SEACAP 27

MID TERM PAVEMENT CONDITION MONITORING OF THE RURAL ROAD SURFACES

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THE SEACAP 27 - BACKGROUND

- The Seacap 27 project is being carried out by primarily by TRL Ltd as the Lead Consultants working in association with OtB Engineering (International) Ltd and TEDI. In additional formal sub-contracts have been signed with the University of Transport and Communication (Hanoi) and ITST.
- This is part of the wider South East Asia Community Access Programme (SEACAP) that funded by DFID.
- It's concerned with the essential continuation of the RRST programmes into the vital phases of long term condition monitoring, analysis and research mainstreaming.
- The sustainable application of all the previous phases of trial road costing, design, construction and short term monitoring is dependant on a successful completion of this project and the continuation of the RRSR programme.

Project objectives

OVERALL PROGRAMME OBJECTIVE

- Demonstrate the suitability of a range rural road pavement options within the constraints of the Vietnam road environment.
- Identify the deterioration characteristics of the pavement options in order to establish their Whole Life Costs and also to define the limits of their appropriate usage.

OBJECTIVES

- An updated and more user-friendly RRSR database
- Form links between the completed short term monitoring and future longer term monitoring
- An updated RRST cost model
- An updated rural road pavement selection procedure
- Manual and handover training material associated with items above
- Define an institutional home for the RRSR database and research
- A comprehensive final report
- Key documents posted on relevant website.

Technical background

THE RRST TRIAL ROADS

- The rural road surfacing trial phase 1 (RRST-I)
- The rural road surfacing trial phase 2 (RRST-II)
- Triall road lengths were designated either as Trial sections, Control sections or Training sections
- The total lengths of trials roads constructed were, for RRST-I: 5.89km and RRST-II: 121.09km
- A total of 12.67km are included in the monitoring programme with section lengths of between 100m and 200m.
- Sections were selected for ongoing performance monitoring included all trial and control sections of RRST-I and 78 trial and control sections of RRST-II.

THE RRST TRIAL ROADS

Province	Constructed Roads (No.)	Monitored Roads (No.)	Monitoring section (No.)
RRST-I			
Hue	1	1	7
Tien Giang	1	1	8
Dong Thap	1	1	9
Da Nang	1	1	5
RRST-II			
Tuyen Quang	5	2	7
Ha Tinh	6	3	10
Quang Binh	3	2	8
Ninh Binh	10	4	13
Hung Yen	5	4	11
Gia Lai	5	2	9
Dak Nong	1	1	11
Dak Lak	3	3	9

RRST-TRIALS MONITORING TO DATE

	Trail Roads Completed	Monitoring					
		I (As Built)	II	III	IV	V	VI
	May 2005	June 2005	February 2006	July 2006	March 2007	January 2008	June 2008
	May 2005	July 2005	January 2006	July 2006	March 2007	January 2008	June 2008
	July 2005	July 2005	January 2006	July 2006	March 2007	January 2008	June 2008
Da Nang	June 2006	July 2005	March 2007	January 2008	June 2008		
Tuyen Quang	May 2006	July 2006	February 2007	December 2007	May 2008		
Ha Tinh	June 2006	July 2006	March 2007	January 2008	June 2008		
Quang Binh	June 2007	July 2006	March 2007	January 2008	June 2008		
Ninh Binh	May 2006	July 2006	March 2007	December 2007	May 2008		
Hung Yen	June 2006	July 2006	March 2007	December 2007	May 2008		
Gia Lai	June 2006	July 2006	March 2007	January 2008	June 2008		
Dak Lak	June 2006	July 2006	March 2007	January 2008	June 2008		
Dak Nong	June 2006	July 2006	March 2007	January 2008	June 2008		

THE RRSR DATABASE

- The RRSR database contains the data files assembled from:
  1. RRST-I trials – SEACAP 1
  2. RRST-II trials - SEACAP 1
  3. RRGAP road condition survey – SEACAP 4
- Data from programmes 1 and 3 were collected and assessed under the direct management of Intech-TRL.
- Data from programme 2 were collected and collated by ITST under a direct contract with SEACAP for which Intech-TRL had only an overall planning and management role

SEACAP 27 activities and progress

MAIN ACTIVITIES

- Formalisation of associations and development of project relationships
- Interim monitoring
- Data management

DEVELOPMENT OF PROJECT RELATIONSHIPS

- TRL and its associates have been able to quickly re-established links with the MoT, the RRST Steering Committee, the Provincial authorities and other key stakeholders such as World Bank.
- Working relationships were also development with the formal and informal project associates.
- Base on the Steering Committee's recommendation the Vietnam Road Authority (VRA) has been identified as the most appropriate agency to be the home institutional of the RRST data.

INTERIM MONITORING

The first phase of interim monitoring was undertaken by SEACAP 27 Team during December 2007 and January 2008. The second phase was undertaken during May 2008 and June 2008.

Key points to note with respect to the completion of this survey are:

- PDoT staff involvement in the condition data collection procures was fully supported by the project.
- Data collection procedures followed the recommendation in the SEACAP 1 guidelines
- Two times of 3-day traffic counts were completed on each of the monitored trial roads in all 12 RRST participating provinces.

DATA MANAGEMENT

- Input of recovered survey information
- Continue to upgrade the Database
- Identification of data analysis and presentation procedure

Input of recovered survey information

All the field data from the first and the second SEACAP 27 surveys have been entered into the RRSR database. This has included the processing of raw DCP and leveling data and transfer into spreadsheets

Continue to upgrade the Database

- A review of the database structure has been done and the second SEACAP 27 surveys data has been upgraded
- The traffic and surface roughness data have been converted from EXCEL spreadsheet format into the main ACCESS database thus allowing more efficient data manipulation

Data analysis procedure

Two basic indexes have been established for assessment of road damage level are Damage Extent Index (DEI) and road Damage Condition Index.

- The DCI: shows the level of damage on each trial section for a selected set of feature such as rust, cracks, potholes, brick condition etc (This features vary with pavement type).
- The DEI shows the percentage of the trial road sections that show any damage in the selected set of features.

Data analysis procedure and presentation

RRST Pavement Condition Monitoring
Concrete Pavement Condition Assessment

Form C1.1

Section: DaN2

Inspector: Nguyen Son Ha

Road: Binh Ky - Khue Dong

Form:

Date: 10/1/2008

Start Point:

				Left Hand												Right hand													
				Carriageway								Shoulder				Carriageway								Shldr					
				Cracks												Cracks													
	Chain	Block	Joint Condition	Type	Intensity	Position	Width	Extent	Surface	Potholes	Edge	Cracks	Erosion	Run-off	Drain	Type	Intensity	Position	Width	Extent	Surface	Potholes	Edge	Cracks	Erosion	Run-off	Drain	Photo	Comment
	0	1	4	3	1	3	3	1	1	0	1	0	5	1	0	3	1	3	3	1	1	0	1	0	5	3	0		
	5	2	4	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	5	3	0		
	10	3	4	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	5	3	0		
	15	4	3	0	0	0	0	0	1	0	1	0	3	1	0	0	0	0	0	0	1	0	1	0	5	3	0		
	20	5	4	0	0	0	0	0	1	0	1	0	2	3	0	0	0	0	0	0	1	0	1	0	5	3	0		
	25	6	3	0	0	0	0	0	1	0	1	0	2	3	0	0	0	0	0	0	1	0	1	0	4	3	0		
	30	7	3	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	4	3	0		
	35	8	4	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	3	3	0		
	40	9	3	0	0	0	0	0	1	0	1	0	4	3	0	0	0	0	0	0	1	0	1	0	3	3	0		
	45	10	4	0	0	0	0	0	1	0	1	0	3	3	0	0	0	0	0	0	1	0	1	0	0	3	0		
	50	11	3	0	0	0	0	0	3	0	1	0	5	3	0	0	0	0	0	0	3	0	1	0	2	3	0		
	55	12	4	0	0	0	0	0	1	0	1	0	4	3	0	0	0	0	0	0	1	0	1	0	2	3	0		
	60	13	2	0	0	0	0	0	1	0	1	0	3	3	0	0	0	0	0	0	1	0	1	0	2	3	0		
	65	14	3	0	0	0	0	0	1	0	1	0	3	3	0	0	0	0	0	0	1	0	1	0	2	3	0		
	70	15	3	0	0	0	0	0	1	0	1	0	2	3	0	0	0	0	0	0	1	0	1	0	3	3	0		
	75	16	1	0	0	0	0	0	1	0	1	0	2	3	0	0	0	0	0	0	1	0	1	0	3	3	0		
	80	17	3	0	0	0	0	0	1	0	1	0	2	3	0	0	0	0	0	0	1	0	1	0	3	3	0		
	85	18	3	0	0	0	0	0	1	0	1	0	2	3	0	0	0	0	0	0	1	0	1	0	2	3	0		
	90	19	3	0	0	0	0	0	1	0	1	0	2	3	0	0	0	0	0	0	1	0	1	0	2	3	0		
	95	20	2	0	0	0	0	0	1	0	1	0	3	3	0	0	0	0	0	0	1	0	1	0	2	3	0		
	100	21	3	0	0	0	0	0	1	0	1	0	2	3	0	0	0	0	0	0	1	0	1	0	2	3	0		
	105	22	5	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	2	3	0		
	110	23	5	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	2	3	0		
	115	24	5	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	2	3	0		
	120	25	5	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	2	3	0		
	125	26	5	3	2	1	3	2	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	3	3	0		
	130	27	5	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	2	3	0		
	135	28	5	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	3	3	0		
	140	29	5	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	3	3	0		
	145	30	5	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	3	3	0		
	150	31	5	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	3	3	0		
	155	32	5	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	4	3	0		
	160	33	5	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	4	3	0		
	165	34	5	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	4	3	0		
	170	35	5	0	0	0	0	0	1	0	1	0	5	3	0	0	0	0	0	0	1	0	1	0	4	3	0		
	175																												
Total			136					3	37	0										1	37	0						78	
Adjust			1					0	1	0										0	1	0							
Norm			101					3	2	0										1	2	0						8	RCI
Max			4					3	2	3										3	2	3							
Total			140					105	70	105										105	70	105						560	RCI_{max}
DEI								2	1	0										1	1	0						5	Damaged blocks
			72.14	%																								3.33	%

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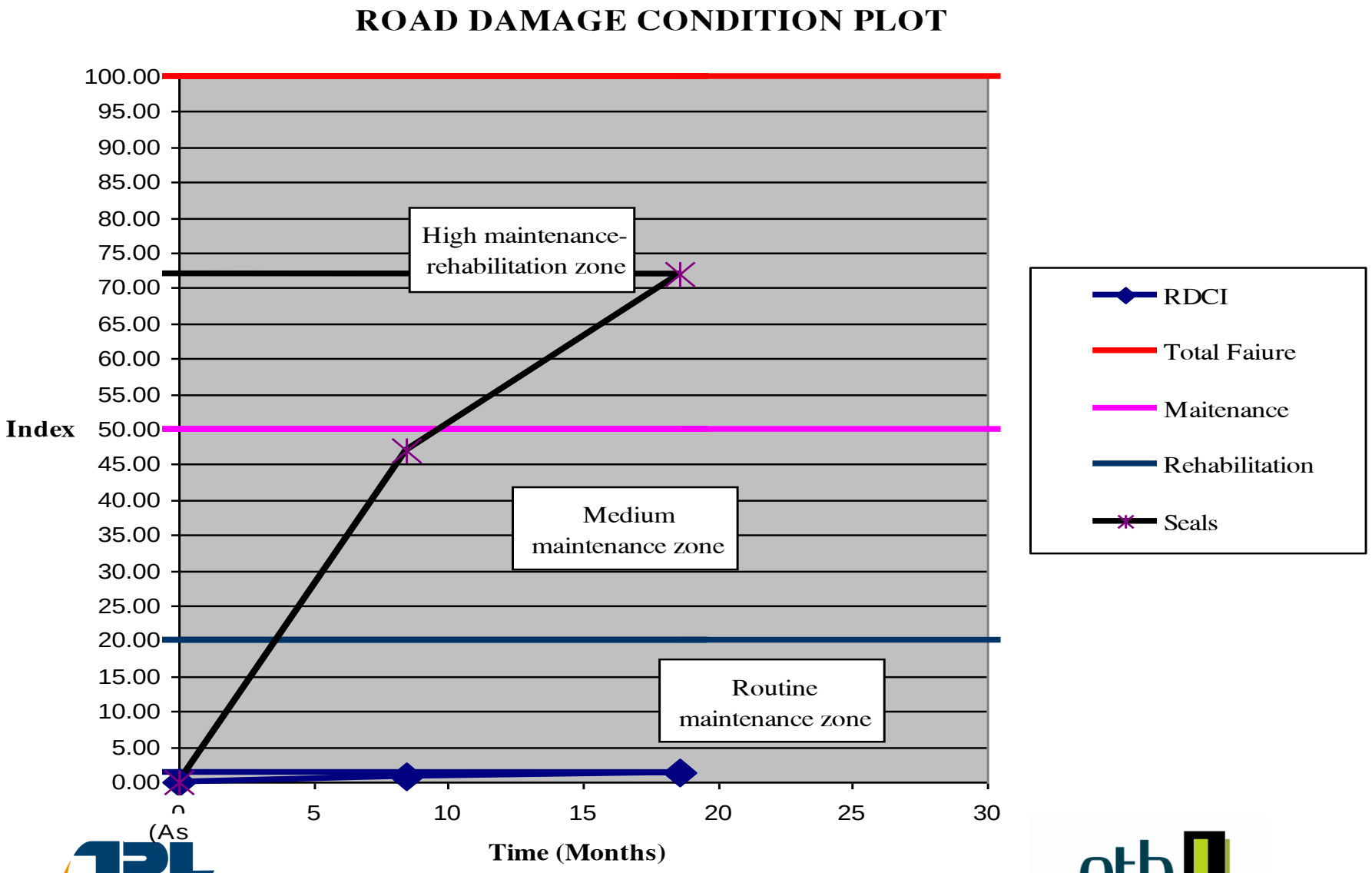
ROAD DAMAGE CONDITION PLOT
Index
100.00
95.00
90.00
85.00
80.00
75.00
70.00
65.00
60.00
55.00
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0
(As
5
10
15
20
25
30
Time (Months)
High maintenance-rehabilitation zone
Medium maintenance zone
Routine maintenance zone
RDCI
Total Faiure
Maitenance
Rehabilitation
Seals

Data Analysis Outputs

Taken together the Damage Extent Index (DEI) and Road Damage Condition Index (RDCI) are being used to establish the relative performance of the RRST trial pavements in a range of Vietnam road environments.

They can also be used to establish the relative maintenance needs of the various options and hence also provide an input to their relative Whole Life Costs

SEACAP 27 is now starting to provide extremely valuable performance data on the sustainability and true costs of rural infrastructure.

This work needs to be carried forward – <u>without effective and sustained application research is a waste of resource.</u>