

The Rural Road Gravel Assessment Programme (RRGAP) SEACAP 4

Intech-TRL
in association with
ITST

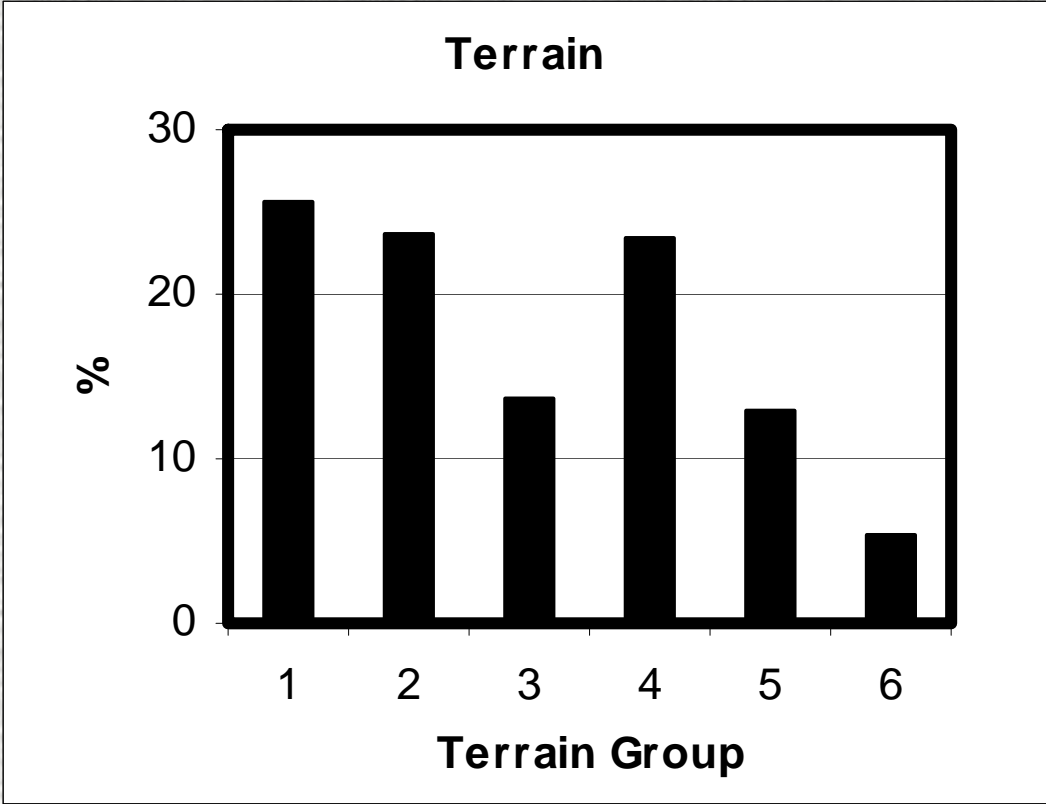
Dr J R Cook
R C Petts

The Rural Road Gravel Assessment Programme (RRGAP)

The RRGAP, undertaken by Intech-TRL in conjunction with ITST, is a snap-shot of unsealed road conditions on a representative sample of existing World Bank funded road links

It is key element in feeding information into the appropriate pavement selection processes.

RRGAP: Sites



1	Coastal delta
2	Flat inland
3	Rolling hills
4	Hilly
5	Intermountain plain
6	Mountains

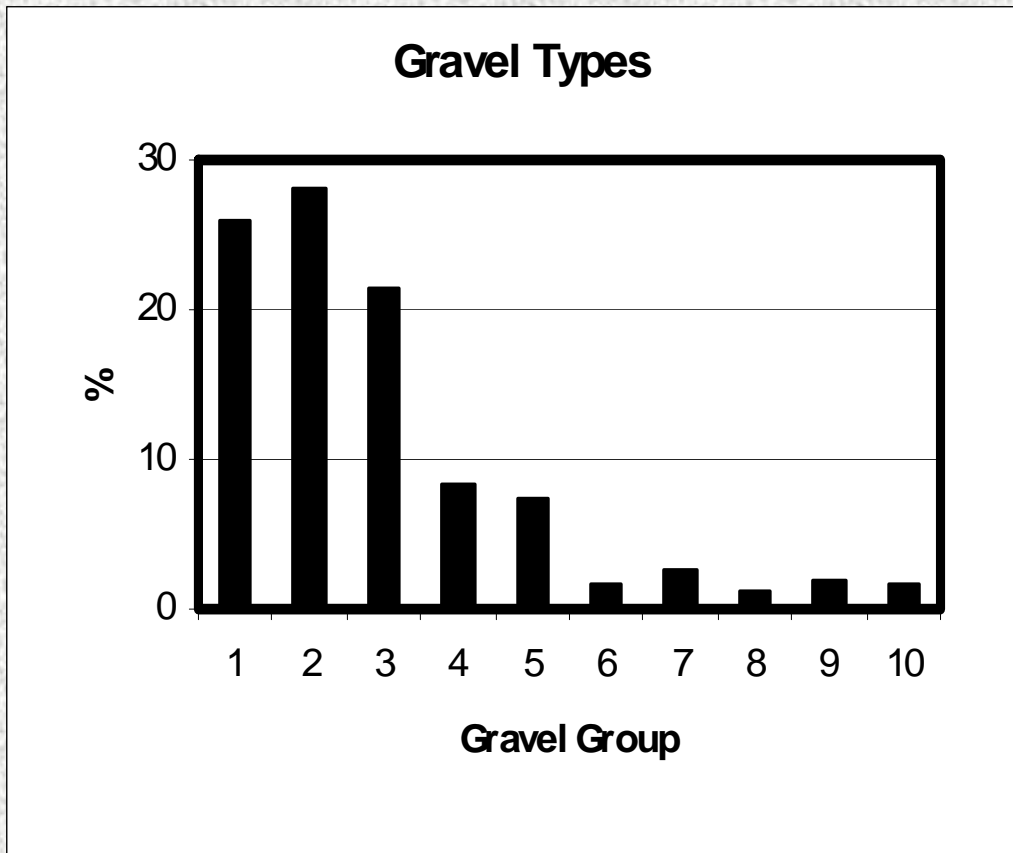
270 Roads; 750 Sections

RRGAP- Analysis

A number of key data road environment data sets were selected from the RRGAP database for road performance analysis

- **Rainfall**
- **Terrain**
- **Gradient**
- **Drainage**
- **Flooding**
- **Drainage**
- **Maintenance**
- **Material Condition**
- **Material Haulage**

RRGAP: Materials Sampled

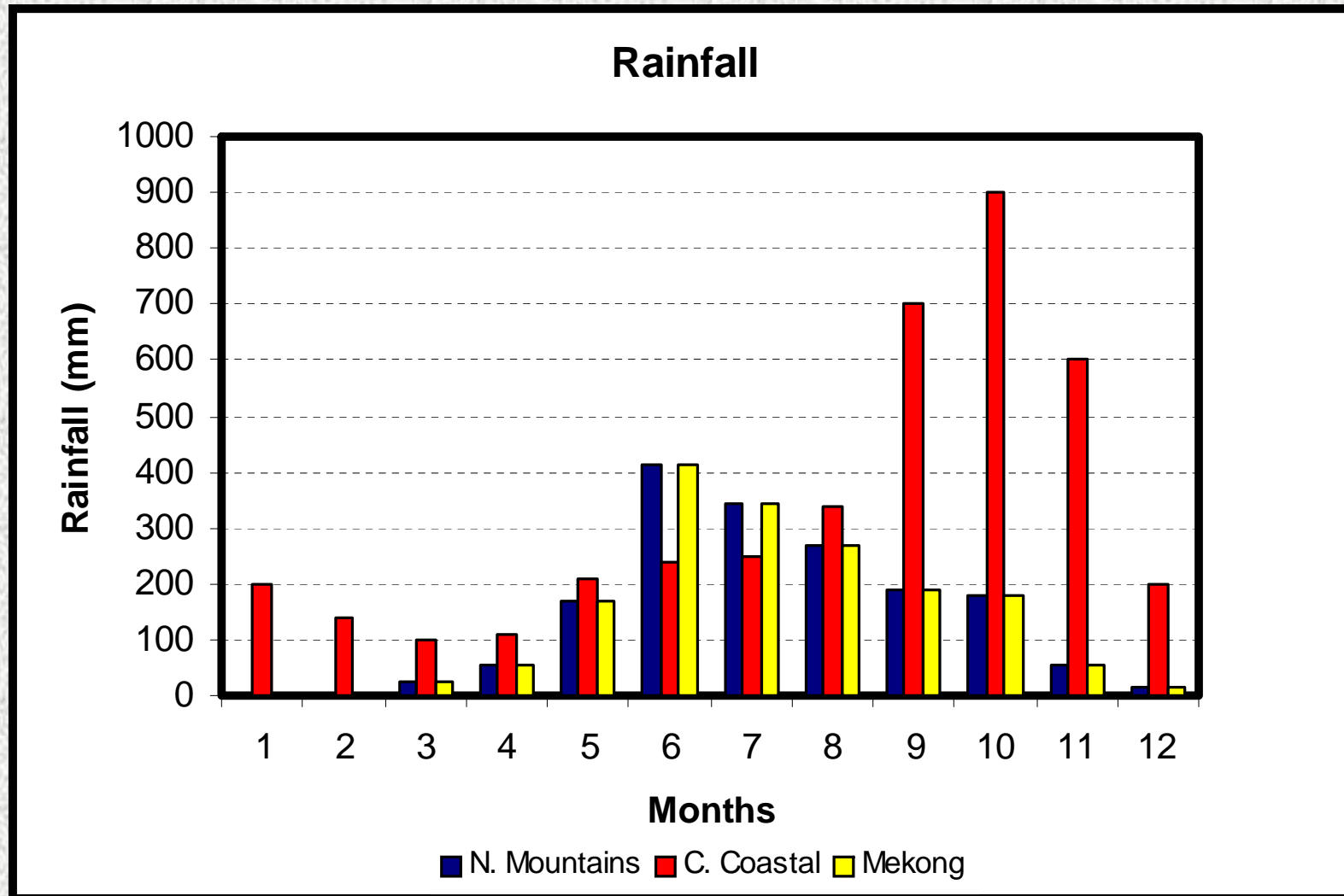


1	Laterite gravel
2	Hill gravel
3	Graded crushed rock
4	Non-graded crushed rock
5	Alluvial gravel
6	Gravel + clay
7	Weathered rock
8	Hand packed stone
9	Quarry waste
#	Other

Annual Rainfall (mm)

	PROVINCE	1998	1999	2000	2001	2002
North	Dien Bien			2004	2208	3132
North	Vinh Phuc- Low	821	1192	1296	1356	1398
North	Vinh Phuc-Hill	1565	1870	2057	2143	1914
North	Lao Cai	2414	1518	2382		
North	Quang Ninh		2011		3065	2296
North	Hung Yen		1475	1286	2037	1176
North	Tuyen Quang			2265	2007	1697
Central	Binh Thuan	2751	2569	2556	2562	2903
Central	Ninh Thuan			1130	856	583
Central	Quang Nam Coast	3803	4381	3700	2862	2464
Central	Quang Nam - Hill	4603	5203	5781	3578	3289
Central	Dong Nai			2554	2094	1984
Delta	Lam Dong	1988	2159	2356	1412	1803
Delta	Can Tho	1952	1895	1911		
Delta	Tien Giang	1371	1894	1640	1538	759
Delta	Vinh Long	1237				
Delta	Ca Mau	2585	3459	2629	2396	

Rainfall: Significant regional and local variation



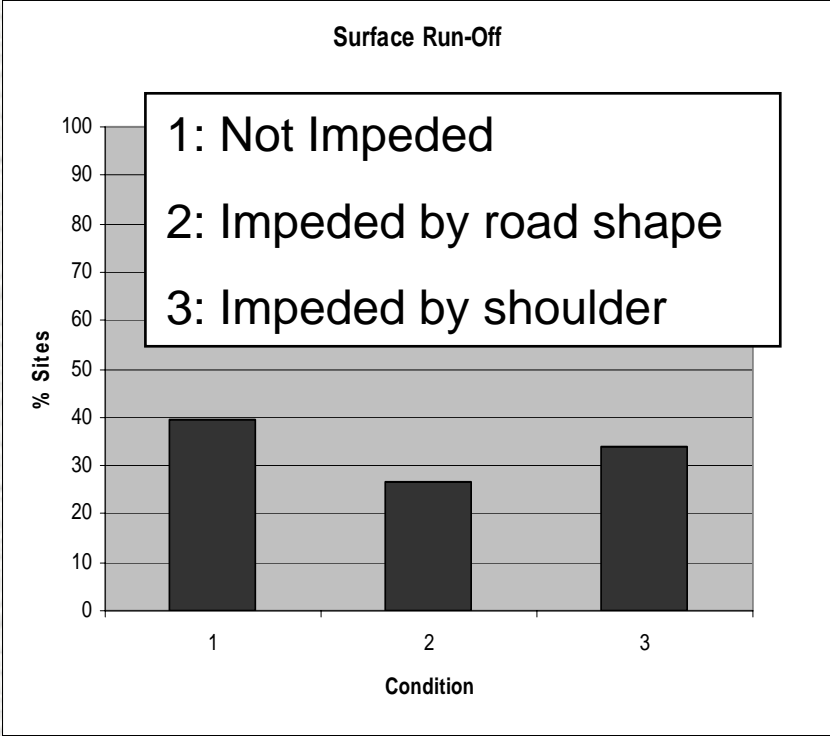
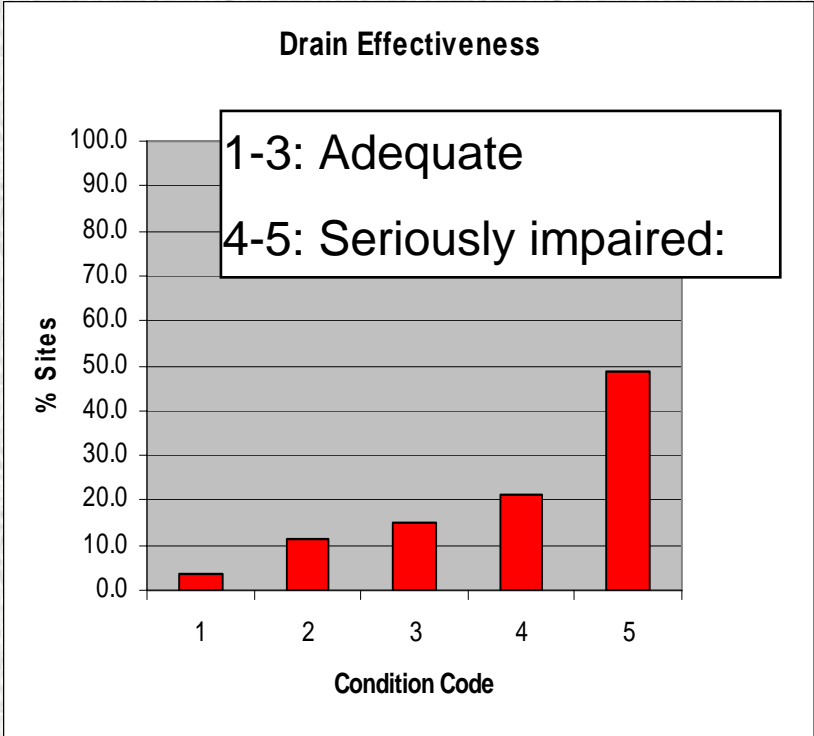
Maintenance Regime

A gravel surface is only viable if a sustainable maintenance regime is in place.

The RRGAP survey indicated that over 70% of roads are receiving no maintenance whatever and less than 10% were receiving any form of periodic maintenance.

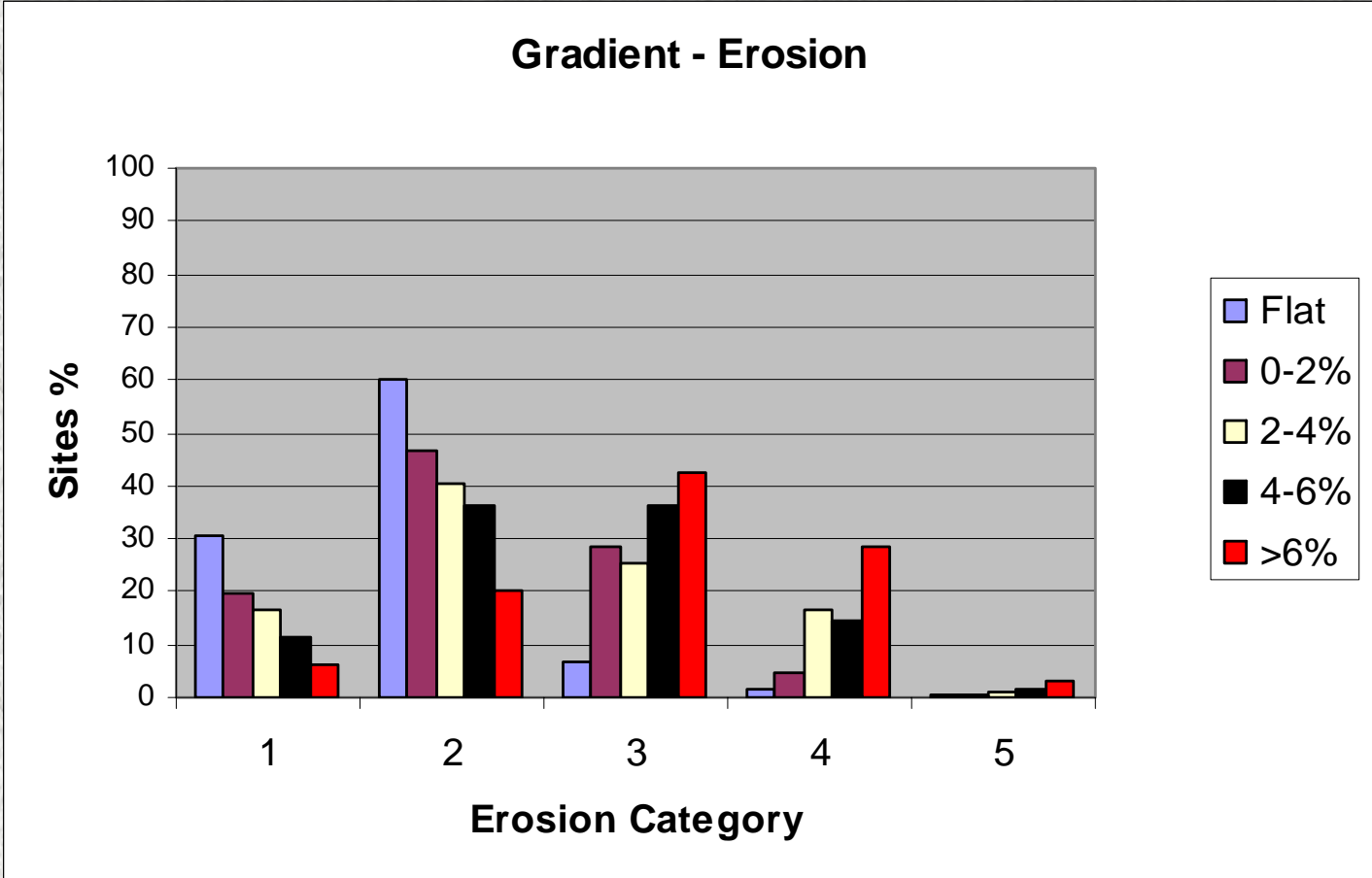
Gravel surface roads are not sustainable in this regime.

RRGAP: Drainage



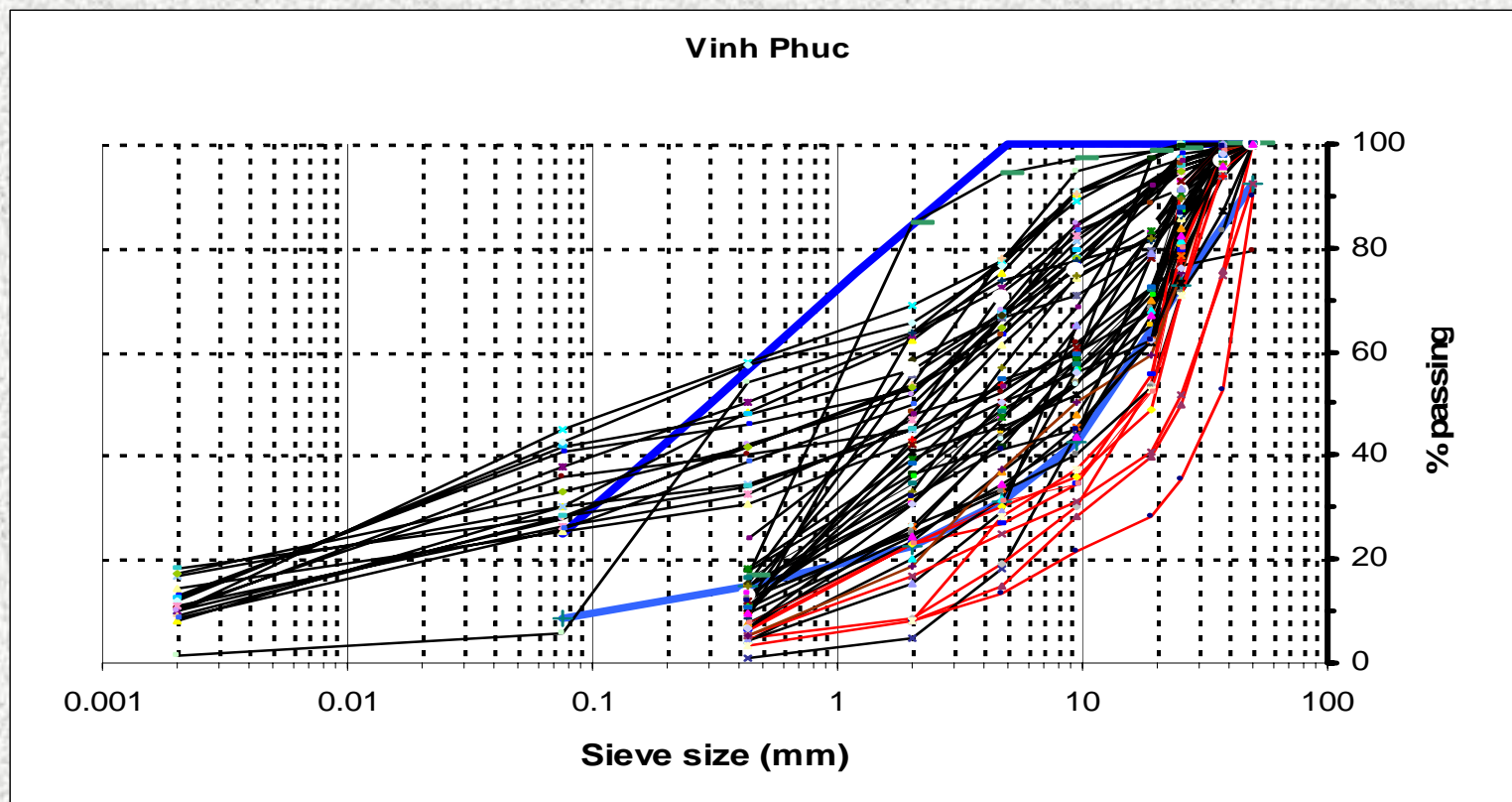
End Result: >80% of required side drainage is not happening.

RRGAP: Gradient



RRGAP- Materials Condition

Most of the badly performing gravels were outside the MoT specification



RRGAP Materials Haulage

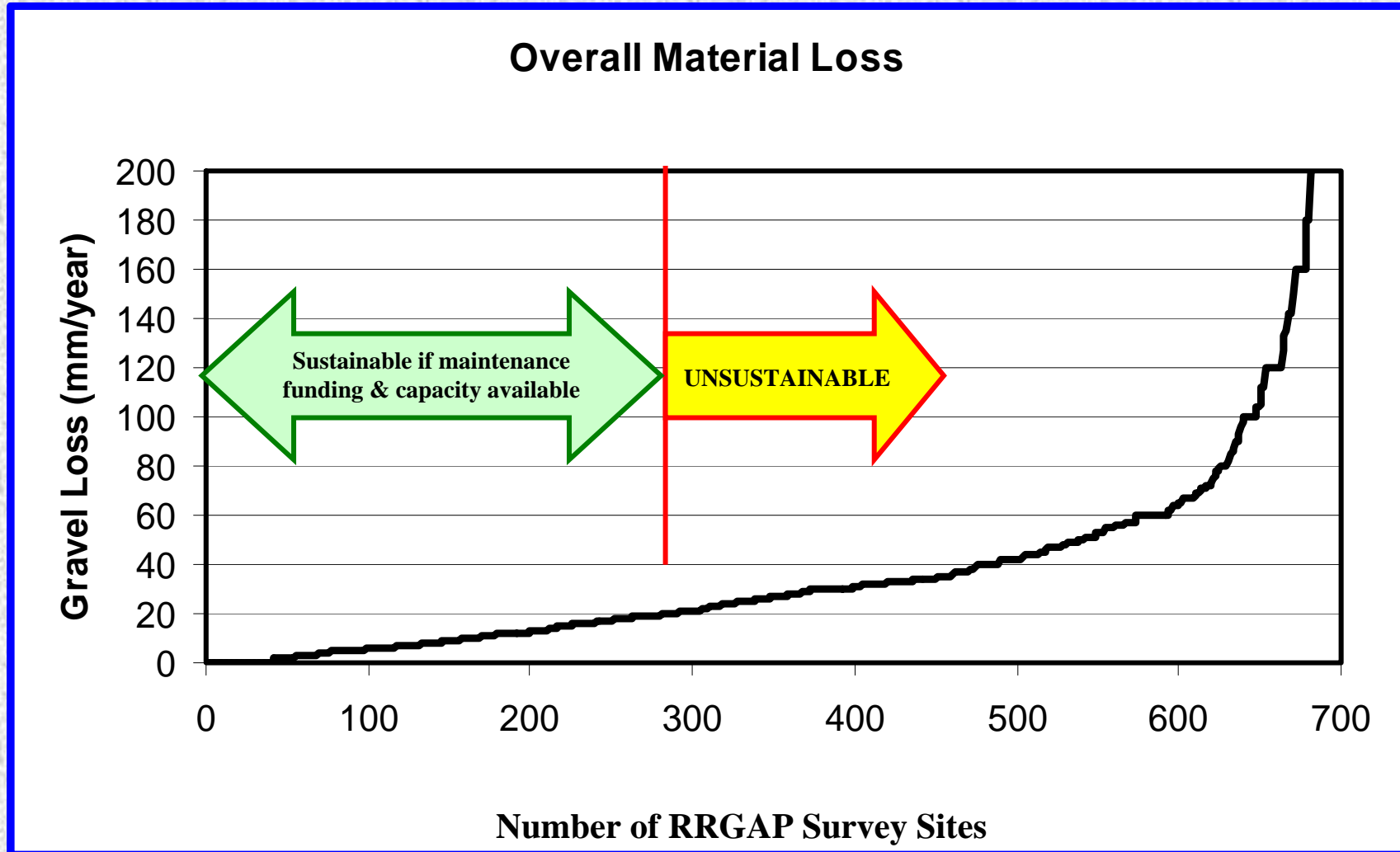
Province	Haulage (km)		
	Min	Max	Av
Tuyen Quang	2	19	6
Dien Bien	5	10	7
Dong Nai	4	10	7
Lam Dong	2	10	7
Ha Tinh	2	15	8
Ninh Thuan	1	20	8
Vinh Phuc	2	24	9
Bin Thuan	2	20	11
Lao Cai	7	15	11
Quang Ninh	1	20	13
Quang Nam	4	50	22
Hung Yen	4	70	69
Vinh Long	110	155	135
Tien Giang	135	165	145
Can Tho	160	170	165
Ca Mau	350	350	350

RRGAP- Analysis

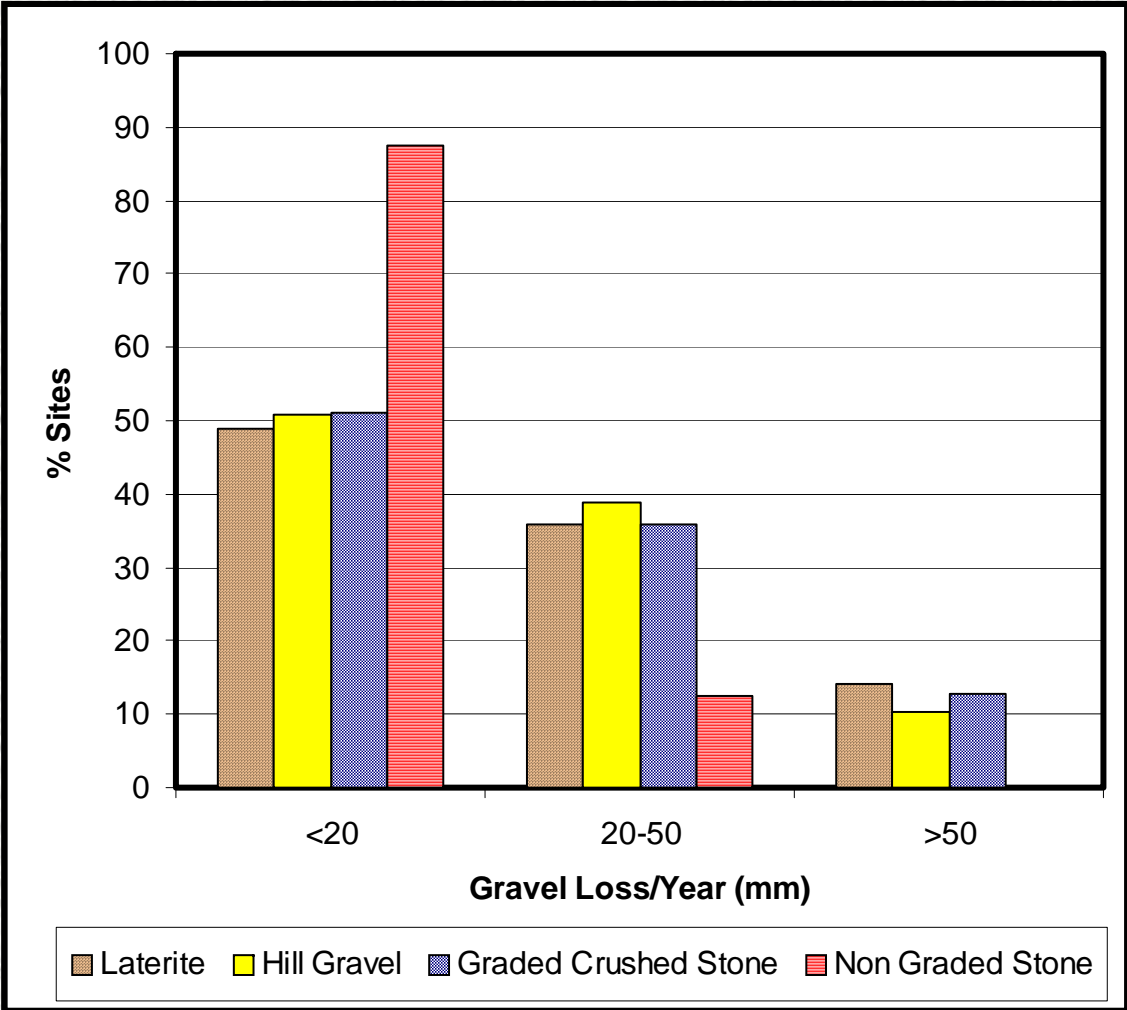
Material Loss and Erosion were seen as key to determining road deterioration factors

A figure of 20mm/year of gravel loss was determined as being a sensible upper limit for road sustainability

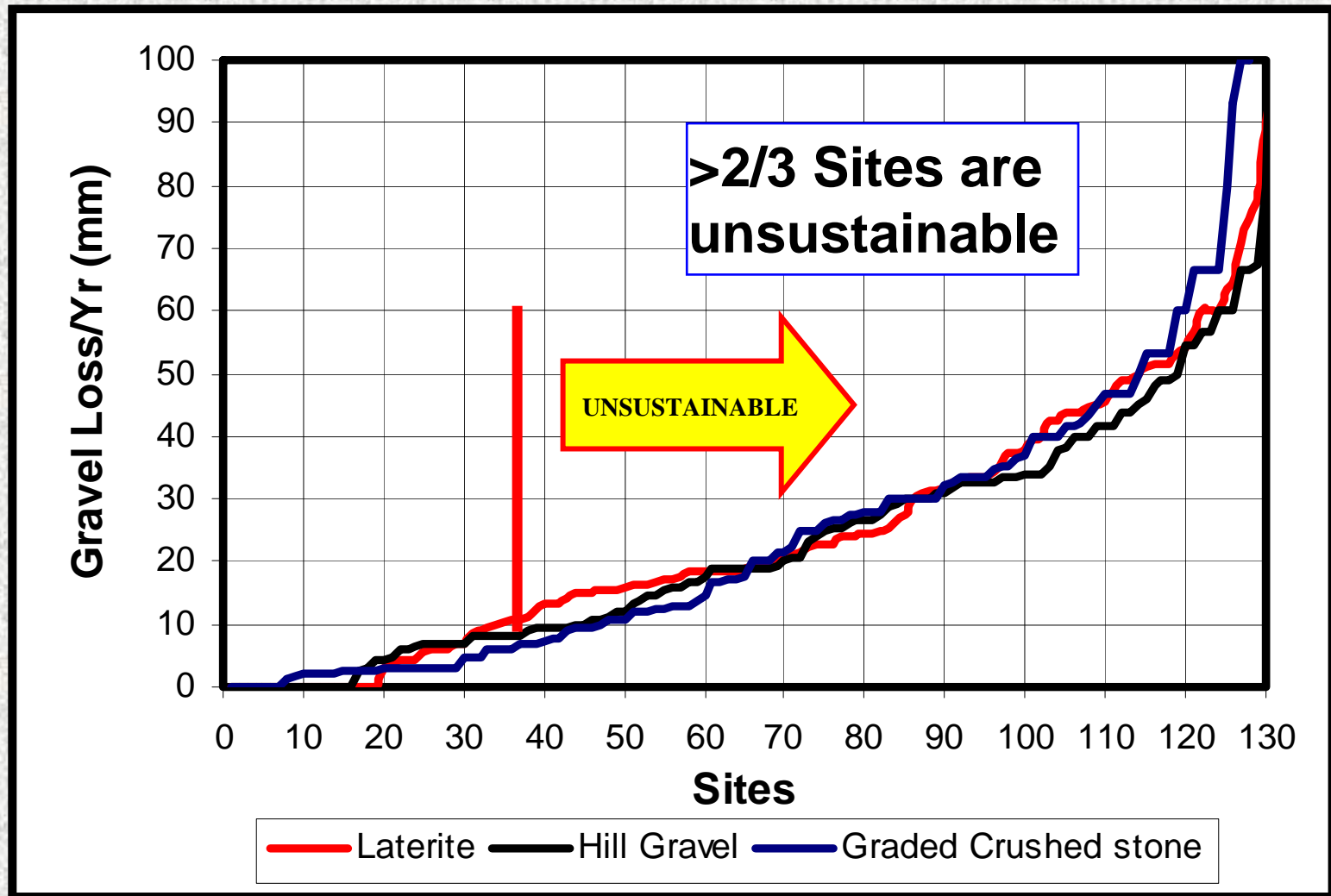
ANNUAL RATE OF GRAVEL LOSS FROM ALL SITES



Gravel Loss- Material Type



Material: Gravel Loss



Material:Gravel Loss

RRGAP data indicates that 58% of sites are unsustainable and 28% are losing material at twice the sustainable rate

Deterioration Model

RRGAP data indicates a performance model comprising differential spot deterioration of critical lengths of road separated by better condition lengths – within a background of general gravel loss

RRGAP Conclusions

Gravel can only be considered as a serious sustainable pavement option for Vietnam rural roads on engineering and economic grounds under the certain definable conditions

Where specified quality **material is locally available** in sufficient quantities both for construction and maintenance (probably within 10km of the road).

Where road **gradients are less than 4%** in medium rainfall areas (1,000 – 2,000 mm/year). Gravel may be unsustainable at any gradient for higher levels of rainfall.

Where **traffic** is below 200 motor vpd equivalent. This is recommended from international experience. However it is possible that alternative, more durable, surfaces could be justified at traffic levels below 100 motor vpd in some circumstances in Vietnam

Where **adequate drainage** (crossfall, side and dispersion) can be guaranteed.

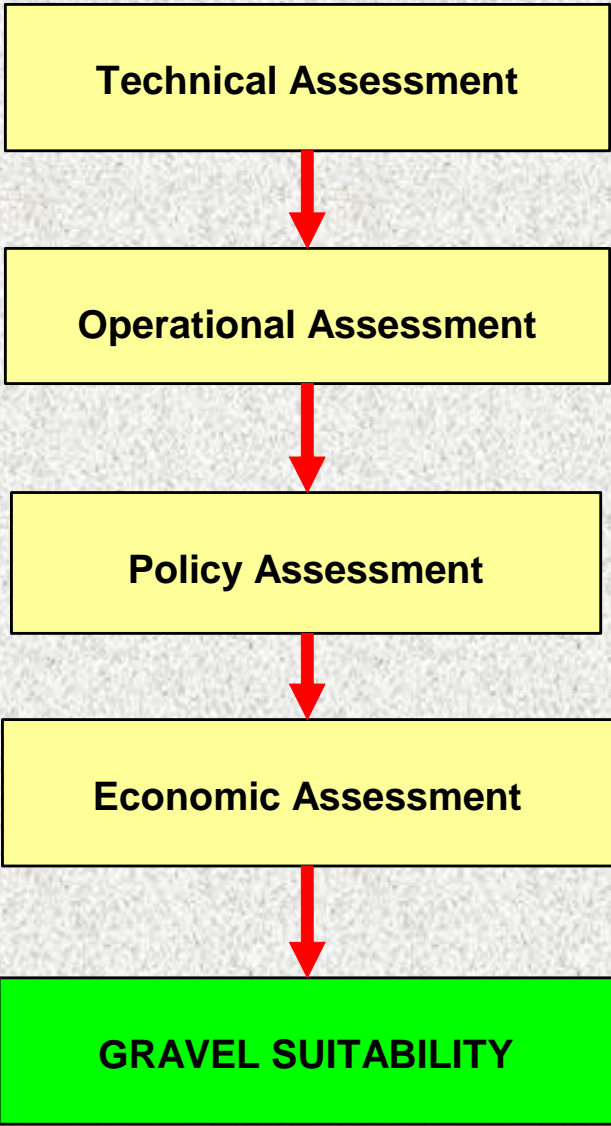
Where **adequate quality assurance** controls are in place for construction supervision to ensure contract and specification compliance.

Where an appropriate **maintenance regime** can be guaranteed as part of a whole-life construction and maintenance specification.

Where **flooding** is only a minor local occurrence.

Proposed New Gravel Use Guidelines for MoT

A Technical assessment is part of an overall suitability selection process



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ENGINEERING ASSESSMENT

