MINISTRY OF PUBLIC WORKS AND TRANSPORT

MAINSTREAMING APPROPRIATE LOCAL ROAD STANDARDS AND SPECIFICATIONS AND DEVELOPING A STRATEGY FOR THE MPWT RESEARCH CAPACITY

PROGRESS REPORT 10
November 2007

SEACAP 03

UNPUBLISHED PROJECT REPORT

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Prepared for: Project Record: **SEACAP 03. Mainstreaming Appropriate Local Road Standards and Developing a Strategy for the MPWT Research Capacity**

CONTENTS

ABBREVIATIONS & ACRONYMS

ADT	Average Daily Traffic
ASEAN	Association of South East Asian Nations
CBR	California Bearing Ratio
CNCTP	Cambodia National Community of Transport Practitioners
CSIR	Council for Scientific and Industrial Research (South Africa)
DBM	Dry Bound Macadam
DBST	Double Bituminous Surface Treatment
DPWT	Department of Public Works and Transport (Province Level)
DCP	Dynamic Cone Penetrometer
DfID	Department for International Development
DoR	Department of Roads
EADT	Equivalent Average Daily Traffic
EDCs	Economically emerging and Developing Countries
ENS	Engineered Natural Surface
esa	equivalent standard axles
FHWA	Federal Highways Association (US)
FM	Fines Modulus
FWD	Falling Weight Deflectometer
GMSARN	Greater Mekong Sub-region Academic and Research Network
gTKP	global Transport Knowledge Partnership
HDM4	Highway Development and Management Model
HQ	Headquarters
HRD	Human Resource Development
IFG	International Focus Group
IFRTD	International Forum for Rural Transport Development
ILO	International Labour Organisation
IRI	International Roughness Index
Km	kilometre
LCS	Low Cost Surfacing
LRD	Local Roads Division (DoR)
LVRR	Low Volume Rural Road
m	metre(s)
MPWT	Ministry of Public Works and Transport
mm	Millimetre(s)
MERLIN	**M**achine for **E**valuating **R**oughness using **L**ow-cost **IN**strumentation
MPa	Mega pascals

MoU	Memorandum of Understanding
NUOL	National University of Lao
OPWT	Office of Public Works and Transport (District Level)
ORN	Overseas Road Note
PAD	Personnel and Administration Division (MPWT)
PCU	Passenger Car Unit
Pen Mac	Penetration Macadam
PIARC	World Road Association
PTD	Planning and Technical Division (DoR)
QA	Quality Assurance
Ref.	Reference
RRGAP	Rural Road Gravel Assessment Programme (Vietnam)
RRSR	Rural Road Surfacing Research (Vietnam)
RRST	Rural Road Surfacing Trials (Vietnam)
RT1	Rural Transport 1st Project, Vietnam
RT2	Rural Transport 2nd Project, Vietnam
RT3	Rural Transport 3rd Project, Vietnam
SBST	Single Bituminous Surface Treatment
SCC	SEACAP Coordinating Committee
SEACAP	South East Asia Community Access Programme
SIDA	Swedish International Developments Cooperation Agency
SOE	State Owned Enterprise
TRL	Transport Research Laboratory
UK	United Kingdom
UNOPS	United Nations Office for Project Services
VN	Vietnam
VOCs	Vehicle Operating Costs
VPD	Vehicles per day
WBM	Water Bound Macadam
WLC	Whole Life Costs

1 Introduction

1.1 General

The SEACAP 3 project is part of the wider South East Asia Community Access Programme whose strategic theme is 'livelihoods of poor and vulnerable people in South East Asia, improved sustainability'. SEACAP 3 will contribute to this overall objective through the development and mainstreaming of local resource-based standards for low volume rural roads. The project seeks to achieve three key outcomes:

- Mainstream appropriate local road standards and specifications into the national road programme,
- Develop an affordable and sustainable strategy for attaining the necessary road (all road categories) research capacity,
- Increase the awareness of good practice experience from this project by disseminating the outcomes at the national, sub-regional and international levels.

This report outlines the work undertaken on the SEACAP 3 project during November 2007; presents a summary of staff resources used and outlines the anticipated programme for the coming month.

1.2 Contractual Arrangements

The Agreement for the project to be undertaken was established under a Memorandum of Understanding (MoU) between the then Ministry of Public Works and Transport (MPWT) on behalf of the Government of Lao PDR and the Department for International Development (DfID), UK. The MoU defines the scope of the project, that it will be undertaken by TRL Limited as the Consultant and implemented under Terms of Reference, and that the Consultant will be appointed by DfID. The MoU also expresses certain Exemptions and Facilities to be provided by MPWT to the Consultant to facilitate implementation of the project. The MoU was signed on the 16th October 2006.

Thereafter, TRL provided a comprehensive technical proposal and a financial proposal for carrying out the project to DfID and subsequently entered into a contractual arrangement with DfID. TRL were appointed on 21st November 2006. The duration of the project is 12 calendar months.

TRL is supported in its undertaking of the project by associate firms and by competent and experienced individual consultants. The principal associate firm is Lao Transport Engineering Consultants (LTEC) who are providing comprehensive local consulting services.

TRL have entered into a contractual agreement with LTEC to provide a total of 68 person months of services over the duration of the project. Forty-Four (44) person months are for engineering and translation services and 24 person months are for administrative, secretarial and coordination services.

The other associate firm is Intech Associates consulting engineers who have worked extensively with TRL on other SEACAP projects in the region. Intech will provide a short-term specialist role on this project similar to that to be provided by the individual consultants.

2 Work Undertaken

2.1 General

The following sections summarise the work undertaken on SEACAP 3 during November 2007. Principal focus was on Task Group 1 and Task Group 2, although progress was also recorded on the other two Task Groups. The Progress on individual Modules within the Project Task Groups is summarised in Table 1. Project meetings are summarised in Table 2.

2.2 Task Group 1: Standards and Specifications

Work was centred on the final preparation of the key Standards and Specifications documents; for discussion at the Standards and Specifications Review Workshop on 16th November. The documents discussed at this workshop were

Document 1(Draft), Classification and Geometric Standards

Document 2 (Draft): Technical Specifications –technical specifications for an initial short list of pavement options and an associated matrix of standard designs.

Document 3 (Outline): Guidelines – containing advice on the application of Documents 1 and 2 within a Lao PDR Environmentally Optimised Design (EOD) Strategy

The documents had also been reviewed and discussed in detail at an LRD working group session on 13th November. Outcomes from both these events were positive and the resulting comments and suggestions will contribute significantly to the final technical quality of the documents. The main workshop was based around open discussion on identified key issues for each of the three Documents.

Summaries of these issues raised at both these meetings are included in Appendix A to this report.

Following the main workshop the principal focus in this Task Group was on reviewing the received comments and beginning the preparation of the final documents.

2.3 Task Group 2: Training

The main focus in the Task Group was in the preparation for the Pilot Training Course (PTC) which took place from 27th-30th November. Details of the PTC are included in full report that is being drafted (Technical Report No. 4).

The preparations for the PTC were carried out by the SEACAP 3 Project Team guided by the Task Leader Mr Simon Done, with local coordination being managed by Local Team Leader Bounta Meksavanh. Close collaboration was maintained with the SEACAP Coordination Committee and the LRD, whose invaluable support is gratefully acknowledged.

2.4 Task Groups 3 and 4 Research Capacity and Dissemination

A SEACAP 3 team took part in the SEACAP 17 Knowledge Exchange Workshop in Bokeo on 6th and 7th November and two presentations were made:

1. Appropriate Low Volume Rural Road Standards and Specifications, by Dr J R Cook
2. Low Cost Structures, by Rob Petts

Table 1 Summary of Module Progress

No.	Module Description	Completed	Programme	Activity in November 2007
Task Group I: Develop Standards and Specifications				
1	Review current situation	95%	100%	No activity this month
2	Research to fill knowledge gaps	100%	100%	No activity this month
3	Draft technical standards	100%	100%	Finalisation of drafts.
4	Finalise technical standards	25%	50%	Finalisation commenced
Task Group II: Develop a Relevant Training Programme				
5	Training needs assessment	100%	100%	No activity this month
6	Training programme elaborated	100%	100%	Completion of training materials
7	Training course tested and trialled	75%	90%	Preparations for pilot course. Course rescheduled
Task Group III: Develop an Appropriate Research Capability:				
8	Gaps in research capacity identified	100%	100%	No activity this month
9	Strategy for strengthening research capacity	100%	100%	Technical paper issued
10	Adoption of strategy by MPWT	80%	90%	Ongoing discussions with DoR and NUOL
Task Group IV: Initiate Dissemination				
11	Materials for Dissemination	70%	80%	Website content

Table 2: Key Meetings, October

Date	Organisation	Key Personnel	Comment
6/11	SEACAP 17	Delegates at Knowledge Exchange Workshop	Presentations on SEACAP 17 work
7/11	SEACAP 17	Delegates at Knowledge Exchange Workshop	Field trip an presentations
9/11	LRD	Sengdarith Kattignasack (Director, LRD)	Introduction of Rob Petts and discussion on Standards Workshop preparations
13/11	LRD Working Group	Sengdarith Kattignasack (Director, LRD)	Group discussions on Standards and Specification documents
16/11	LRD	Laokham Somphet and members of the Coordinating Committee	Workshop on Standards and Specification documents

3 Staff Resources

A summary of the SEACAP 3 staff resources utilised in November 2007 is presented in the following Table 3.

4 Programme and Status

The SEACAP 3 programme is included as Appendix B to this report, together with a manning schedule for the remaining months of the programme.

Table 1 indicates that the project progress is generally satisfactory, although the drafting of the Standards and Specifications utilised more resources than envisaged. The programme has been adjusted to accommodate some delay in this task.

In the upcoming final months of the project the emphasis will be o producing final versions of thr Project Documents and Technical Reports.

Table 4: Staff Resources October s

Name	Position	Project Time : November
Dr Jasper Cook (TRL)	Team Leader Geotechnical Specialist	2nd-19th November
Michael O'Connell (TRL)	Transport and Road Engineering Specialist and Deputy Team Leader	1st – 30th November
Simon Done (TRL)	Training Specialist	19th-30th November
Rob Petts	Panel Reviewer	3rd-17th November
Bounta Meksavanh (LTEC)	Local Team Leader and Road Engineer Specialist	1st- 30th November
Saysongkham Manodham (LTEC)	Road Engineering Specialist	1st- 30th November
Somphit B (LTEC)	Training Support	1st- 30th November
Mr. Keithiphan Senamahmountry (LTEC)	IT Support	1st- 30th November
Mr. Bounhom K. (LTEC)	Translator	1st- 30th November
Ms Chanthida Ph (LTEC)	Office Management	1st- 30th November
Mr. Thipdavanh V. (LTEC)	Project Coordinator	1st- 30th November

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APPENDIX A

Workshop Summaries

MAINSTREAMING APPROPRIATE LOCAL ROAD STANDARDS AND SPECIFICATIONS AND DEVELOPING A STRATEGY FOR THE MPWT RESEARCH CAPACITY

Appendix A1

LRD Working Group Meeting on LVRR Standards and Specifications
13th November 2007

Lao Low Volume Rural Road Standards and Specifications – SEACAP 3

Informal Discussion and Comments on 3 Presented Documents

Document 1

- Page 1 para 4, Elaborate deterioration mechanisms – caused by traffic/climate/physical environment/construction quality/maintenance
- Needs to be aimed at level of understanding of district engineers
- Assistance with Whole Life Asset costing – not in contract but will put something in Volume 3.
- Spot improvements and EOD concepts to included .
- Will be some rationalisation – moving some material to document 3
- Safety issues to be further considered
- Upper limits defined by axles and traffic 150 VPD, max axle 4.5 t axle. + width
- Design Kolao and Gaz 66 vehicles, Isuzu also becoming more common
- Consideration of traffic (and speed), non-motorised traffic and pedestrians
- ***Request executive summary (LRD)***
- Comment - Good document (LRD)
- ***Speed issue*** – discussion – could put in 50kph column in Table 4.2
- ***Gradient issue to be further investigated and qualifications to be suggested***
- Explain issues for the design engineer in Document 3
- Limitation of gravel surface to long grade of 6%
- Concrete crossfall 1-2%
- Footnote required on Table 4.3 – referring to " Road Design Manual " 1996
- Prevent wide trucks - ***Consider restriction posts recommendations***
- Road environment and slope protection issues planned to be covered in Document 3. Waiting for inputs from SEACAP 21
- Local materials application for drainage and slope protection – structures manual
- Right of way issues – Lao law issues – ***document 3 to comment on***

Document 2

- Draft specs to be issued (in Annex)
- 4 types of gravel from capping to road base
- Typical Lao gravels 40 – 50 CBR common. Try to reserve high quality gravel for roadbase application
- From available low tyre pressures allow relaxation of materials requirements
- 30 – 40 psi tyre pressures on the sort of vehicles we are considering, not the 75 – 100 of heavy trucks
- A further combination of subgrade groupings may be possible
- Surface / pavement options outlined
- **Assumptions on Maintenance** to be included in document 3
- Surface selection guidelines to be in document 3
- **Executive summary required for Documents 2 and 3**
- **Structures and drainage issues to be outlined**
- Whole life costing outline guidance only
- Must be user friendly for District Engineers – feedback required from LRD
- **Guidance on how the designer should use the various manuals available.**

Appendix A2

Standards and Specifications Workshop 16th November

Summary

MAINSTREAMING APPROPRIATE LOCAL ROAD STANDARDS AND SPECIFICATIONS AND DEVELOPING A STRATEGY FOR THE MPWT RESEARCH CAPACITY

SEACAP 3

Workshop on LVRR Standards and Specifications
16th November 2007

Outline Agenda

0830-0845:	Registration – Coffee
0845-0900	Welcome and Aims of Workshop (Mr Laokham- Chairman)
0900-0915:	Introduction to the Standards and Specification Programme (Dr J R Cook)
0915-1000:	Discussion on Document 1: Classification and Geometric Classification Facilitator: Mr Sengdarith:
1000-1015	Coffee
1015-1115	Discussion on Document 2: Technical Specifications and Pavement Options Facilitator: Mr Sengdarith
1115-1145:	Discussion on Document 3: Application of LVRR Standards and Specifications Facilitator: Mr Sengdarith
1145-1200	Presentation on the Low Cost Structures Manual (Mr Rob Petts)
1200-1215:	Completion Programme and Way Forward (Mr Sengdarith)
1215-1225	Closing Remarks

The workshop was based around open discussion sessions on the 3 key Documents which were introduced by Dr J R Cook with facilitation by Mr Sengdarith. A number of key issues for each documents were highlighted for discussion by Dr Cook and there listed below.

Key Issues Discussed During Discussions

Key Issues Raised by Delegates	**Comments by TRL-LTEC**
LVRR traffic definition: AADT of 150 may be too high compared to existing main road flows.	This is an upper limit and takes into account likely increases over a 12-year period. TRL experience indicates the difficulties in traffic forecasting for this period
Road widths: Need to explain some aspects, eg shoulders.	1.0m to 1.5m shoulders are recommended in addition to carriageway. Width restrictions are an important element in discouraging heavy or large vehicles.
Maximum gradient: 10% is too restrictive.	The maximum gradient will be increased to 15%, with some restrictions on length of steep gradients.
Design speed: Some delegates queried this as being too low and likely itself to cause a hazard. Others agreed that 40 kph was sensible on safety grounds and that adequate signing was an issue.	The TRL-LTEC team had some concerns on this issue and would undertake some further research. The 40kph limit was based on World Bank recommendations in basic access mixed traffic conditions. An increase to 50-60kph may be considered.
Limitations on gravel: General agreement – with RW pointing out that the ADB projects have a limit of 5% gradient for gravel	The limitations on gravel were based on SEACAP research in other counties in the region.
Cost Implications: There was concern (BH) that the cost of complying with the proposed LVRR Standards would be too high for basic access budgets.	TRL-LTEC agreed that there is inevitably a cost implication for building appropriate roads but that looked at in whole life terms the cost of building sustainable roads is justifiable. The use of Spot Improvement and the narrower 2.5 m carriageway should also be borne in mind.
Relaxation of Standards: In some cases, for example in difficult mountainous terrain, it may be difficult and costly to construct roads to the proposed Standards	The LVRR geometry is a proposed Standard and is not a definitive design – road designers in agreement with the LRD may opt to relax the standards in special cases.
Use of Capping Layer: This is a normal and acceptable approach with various terminologies used (improved earthwork; improved sub-grade etc).	A capping layer means the use of cheaper more readily available materials and less need for more expensive higher quality base materials which may not be readily available.
Pavement Layer Thicknesses: Queries were raised concerning the pavement layer thicknesses which appeared thinner than normally use in Lao	The pavement layer thicknesses were based on the use of light axle loads (<4.5T) and the use of a capping layer. Based on standard calculations this allowed thickness (and cost) reduction

Gravel Wearing Course; The proposed thicknesses (200mm) appeared less than used on current projects.	A wearing course is by definition a surface that wastes over time and the initial design thickness should take likely maintenance into account. Individual road designs may increase the initial design thickness if it is considered that re-gravelling is unlikely within a reasonable period.
User friendly documents: The delegates clearly expressed a need for the standards and specification documents to be user-friendly and capable of being understood by district engineers	The documents would be finally drafted in a clear manner. The two primary technical documents would be short and concise and would be accompanied by a third guideline document containing a step-by-step flow chart.
University Training: There was need for cooperation with the NUOL so that the Rural Engineering Course could be updated to take into account the SEACAP outputs	Close cooperation would be maintained with the NUOL with respect to integrating the LVRR Standards into the Rural Engineering Modules which would be starting shortly.
District training: Doubts were expressed by some delegates at the current capacity of the districts to undertake road design based on the LVRR documents and that capacity needs to be built up in this regard.	TRL-LTEC agreed that there was a need for a programme of mainstreaming, explanation and training. The proposed Pilot Training Course was a first step in this process. Longer term training programmes should include site supervisors and contractors.
Method specifications: Delegates were split in their opinions on the suitability of using method specifications for LVRR construction.	TRL-LTEC are favour of considering some form of method specification for LVRR road construction – although they acknowledged the concerns regarding the implications of material and plant variability.
Laboratory testing: Delegates raised the question of encouraging contractors to setup materials testing facilities as part of their LVRR contracts.	Experience indicated that most LVRR contractors would not have the capacity to set up their own laboratories and that most materials testing would have to done in provincial laboratories. There were issues of Quality assurance to be considered in using local laboratories
Spot Improvements; Delegates generally agreed on the potential usefulness of a Spot Improvement strategy.	Spot Improvements was potentially a very useful tool for the development of the Lao rural infrastructure. However it had to be emphasised that Spot Improvements had to be clearly differentiated from periodic or emergency maintenance. Spot Improvements had to comply with LVRR Standards and Specifications
Pilot Training Course: Delegates agreed that the material in the draft LVRR documents was suitable for the proposed Pilot training Course	The Pilot Training Course materials were being finalised based on the LVRR document. The course would take place Later this month (November)

SEACAP 03 LVRR Standards and Specifications Workshop 16th November 2007
Key Discussion Topics Document 1

	Issue	Agree	Disagree	No Opinion
1	The use of 4.5 tonne axle load and an AADT of 150 as an upper limit for LVRR	5	1	
2	Control on axle limits and large vehicles achievable	5	1	
3	The alternative 2.5 or 3.5m carriageway widths are suitable	6		
4	Variation of shoulder width depending on traffic mix is suitable	6		
5	Safety is an issue that we should be more concerned with?	6		
6	Is a design speed limit of 40km/h appropriate	5	1	
7	Limitations on gravel above 6% gradient	5	1	
8	General limitation on gradient of 10% - with 15% in special cases	6		
9	Horizontal and vertical geometry	6		
General Comments				
Name				

Key Discussion Topics **Document 2**

	Issue	**Agree**	**Disagree**	**No Opinion**
1	Guiding Principle 1: Reduction in pavement thickness	4	1	1
2	Guiding Principle 2: Allow variation in material quality	6		
3	Guiding Principle 3: Use of capping layer material	5		1
4	Initial pavement types	5		1
5	Pavement types and thicknesses (Table 4)	5	1	
6	Traffic groups and traffic assessment is appropriate at district level	6		
7	Pavement and surfacing matrix	5	1	
8	Unsealed gravel design	5	1	
9	Flexible sealed option design	6		
10	Concrete option design	5	1	
11	Format and general content of draft pavement specifications	6		
12	Method specification is better suited to LVRR construction than target specification	5	1	
13	Laboratory control on materials is realistically achievable	5	1	
14	The use of bitumen emulsion seals should be investigated for Lao	6		
15	Additional options should be investigated – cement stabilisation, clay brick, cobblestone	6		
General Comments				
Name				

Key Discussion Topics **Document 3**

	Issue	**Agree**	**Disagree**	**No Opinion**
1	The flow-chart approach is appropriate for pavement selection and design	6		
2	The flow chart is suitability for use by district engineers	4	1	1
3	The EOD principle is appropriate for Lao LVRRs	4	1	1
4	Spot Improvements and Variable Longitudinal Design concept is appropriate for Lao LVRR	5	1	
5	Whole Life Asset Costing guidance is useful for district engineers	6	1	
6	Maintenance issues should be an integral part of the pavement selection design process	6		
7	Construction issues should be included in the documentation	6		
8	Environmental issues should be part of the documentation	6		
9	The use of separate stand-alone appendices is useful	6		
General Comments				
Name				

Standards and Specifications Workshop 16th November

Additional Comments: Document 1

1. The LVRR designs can involve other ministries and organisations and they should be involved in the training programme.
2. Recommendations are needed for the situation when gradient is >6%.
3. An AADT of 150 vpd is high for rural roads. Initial traffic during design of NR7 rural component was around 100 vpd. Suggest a basic access of around 50 vpd is more normal.
4. Loading on a passable road would possibly be above 4.5 Tonne. Current designs for all roads are at 9.1 Tonne.
5. Low design speeds could introduce hazard onto roads- 60 kph is suggested.
6. For ADB9 and ADB 10- gradients > 5% SBST and >10% DBST.
7. The horizontal and vertical geometry would be difficult to work with in mountainous terrain.
8. The use of a 4.5 Tonne axle load is OK, but a survey needs to done prior to application.
9. Appropriate measure need to be in place to prevent overloaded vehicles form using LVRRs.
10. Passing bays need to be considered
11. Health aspects as well as safety aspects need to be considered.
12. A design speed limit of 40kph is appropriate but super elevation needs to be considered.

Additional Comments: Document 2

1. A user-friendly guideline is appropriate to enable local engineers to apply the new standards and specifications.
2. Some options may be too expensive for basic access budgets.
3. Emulsion seals and other new options should be used where applicable.
4. The proposed thicknesses of the gravel wearing course should be increased.
5. Gravel grade III with CBR >80% is normally crushed stone.
6. Stabilised soils is probably a better option than non-reinforced concrete.

7. Construction specifications should be performance based rather than Method Specification as the latter can lead to poor quality.

Additional Comments: Document 3

1. District engineers would need large amounts of training in order to use the proposed flow chart.

2. Vehicle operating costs need to be researched.

3. A Spot Improvement strategy is appropriate and should be considered first before applying a homogenous pavement structure.

4. There is a need to recommend Appropriate Technology for LVRR construction and maintenance; ranging from equipment based through labour based with equipments support to labour intensive.

5. It is doubtful if district engineers currently have the capacity to deal with the proposed flow chart.

6. Spot Improvement has been used but generally becomes total improvement VLD, but seen as a viable concept.

7. District engineers do not have control of construction budget.

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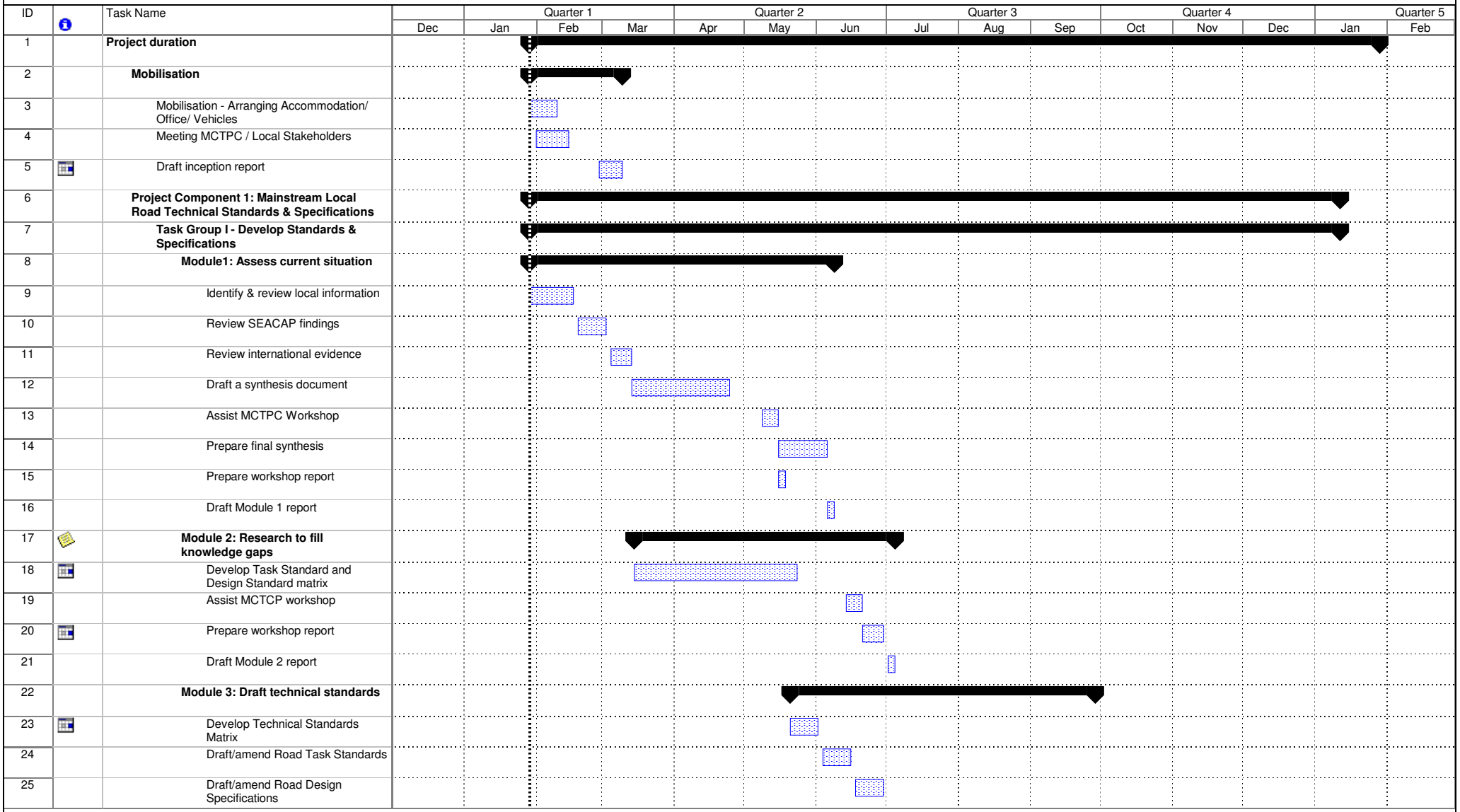
APPENDIX B

Programme

		Dec	Jan
J Cook	Team Leader		
M O'Connell	Deputy Team Leader		
S Done	Training Specialist		
R C Petts	Quality Review		
Bounta Meksavanh	Local Team Leader		
Saysongkham Manodham	Road Engineer		
Somphit B	Training		
Keithiphan S	IT Engineer		
Bounhom K.	Translation		
Chanthida Ph	Office Manager		
Thipdavanh V.	Project Coordinator		

SEACAP - 3

Mainstreaming appropriate local road standards and specifications & developing strategy for MCTPC research capacity



Project: SEACAP 03 - Lao PDR

Task	Summary	Rolled Up Progress	Project Summary
Progress	Rolled Up Task	Split	Group By Summary
Milestone	Rolled Up Milestone	External Tasks	

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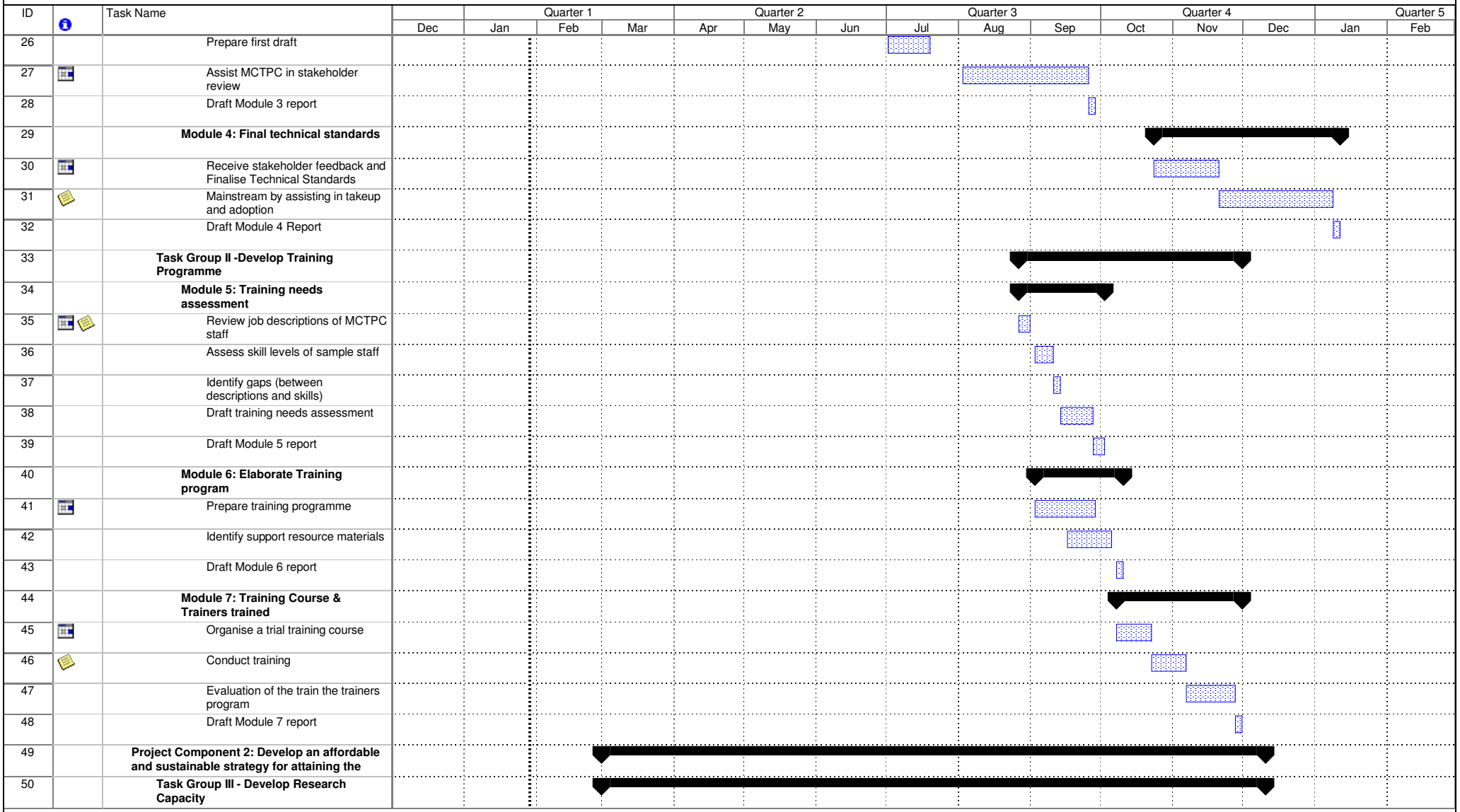
Mainstreaming appropriate local road standards and specifications & developing strategy for MCTPC research capacity



Project: SEACAP 03 - Lao PDR

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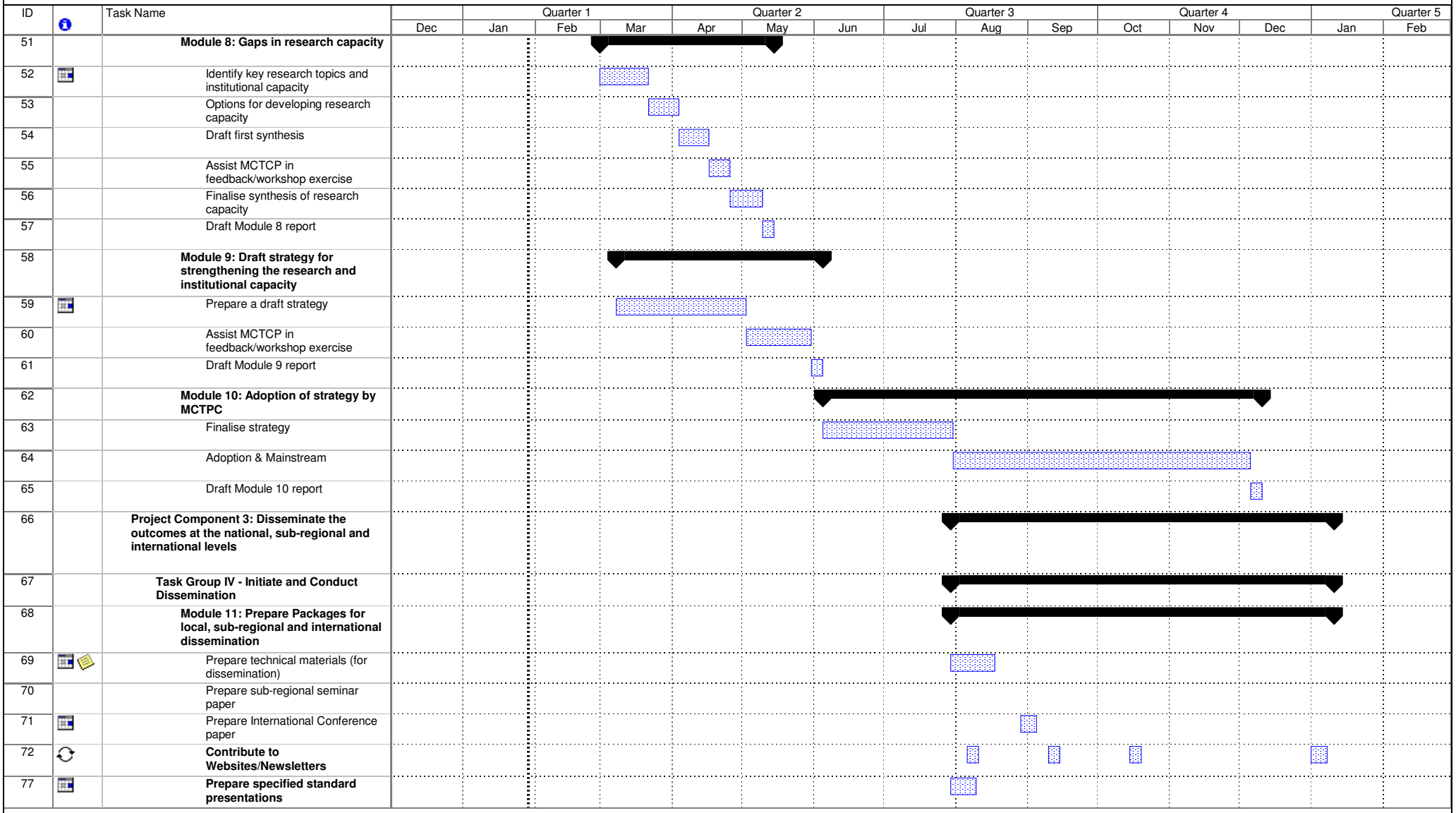
SEACAP - 3

Mainstreaming appropriate local road standards and specifications & developing strategy for MCTPC research capacity



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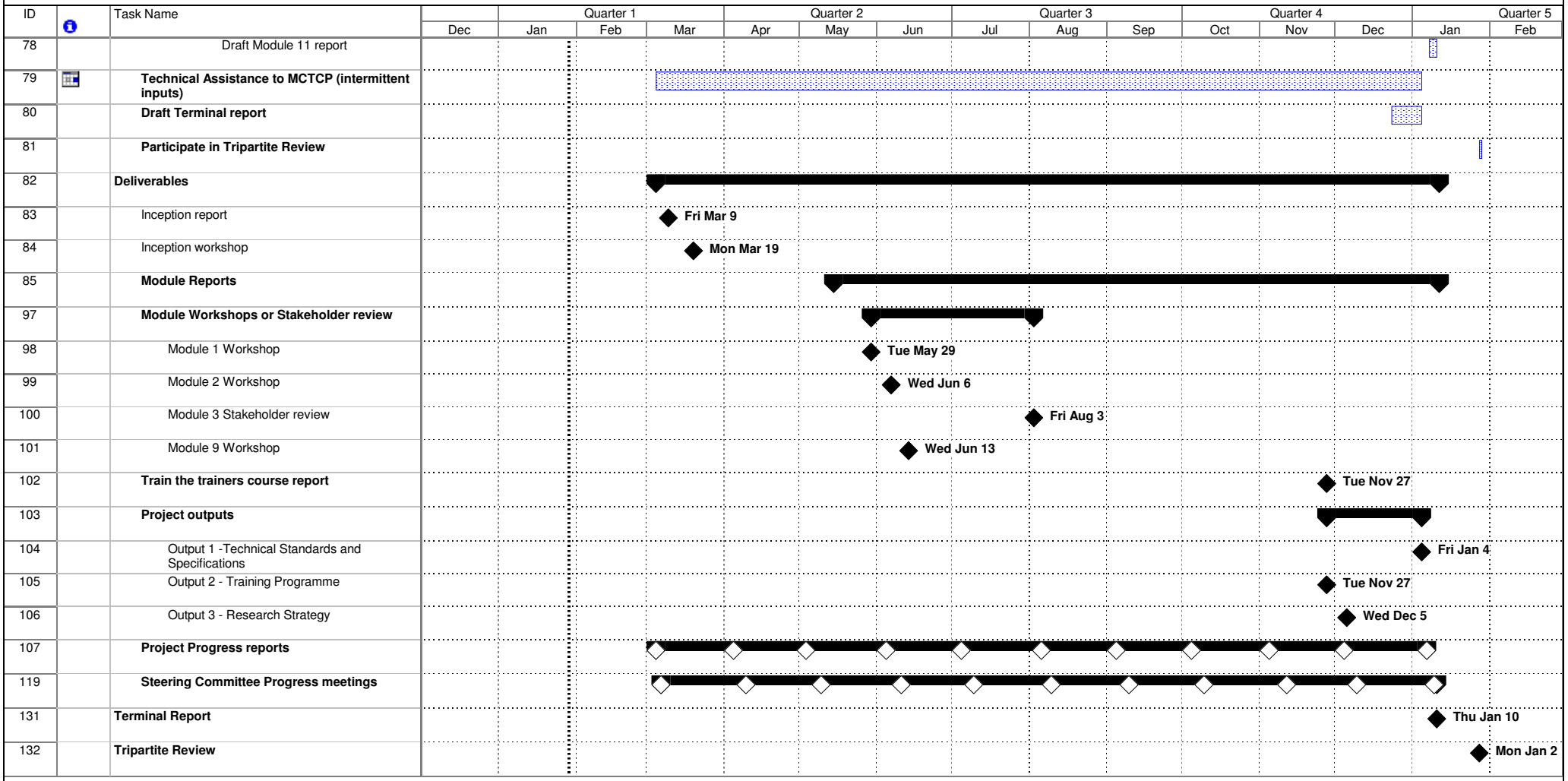
SEACAP - 3

Mainstreaming appropriate local road standards and specifications & developing strategy for MCTPC research capacity



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