalize all details.

6.1.13 Modification of the guides and shooting scripts as a result of the meeting and production of the visual materials (ESCAP).

Both the guides and the visual materials are likely to require modification as a result of the review meeting. The task is clearly best organized by ESCAP.

6.1.14 Regional Meeting of Trainers

This meeting marks the outcome of the whole project. It would be helpful if both the CE and the TC could attend the meeting to evaluate reactions of participants.

6.2 TIMETABLE OF ACTIVITIES

Figure 2 presents an estimated timetable of activities. Gaps have been left in some of the activities to allow time for postal communications between the various individuals and organizations.

Figure Two

Implementation Plan Timetable for the Production of the Training Modules

STEP NUMBER	ACTION	10	20	30	40	50	60	70
1. Analysis of Design Situation	CE	-						
2. Drafting Technical Content	TC	-						
3. Review Technical Content	ESCAP	-	-					
4. Testing, Instructional Strategy Media, Visual Material Specification.	CE		-	-				
5. Consultations on Guides and Scripts.	CE/TC			-				
6. Drafting Guides.	TC			-				
7. Production Guidelines.	CE			-				
8. Review of Guides and Scripts.	ESCAP/CE			-				
9. Assigning Visual Production to Member Countries.	ESCAP		-	-	-	-	-	-
10. Production of Shooting Scripts.	Member Countries CE				-	-		
11. Printing of Guides and Draft Video Tapes.	ESCAP			-	-	-	-	-
12. Review Meeting with Expert Group.	ESCAP						-	
13. Editing of Guides and Videos and Reproduction.	ESCAP						-	
14. Training Meeting.								-

6.3 RESOURCES

Consultancy resources are indispensable to the production of the proposed training modules if they are to be efficient as teaching materials and to reflect the latest technical developments in the application of labour-based equipment-supported methods of road construction and maintenance. The services of both a communications expert and a technical consultant will be required.

6.4 COMMUNICATIONS EXPERT

The role of the communications expert is to design instruction which will achieve the stated instructional objectives. At the outset, the CE will work closely with the technical consultant to ensure that the information on the units arrives in a form which will facilitate the design of instruction. Once the draft content arrives, the CE will design the actual instruction. The design process will include the preparation of tests of the content, the selection of the instructional strategy and the selection of the media. In addition, the CE will develop an overall plan for each module. This plan will describe how the three elements (trainer's guide, trainees' guide and visual material are to be integrated). The CE will also prepare script guidelines for producers. The CE will then advise producers on the preparation of the shooting script. During production, the CE may be available to assist the producers.

The CE will require a thorough knowledge of the process of instructional design, production and evaluation. He/she also should have some experience in developing countries and should be able to work with content experts to develop instruction. He/she should be able to work with the technical consultant in his/her home location and to travel to the production sites to consult with the producing agencies.

It is estimated that the CE's services will be required for three months. However, the work to be undertaken will have to take place over a span of about ten months. A suitable consultant is likely to cost about \$6,000-7,000 per month. This amount includes the costs of photocopying, communications and postage.

6.5 TECHNICAL CONSULTANT

The TC's main role, as detailed in Annex 7 of the TC's report, is to draft the trainee and trainer guides. This will require an intimate knowledge of both the relevant

literature on, and practice of, local level road construction and maintenance in the ESCAP region. It will also require considerable experience of modern efforts to introduce and improve the efficiency of labour-based, equipment-supported rural road construction and maintenance worldwide. The consultant should be required to demonstrate familiarity with recent work by the ILO, TRRL and World Bank in this field. He must also have a proven background in the training of rural road engineers of all levels.

Efforts to improve the efficiency of labour-based road construction and maintenance methods are comparatively recent so there are relatively few consultants with the necessary experience for such an assignment. It is suggested that the ILO or World Bank be contacted to supply a list of suitable consultants.

It is estimated that the TC's services will be required for a period of three man-months in total for the tasks defined in Annex 7 of the TC's report. A suitably qualified consultant is likely to cost about \$6,000-\$7,000 per month inclusive of an allowance for the significant amount of communications, liaison, photocopying and typing expenses.

6.6 VISUAL MATERIAL PRODUCTION COSTS

The major resource requirement is funds to cover the visual material production costs. At this stage without draft guides or script guidelines, it is only possible to give an estimate of costs. Information on both the time and cost of video production reported at the meeting on February 25-27, 1987 was too imprecise to form a satisfactory basis for estimation.

At the meeting, the CRRRI reported that their modules required two months to produce and that production costs were estimated at \$5,000 for a 20 minute production, inclusive of CRRRI input on content. The ILO reported that their two modules (1.5 hours) are estimated to have cost \$6,000-7,000 exclusive of ILO expert time. The unit produced in the studio on planning cost \$2,000-\$5,000 and took 1.5 months to produce. Video production cost in Thailand was reported to cost \$5,000-6,000 per week.

Because of the imprecision of this data it was decided to use a figure of \$5,000 per module on the assumption of an average of 30 minutes per unit. The cost of each module can be reduced by the use of existing visual materials and a simplification of the production process. Also, a preliminary assessment of the phase 1 modules suggests that not all will require complex video materials. Production cost estimates have been based on 10 video units.

6.7 SUMMARY OF THE IMPLEMENTATION COSTS

The costs detailed below represent one trip by the CE to Britain and one trip to three sites in member countries. Additional travel will entail additional cost. In addition, the estimates below do not cover expenses or consultation fees for steps 6.1.12 or 6.1.14.

		\$
Production of 10 video units		
@ \$5,000 each		50,000
Consultation travel costs and per diem		
for one week		1,500
Travel and per diem costs for CE support to		
production units		
Travel	\$1,800	
Per diem	\$90 x 30 days	4,500

Hire of Communications Expert (3 man-months)		19,500
Hire of Technical Consultant (3 man-months)		19,500
		\$ 95,000
		=====