

Annex B. Statistics of Railway Sector

Table B-1 Pakistan Railways: Number of Locomotives

Year	Broad Gauge			Meter Gauge	Narrow Gauge	Total
	Steam	Diesel	Electric	Steam	Steam	
1950-1955 average	751	37	-	28	46	862
1955-1960 average	634	126	-	36	44	840
1960-1965 average	620	255	-	44	42	961
1965-1970 average	622	333	29	46	41	1,071
1970-1975 average	517	401	29	38	41	1,026
1975-1980 average	416	470	29	36	41	992
1980-1985 average	367	488	29	32	36	952
1985-1990 average	172	550	29	25	33	809
1990/91	121	564	29	22	17	753
1991/92	121	563	29	22	17	752
1992/93	90	549	29	18	17	703
1993/94	79	533	29	18	17	676
1994/95	60	528	29	18	17	652
1995/96	40	534	29	18	-	638
1996/97	25	544	29	18	-	632
1997/98	5	541	27	12	-	587
1998/99	5	550	27	12	-	596
1999/00	5	555	27	10	-	597
2000/01	5	569	27	9	-	610
2001/02	5	536	27	9	-	577
2002/03	5	536	27	9	-	577
2003/04	5	551	27	9	-	592
2004/05	5	520	23	9	-	557

Source: P.R. Yearbook.

Table B-2 Pakistan Railways: Number of Coaching Vehicles

Year	Broad gauge		Metre gauge		Narrow gauge		Total	
	Passenger carriage	Other coaching vehicles	Passenger carriage	Other coaching vehicles	Passenger carriage	Other coaching vehicles	Passenger carriage	Other coaching vehicles
1950-1955 average	1,429	839	81	24	164	48	1,674	911
1955-1960 average	1,540	935	87	27	153	48	1,780	1,010
1960-1965 average	1,643	1,091	123	29	125	47	1,891	1,167
1965-1970 average	1,899	1,128	126	32	114	46	2,139	1,206
1970-1975 average	1,846	1,035	124	32	113	46	2,083	1,112
1975-1980 average	1,917	764	109	30	111	45	2,137	838
1980-1985 average	2,166	607	96	28	108	41	2,370	676
1985-1990 average	2,447	458	76	17	99	30	2,623	505
1990/91	2,189	370	68	10	82	27	2,339	407
1991/92	2,285	370	58	10	82	27	2,425	407
1992/93	2,285	370	58	10	82	27	2,425	407
1993/94	2,206	368	57	6	80	27	2,343	401
1994/95	1,984	376	39	8	18	-	2,041	384
1995/96	1,805	376	39	8	18	-	1,862	384
1996/97	1,798	376	39	8	18	-	1,855	384
1997/98	1,711	376	39	8	18	-	1,768	384
1998/99	1,686	376	33	8	-	-	1,718	384
1999/00	1,526	376	32	8	14	-	1,572	384
2000/01	1,523	321	32	7	2	-	1,557	328
2001/02	1,523	253	12	7	-	-	1,535	260
2002/03	1,541	283	12	7	-	-	1,553	290
2003/04	1,567	283	12	3	-	-	1,579	286
2004/05	1,592	212	12	2	-	-	1,604	214

Source: P.R. Yearbook.

Table B-3 Number of Passenger Coaches by Age and by Type

DESCRIPTION	CODE	Age (years)								Total	Rehabilitated Stock			Grand Total
		0-5	6-10	11-15	16-20	21-25	26-30	31-35	>35		0-5	6-15	Total	
Air Condition Sleepers	ZA-UA			4				9	18	31			0	31
Palour Car	ZC-UC	3			8		2			13			0	13
Palour Car with dining	ZCD-UCD	4				3	4			11			0	11
Air Condition lower	ZB-ZBX	32		38	7	6	14	4		101	26		26	127
Trailer Air Condition with dining	CDZ									0	7		7	7
Trailer Air Condition lower	CBZ							11		11	8		8	19
First Sleeper	N-ZN-UN					69	1	1	4	75	10		10	85
First Sleeper with Economy	NF-NFS-NS				4			2	9	15			0	15
Economy with Postal Van	FPPH					4				4			0	4
Economy with Dining Car	ZFTDH-UFDH-FD						3	4	5	12	21		21	33
Economy with 3 tiler	ZFTH	52								52	317		317	369
Economy Sitter	ZFCH									0	22		22	22
Economy	ZF-UF-F				132	266	151	8	18	575	60		60	635
Economy with Second	FS					1	7	2	5	15			0	15
Second Class	S				31	3	74	33	27	168			0	168
Economy with Luggage/Guard	ZFL-UFLR			14	14	1			1	30	1		1	31
Economy with Luggage/ Guard& Generator	ZFLRGH-ZFTLR GH-UFLRGH	6				31	21	5	12	75	55		55	130
Vacuum brake Economy Luggage Guard& Generator	FLR-FLRGH					38	1		3	42	8		8	50
Vacuum Brake Second Class Luggage&Guard	SLR					20	5		3	28			0	28
Suburban Coach	Y				1	22	32		9	64			0	64
Suburban Coach with Guard Compartment	YR						6		3	9			0	9
Economy Trailer	FZ								32	32			0	32
Economy Trailer with Guard Luggage& Generator	FLRGUM								10	10			0	10
Total		97	0	56	197	464	321	79	159	1,373	535	0	535	1,908

Source: PR

Table B-4 Number of Freight Wagon by Age and by Type

TYPE OF STOCK	CODE	0 - 5 YEARS	06 - 10 YEARS	11 - 15 YEARS	16 - 20 YEARS	21 - 25 YEARS	26 - 30 YEARS	31 - 35 YEARS	36 - 40 YEARS	41 - 45 YEARS	ABOVE 45 Years	TOTAL
(4 WHEELED STOCK)												
Covered	C	-	-	-	-	-	19	631	2721	3628	2419	9418
Covered for life stock	CA	-	-	-	-	-	-	-	-	74	114	188
Covered for cement	CWR	-	-	-	-	-	-	-	-	306	-	306
Flat for container	FRC	300	-	-	-	-	-	-	-	-	482	782
High sided open truck	KC/KCC	600	-	-	60	-	-	-	280	1087	977	3004
Low sided open truck	KF	-	-	-	-	-	-	-	196	437	443	1076
Ballast wagon	KW	-	-	-	-	-	-	-	-	135	6	141
Brake van	V	-	-	-	-	-	-	15	38	169	102	324
Tank wagon	TO	-	-	-	-	-	40	105	669	679	1061	2554
Total		900	-	-	60	-	59	751	3904	6515	5604	17793
(8 WHEELED STOCK)												
Covered	BC	-	-	-	1	-	1	-	-	25	90	117
Covered for life stock	BCA	-	-	-	-	-	1	-	4	19	-	24
High sided open truck	BKC	-	-	-	-	-	-	-	-	111	118	229
Bogie brake van	ZRVV	-	-	-	-	3	15	-	-	-	-	18
Low sided open truck	BKF	-	-	-	-	-	-	-	-	119	29	148
Low sided open truck for container	BFC	-	-	-	28	-	-	-	-	63	17	108
Low sided open truck for container	MBKF	-	-	-	69	-	-	-	-	197	14	280
High sided open truck for container	ZBFC	130	-	-	-	-	-	-	-	-	-	130
Flat truck	BFR	-	-	-	-	-	-	-	-	121	246	367
Flat truck for military	MBFR	-	-	1	-	-	-	-	123	171	-	328
Crocodile truck	BFU	-	-	-	-	-	-	-	6	1	14	21
Crocodile truck	MBFU	-	-	-	-	-	-	-	-	-	43	43
Truck for ballast	BKW	-	-	-	31	397	-	-	75	-	-	503
Tank wagons	BTO	-	-	32	-	-	218	370	190	82	346	1238
High capacity bogie brake	ZNRV	27	0	-	-	-	-	-	-	-	-	27
Total		157	0	33	129	400	235	370	398	909	917	3581
(VAN)												
High capacity bogie covered wagon	ZBC	117	-	-	-	-	-	-	-	-	-	117
High capacity open top bogie wagon	ZBKC	130	0	-	-	-	-	-	-	-	-	130
Total		247	0	-	-	-	-	-	-	-	-	247
G-Total		1304	0	33	189	400	277	1121	4302	7424	6521	21621

Source: PR

Table B-5 Pakistan Railways: Number of Freight Wagons

Year	Broad gauge	Meter gauge	Narrow gauge	Total
1950-1955 average	22,835	803	613	24,251
1955-1960 average	24,310	969	607	25,886
1960-1965 average	30,033	1,070	578	31,681
1965-1970 average	34,999	1,073	574	36,646
1970-1975 average	35,767	1,065	563	37,395
1975-1980 average	34,966	1,001	548	36,915
1980-1985 average	34,643	826	446	35,915
1985-1990 average	34,774	626	340	35,774
1990/91	33,947	604	300	34,851
1991/92	29,465	604	300	30,369
1992/93	28,547	604	300	29,451
1993/94	28,525	425	278	29,228
1994/95	28,076	425	60	28,561
1995/96	26,270	425	60	26,755
1996/97	24,728	425	60	25,213
1997/98	23,358	425	60	23,843
1998/99	24,031	425	-	24,456
1999/00	23,459	387	60	23,906
2000/01	23,405	428	60	23,893
2001/02	23,255	145	60	23,460
2002/03	23,583	139	-	23,722
2003/04	21,667	145	-	21,812
2004/05	21,471	85	-	21,556

Source: P.R. Yearbook.

Table B-6 Statistics of Accidents

Description of Accident	1989 /90	1990 /91	1991 /92	1992 /93	1993 /94	1994 /95	1995 /96	1996 /97	1997 /98	1998 /99	1999 /00	2000 /01	2001 /02	2002 /03	2003 /04	2004 /05
Collision of passenger trains	2	6	5	2	3	1	4	2	0	0	4	0	2	0	1	1
Collision of goods trains	2	1	0	2	1	3	0	0	2	2	0	1	0	2	0	1
Collision of light engine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Derailment of passenger trains	61	40	28	25	12	23	30	14	28	42	25	27	24	18	11	10
Derailment of mixed trains	0	0	0	13	13	17	13	13	16	13	13	13	19	4	10	13
Derailment of M.G. trains	0	0	0	0	5	8	2	0	0	0	2	1	1	2	2	1
Derailment of goods trains	40	51	39	44	31	40	47	47	48	62	60	62	65	48	49	36
Collision at manned level crossing	11	6	6	7	5	6	7	5	7	9	6	8	6	5	7	1
Collision at unmanned level crossing	33	17	37	19	23	29	21	25	32	44	43	42	35	31	40	23
Fire in trains	3	1	2	7	1	1	0	2	8	3	1	0	2	2	2	1
Averted collision	1	2	0	0	0	1	0	0	0	0	0	0	0	0	1	0
TOTAL	153	124	117	119	94	129	124	108	141	175	154	154	154	112	123	87

Source: P.R.

Annex C. Review of Past Studies on Overloading Problem

C.1.1 Previous Reports - NTRC Survey 1982

(1) Survey Details

Between May 1981 and April 1982 NTRC conducted surveys on vehicle loads at 35 points on major roads throughout Pakistan. Surveys lasted 24 hours and were conducted 3 or 4 times a year. In total, 31,746 vehicles were checked of which 30,112 were loaded and 1,634 empty. Weigh bridges were used and the results were later crosschecked / calibrated against weighbridges at the Quetta coalmines and the Octroi stations in Karachi.

(2) Cargoes and Vehicle Ages

The commodities carried were found to comprise the following.

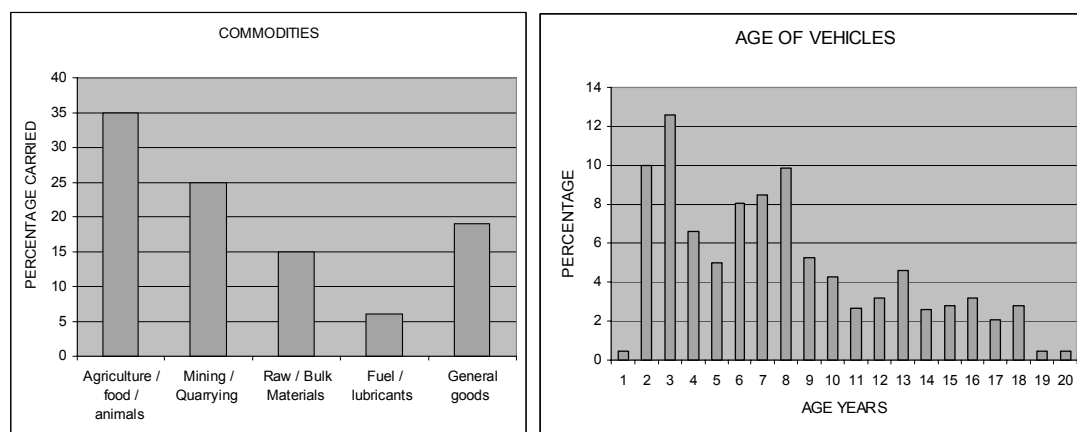


Figure C-1 Commodities and Age of Vehicles

The vehicles were predominantly Bedford Trucks, 97%, with 1% Nissan or Hino and the rest indeterminate. The age distribution showed the majority (in 1982) was relatively new.

(3) Seasonal and Diurnal Variations

No differences were noted in seasonal cargoes. At night loads were slightly higher, but by an insignificant amount, only 2%.

(4) Axle Loading

The results showed that when the trucks are empty the axle load distribution front : rear is 48:52 but when the trucks are full the axle load distribution front : rear is nearer 30:70. In general trucks in Northern Areas carried lower loads than those around Karachi. For example, typical figures were 12,764 kgs on the Rawalpindi to Murree Road, and 15,312 kgs on the Rohri to Dadu road, both being gross vehicle weight.

Taking average figures for all the vehicles surveyed, for empty vehicles the average front axle load was 2,868 kgs and the average rear axle load 3,308 kgs, giving an average gross weight of 6,177 empty.

For fully loaded vehicles the average front axle load was 4,343 kgs and the average rear axle load 10,020 kgs, giving an average gross weight of 14,377 fully loaded.

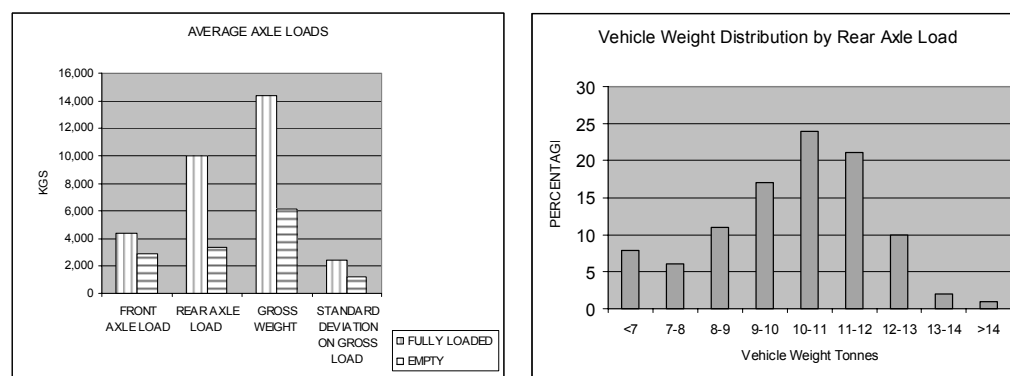


Figure C-2 Average Axle Loads and Distribution

The maximum axle load limit at this time was taken as 8,165 kgs. This is the generally accepted ESA or equivalent standard axle figure, which is used as the anticipated load-bearing factor in road design. According to the results more than 83% of the loaded vehicles exceeded this limit. Some discretion is allowed in the assessment and measurements, but even if an allowable axle load limit of 9 tones is allowed, then 75% of these vehicles were still overloaded.

It must be noted that this figure of 9 tones is a technical standard used in pavement design and was not a legal requirement at that time. It had no enforcement value. Almost without exception all trucks were 2 axle Bedfords. Therefore the conclusion of the study was that, in terms of damaging effects, loaded trucks were on average equal to 3.2 standard axles and an empty vehicle equal to 0.12 standard axles.

C.1.2 Previous Reports – Supplementary

(1) Multi Axle Vehicle Study 1982

NTRC also carried out a Multi Axle Vehicle Study in 1982 to determine what proportion of the traffic stream was composed of multi axle vehicles. At that time the proportion was minute and mainly operated by NLC who employed convoy systems.

(2) ACE Study 1988

ACE prepared an axle load report for the Indus Highway N-55. Some 2,640 vehicles were surveyed at 17 stations on N-55. According to the report, the damage factor for loaded vehicles ranged from 0.8 for tractor trolleys to 18 for 4 axle rear tandem vehicles consisting of a prime mover and trailer.

(3) RRMTI Study 1989

The Road Research and Materials Testing Institute carried out an axle load study of 302 vehicles in 1989. Of the total vehicles, 502 were tractor trolleys and the survey was confined to Lahore and Faisalabad.

(4) NESPAK Study 1993

NESPAK carried out an axle load study on the Sheikhpura –Multan-DG Khan Motorway in 1993. A total of 658 vehicles were surveyed and the equivalent standard axles / vehicle figure was found to be much higher. The study reported that 2 axle trucks had an ESA of 7.4 compared to the NTRC figure of 3.2 in 1982. The ESA for 5 axle truck trailers was given as 28.3 compared to a figure of 9.2 derived in 1982.

C.1.3 Previous Reports - NTRC Survey 1995

(1) Survey Details

Between 1982 and 1995 there was a significant increase in the number of multi axle vehicles in use in Pakistan, with an increase in axle loads. It was felt that it was necessary to re-specify the Equivalent Standard Axle figure used for road pavement design. Subsequently NHA requested NTRC to carry out another survey. Between March 1994 and September 1994 NTRC conducted surveys on vehicle loads at 30 points on the national highway network. Surveys lasted at least 24 hours at each station but for dual carriageways and heavily trafficked roads they lasted 48 hours. This was 24 hours in each direction. In total, 4,768 vehicles were weighed of which 4,599 were loaded and 169 empty. The results were later crosschecked / calibrated against private weighbridges.

(2) Commodities and Vehicle Types

There was no significant difference observed in the types of commodities carried by the trucks compared with the 1982 survey but it was noted that vehicles with more than 3 axles mainly carried manufactured items and food products. The survey showed that the composition of make and configuration of vehicle had changed.

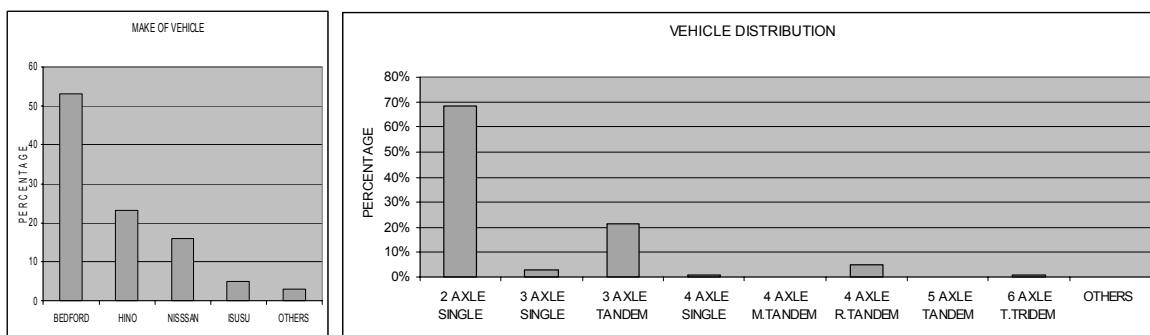


Figure C-3 Type of Vehicle

Previously commercial vehicles were predominantly 2 axle Bedford Trucks, around 97%, but this dropped to 69%. The 3 axle tandem vehicles had increased from 1% in 1982 to 23% in 1994. As before, night loads were slightly higher than daytime loads. In general, commercial traffic was 35% of the total traffic flow.

(3) Axle Loading

The results show the load in tonnes per axle. It should be noted that these are average figures.

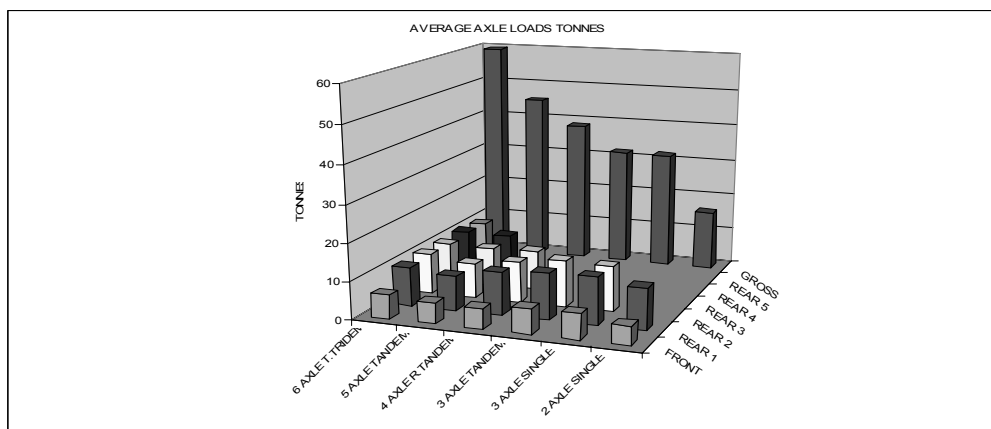


Figure C-4 Axles Loading by Types

Figures are typically in excess of 12 tonnes per axle with gross weights approaching 60 tonnes.

(4) Overloading

If one considers the full weight distribution then the amount of overloading can be assessed.

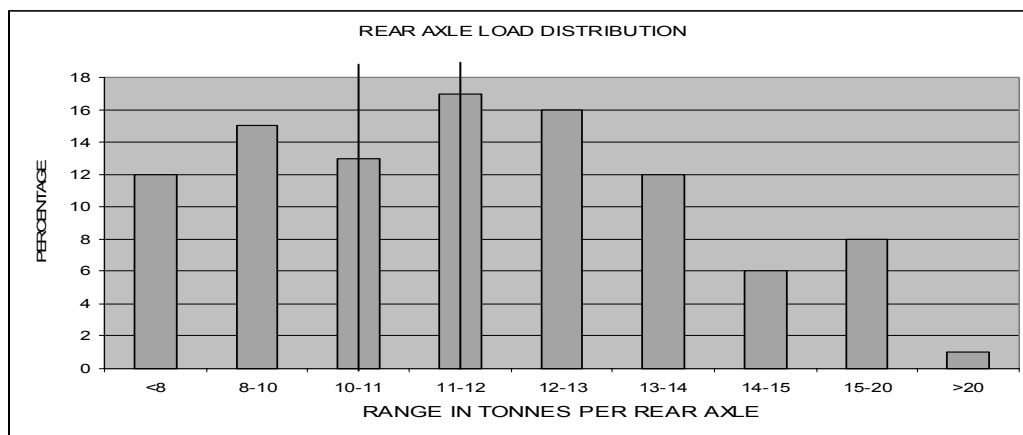


Figure C-5 Rear Axle Load Distribution

From the above table it can be seen that if the rear axle road limit were set at 10 tonnes then 74% of the vehicles would exceed this. Similarly, 43% exceed 12 tonnes and 28% exceed 13 tonnes.

The ESA's of the multi axle vehicles were calculated to range between 4.67 for a 2 axle single vehicle and 10.9 for a 6-axle tandem tridem.

(5) Tyre Pressures

Higher tyre pressures may be required because of the excessive loading. Elevated tyre pressures reduce the area of tyre in contact with the road and so increase the load per unit area. This was identified as another factor in damage to roads caused by overloading.

(6) Other Countries Standards

Other countries have adopted axle load limits in tonnes as being a legal restriction to prevent damage to roads. These are given below:

COUNTRY	JORDAN	JAPAN U.K. NIGERIA	TURKEY	ETHIOPIA KENYA MALAYSIA
LEGAL AXLE LOAD LIMIT IN TONNES	12.0	10.0	8.3	8.0

If the legal limit for Pakistan were set at 12 tonnes per rear axle then 43 % of the commercial vehicles in the country would have to be controlled.

(7) Maximum Figures

In the 1995 study the maximum figures recorded were a total gross weight of 87.17 tonnes for a 6-axle tandem tridem truck carrying agricultural products. The highest front axle load recorded was 7.45 tonnes; the highest rear axle load recorded was 18.96 tonnes and the highest tyre pressure was 155 p.s.i.

C.1.4 Previous Reports - ENERCON Report 2002

(1) Objectives and Scope of Works

UNDP/ENERCON's Fuel Efficiency in Road Transport Sector (FERTS) appointed Production & Marketing Strategies (Pvt) Ltd (PROMARK) to carry out a study on this subject. The main focus of the study was on self-regulation by the trucking industry to control and eliminate overloading. A total of 152 interviews were conducted with stakeholders. These were:

Table C-1 Interviewed Stakeholders

Stakeholders	No.
Truck Drivers	61
Truck Owners	16
Freight Forwarding Agencies	16
Clients / Customers	12
Vehicle Manufacturers / Assemblers	3
Traffic Police	4
Transport Department	4
Environment Department	4
NGOs involved in Transport and Environment	3
Body Makers / Manufacturers	12
National Highway Authority (NHA)	5
Repair and Maintenance Workshops	12
Total	152

The fieldwork survey commenced in Lahore in January 2002 and concluded in March 2002 after surveying all four regions.

(2) Findings

Over 145,000 trucks use the country's roads and 2-3% annual growth in goods transport is estimated. Road transport now represents about 70% of all goods transport movements. Trucking in Pakistan is described as an industry, but does not operate in a conventional manner. Due to lack of effective legal and administrative controls, overloading is commonplace and the trucking industry relies on operation of overloaded trucks to be profitable. If overloading is stopped, it may relieve pressures on the national highways but also may upset the trucking sectors viability and the country's economy.

Axle loads have been defined in the governments' legislation but due to poor implementation of laws, overloading practice is wide spread and many trucks are overloaded.

(3) Cause of Overloading

Trucking 'people' have a misconception about overloading. To them a truck is overloaded when the loaded goods are jutting out from its body. Traffic police will stop those trucks which look overloaded. It is possible that a truck loaded beyond its volumetric capacity may in fact be carrying less than the registered load. Overloading by weight is mostly unchecked since there is a shortage of official weighing equipment. The study established that the major cause for overloading is to gain financial benefits. A reason put forward is that lack of transportation requires overloading but this is dubious as trucks are underemployed and may wait for loads.

(4) Overloading Benefits

The survey showed that the truck owners are the main beneficiaries of overloading, followed by customers who save on freight costs by using the minimum number of trucks. Transport Goods Companies are also a stakeholder but their benefits come to them in an indirect

manner. They will get their due percentage irrespective of the fact whether a certain bulk of goods is loaded in one truck or more. For police overloading is a reason to stop a truck and fine the driver but no quantification is carried out, as the police have very limited resources. Drivers sufferer as they have to pay fines to police, but may benefit from cheating by transporting goods hidden from the truck owner or present false or tampered repairs bills. Workshop owners and body manufacturers also benefit from overloading by carrying out illegal modifications to trucks.

(5) Difficulties in Preventing Overloading

Poor implementation of laws permits overloading. Policemen on duty do not know the axle loading capacity of different trucks and do not have the weighing facilities to determine whether a truck is overloaded or not. The low rate of fines does not discourage overloading. The drivers do not produce their licenses or registration books when asked to do so because the law enforcement agencies do not insist in these matters.

(6) Problems Caused by Overloading

The report suggests that overloading is not the main direct cause for accidents. Overloaded trucks move slowly and lack enough speed to lead to accidents. It is reported that empty trucks cause more accidents. However, overloaded trucks drive in the centre of the road to avoid getting entangled with trees and overhead wires, and do not give way to oncoming traffic. Overloaded trucks will damage the roads and transporters challenge whether roads are built strong enough to sustain known axle loads. Also it is queried whether fines are actually directed to road repairs. Truck engines straining under extra load add pollution and noise to the environment.

(7) Eradication of Overloading

Corrective action requires many aspects to be addressed. A differentiation must be made between overloading by weight and overloading by volume. Transport companies should be registered with the government and be required to maintain records.

Truck drivers should have the opportunity to attend government sponsored training in maintenance, understanding of traffic laws and the need for its observance. Road markings announcing load bearing capacities and axle loads should be installed on intercity roads and highways. Loading capacities of trucks and trailers should be visibly marked on the vehicle. The low literacy rate amongst the drivers must be acknowledged. Drivers unions may promote these issues.

National Highway Authority (NHA) and city authorities should prepare directories containing data regarding load-bearing capacities of the road network with maps for issue to all concerned.

NHA, police, Environment Protection Agencies (EPAs) and Regional Transport Authorities should jointly establish at least one "Check Station" near each major city on the main roads. Every truck should be obliged to stop at least once during the journey at one of this Check Stations, which should have the facility of weighbridges and inspectors to perform the following functions:

- Checking of laden/unladen weight
- Mechanical fitness check, tyre pressure check
- Documentary check (permit, driver's license, registration books, challan or bilti issued by transport company etc.)

Efforts should be made to introduce more multi-axle trucks with modern technology, and transport companies be given soft loans to purchase such trucks. Open body trucks allow "overloading by volume", which can be curbed by promoting use of containers.

The size and expanse of the trucking business may justify it being under the control of a

single ministry, as in the case of railways. Control is divided between transport authorities, NHA and police with an inherent lack of co-ordination.

Truck repair workshops lack dependable equipment and trained mechanics and repairs carried out by these workshops is a direct cause for road accidents e.g. breaking of tie-rods is common. Regulations governing these workshops are required.

(8) Transportation of Hazardous Chemicals

Among the commodities transported on the roads and railways of Pakistan, hazardous chemicals do not form a large proportion. Therefore they are not seen by the authorities as a major problem. No policy exists for dealing with them and emergency services receive no special training in this regard.

However, the amounts transported in the future may increase and provision should be made for the authorities to have the knowledge and resources to deal with any such emergencies.

The main material transported at the moment is gasoline for motor vehicles. One recent accident involved a passenger bus ramming the back of a stationary gasoline tanker and resulted in many fatalities. Fortunately such accidents are not frequent. Steps should be taken to separate such vehicles on the road under normal conditions.

Transport of hazardous materials whether by road, rail or ship, has been extensively regulated in many countries and by many organizations. There are four main classes of material:

- Inflammable
- Acidic
- Corrosive
- Explosive

Two classes are considered special cases and are usually excluded: radioactive materials and military ammunition.

The four main classes are covered by regulation and guidelines issued by U.N. and IMO and are usually referred to as Requirements for Transport of Hazardous Chemicals or "HAZCHEM".

All vehicles carrying bulk materials, or individual drums, must be clearly marked with a HAZCHEM warning triangle sign, the U.N. category number and the name of the material.

Authorities should maintain in the HQ offices a HAZCHEM register which contains all the MSDS (Material Data Safety Sheets) for each category and material. In the event of an accident the first officer on the scene should be able to identify the material from a distance from the HAZCHEM sign, know whether it is safe to approach without PPE (Personal Protective Equipment) and should then be able to contact HQ, report the Category number and receive detailed advice on how to proceed. This information should be shared with the emergency response services.

No such procedure currently exists in Pakistan and it is recommended that such a system be implemented.

C.1.5 Current Reports – Finn Roads 2005

FINNROAD Consultants are carrying out a study on overloading and as part of this study they interviewed 402 stakeholders in all provinces to ascertain their attitude to the current situation. The main groups were manufacturers, service providers, authorities, truckers and others.

The results gave diverse and mixed views. Many of the responses were based on “perceptions” held by the persons being interviewed. These may be factually incorrect, and this is acknowledged in the report, but the report correctly points out that these perceptions still dictate that person’s action.

Some 25% of the respondents did not see overloading as a problem, and over 33% of the trucking industry had no clear understanding of its meaning. There was also wide variance across provinces as to the interpretation of the concept of overloading.

There are many weighing stations throughout the country but they are regarded as ineffective. Many are non operational as traffic divert to different routes to avoid them. Truckers objected to the weighing stations as being a waste of time serving no practical purpose.

The majority of the respondents felt no responsibility for road conditions and felt it was the responsibility of the authorities to accept overloading as the norm and build roads of sufficient strength and durability to cope with the loads. Only 32% linked overloading with damage caused to roads. Also the fine system for overloading was criticized as it was doubted that the fines collected went to road maintenance.

When fines are imposed they are subject to “negotiation”. The drivers felt that as long as the level of fine left them with a reasonable profit margin then the situation was acceptable. They had no thoughts on reducing loads but regarded the imposition of the fines as similar to the old traditional need to pay for “right of passage” through a territory.

The truckers were critical of toll stations considering the number excessive and the tolls too high. The truckers argued that profits in their industry were marginal and overloading was the only way to operate economically. They argued that higher fines, or lower transport rates due to lighter loads, would render them jobless.

The poor state of the vehicles was acknowledged but the high interest rates on loans for new vehicles were given as a reason for non-replacement.

Solutions suggested were construction of better and wider roads, reducing cost of diesel, reduction of tolls, and soft loans for drivers and transporters.

Annex D. Calculation of Railway Capacity

(Annex to Chapter 8)

(1) Scott's Formula

$$N = f * T / (t + c)$$

N: Line capacity (Trains/day-track)

T: 24 hours = 1,440 min.

f: Track use ratio

t = 60 * L/V: Running time (min.)

L: Distance between adjoining stations (km) (Tokenless/token block system)

Signal sighting distance + 2 block sections + train length (km) (Automatic block system)

V: Train speed (km/hr)

c: Time required for blocking

Assumption in common

Track use ratio: 70%

Train speed: 70% of Maximum speed of the slowest train

Time required for blocking: 0 --- Automatic block system

3 min --- Tokenless block system

(Based on the official time table)

5 min --- Token block system

Distance between adjoining stations: Longest distance except special cases

Signal sighting distance: 1.2 km

Block section length: 3,0 km (Maximum)

Train length: 0.6 km

(2) Line Capacity of Double-track in Karachi - Lahore

a) Present state (Double-track section)

Assumption

Distance between adjoining stations: 15 km

Train speed: 55 km/hr * 0.7 = 38.5km/hr

Tokenless block system (c = 3 min)

N = 38 trains/day-direction

b) After improvement (Automatic block system, freight wagons mainly 4-wheeled)

Assumption

Signal sighting distance + 2 block sections + a train length: 7.8 km

Train speed: 55 km/hr * 0.7 = 38.5km/hr

Automatic block system (c = 0)

N = 83 trains/day-direction

c) After improvement (Automatic block system, freight wagons mainly high performance)

Assumption

Signal sighting distance + 2 block sections + a train length: 7.8 km

Train speed: 80 km/hr * 0.7 = 56 km/hr

Automatic block system (c = 0)

N = 121 trains/day-direction

- d) After improvement and electrified (Automatic block system, freight wagons mainly high performance, and electrified)

Assumption

Signal sighting distance + 2 block sections + a train length: 7.8 km

Train speed: $100 \text{ km/hr} * 0.7 = 70 \text{ km/hr}$

Automatic block system ($c = 0$)

$N = 151 \text{ trains/day-direction}$

- e) After further reinforcement (Shortening block section, expansion of station effective length, strengthening substation, and almost all freight wagons high performance)

Assumption

Signal sighting distance + 2 block sections + a train length: 5.1 km

Train speed: $100 \text{ km/hr} * 0.7 = 70 \text{ km/hr}$

Automatic block system ($c = 0$)

(Calculated $N = 231 \text{ trains/day-direction}$)

$N = 0.7 * 10 * 24 = 168 \text{ trains/day-direction} < 231$

Taking into consideration actual operation condition such as acceleration of heavy ((3,000 ton)) freight trains and window times for infrastructure maintenance, this is considered to be upper limit.

(3) Calculation of Freight Transport Capacity of a Train

Assumption

Average loading tonnage of a container : 20 ft---17.5 ton, 40 ft---23.1 ton

Tare of a container: 20 ft---2.3 ton, 40 ft---4.0 ton

Ratio of 20 ft to 40 ft: 1 to 0.63

Average loading tonnage of a container: 14.2 ton/TEU

Average gross tonnage of a loaded container: 16.3 ton/TEU

Tare of a container wagon for 3 TEU: 23.2 ton

Average gross tonnage of a loaded container wagon: 72.1 ton

Average load efficiency of a loaded container wagon: $14.2 * 3 / 72.1 = 0.59$ ---59%

Adopted assumption

Average load efficiency of a loaded wagon: 60% (Including bulk transport)

Average gross tonnage of a loaded wagon: 72 ton

Average length of a wagon: 20 meter

- Hauled by a 3,000HP diesel locomotive

Hauling capacity: 1,800 ton (Maximum speed: 80 km/hr)

Net transported tonnage: 1,080 ton/train

- Hauled by a 3,900 kW electric locomotives

Hauling capacity: 2,000 ton (Maximum speed: 100 km/hr)

Net transported tonnage: 1,200 ton/train (Train length: 580 m < 600 m)

- Hauled by a 7,000 kW locomotives or 2-3,900 kW electric locomotives

Hauling capacity: 3,000 ton (Maximum speed: 100 km/hr)

Net transported tonnage: 1,800 ton/train (Train length: 870 m < 900 m)

* Note: It is necessary to take into consideration imbalance of transport volume between directions. Proportion of transport volume up-country to down-country is assumed to be 6 to 4.

(4) Line Capacity of Single-track in Primary A Lines

a) Present state (Single track section)

Assumption

Distance between adjoining stations: 12 km
Train speed: $55 \text{ km/hr} * 0.7 = 38.5 \text{ km/hr}$
Tokenless block system ($c = 3 \text{ min}$)

$N = 46$ trains/day (both directions)

b) After improvement (Automatic block, freight wagons mainly 4-wheelers)

Assumption

Distance between adjoining stations: 12 km
Signal sighting distance + 2 block sections + a train length: 7.8 km
(In case to operate in the same direction successively)
Ratio of operation in the same direction successively: 20%
Train speed: $55 \text{ km/hr} * 0.7 = 38.5 \text{ km/hr}$
Automatic block system (Train exchange; $c = 0.5$)
(Successive operation; $c = 0$)

$N = 57$ trains/day (Both directions)

c) After improvement (Automatic block, freight wagons mainly high performance)

Assumption

Distance between adjoining stations: 12 km
Signal sighting distance + 2 block sections + a train length: 7.8 km
(In case to operate in the same direction successively)
Ratio of operation in the same direction successively: 10%
Train speed: $80 \text{ km/hr} * 0.7 = 56 \text{ km/hr}$
Automatic block system (Train exchange; $c = 0.5$ / Successive operation; $c = 0$)

$N = 78$ trains/day (Both directions)

(5) Line Capacity of Single-track in Other Line

a) Present state (Single track section)

Assumption

Distance between adjoining stations: 15 km
Train speed: $55 \text{ km/hr} * 0.7 = 38.5 \text{ km/hr}$
Tokenless block system ($c = 3 \text{ min}$)

$N = 38$ trains/day (both directions)

b) After improvement (New type tokenless block, freight wagons mainly 4-wheelers)

Assumption

Distance between adjoining stations: 15 km
Train speed: $55 \text{ km/hr} * 0.7 = 38.5 \text{ km/hr}$
New type tokenless block ($c = 0.5$)

$N = 42$ trains/day (Both directions)

c) After improvement (New type tokenless block, freight wagons mainly highperformance)

Assumption

Distance between adjoining stations: 15 km

Train speed: $80 \text{ km/hr} * 0.7 = 56 \text{ km/hr}$

New type tokenless block ($c = 0.5$)

N = 61 trains/day (Both directions)

Annex E. Environmental Criteria

E.1 Environmental Background

Environmental indicators are required for projects prioritization on the view of sustainable environmental assessment in the master plan stage.

Present condition of indicator in each area is described in following sections, such as natural environment, social environment and natural condition.

E.1.1 Natural Environment

Pakistan has many habitats or sensitive areas due to the diversity of geography and climate differences. Especially the following areas are protected by Federal government legislation.

- National park (18 parks: 15 registered and 3 proposed for registration now)
- Game reserve (89 reserves)
- Wildlife sanctuary (98 sanctuaries)
- Unclassified protected area (17 areas)

(Source: Guidelines For Sensitive And Critical Areas Government of Pakistan October 1997)

Each description is shown in Table E-1, and location of national parks is shown in Figure E-1.

Table E-1 Outline of Protected Area

Protected Area	Descriptions
National Park	Some of the key features of the national park classification include: · protection and preservation of scenery, flora and fauna in its natural state · an area of outstanding scenic merit and natural interest. The following acts are prohibited in a national park: a) Hunting, shooting, trapping, killing or capturing of any wild animal in a national park or within three miles radius of its boundary b) Firing any gun or doing any other act which may disturb any animal or bird or doing any act which interferes with the breeding places c) Felling, tapping, burning or in any way damaging or destroying, taking, collecting or removing any plant or tree there-from d) Clearing or breaking up any land for cultivation, mining or for any other purpose e) Polluting water flowing in and through the national park Once an area is identified the specific rules pertaining to that area should be sought from the provincial forestry and wildlife department
Game Reserve	The Government may declare any area to be a game reserve where hunting and shooting of wild animals is not be allowed; except under a special permit, which may specify the maximum number of animals or birds that may be killed or captured in the area and the duration for which such a permits will be valid.
Wildlife Sanctuary	The main features of a wildlife sanctuary include · undisturbed breeding ground · prohibited or regulated public areas · non-exploitation of forest. The government rules pertaining to wildlife sanctuaries require either prohibition or control of the following variables: a) Entry or residence, b) Cultivate any land, c) Damage or destroy any vegetation, d) Hunt, kill or capture any wild animal or fire any gun or other firearm within three miles of the boundaries or, e) Introduce any domestic species of animal or plant, f) Introduce any domestic animal or allow it to stray, g) Cause any fire, or pollute water. The level of control will vary for different reserves; the only logical contact to elaborate on this matter will be the relevant provincial forestry and wildlife department. The Government may, by notification in the official gazette, declare any area to be a wildlife sanctuary and may demarcate it in a manner as it sees fit. The government may also for scientific purposes, aesthetic enjoyment, or for betterment of scenery authorize the doing away with the above-mentioned regulations.
Unclassified Area	These protected areas are not categorized so far in the same manner as above.

Source: Guidelines For Sensitive And Critical Areas Government of Pakistan October 1997

Furthermore Pakistan government approves the ratification of the Ramsar Convention. Registered 19 wetlands are habitats for considerable wildlife such as Indus dolphin and migrating birds. The location of Ramsar site is shown in Figure E-1.



Source: National Park: JICA Study Team (based on Guidelines For Sensitive And Critical Areas Government of Pakistan October 1997), Ramsar Site: <http://www.wetlands.org/reports/rammap/mapper.cfm>

Figure E-1 National Parks and Ramsar Sites Map

Table E-2 List of National Park

NP Name	IUCN Category	Location (Coordinates)	Area (ha)	Notification Date
1 Machiara	-	AJK (34/31 - 34/34 N.73/32 - 73/39 E.)	13,537	1982
2 Dhrun	II	Balochistan (Not recorded)	167,700	1988
3 Hazar Ganji-Chittan	V	Balochistan (29/59 - 30/09 N. 66/24 - 66/54 E.)	15,555	1980
4 Hingot	II	Balochistan (Not recorded)	165,004	1988
5 Margalla Hills	V	Federal Territory (33/48 N. 73/10 E.)	17,386	1980
6 Ayubia	V	NWFP (34/01 - 34/03 N. 73/22 - 73/27 E.)	1,684	1984
7 Chitral Gol	II	NWFP (33/51 - 33/56 N. 71/38 - 71/46 E.)	7,750	1984
8 Sheikh Buddin	IV	NWFP (32/15 - 32/25 N. 70/45 - 71/10 E.)	15,540	1993
9 Central Karakoram	-	Northern Area (Not recorded)	Not recorded	1995
10 Deosai Plains	-	Northern Area (35/10 N. 75/50 E.)	362,600	1993?
11 Handrap Shandhoor	-	Northern Area (Not recorded)	51,800	1993?
12 Khunjerab	II	Northern Area (36/52 N. 75/27 E.)	226,913	1975
13 Chinji	II	Punjab (32/42 N. 72/22 E.)	6,070	1978
14 lai Suhanra	V	Punjab (29/21 N. 71/58 E.)	51,588	1972
15 Kirtha	II	Sindh (25/44 - 27/15 N. 67/10 E.)	308,733	1974
16 Gharnot	-	AJK (34/11 N. 73/30 E.)	-	(Proposed)
17 Lake Lulu sar	-	NWFP (34/33 N. 73/25 E.)	-	(Proposed)
18 Lake Saiful Maluk	-	NWFP (34/22 N. 73/20 E.)	-	(Proposed)

(NOTE) List of Game reserve, Wildlife sanctuary is shown in annex

Source: JICA Study Team (based on Guidelines For Sensitive And Critical Areas Government of Pakistan October 1997)

Table E-3 List of Ramsar Sites in Pakistan

No.	Name	Designation Data	Coordinates of Center	Area (ha)	Category in National Protected Area
1	Astola (Haft Talar) Island	10-05-2001	25°07'N 063°52'E	5,000	none
2	Chashma Barrage	22-03-1996	32°25'N 071°22'E	34,099	WS
3	Deh Akro-II Desert Wetland Complex	05-11-2002	26°50'N 068°20'E	20,500	WS
4	Drigh Lake	23-07-1976	27°34'N 068°06'E	164	WS
5	Haleji Lake	23-07-1976	24°47'N 067°46'E	1,704	WS
6	Hub (Hab) Dam	10-05-2001	25°15'N 067°07'E	27,000	WS
7	Indus Delta	05-11-2002	24°06'N 067°42'E	472,800	WS
8	Indus Dolphin Reserve	10-05-2001	28°01'N 069°15'E	125,000	none
9	Jiwani Coastal Wetland	10-05-2001	25°05'N 061°48'E	4,600	none
10	Jubho Lagoon	10-05-2001	24°20'N 068°40'E	706	none
11	Kinjhar (Kalri) Lake	23-07-1976	24°56'N 068°03'E	13,468	WS
12	Miani Hor	10-05-2001	25°24'N 066°06'E	55,000	none
13	Nurri Lagoon	10-05-2001	24°30'N 068°47'E	2,540	none
14	Ormara Turtle Beaches	10-05-2001	25°13'N 064°28'E	2,400	none
15	Runn of Kutch	05-11-2002	24°23'N 070°05'E	566,375	WS
16	Tanda Dam	23-07-1976	33°35'N 071°22'E	405	none
17	Taunsa Barrage	22-03-1996	30°42'N 070°50'E	6,576	WS
18	Thanedar Wala	23-07-1976	32°37'N 071°05'E	4,047	GR
19	Uchhali Complex (including Khabbaki, Uchhali & Jahlar Lakes)	22-03-1996	32°37'N 072°00'E	1,243	WS

(NOTE) Category in National Protected Area: WS: Wildlife Sanctuary, GR: Game Reserve

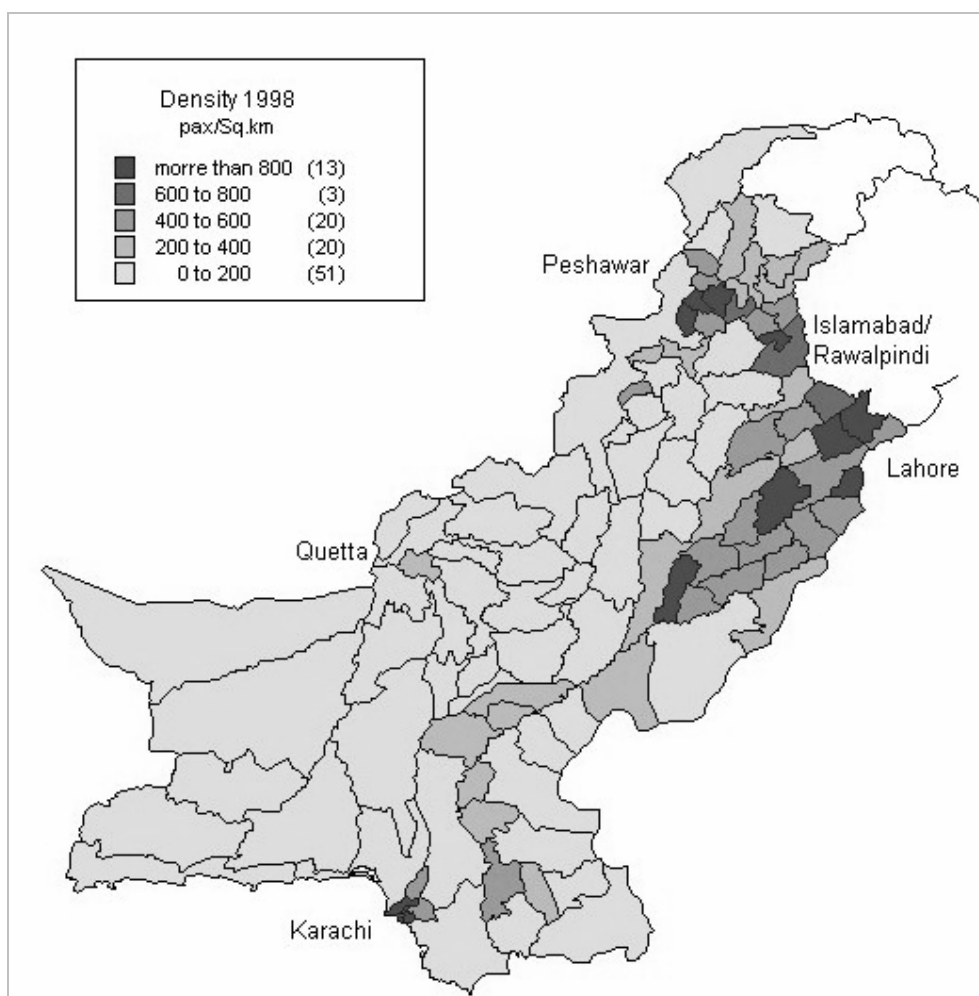
Source: <http://www.wetlands.org/reports/rammap/mapper.cfm>

E.1.2 Social Environment

High-density residential areas and historical sites are major indicators of valued social environment. Population density by district map is shown Figure E-2.

(1) High-density residential area

Figure E-2 shows clearly the concentration of population in the corridor along the Indus, its tributaries and another corridor from Lahore to Peshawar via Islamabad/Rawalpindi. According to the 1998 census, about one person out of three lives in an urban area. This urban population ratio has been steadily growing from 25 % in 1972 and 28 % in 1981. Most of urban population live in Punjab and Sindh. The most populous city is Karachi (9.3 million in 1998), followed by Lahore (5.4 million), Faisalabad (2.0million), Rawalpindi (1.4 million), Multan (1.2 million), Hyderabad (1.2 million), Gujranwala (1.1 million) and Peshawar (1.0 million). Quetta, the capital of Balochistan had a population of 0.6 million in 1998.



Source: JICA Study Team (based on 1998 Population Census)

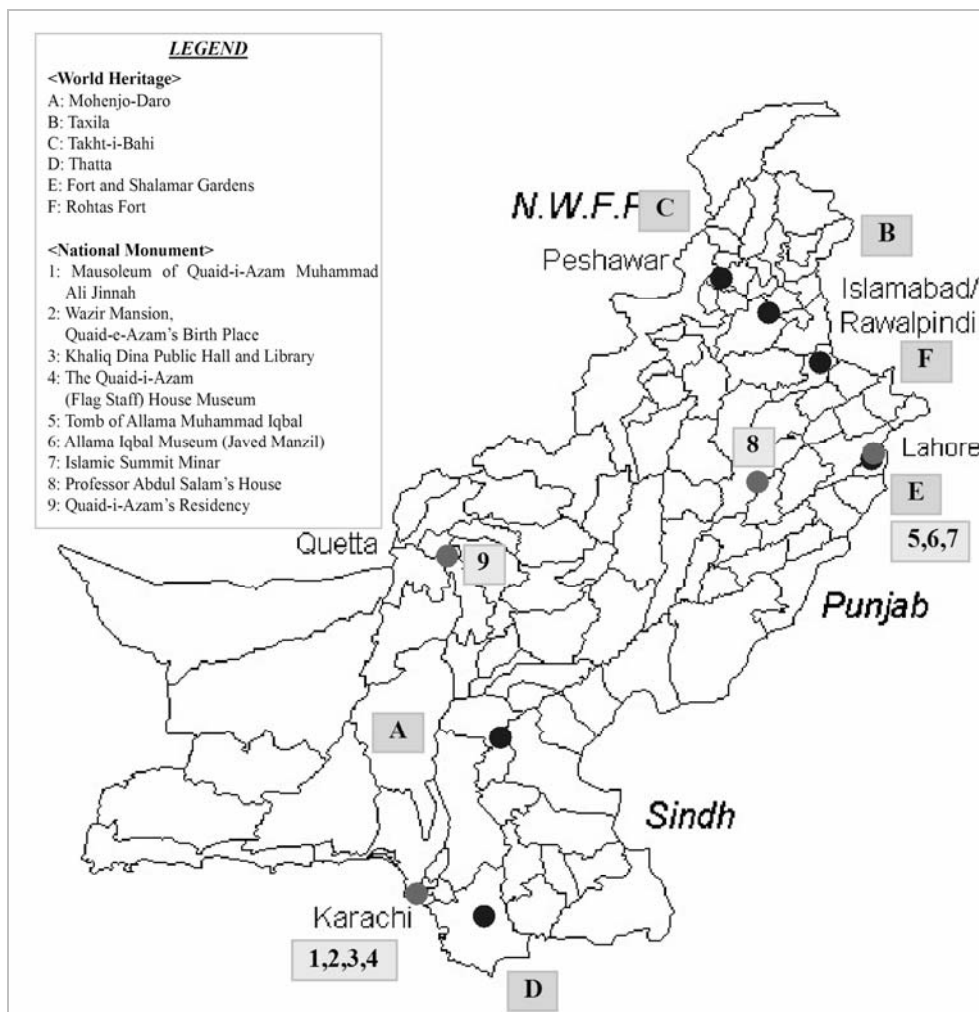
Figure E-2 Population Density by District Map

(2) Historical Monument

Pakistan Government has two categories for protected historical property, one is World Heritage Sites and the other is National Historical Monuments.

There are 7 World Heritages Sites and 9 National Historical Monuments registered at the present time. Additionally, three more proposed world heritage sites will be registered with UNESCO in the near future, and possibly another three national monuments. However at this time full details were not available. At the time of project preparation, the Department of Archaeology and Museums should be consulted for the most up to date list.

The 7 World Heritage Sites and National Monuments are shown in Fig. 12-2-3, and a description of each is shown in Table E-4 and Table E-5



Source: JICA Study Team (based on Guidelines For Sensitive And Critical Areas Government of Pakistan October 1997)

Figure E-3 Cultural Monument Map (World Heritage and National Monuments)

Table E-4 Outline Historical Monument (World Heritage)

Name	Location	Explanation
Archaeological Ruins at Mohenjo-Daro	Sind Province	It is about 300km to the north from Karachi of the Indus lower stream of a river. The ruins have an area of about 1.6km around. The Indus which brought about various development for India. It was unearthed on a large scale, having applied them from 1921 near the Indus. Having been unearthed turns out to be a front thing 4000 or more, and it calls it Indus civilization clearly for the first time there. Mohenjo-Daro makes the west of a site the fortress area, and makes the east the city area. The way of various sizes filled with brick like thin brown that is purple travels the inside of ruins in the shape of a lattice. The slot of a small sewer is also checked along the street. The large bathroom for people living, a watch stand, a granary, a priest of high virtue, a high official's house, etc. are located in a fortress area. The building compared with a city area where they are larger is conspicuous. The large bathroom is considered to be the place of the ceremony in which posterity prosperity is wished. It is hardened with asphalt so that it may not leak exactly. A city area has many private houses closely made with brick. It thinks suddenly that the shadow of men of power, such as a shrine and a king's palace, is not found in Mohenjo-Daro here. It is supposed that it is because Mohenjo-Daro used the blessing of a river and it was carrying out the life dependent on nature. Then, why was it ruined? Although the opinion of having been invaded by ARIA people until now was strong, it is said whether, now, people threw away this ground by the massive flood of the Indus. It was registered in 1980.
Taxila	Punjab Province	Taxila is in west and one corner in Gandhara from Islamabad. Excavation work has been eagerly done since 1912. Taxila was the subordinate of an Ashamedness dynasty during the 6th century after from the 6th century of B.C. the era. It considered as the base of the Gandhara district and king of Alexander etc. was visited. Also after that, the dynasty of 6 governed this ground one after another. Therefore, various ancient ruins will remain in Taxila. The ruins of Buddhism are made into the start and there is also a Zoroastrianism shrine. Bhir Mound in the southeast of Taxila. Here, the building of the Maurya dynasty is left behind. Although this town will be thrown away if the town of Sirkap develops the future, the drain and place back into which garbage is dumped was seen. Sirkap is the place which was the capital of Taxila from the 1st century to the 3rd century. There is "Stupa of the eagle of dual leadership" which three countries, India, Iran, and Greece, united. Jandial which is in the place of 640m from Sirkap is the shrine of Zoroastrianism, and will be made into the thing in the 5th century from the 2nd century of B.C. It was registered in 1980.
Buddhist Ruins at Takht-i-Bahi and Neighboring City Remains at Sahr-i-Bahlol	NWF Province	Takht-i-Bahi is in the slightly elevated place which can command a whole view of the northwest in Mardan, and the Gandhara plain. Gandhara was the old name of a place of the Peshawar whole capital of a state, and it prospered most at the time of a Couant dynasty. It which combined the Buddhism of India and the grace of Greece was called Gandhara fine arts. The Buddhist image was also produced here. It is because the tendency to worship what visible was stronger than idol worship. Although the Couantrace which made the Gandhara fine arts is a nomad and had extended the range till the 5th century, it will be completely destroyed by invasion of the race which is different about the middle of the 5th century. The foundation to which Stupa was in Takht-i-Bahi is surrounded, a small shrine stands in a row, and the white wall of mortar is left behind here and there. Sahr-i-Bahlol near the Neighboring City Remains at Sahr-i-Bahlol is spoken about as it was the town of a fortification surrounded by the mighty wall those days. It was registered in 1980.
Historic Monuments of Thatta	Sind Province	Historic Monuments of Thatta the southern part of the State of Sind, and near Karachi. Once, Thatta was the capital in Sind from the 14th century to the 18th century. Thatta which received the blessing of the Indus and reached to an extreme of prosperity. However, trade becomes impossible gradually by flood of the Indus. After all, it has gone to ruin by the Persia army about the middle of the 18th century. Huge "Makli Hill" before going into a town is a 15-square kilometer vast grave, and has a 1 million people thing grave. Jami Masjid in the city of Thatta was built from 1647 by the 5th generation Shah Jahan of a Mughal period. It is said that it built this mosque since Shah Jahan was warmly watched by people of Thatta after it caused rebellion for the father and fled for him. He who has noticed an aunt's artifice after that continued fighting with a father. It was registered in 1981.

Name	Location	Explanation
Fort and Shalamar Gardens	Punjab Province Lahore	Lahore, which is a big city to the next in Karachi in Pakistan. A figure with medieval times is still left there. Akbar, the third generation emperor of the Mughal Empire, inherited grade at the age of 13, and built the Lahore castle. Lahore, which was not so big a city, then was made into the capital in the Mughal Empire, and various kings repeated the extension after that. However, if the 18th century will come, the Mughal Empire will decline and the Mughal Empire will see an end by invasion of the Persia army. The Masti gate was built by the 3rd generation Akbar. The picture of many animals is drawn in Hinduism. There were many especially elephants and, as for the time and the elephant, the battle was also used. It is characteristic that it is also a gate larger so that an elephant may tend to go in and out. Although the Lahore castle was built by military purposes, it also had the role of a royal palace. Shalamar Gardens is a garden as a health resort which emperor Shah Jahan of the 5th generation built. It has an area of no less than 37ha, a waterway, a waterfall, and green are also used skilfully, and there is also an image of a Buddha in a museum. This garden that a fountain will go up twice on the 1st still serves as a place of relaxation of people. It was registered in 1981.
Rohtas Fort	Punjab Province	It is a fort which is located in Rawalpindi southeast and follows the ridge of a river for a long time. There is at least 1km only of portions in which it faced the river. This fortification had the role from which the highway which connects Calcutta to Peshawar is protected, and prevented a nomad's invasion. 5km or more of circumferences. Sher Shah which banished the Humayun emperor from India built such a fortification. Rohtas Fort is for protecting a country and was built in 1541. The wish of Cher Shache which grasped control was "becoming one of the greatest persons in the history of India." In five years, according to the wonderful talent, he decided the high official for every prefecture, and finished various achievements, such as aiming at relief of confrontation with a Muslim and a Hindu believer. The hand was also rendered to military reinforcement on the reverse side, and reliance of people was also thick. It was registered in 1997.

Source: <http://www.un.org.pk/ych/world-hert-pak.htm>

Table E-5 List of National Monument (Protected Federal Government)

	Name of National Monument	Location (Coordinates)
1	Mausoleum of Quaid-i-Azam Muhammad Ali Jinnah	Karachi, Sind Province
2	Wazir Mansion, Quaid-e-Azam's Birth Place	Karachi, Sind Province
3	Khaliq Dina Public Hall and Library	Karachi, Sind Province
4	The Quaid-i-Azam (Flag Staff) House Museum	Karachi, Sind Province
5	Tomb of Allama Muhammad Iqbal	Lahore, Punjab Province
6	Allama Iqbal Museum (Javed Manzil)	Lahore, Punjab Province
7	Islamic Summit Minar	Lahore, Punjab Province
8	Professor Abdul Salam's House	Jhang, Punjab Province
9	Quaid-i-Azam's Residency	Ziarat, Balochistan Province (Suburb of Quetta)

Source: Guidelines For Sensitive And Critical Areas Government of Pakistan October 1997, Under the Antiquities Act 1975

E.2 Natural Condition

Rainfall data, seismic zone and earthquake history are included as being significant natural condition data for transport facilities design.

Each data is shown in following Tables and Figures.

(1) Meteorology

Pakistan is situated in the mon-soon region however; it is arid, except for the southern slopes of the Himalaya and the sub-Mountainous track which has a rainfall rage of 76 to 127cm per year. The province of Balochistan is the driest part of the country with an average rainfall of 21cm. Three-fourth of Pakistan receives an annual precipitation of less than 250mm and 20% of it less than 125mm. A large part of the precipitation in the northern mountain system is in the form of snow which feeds the rivers.

Table E-6 Rainfall Data in Major Cities (Average mm)

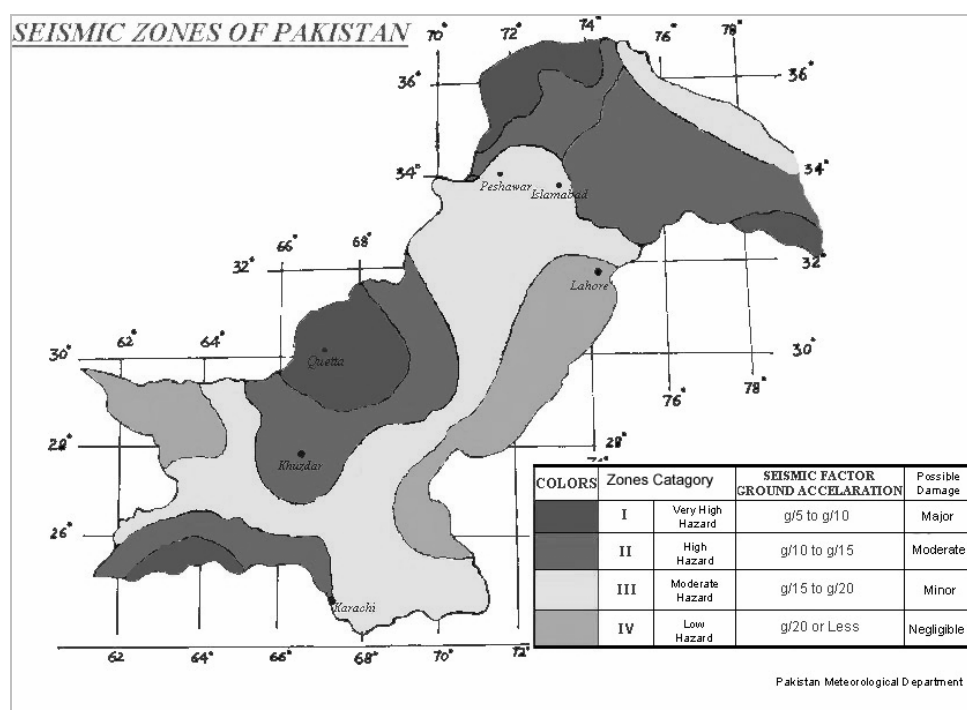
City Name	Jan.	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ISLAMABAD (During 1954-2002)	166.9	248.8	224	264.9	115.3	239	743.3	641.4	279.1	95.8	91.2	177.9	1735.1
KARACHI (During 1931-2002)	89.3	96	130	52.8	33.3	58.9	429.3	262.5	315.7	98	83.1	63.6	713
LAHORE (During 1931-2002)	121.2	509	254.5	141	129	208.6	477.9	825.5	523.2	155	77.9	111.8	1317.5
PESHAWAR (During 1931-2002)	150.3	144	222.6	179.1	119.6	55.4	212.9	280.2	75.4	203	111.5	254.3	710.2
QUETTA (During 1946-2002)	178	189.2	232.4	158.7	39.9	19.2	163.6	173	62	68.8	39.4	162	949.8

Source: Pakistan Metrological Department Web-Site (<http://www.met.gov.pk/cdpc/karachi.htm>)

(2) Seismic Zone

According to the seismic zone map by provided by the Department of Meteorology, Category I (Very high hazard) occurs in 3 areas, these being Chitral in NWFP, Quetta and Pasni in Balochistan.

Category II (High hazard) areas are located around Category I areas.



Source: Pakistan Metrological Department Web-Site

Figure E-6 Seismic Zone Map

(3) Construction of Roads in Unstable Areas

The procedure for construction of roads in geologically unstable areas is specified in documents issued by NHA to consultants.

When NHA are considering constructing a road they retain the services of a consultant. This consultant is issued with standard TORs with which they must comply. These are designated Appendix A "Scope of Services / Terms of Reference : Detailed Design for Road ..." and form part of the consultants contract.

A proposed alignment is given but the consultant must prepare an Inception Report in which

they either confirm the proposed alignment or make suggestions for changes. As part of the Inception report the consultant must also prepare a “Safety Audit” where they carry out a condition survey and identify any structures or natural features that may require special attention in the design of the road.

Following acceptance of the Inception Report, and confirmation of the route alignment, the consultant must then prepare a geotechnical survey and an environmental impact assessment.

The geotechnical survey includes ground condition surveys and soil sampling. The location and spacing of the sampling must be agreed with NHA.

For soils, boreholes and shallow pits are required. Standard penetration tests, compression tests and shear tests are then carried out at site or on the samples.

For rock, compressive tests are carried out. For granular material, tests are made for grain size, compaction and elasticity. These tests are all to be made in accordance with generally accepted industry practice and international standards. These data are then compiled into a full geotechnical report.

Also a hydraulic study is required which must identify flood prone areas. This is based on a 100-year return period. The study must also give flood protection measures and necessary works to avoid road damage, slope landslide and provide adequate drainage.

The above information is submitted separately but must also be included in the EIA. The EIA should contain details of the methodology for cutting slopes, including slope stabilization above the roads, locations for dumping of cut material and details for ensuring the stability of the dumped material if not used for fill.

It is explicitly stated in the TOR that it is a requirement of the consultants that they must take cognizance of the latest Seismic Zoning Map for Pakistan. No other specific information is referred to in the TOR. However, it is known that the mountainous parts of the northern areas and NWFP are subject to landslides, particularly in the spring season when snows melt. Also the monsoon season can bring intensive rains which can cause mudslides blocking roads.

In the more desert regions of Sindh and Balochistan, the annual rainfall is low but storms of short duration and high intensity can occur. Due to the hard sun baked surface, rainfall penetration is low, run off is high, flash floods can occur and natural dry channels rapidly become flooded. Roads crossing these dry channels often use surface level crossings but these and bridges can be carried away if the flow is sufficiently intense.

Other than this, identification of any other ground instability factors is expected to be assessed on a project by project basis.

Annex F. PRELIMINARY STUDY OF ENVIRONMENTAL ASSESSMENT PROCESS

F.1 Legal Background

F.1.1 Review

The 1973 Constitution gave responsibility for environmental pollution control to the Federal and Provincial Governments, and in 1974 the Ministry of Housing and Works established an Environment and Urban Affairs Division (EUAD). However, there was little environmental input in national planning throughout the 1970s. Environmental legislation was addressed in the Pakistan Environmental Protection Ordinance (PEPO) 1983, which enables both Federal and Provincial legislatures to enforce pollution control. Under the Ordinance, Provincial EPAs were established.

There are a number of Acts, Ordinances and Codes covering other sectors such as agriculture (1971), forestry (1927), wildlife (1974), motor vehicles (1965) and factories (1934), these last two include provisions for controlling air pollution. The 1984 Factory Act contains provisions for controlling discharge of industrial effluent to land, air and water. However, a 1985 survey showed that only 3% of industrial plants treated waste to the Factory Act standards.

Following a three-year consultative process the National Conservation Strategy (NCS) was approved by Cabinet in March 1992. The NCS focused on four areas: clean air, clean water, solid waste, and ecosystem management. The Government allocated 1% of GNP in the 8th Five Year Plan (1993-98) to support the environmental activities proposed in the NCS.

The fundamental environmental legislation is the Pakistan Environmental Protection Act, 1997 that has superseded the PEPO, 1983. Under the ordinance, the Pakistan Environmental Protection Council (PEPC) was created in 1983 and is the senior federal body. Under the PEPC the Ministry of Environment (MOE) is the main institution responsible for environment, and pollution control.

Within the Ministry of Environment, the National Conservation Strategy (NCS) Unit is responsible for promoting and monitoring progress of NCS implementation.

Subsequently, a National Environmental Action Plan (NEAP) was prepared and approved by PEPC in 2001 and implemented in 2002. The NEAP attempted to give a short-term direction to the Ministry of Environment. The NEAP has yet to complete the activities that were to be the precursors for the development of a detailed action plan.

Recently the draft National Environmental Policy 2005-15 has been circulated and comments invited on enforcement and proposed changes in the short and long term.

F.1.2 Institutions and Devolution

There are five sets of institutions concerned with environmental issues in Pakistan: government agencies, governance bodies, local authorities, national and international NGOs, and bilateral and multi-lateral donors. The government agencies are responsible for planning and implementing activities for preserving and protecting the environment and for controlling pollution. The governance bodies include parliament and provincial assemblies while local authorities include district governments. Within the NGOs, IUCN are very active, having prepared the NCS. All the major donors are represented.

There are three tiers of governance, federal, provincial and district, which is different to other countries where a two tier system, federal and local, is common. There are no environmental regulatory bodies at the district level, and local governments operate within the provincial framework. This leads to confusion in roles and responsibilities as the process of devolution is still in progress.

The Local Governments are mandated to function within the provincial framework. The provincial Governments were instructed to decentralize activities to the district government, which included the environment department. So far this is only possible in Punjab, where the Environment Protection Department already existed prior to devolution. In the rest of the provinces the EPAs are working as attached departments in one of the related agencies.

Under the provincial SBNP Local Government Ordinance, environmental protection only deals with environmental pollution. Local governments may implement schemes for the prevention of pollution by automobile engine, factories, kilns, and such other sources for which bye-laws exist.

F.2 Policies, Programme and Strategies

F.2.1 National Conservation Strategy (1992)

The National Conservation Strategy (NCS) became the de facto Environmental Policy of Pakistan. It identified 14 core programme areas. The mid-term review of NCS emphasized improvement in implementation capacity and the need to reinvigorate and refocus through development of an NCS-2 with a more focused approach to serve as Pakistan's Sustainable Development Strategy for 2002-2012 with greater emphasis on poverty reduction, economic development and environmental sustainability.

F.2.2 Draft National Environmental Policy (2005-15)

The draft National Environmental Policy is based on a participatory approach to achieving sustainable development through strong institutions. It recognizes that cross sector linkages of environment with population, gender, health, trade, poverty and local governance are critical to sustainable environmental management.

It recommends the government establish nationwide district environment offices and district environment committees with a mandate to develop and implement district and Tehsil level environment management plans. It also describes the devolution of necessary powers to local government for effective environmental management and establishment of district sustainable development funds.

F.2.3 National Forest Policy (2000)

The National Forest Policy of Ministry of Environment provides a legal framework for the management of sustainable forest development and wildlife, which has been defined as a renewable natural resource. The forest policy provided guidelines for the provincial governments, but they can make changes according to their needs. The commercial timber is a source of income to the owners of the forests and gives employment to the villagers. Regeneration will enhance this resource and poverty alleviation is the main purpose.

F.2.4 Draft National Water Policy (2002)

The Ministry of Water and Power is presently reviewing the Draft National Water Policy. It does not clash with the draft National Environmental Policy but there are many overlaps. Issues like municipal, rural and industrial water supply are covered in more detail in the draft water policy than in the draft environmental policy. Economic and financial management of water resources are discussed.

F.2.5 Education Policy (2001)

The Education policy accepts the importance of educating people on environmental issues. It supports the integration of environment in the syllabi and curricula of schools.

F.2.6 Population Policy (2002)

The Population Policy is linked directly with protection and conservation of environment. The population policy includes environment and sustainable development in its focus areas and advocates cross-sectoral coordination at the local government level.

F.2.7 National Policy for Development and Empowerment of Women (2002)

The National Policy for Development and Empowerment of Women is directly linked with population policy and in the cross-sectoral theme of gender and environment. This policy does not explicitly state these objectives but in the context of sustainable development, there is no contradiction with the environmental policy.

F.2.8 The 8th Five Year Plan (1993-1998)

The 8th Five Year Plan (1993-1998) stated that: "environmental problems that have arisen due to unintended side effects of development would be addressed through proper environmental planning. The emphasis would be on controlling and correcting industrial discharge of residues and wastes, handling of toxic chemicals, etc. Environmental protection will be one of the key criteria in the selection and development of technology". The Plan expressed strong concern about the heavy concentration of industries and committed itself to improving the location of industry.

F.2.9 Policy for Power Generation Projects (2003)

The Ministry of Water and Power has developed a Policy for Power Generation Projects, including a draft policy on the use of alternative energy such as solar power and wind power. It refers to the EP Act 1997. Companies running hydro and geo-thermal projects will not be charged with income tax. Those using oil-fired plants will not be given this concession. The provincial authorities will be granted concessions to help projects of low capacity (less than 50MW). These smaller power plants are intended to supply isolated areas not connected to the national grid.

F.2.10 National Transport Policy 2005-2015 (under preparation)

The transport sector accounts for 10% of GDP and 20-25% of the annual Public Sector Development Program. An efficient transport network is regarded as a pre-requisite for socio-economic development. A responsive transport system was said to be needed to sustain and enhance economic growth and improving the quality of life. In February 2005, the government decided to formulate a new national transport policy to develop a modern and an efficient transport sector. The ADB will provide technical assistance. The policy will be finalized through a consultative process based on transport demands, infrastructure shortfalls, resource requirement and constraints, governance aspects and institutional capacity. The purpose of the policy is to make the transport sector help achieve the goal of more than 6% growth in GDP.

F.2.11 National Policy for Urban Development

So far there is no policy for urban development or urbanization, and land use planning is a pressing environmental issue.

F.2.12 Road Improvement Programme (2005)

The ADB are funding a programme for Enhancing Road Improvement Benefits to poor communities in NWFP. This is grant funded and has been approved by ADB. A concept paper has been submitted by NWFP Provincial Government to P&D in the Federal Planning Commission and their decision is awaited.

F.3 Legislative Framework

F.3.1 Jurisdiction

The constitution of Pakistan identifies environmental pollution as a concurrent subject, which means that both Federal and Provincial Legislatures can make laws related to the environment, but should there be conflict between a federal and provincial law, federal rulings have primacy.

The Federal Ministry of Environment, and its attached department, the Pakistan Environment

Protection Agency, operates in the Federal Government as do the Ministries of Health, Population, Planning and Social Welfare. The provincial governments support environmental protection agencies (EPAs) by attaching them to one of their provincial departments.

Fundamental Rights fall under the jurisdiction of the four Provincial High Courts and the Supreme Court of Pakistan. The jurisdiction of the Supreme Court has been extended to environment by public interest litigation. Under the Constitution, any decision of the Supreme Court is binding on the four Provincial High Courts and the subordinate judiciary.

F.3.2 Pakistan Environmental Protection Act (PEPA), 1997

The Pakistan Environmental Protection Act 1997 was passed by the National Assembly, the Senate, and received the assent of the President of Pakistan in 1997.

This Act repealed the previous legislation that is the Pakistan Environmental Protection Ordinance, 1983. Notwithstanding the repeal, actions under that Ordinance are deemed to have been made under this new Act. The Act provides for the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and promotion of sustainable development.

In this Act, "Initial Environmental Examination" (IEE) means a preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment of a proposed project to determine whether it is likely to cause an environmental effect for requiring preparation of an Environmental Impact Assessment. List of projects requiring an IEE is given in Appendix 2.

"Environmental Impact Assessment" (EIA) means an environmental study comprising collection of data, prediction of qualitative and quantitative impacts, comparison of alternatives, evaluation of preventive, mitigation and compensatory measures, formulation of environmental management and training plans and monitoring arrangements, and framing of recommendations and such other components as may be prescribed. List of projects requiring EIA is given in Appendix 3.

"Project" means any activity, plan, scheme, proposal or undertaking involving any change in the environment and includes:

- Construction or use of buildings or other works
- Construction or use of roads or other transport systems
- Construction or operation of factories or other installations
- Mineral prospecting, mining, quarrying, stone-crushing, drilling and the like
- Any change of land use or water use
- Alteration, expansion, repair, decommissioning or abandonment of existing buildings or other works, roads or other transport systems; factories or other installations

"Proponent" means the person who proposes or intends to undertake a project.

"Sustainable development" means development that meets the needs of the present generation without compromising the ability of future generations to meet their needs.

F.3.3 Penalties

Anyone who contravenes the Act can be punished with a fine up to one million rupees, and in the case of a continuing contravention, with an additional fine of up to one hundred thousand rupees every day.

F.3.4 Environmental Protection Order

Where the Federal or Provincial Agency is satisfied that a violation of the Act has occurred, and has an environmental effect, the Agency must give the person responsible an opportunity to be heard. If after this, the situation is not resolved, they may direct the person to take remedial measures within a time period to be specified in a legal order. If the person does not comply, the Agency may itself implement the measures specified in the order and recover the

costs as arrears of land revenue. In addition the agency will initiate proceedings against that person.

F.3.5 Offences by Government Agencies or Local Authorities

If a contravention of the Act is committed by any Government Agency or local authority, or is attributable to any negligence on the part of any officer, the agency and officer will be liable to be prosecution. Statutory undertakers are not exempt.

F.3.6 Regulations and Standards

(1) National Environmental Quality Standards (NEQS)

The National Environmental Quality Standards (NEQS) issued under PEPA 1997 specify limits for industrial and municipal effluents, gaseous emissions, vehicular emissions, and noise levels. The PEPA 1997 empowers the EPAs to impose pollution charges in case of non-compliance to the NEQS. (See Table F-1)

(2) Regulation of Motor Vehicles

Under the Act no person can operate a motor vehicle from which air pollutants or noises are in excess of the National Environmental Quality Standards. The Federal Agency may direct certain classes of vehicles to install pollution control devices, use specified fuels, undergo maintenance or be tested in a prescribed manner. If such an order is given it is an offence to operate vehicles that do not comply. (See Table F-2)

Table F-1 NEQ's for Municipal and Industrial Effluents

Parameters	Into Inland Water	Into Sewage Treatment
Temperature or temperature increase	≤ 30°C	≤ 30°C
PH	6-9	6-9
Biochemical Oxygen Demand (BODs) at 20°C°	80	250
Chemical Oxygen Demand (COD) °	150	400
Total Suspended Solids (TSS)	200	400
Total Dissolved Solids (TDS)	3,500	3,500
Grease and oil	10	10
Phenolic compounds (as phenol)	0.1	0.3
Chloride (as Cl)	1,000	1,000
Fluoride (as F)	10	10
Total Cyanide (as CN)	1.0	1.0
An-ionic detergents (as MBAS°)	20	20
Sulphate (SO4)	600	600
Sulphide (S)	1.0	1.0
Ammonia (NH3)	40	40
Pesticides	0.15	0.15
Cadmium	0.1	0.1
Chromium (trivalent & hexavalent)	1.0	1.0
Copper	1.0	1.0
Lead	0.5	0.5
Mercury	0.01	0.01
Selenium	0.5	0.5
Nickel	1.0	1.0
Silver	1.0	1.0
Total Toxic metals	2.0	2.0
Zinc	5.0	5.0
Arsenic	1.0	1.0
Barium	1.5	1.5
Iron	8.0	8.0
Manganese	1.5	1.5
Boron	6.0	6.0
Chlorine	1.0	1.0
Notes:		
a. All values are in mg/L, unless otherwise defined.		
b. Applicable only when and where sewage treatment is operational and BOD5 = 80 mg/L is achieved by the sewage treatment system.		
c. The effluent should not result in temperature increase of more than 30° C at the edge of zone where initial mixing and dilution take place in the receiving body, In case zone is defined, use 100 meters from the point of discharge.		
d. Assuming minimum dilution 1:10 on discharge, lower ratio would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of treated effluent, the recipient water body should have 10 cubic meter of water for dilution of this effluent.		

Table F-2 National Environmental Quality Standards for Motor Vehicle Exhaust and Noise

#	Parameters	Standards (max: permissible limit)	Measuring Method
1	Smoke	40% or 2 on the Ringleman Scale during engine acceleration.	
2	Carbon Monoxide	Emission Standards	
		New Vehicle	Used Vehicle
		4.5 %	6 %
3	Noise	85 db (A)	Sound meter at 7.5 m from the source.

F.4 Implementing Agencies

F.4.1 Pakistan Environmental Protection Council

Establishment of the Council

Under the Act the Federal Government established the Pakistan Environmental Protection Council consisting of the Prime Minister as Chairperson, Minister of Environment as Vice Chairperson, Chief Ministers of the Provinces, and Minister's in charge of the subject of environment in the provinces. Members should not exceed thirty-five of which at least twenty are non official including five representatives of the Chambers of Commerce and Industry and Industrial Associations and one or more representatives of the Chambers of Agriculture, the medical and legal professions, trade unions, and non-governmental organizations concerned with the environment and development, and scientists, technical experts and educationists.

The Members hold office for a term of three years, the Council holds meetings as necessary, but not less than two meetings a year. The Council or any of its committees may invite any technical expert or representative of any Government Agency or non-governmental organization or other person possessing specialized knowledge of any subject for assistance in performance of its functions.

The functions of the Council are, inter alia, to:

Approve comprehensive national environmental policies and ensure their implementation within the framework of a national conservation strategy

Approve the National Environmental Quality Standards

Provide guidelines for the protection and conservation of species, habitats, and biodiversity in general, and for the conservation of renewable and non-renewable resources

Coordinate integration of sustainable development into national development plans

The Council may direct any Government Agency to prepare projects for improvement of the environment, control of pollution, and sustainable development of resources, or to undertake research.

The Council was actually formed under the previous Ordinance, and since its inception has met 8 times. The last meeting was chaired by the prime minister.

F.4.2 Environmental Courts

(1) Environmental Tribunals

The Federal Government has established Environmental Tribunals for reversal of grievances. In criminal jurisdiction, the Environmental Tribunal has the same powers as the Court of Session under the Code of Criminal Procedure. In appellate jurisdiction the Environmental Tribunal has the same powers as an appellate court. Otherwise it follows the Code of Civil Procedure.

The Tribunal consists of a Chairperson who is a qualified Judge of the High Court, and two members appointed by the Federal Government, one of whom is a technical member with suitable qualifications. So far the tribunals have secured legal expertise but lack technical members. Several Environmental tribunals have been established with one at Lahore for Punjab, one at Peshawar for NWFP and one at Karachi for Sindh and Balochistan.

An Environmental Tribunal responds to complaints from the Federal Agency, Government Agency, local council or an aggrieved person. The Tribunal may order the arrest of persons for a contravention. Conversely, where the Tribunal is satisfied that a complaint is false, it may direct the complainant to pay to the person complained against compensation up to one hundred thousand rupees. Any person who disputes an order of the Federal or Provincial Agency may lodge an appeal with the Environmental Tribunal within 30 days. Any person

aggrieved by any final order or by any sentence of the Environmental Tribunal may, within 30 days appeal to the High Court.

(2) Environmental Magistrates

All offences under the Act can be tried by a judicial Magistrate as an Environmental Magistrate empowered by the High Court. Any person convicted by an Environmental Magistrate may, within 30 days, appeal to the Court of Sessions, whose decision is final.

F.4.3 Federal, Province and District

Pakistan has four provinces, where the system of governance is congruent to the federal structure. There is a three-tier system of governance, federal, provincial and local. The principal body is the Federal Environmental Protection Agency (EPA). Most of the powers of the Federal EPA have been delegated to the provincial EPAs. The Federal EPA has conferred powers to approve IEE's or EIA's to provincial EPAs. Under the recent devolution of government, certain programs are being transferred to the districts.

F.4.4 Pakistan (Federal) Environmental Protection Agency (PAK-EPA)

The Federal Government established the Pakistan Environmental Protection Agency in 1987 to administer the Act, its rules and regulations. PAKEPA has among its duties:

Ensure enforcement of the National Environmental Quality Standards

Establish standards for the quality of the ambient air, water and land

It may allow different standards for discharge or emission from different sources, and for different areas, but where standards are less stringent than the National Environmental Quality Standards; prior approval of the Council is required.

Pak-EPA is staffed with 46 regular staff of which 11 are officers and 35 are ancillary staff. It has a Central Laboratory for Environmental Analysis (CLEAN), and a Green Library, which is also a resource centre for the Ministry of Environment.

In accordance with section 26 (1) of the 1997 Act, the Federal Government has delegated the powers and functions of the Federal EPA to the Provincial Governments, which have set up provincial EPAs. Provincial EPAs can now implement environmental regulations, monitor compliance, inspect environmental performance and take action against violators.

F.4.5 Provincial Environmental Protection Agencies

Under PEPO 1983 all Provincial Governments were required to establish a Provincial Environmental Protection Agency. To assist Provincial Agencies in their functions, the Provincial Government can establish Advisory Committees for various sectors and appoint members from amongst eminent representatives of the relevant sector, educational institutions, research institutes and non-governmental organizations.

Provincial EPAs are part of the provincial administration. They answer to the provincial governments and provincial assemblies and are not accountable to the Pak-EPA. Allocation of resources is determined by provincial budgets and plans.

Although the Federal government has delegated powers to the provincial government, the provincial government may assign these powers to any provincial government agency. In practice the Federal EPA has delegated its powers on assessing EIAs to the provincial EPAs.

(1) Punjab Environmental Protection Department

The Punjab Government has an independent Environment Protection Department (EPD) headed by a Secretary, which has Punjab EPA as its attached department. The EPD had offices in the districts, which are headed by Assistant Directors. Under the Punjab Local Government Ordinance, 2001 the EPD has been devolved, and the officers reassigned at district level. Punjab EPA has 30 officers and 133 ancillary staff, and a laboratory staffed

with 5 officers, which generates revenue for the EPD.

(2) Sindh Environmental Protection Agency

Sindh EPA has 12 technical officers, 5 non-technical officers, and 74 ancillary staff. They have a laboratory but lack necessary financial resources. The laboratory provides testing services for which they hire short-term casual staff.

(3) NWFP Environmental Protection Agency

NWFP EPA has 7 officers and 41 ancillary staff. The establishment is short of 5 officers. They have a functioning laboratory and are establishing offices at two other districts, initially at Abbotabad. They have a centre for human resource development in EIA.

(4) Balochistan Environmental Protection Agency

Balochistan EPA has 7 officers and 40 ancillary staff. They have a laboratory established under World Bank funding. The laboratory is not operational as it has a shortage of staff.

F.4.6 Planning and Development (P&D) Division

An Environment Section was established in 1993 in the Planning and Development (P&D) Division of the federal Planning Commission. Its function is to ensure that environmental concerns are addressed at the policy, planning, and project conceptualisation and approval stages. The Section is mandated to formulate and review policies related to environment, Medium Term Development Frameworks (MTDF), and screen projects.

There is duplication and conflicts in the work. For example, the responsibility of IEE management and review, and granting or refusing environmental approvals, rests with the departments at federal and provincial level responsible for economic and development planning (referred to as P&Ds). The Environment Section in the Planning and Development Division do the environmental screening and again send the PC-I of the projects for issuance of N.O.C., which duplicates the function of reviewing an IEE.

The Federal EPA reports that they are over-burdened and lack resource for reviewing a large number of PC-I documents. The P&D are not authorised by PEPA of 1997 and their role has not been specified in the Pak-EPA (Review of IEE/EIA) Regulations of 2000.

The NCS Unit in the Ministry of Environment and the Environment Section in the Planning and Development Division have been instructed to improve co-ordination among government agencies, NGOs and private sector.

F.4.7 Planning and Development Division / Departments

At the federal level, an organization is known as a division and as a department at provincial level. The federal Planning and Development Division and its corresponding provincial departments have established Environment Sections or Cells. Their main role is the environmental screening of projects submitted for approval for funding from the public sector development funds. The environmental cells in the provincial planning and development departments lack the necessary skills and do not perform environmental screening.

F.4.8 Urban Development Authorities

In large urban centres, Development Authorities have been established to address local development needs. Most of these DAs have now created environment sections or directorates to plan and implement protection and conservation-oriented environmental activities. In small cities and rural areas Municipal Committees and Union Councils have been made responsible to address environmental concerns.

F.5 Environmental Impact Assessment (EIA)

F.5.1 EIA Regulations

In 1997, the National Assembly passed the 1997 Pakistan EP Act, which subsumed the 1983 ordinance. This act requires IEEs and EIAs for all developmental projects.

Environmental impact assessment of all development projects whether public or private is a legal requirement under section 12 of PEPA 1997, which became operational in 2001. Project categories, which require an IEE, are listed in Schedule 1 (See Appendix 2) and the projects for which an EIA is required are in Schedule 2. (See Appendix 3)

The Pakistan EPA Review of IEE and EIA Regulations, 2000 (The 2000 Regulations) prepared under PEPA 1997 define the procedures for IEEs and EIAs, and give legal status to the Pakistan Environmental Assessment Procedures, prepared by the Federal EPA in 1997.

The number of EIA reports submitted to EPAs has increased from 6 in 2000 to 29 in 2004 and the number of IEE's from 31 in 2000 to 189 in 2004.

F.5.2 Procedure

No proponent of a project can proceed unless he has filed an Initial Environmental Examination (IEE) with the Federal Agency and received approval. No proponent of a project which is likely to cause adverse environmental effects can proceed unless an EIA has been approved by the Federal Agency.

After filing the IEE, the Federal Agency must respond within 10 working days and state if the submission is acceptable or not, or if an EIA is required. If acceptable, the agency is required to review the IEE and approve, within 45 days. If an EIA is required the Agency must review the EIA and give approval subject to conditions, within 90 days, require that the EIA be re-submitted after any stipulated modifications, or reject the project.

Every review of an EIA must be carried out with public participation but no information will be disclosed during the public participation if it is commercially confidential, unless such disclosure is in the public interest. The Federal Agency must communicate its approval or otherwise within four months from the date the IEE or EIA is first filed. If the submission is complete and complies with procedure, but no response is given, then the IEE or EIA shall be deemed approved. The Federal Government can, at its discretion, extend the four months period if justified by the nature of the project.

The Federal Agency must maintain separate registers for IEEs and EIAs projects, which contain brief particulars of each project and a summary of decisions taken. These registers are to be open to the public. The IEE and EIA submission and approvals procedure is depicted in Appendix 4.

F.5.3 Areas of EIA Overlap and Conflict

Pak-EPA receives copies of PC-1 documents from the Planning Commission for projects which require an EIA. However, there are conflicts between the federal and provincial EPAs due to the shared legislation at federal and provincial level. Although provincial legislation has not been made, provincial EPAs are operating under delegated powers and for environmental legislation at provincial level, there is no institution comparable to PEP Council.

The delegated powers can be rescinded, although in practice this has not happened, as PEPA has to be implemented through Provincial Governments. The Pak-EPA (Review of IEE/EIA) Regulations of 2000 do not specify the role of P&Ds in managing the IEE of public sector projects but it was specified in the guidelines issued by the Pak-EPA in their EIA package of 1997.

On May 2, 2005 a 38-member parliamentary committee was constituted to review exclusion of 29 items including environment from the concurrent legislative list of the constitution. If

environment becomes a provincial subject this might resolve the conflict as the local governments will be allowed to function within the framework of provincial governments.

Under the existing legislative framework, the federal EPA has jurisdiction over all EIAs and IEEs. However the federal EPA has delegated these powers (under section 26(1) of PEPA, 1997) to Provincial Governments except for federal, military, inter-provincial or international projects.

For public works, responsibility for IEE approval of all the projects listed in Schedule-I of IEE Regulations is vested in the P&D Division and its corresponding provincial departments.

For IEEs and EIAs of all private projects, the respective EPAs are responsible for environmental approvals.

F.5.4 Environmental Management Plan

The project proponents will be responsible for ensuring implementation of the environmental mitigation measures recommended in the IEE or EIA. An Environmental Management Plan (EMP) should be prepared during the EIA / planning phase and should include specific mitigation measures, environmental monitoring requirements, institutional arrangements and budget.

The EMP is a crucial document and should be prepared during the IEE / EIA. It must be approved by the EPA and included in the contractual obligations imposed on the contractor.

Implementation of the EMP during construction is the responsibility of the contractor. Contractor is responsible for environmental monitoring and reporting. The project proponent must ensure that the performance of the contractor is in accordance with EMP. The contractor should submit a report on EMP implementation annually.

F.6 Environmental Impacts of Transport Schemes

F.6.1 Roads

Road schemes can include national highways, provincial highways and rural roads. The main environmental impacts of transportation projects are associated with roads, and these must consider construction as well as operational impacts. These include noise, vibrations, air pollution, visual intrusion, severance of communities and safety. These are discussed in detail below.

F.6.2 Railways

Human reaction to railway noise is less pronounced than roads and aircraft. Air pollution impacts are minimal, particularly if electrification is used. Severance may be issues as crossings are more problematic than roads.

F.6.3 Airports

The main issue at airports is noise, predominantly take off noise. This usually results in hours of use restriction with night flights banned. There may be limited concerns among residents about heightened risk of accidents.

F.6.4 Rivers

Major concerns with river transport are accidental spills of toxic materials and downstream pollution effects. Dredging to allow deeper draught vessels can cause adverse sedimentation effects.

F.6.5 Road Schemes Impacts

Potential environmental impacts are associated with various project stages:

- Environmental problems from construction.

- Environmental problems post construction
- Environmental problems from road operations

F.6.6 Impacts Due to Construction

Construction work could entail the following potential impacts:

- Disruption to traffic in the construction area while laying drainage lines (Only a few roads in Pakistan have drainage)
- Increased air pollution due to dust
- Noise and vibration
- Disruption of water systems due to cut and filling and other earth works
- Interference with utilities, irrigation channels and blockage of access
- Excavation of borrows pits and spoil heaps for overburden
- Appropriate disposal of spoil and soil for recycling

Mitigation measures will include:

- Implementation of an appropriate traffic diversion plan during construction stage
- Spraying water to minimize dust
- Maintaining distance between asphalt plants and public facilities including schools / hospitals
- Controlling noise and vibration by prohibiting night work near residential areas
- Careful planning / design to avoid siltation and erosion
- Pumping stagnant water, and providing adequate drainage systems
- Stabilizing embankment side slopes
- Widening roads only on one side to avoid excessive tree cutting
- Establishing communications with affected persons and broadcasting “helpline”, i.e. public participation.

F.6.7 Impacts Due to Operations

Once the roads are constructed, as well as benefits, there may be long term adverse impacts:

- New roads have higher operating speeds and higher traffic volumes, generate dust, air pollution, noise and vibration may increase accidents, severity of accidents and cause fatalities to wildlife.
- Increased accessibility to remote areas may bring economic opportunities, but also introduce communicable diseases, influence biodiversity, disturb cultural and historical monuments, and change traditional lifestyles.
- Spills of oil and other transported chemicals may be carried over in storm water runoff leading to pollution of waterways.
- Ribbon developments can result in future traffic bottlenecks and poor road safety.
- Over loading is a common trend and generates extra emissions, vibrations, noise, and can be a major cause of additional maintenance.

On a positive note, tree plantations on embankments or in the RoW can give benefits from timber, fuel wood and fodder. Plantations can provide soil retention, erosion control, aesthetic and visual screens against sound, dust, and night glare. Increase of buses accidents results in large numbers of fatalities.

F.6.8 Post Construction

Contractor camps can be a source of social disputes with locals, leading to serious conflicts, particularly in remote locations. There are potential social impacts during construction, which mainly stem from negative interactions between project activities and local communities, for example, intensive scheduling of construction activities, or inappropriate timings of construction traffic. These can be mitigated by good communication with local communities, the provision of information and developing provisions regarding accepted

worker behaviour, management of the construction schedule and development of socio-economic actions.

Machinery parking yards, repair areas, pipe lay down areas and chemicals storage may be a source of contamination for water resources. Borrow pits often become a source of marred landscape and stagnant water, leading to malarial diseases along all the roads. Quarrying sites of other construction materials, such as construction stones, aggregates, and sand may cause dust problems.

Camps and borrow areas should be carefully located and made good after construction. After completion, landscaping, including roadside planting, should be implemented for closed camps and borrow areas. All such camps should have a “closure plan” included in the EMP (see below).

F.7 Identification of Social & Environmental Issues that Hinder Implementation of a Transport Project by Reviewing Past Performances

F.7.1 Consultations

The “ownership” of strategic projects such as a transport master plan should be extended to include other ministries apart from MOC. Other “actors” should be given a chance to comment on the TOR, as by the time the Inception Report is circulated the main direction of the project has been decided and there is no opportunity to influence the overall strategy. Success stories from elsewhere around the world should be included so that “lessons learned” can be transposed to Pakistan.

F.7.2 Decision Making and Transparency

The decision making procedure needs to be more transparent. There are several questions to which the public would like an answer:

- Which roads are given priority for improvement, who decides and on what basis?
- What is the rationale for building new roads, what are the criteria for justification?
- What are the standards by which roads are selected for improvement?
- How are rural and provincial roads integrated into the national network?

There seems to be many traffic bottlenecks due to neglect in some areas, yet overemphasis in others. The allocation of new roads does not seem to be dictated by need but by decision making of a select group of people.

F.7.3 Transport Options

Air links are seen as unattractive for domestic travel. Because of security concerns, check-in times are very long, often over 3 hours. Travel times such as Islamabad to Peshawar and Islamabad to Lahore are shorter if one travels by road. The new motorway links M1 and M2 assist in this. High speed rail links between Islamabad, Peshawar and Lahore were advocated for passenger use during the day and to be used for freight movements at night. At the moment rail links are poor, infrequent and arrive at inconvenient times.

F.8 Sector Analysis

F.8.1 Roads

(1) Holistic Approach

An integrated approach is required, as there appears to be no efficient traffic management system. Items such as ring roads, traffic lights, and pedestrianisation of urban areas are not managed by an integrated approach, but are planned in isolation as stand alone projects.

(2) Encroachments

On major highways the general population has unrestricted access to major highways. They

can establish roadside stalls, build to the edge of RoW and cause encroachments. Service lanes for traffic leading to highways would place restrictions on local residents to prevent encroachments.

Murree Road in Rawalpindi was quoted as an example. The road is 3 lane carriageways in two directions. It can therefore be assumed that 6 lanes would give a smooth traffic flow. However at rush hour the traffic is stationary. The inside lane is used for parking. The second lane is blocked by public transport vehicles stopping to collect passengers. There is no system, they stop anywhere and block the traffic. Only one lane is available. This leads to congestion, noise and air pollution. It is felt that these are not technical issues but traffic management problems.

(3) Traffic Policing

The control of traffic can be assigned to the police. Normal police training does not prepare officers for traffic control and management, which require sound scientific knowledge. If improved management is to be achieved then extra training must be given. The motorway police would be a good model to follow. They are well trained, have strong logistic support, modern equipment, good salaries and pride in their positions. They are respected and obeyed, where as local police when deployed for traffic control lack complete knowledge and credibility.

(4) Overloading

HGVs (buses, trucks) do not comply with any standards set by a competent authority and regularly exceed their permitted axle loads. Although weighbridges are used to catch offenders they simply pay the fine. They do not correct the problem. The amounts of fines are minimal compared to apparent due to overloading.

Transporters do not object to load short time restrictions, as if they are enforced, the transporters will be able to use more vehicles. The goods owners insist on overloading vehicles to save on transport costs. Any penalty fines are passed on from the transporters to the goods owners who pay them, as this is still cheaper than using correctly loaded vehicles. Fiscal measures could prove effective. If transporters charged by weight, rather than by trip, then overloading would have no advantage to the goods owners. Of course, transporters may then be tempted to overload.

(5) Replacement of Vehicles

Many of the existing vehicle fleets are old and need to be phased out. This requires a realistic national policy, which includes the private sector. New fleets will require financial help and this should be at reasonable rates, not through private money lenders. Also any public transport system will require significant financing.

(6) Severance

Large areas of land are sometimes taken for construction of motorways. Pakistan rural areas are essentially a feudal society and such a construction physically divides societies and communities.

The M1 was cited as an example. Compensation is paid for loss of land. For large land owners this is an opportunity but for small land owners it can represent a loss of income and livelihood.

Some property values next to a road are degraded and the owners receive no benefits from the road. The Pakistan system does not always recognize the informal sector. Relocation of informal services such as food vendors can present them with an opportunity, but this must be explained to them, particularly when they see no benefits from the new road to them. Local residents may feel the benefits are for road uses i.e. persons remote from that area, and such major schemes require social justification.

Roads which are newly constructed, or improved, near population centres often cause “severance”. Communities are split and free movement across roads is restricted. This particularly affects old people, children and movement of animals. Persons trying to cross busy roads against fast flowing traffic can place themselves at risk.

In order to discourage them, the only effective measure is a central reservation, but this must extend for several hundreds of meters either side of the crossing point. Even with such barriers it is common for residents to break them down to allow crossing.

If central barriers are constructed an alternative crossing point must be provided. Footbridges can be an obstacle to old and infirm persons, and animals, unless ramps are provided. There are instances of persons standing on footbridges near schools and watching schoolgirls playing in school yard, to the annoyance of their teachers and parents alike.

Underpasses are an alternative to footbridges. These are susceptible to flooding, dark, and unattractive, often being used as a substitute for public toilets, or shelters for poor homeless individual. These can encourage unsavoury practices and crime. Conversely, an example in Peshawar is more promising. Local shop keepers and footstalls have been established in the underpass and lighting provided. The underpass is well illuminated, frequented by many passers by and has resident shopkeepers who have an interest in preserving its appearance. However, the shopkeepers do not pay rent for the land.

The concept of road safety, and civic pride so that barriers are not deliberately destroyed, should be taught in schools. Primary school curricula should include such issues. (Note the recent GOP “Policy on Education” acknowledges this)

(7) Noise

Roadside noise barriers in Japan had been observed to be made of local materials and have a drainage system. Roads near noise sensitive properties in Pakistan should have noise barriers constructed from local materials to generate local income.

F.8.2 Railways

Railways are considered to be environmentally friendly but are not popular in Pakistan, whereas in Japan passengers prefer to travel by rail rather than road. For long journeys, services are irregular, sometimes there is only one train per day and arrival is at inconvenient times of the night. In Japan railway stations connect to other forms of transport. In Pakistan there are no taxis or bus services. Stations could be attractive if developed as an integrated part under development. This may encourage commuters to travel by train to city centres.

A mass transit system is needed to transport large number of commuters to city centres. It must be efficient and railways are one option. Rail passenger services are presently intermittent, unreliable and unpopular with commuters as arrival times are not convenient; journey times are longer than travel by road.

Cities are congested as many people have to live near their workplace. Long distance commuting is not feasible. Travel time from Hyderabad to Karachi is 2 hours. Travel time from Faisalabad to Lahore is also 2 hours. If a rapid transit link could be provided between such cities, which delivered commuters to the city centre in less than 1 hour, then inner city congestion and pollution from local transport would be alleviated. Rail links could provide such a system.

Existing bus services are crowded. Even if it were necessary to stand, if the journey was less than one hour, a transit system that was fast, clean, air conditioned and comfortable would be popular. Standing in a train is preferable to being crowded in a bus. One interviewed passenger stated “he wished to arrive at work with shoes still shiny”.

There are few incentives to attract passengers to travel by rail. Rail fares are reported to be lower than bus fares but the poor service does not attract passengers. The low fares means

revenues are insufficient to improve the service. Fares should be set at a realistic rate which would enhance patronage, but only if the service is improved.

It would be preferable if goods were transported by rail, rather than roads, to reduce the number of polluting HGVs on the roads. There is no reason why goods could not be transported from Landhi Kotal all the way to Karachi by rail. However, currently goods trains are not properly logged and cargo can be left standing outside stations in remote areas. Delivery dates for goods are not met.

In Japan railway stations perform many functions as a community hub. They are a commuter feeder system, mass rapid transit system, transportation interchange, and focal point for shops, markets, hotels and entertainment.

In Pakistan, railway stations often occupy prime land but are located in unpleasant areas, surrounded by poor infrastructure and slums, with no connecting services. The concept of Japanese railway stations could be transferred to Pakistan. This would give a boost to inner city regeneration, create attractive areas with multi functional facilities, and if connecting transport services were provided, encourage commuters to travel by train to city centres.

Railway stations should be treated as property management assets. Spin off benefits through joint development should include the surrounding land and buildings, increasing their value as the areas became more desirable.

There is scepticism as to whether the infrastructure is sound that is, tracks and rolling stock. A major investment may be needed to upgrade. Railway workers are state government employees. They are very numerous, lowly paid and unproductive. Many land areas are occupied by railway staff as free housing is provided for life time and at times to the next generation. Privatisation may be a way to improve efficiency but an investor may be unwilling to take over such a liability.

F.8.3 Airports

Air transport was not considered to have many significant social aspects, as it provides a service to a small high income demographic group. PIA operates many non-profitable sectors that are sustained by political will. There are no links between airports and railways, so arriving passengers must rely on private cars or taxis. Bus services to airport are rare, if any convenient interchanges are needed.

Airports were not considered to have major adverse social issues. There are 32 domestic airports but many are now redundant. Security concerns mean check in times can be 3 hours and it may be quicker to go by road.

F.8.4 Rivers and Canals

Rivers and canals are not seen as a viable option for goods and passenger transport. The Indus River Basin Treaty with India means two out of the five Punjab rivers are under India's control. The rivers used to be a good source of transport with many riverbank settlements. Now, a net work of irrigation canals is used primarily for realisation of water for irrigation purposes, with little provision for transport of goods and passengers by water ways. Seasonal fluctuations restrict movements by water ways, and roads and railways offer alternative modes of transport. This has altered the social infrastructure of the riverside settlements.

Water level fluctuations are extreme in the rivers, ranging from floods to drought. Any transport system would be at the mercy of the water flow at that time of year and so it is not efficient. Local passenger transport may be viable but penetration into inland areas is limited by the barrages, which block the river Indus at several locations. In downstream Sindh, the river delta is too wide to permit road and rail bridges so transport by river has limited use.

F.8.5 New Developments

The government is planning a new link to parallel the Karakoram Highway. This will link Islamabad to Chilas via the Kaghan Valley and cut 5 hours off the trip to Gilgit. This will facilitate more trade with the Chinese markets. It will also open up a previously remote area. This has positive and negative social impacts for the residents.

GOP is currently mapping mining and mineral resources in Balochistan. Exploitation of such materials may benefit from improved rail links in Balochistan for bulk movement of minerals, and this would have spin off benefits for the local population. At the moment the main focal point of developmental activity is around Gwadar port.

F.9 Sustainability

A transport system must be sustainable. Much of the hardware, such as road vehicles, railway tracks, signalling systems and rolling stock has far exceeded its intended operational life, often being beyond 30 years old. These vehicles will never be able to comply with international standards and attempts to prolong their useful life are furthering a system that is not viable. Concerns were expressed that the master plan project is looking for ways to cure problems but should be addressing prevention. However, major upgrade, streamlining and improved efficiency through Privatisation may lead to loss of jobs and this will create a social issue.

Human security of lifestyle is an issue. Vulnerable groups must have their rights protected. Resettlement and loss of livelihood are key issues. Compensation which is charity is not acceptable. Replacement forms of income generation must be sustainable in that they help people to help themselves to become self sufficient.

F.10 Public Interest and Awareness

A recent study has shown that 60% of health and sickness problems are water related. It could be useful if a similar study be carried out on a macro level to see how much public time and money is wasted, and what proposition may be saved by, by more efficient traffic management and shorter commuter travel times.

In Lahore the High Court ordered a report on air pollution from all sources, but mainly traffic, following a Writ filed by Lahore residents “in the public interest” protesting about poor living conditions, as an infringement of Human Rights.

F.11 Land Acquisition and Resettlement

A major social issue is resettlement. Land may be acquired by the government for projects of national interest. If it is currently under private ownership, or if activities are taking place on the land which generates revenue, then compensation is paid in accordance with the prevailing market price and legislation.

F.11.1 Land Acquisition Act (LAA)

The Land Acquisition Act 1894, (with regular amendments) is the core legal tool used by the Government of Pakistan and the Provincial Governments, for acquiring private lands for “public” purpose.

The process is initiated by a preliminary notice under Section 4 of LAA served by the District Land Acquisition Collector (LAC) expressing the desire to "enter upon" broadly identified private lands for surveying and soil-testing for the specified public purpose. Then, under Section 5, marking and measurement of the land is performed and an assessment made of compensation. The final declaration for possession is issued under Section 17 of the Act, having issued the award for individual owners.

Under this Act, only legal owners and tenants officially registered with the Land Revenue Department, or possessing formal lease agreements, are considered “eligible” for land compensation. Following the Act (S.5), cash compensation is assessed on the basis of three -

five years average registered market rate, and is paid to the landowners for their lands being acquired. Land acquisition is to be completed in a total of 52 weeks (One year – See Table F-3 below)

Table F-3 General Timeframe for Land Acquisition in Pakistan

Step	LAA Process	Agency Responsible	Timeline
1	Land Acquisition Proposal to Revenue Dept; project description, location, extent of land to be acquired.	Pak-EPA	Week 1-2
2	Publication of Notice expressing the intent to acquire the land under Section 4	Revenue Department (Each District)	Week 3-4
3	Field survey, inventory of assets under Section 5	Revenue Department	Week 5-20
4	Declaration for possession under Section 6	Revenue Department	Week 21-22
5	Compensation assessment & award preparation	Revenue Department	Week 23-24
6	Dispute/Objections (Grievance Redressal)	Aggrieved parties	Week 25-26
7	Possession of land, marking, clearance	Revenue Department	Week 23-52
8	Disbursement of compensation		Week 23-52
	Land acquisition to be completed in a total of 52 weeks (One Year)		

According to LAA the owner is eligible for 15% solarium, or "compulsory acquisition surcharge", plus 8% compound interest per annum from the date of notification (under Section 6) in case of delay in payment of compensation.

In the 1960-70s, for some major projects in Pakistan, such as Mangla and Tarbela Dams, and the Capital City of Islamabad, the government gave "land for land option" for "persons interested"¹. The affected families were given house plots and agricultural land, and provided free transportation for moving household effects and salvaged construction materials.²

F.11.2 "Illegal" Squatters and Encroachments

Many roadside shops and businesses are located within the "right-of-way" of roads, even though the land is owned by government. Road projects can impact on these, particularly if road widening is necessary.

According to legal procedures, the shops and businesses would be considered "illegal" squatters and encroachments and, therefore, ineligible for any compensation for loss of structures and/or businesses. However, in many project-specific cases, the Government of Pakistan has assisted project-affected persons even without any legal titles.³

F.11.3 General Guidelines

The resettlement principles provide compensation and resettlement assistance to *all* affected persons and businesses, including the informal squatters/encroachers on the project corridor of impact (COI). The basic resettlement principles and guidelines include the following:

The affected persons (APs) and businesses are defined as those who stand to lose income as a consequence of the improvements of the project roads.

All APs/owners of SBEs are equally eligible for compensation, irrespective of their ownership status to ensure that those affected by the project should be at least as well off, if not better off than they would have been without the Project.

The compensation packages shall reflect market-based replacement costs for all physically measurable losses.

Affected people will be systematically informed and consulted about the project, and project

¹ The LAA uses a legal term – "persons interested" - for all persons currently using or benefiting from land being acquired. In resettlement terms, they are "affected persons - APs."

² "Land Acquisition and Resettlement Policy and Practices in Pakistan – A Review." Report prepared under ADB-SSTA No. 3679 "Social Impact and Resettlement Analysis for the Pakistan Roads Sector Development Project", August 2001.

³ E.g. ADB/World Bank-funded *Ghazi Barotha Hydropower Project* (1997); World Bank-funded *Mangla and Tarbela Dams* (1962); and ADB-funded *Sukkur Bridge Project* (1996).

resettlement plan(s) will be made available in both English and Urdu languages to the affected persons and communities.

The consultative process shall include not only those affected, but also representatives of the local governments of the areas where the project is located, community leaders, and social development organizations, such as NGOs/CBOs.

All of these details should include and addressed in a Resettlement Plan.

F.11.4 Compensation and Assistance

The LA Act of 1894 deals with all aspects of land acquisition, and resettlement.

The Government has recently issued the Resettlement and Rehabilitation of Project Affected Persons Ordinance/Act 2003 and the National Resettlement and Rehabilitation Policy 2003.

These laws and guidelines require compensation for the lost assets at replacement costs both for titled and non-titled holders and resettlement assistance for lost income and livelihoods. The absence of formal titles will not constitute a bar to assistance and rehabilitation. Further, the principles contain special measures and assistance for vulnerable Affected Persons (APs) such as female-headed households, disabled persons, small farmers and the poor.

Persons affected by land acquisition or relocation of small businesses, structures and assets are entitled to a combination of compensation and resettlement assistance, depending on the nature of ownership rights, lost assets, extent of impact, and vulnerability of the affected persons.

In general terms, the affected persons in a project will be entitled to five types of compensation and resettlement assistance that would help them in restoration of their livelihoods, at least, to the pre-project standards:

- Compensation for loss of land, standing crops or trees
- Compensation for the loss or damage of commercial structures and immovable assets.
- Assistance for livelihood restoration against loss farmlands, and farming income by tenants
- Assistance for livelihood restoration against loss of business by Small Business Enterprise owners, or loss of wages by employees
- Compensation for the relocation and restoration of cultural or community structures

Landowners and tenants of the acquired lands are considered as “entitled” persons when compensation is paid. For community structures, the compensation will be paid to the leader of the community group who use the structures.

Resettlement assistance is extended to the APs not covered under the compensation plan, which are non-title-holders, encroachers and squatters, business employees and other vulnerable groups. A detailed description of compensation measures and assistance is given in Appendix 6.

The following Entitlement Matrix (Table F-4) provides further details regarding losses, entitled persons, and entitlements.

Table F-4 Entitlement Matrix

#	Type of Losses	Entitlement
1	Partial loss of agricultural land, crops and trees by owners & (sharecrop/lease) tenants	<ul style="list-style-type: none"> ▪ Cash compensation based on current market replacement value, plus 15 per cent Compulsory Acquisition Surcharge (CAS). ▪ Cash compensation for loss of crops/trees at the market value ▪ Compensation to tenants at mature crop value crop-share ▪ Encroachers/squatters are not eligible for compensation for land on Road ROW but eligible for cash compensation for lost assets
2	Total/major loss of agricultural land by owners/tenants	<ul style="list-style-type: none"> ▪ Financial assistance (grant/loan) and/or job opportunities in the Project for an immediate restoration of livelihood (This will be in addition to the "cash compensation" paid under item No. 1)
3	Loss of commercial/other structures/installations by owners (SBEs, tube-wells, livestock-sheds, etc.)	<ul style="list-style-type: none"> ▪ Compensation for loss at full replacement cost on current value ▪ All salvageable materials will be allowed for rebuilding purposes ▪ Shops/SBE owners once paid due compensation will not be allowed to re-establish within the active ROW of the Project roads ▪ Compensation for all other immovable assets on replacement value, plus installation costs (salvageable materials allowed) ▪ Where necessary, adequate transportation and labour costs will be paid, especially to the most vulnerable persons (poor/women)
4	Loss of business premise by renters/tenant	<ul style="list-style-type: none"> ▪ One-time cash assistance equivalent to 2-months rent to the renters for alternative premise for re-establishing businesses ▪ If necessary, adequate transportation & labour costs will be paid
5	Income assistance for loss of business by shops/SBE owners/tenants	<ul style="list-style-type: none"> ▪ One-time assistance, a lump sum grants; based on the nature of business and type and size of losses, the following range will apply: (i) small business up to Rs. 2,000; (ii) medium business up to Rs. 3,500; and large business up to Rs. 10, 000.
6	Loss of wages by SBE employees	<ul style="list-style-type: none"> ▪ Wages for 30 to 60 days at local wage rate (or latest wages) ▪ Family workers in SBEs will not be paid any compensation; they are already covered by income assistance under #5. ▪ Special assistance to vulnerable persons, like, the poor, disabled and women-headed HH – one-time lump sum grant of Rs 1,000
7	Loss of cultural/community structures/installations	<ul style="list-style-type: none"> ▪ Cash compensation at replacement value to patrons/user group leaders for rehabilitation/rebuilding of the affected part/whole, including construction/installation costs (salvageable material will be allowed for free for reuse in reconstruction/restoration) ▪ If not feasible, then the Project will rebuild/restore on its own cost

F.11.5 Indigenous Persons

Any transport scheme that may impact on indigenous persons must have a full study on these impacts. Indigenous persons who may lose land, income, and livelihood or have their traditional way of life disturbed must be given extra attention. Pakistan has many tribal areas (e.g. NWFP, FATA, Northern Areas) but limited Indigenous Persons.

The main area having indigenous person's issues is Balochistan. Balochistan is the largest province of Pakistan by area of land but it is the smallest province by population. It is known to be the most tribal province of Pakistan. There are two major indigenous tribes: the Baloch are in a clear majority by population and land area (75%) and the Pukhtun are in minority (25%). The province as whole sustains centuries old socio-political traditions to a great extent. The Baloch follow a relatively authoritarian rigid Sardari system (controlled sub-tribal/clan leadership), while the Pukhtun follow a relatively flexible democratic Jirga system (council of elders) led by a Khan or Malak (clan leader). Each of the two tribes inhabit largely their well-defined territories with minimal over-lapping of ownership and usufruct rights of the land, water and other natural resources.

They both enjoy their socio-political authority in their respective areas, and neither of them can be termed as the majority or minority tribe when it comes to collective pursuits of power-sharing, decision-making, and distribution of and control over resources. Each of the

two tribes elects its representatives for both the National and Provincial assemblies, to participate actively in the mainstream politics of the country and the province. However, there do exist a few examples of decades-long intra-tribal and/or inter-tribal conflicts relating mainly to the commercialization of the natural resources, namely minerals (the coal copper mines in low-hilly areas), fuel-gas (in low hillsides and desert areas) and forests (mountain region) but such conflicts are restricted mostly to their respective areas.

There are a number of minority clans/sub-clans of the same two tribes which have relatively unique socio-cultural characteristics, like, the Marri Baloch and Pukhtuns of mountain forests and the small Makrani Baloch fishermen communities all along the coastal line.

Almost all the people in the province have already been linked to the outer world by various means of modern communication, including old motorable roads and tracks. They are not secluded indigenous people whose cultural values or resources may be affected adversely by projects. They are reportedly affected adversely by commercial exploitation of the mineral and forest resources and Gwadar Port development works, but not by proposed development works on existing roads and tracks.

F.11.6 Cultural Monuments

Any structures of historical, cultural, religious or community value must be treated with utmost caution and all attempts made to avoid any impacts. Actions must be in accordance with the Antiquities Act 1975 (VII Of 1976) Department Of Archaeology, Ministry Of Education & Provincial Co-Ordination. This Act defines a Preservation District which is a topographical area which is of special value for several reasons: scientific, cultural, aesthetic, archaeological, historical, anthropological, and ethnological. A preservation district may incorporate part of a landscape, a human settlement or both. It is essential to include local resident groups in any discussions, seek their advice and gain their acceptance. Failure to do this may lead quickly to strong local resistance to any scheme. Such issues should be identified at the IEE / EIA stage. Any discoveries made during construction should be reported to the local authorities, and advice sought from Antiquities Department and Ministry of Cultural and Religious Affairs.

Any work should be conducted with sensitivity to the values of the original monument. Irreversible damage has been done when archaeologists unearth monuments or remove plaster as part of their work and then leave the sites exposed to rain and water.

This is the responsibility of the contractor. The project proponent is responsible for checking the contractor observes these requirements.

F.11.7 Right of Way

The Right of Way for National highways is 220 ft (66m) minimum, for Provincial Highways is 110 feet (33.5 m), while for Rural Access Roads it is 66 feet (20.1 minimum). In fact, only the respective "formation widths" need actually be repossessed, while the remaining land can be left with the original landowners, or occupants. For a resettlement plan, only the corridors of immediate impact (COII), or the "Formation Widths" required for widening the roads need to be considered. This can minimize involuntarily resettlement.

F.11.8 Stakeholders Meetings and Disclosure

Stakeholders meetings give disclosure about proposed road improvements. Meetings provide the affected persons an opportunity to voice their concerns about relocation, assistance to restore businesses and maintain livelihood sources. A consultative approach should identify measures to minimize displacement and reduce disruption of livelihoods.

F.11.9 Disclosure of Resettlement Plan

The Resettlement Plan should be disclosed to stakeholders immediately following the appraisal of any scheme. The RP should be made available to local government councils and local offices as a "public" document. The affected persons should be well informed about

their entitlements in advance of receiving payments and be prepared for their actual relocation.

F.11.10 Grievances Redress Committees

The LAA enables aggrieved APs to represent their cases to the Land Acquisition Collector (LAC) or refer to a court of law for redress, and seek higher rates of compensation.

F.11.11 Tribal Areas

It should be noted that the above discussion only refers to areas covered by the LAA, that is the four provinces and the capital areas. The situation in tribal areas is different and comes under separate legislation. The procedure is similar but the means of evaluating compensation is not based on individual assessment of land, structures etc but is based on a fixed percentage of the capital costs of the project. This percentage is generally fixed by government but the disbursement of the funds is made through elected tribal leaders whose lands are affected. These leaders decide how the funds shall be divided among deserving persons. This procedure often involves a Jirga, a meeting of the tribal elders, during which everyone is entitled to express an opinion. These meetings are held under the auspices of the federally appointed Commissioner for the tribal area or agency.

F.12 Social & Environmental Issues that Hinder Implementation

F.12.1 Land Acquisition

On an occasion in Punjab the construction of a water treatment plant required the purchase of a large rectangular piece of land, of approximately 10 hectares. The land was under private ownership and when the purchase was initiated it was discovered that there were over 600 separate owners. The land acquisition would have required 600 legal transactions which would have caused considerable delay to the project. Eventually the plant was located on disused railway line land as this was owned by the provincial government.

F.12.2 Karakoram Highway

A villager living on barren land on the side of a mountain adjacent to the Karakoram Highway was asked to relocate to permit road improvements. He refused and would not entertain any degree of compensation. When it was pointed out to him that the mountain was totally barren, devoid of all vegetation, had no natural resources and was essentially of no value, he stated that the mountain had been owned by his family for many generations and that if he was to move away, his family would lose the mountain. He could not accept such shame and refused to leave.

F.12.3 Kalash Valley

The Kalash Valleys are a remote area to the west of Chitral. They were only accessible by 4 WD vehicles. The inhabitants are reputed to be descended from Greek soldiers, are fair skinned and have pagan religion. The valley is famous for natural beauty and production of wine from locally grown grapes. As part of the Lowari Tunnel project, improved road access was given to the valleys. There are now reports of regular visits from tourists from lower Pakistan, loss of the traditional lifestyle, prevalence of drugs and prostitution.

F.12.4 Rural Roads - Balochistan

As part of the compulsory consultation procedure, an elderly man in a village near Turbat was asked if he would like a new road connecting his village to urban centres. He said no, as he liked his lifestyle, saw no need for new roads, and was afraid the road would intrude on the privacy of his daughters. Such adverse comments must be included in the social evaluation.

F.12.5 Indus highway

The original route of the Indus Highway cut through Kirthar National Park. IUCN took an

injunction out against the design and construction company to stop the work. An EIA was prepared which changed the alignment and resulted in an additional 50 kms being added to the route.

F.12.6 Khyber Pass

A new four lane highways is planned through the Khyber Pass to connect with Afghanistan and the Central Asian States. In the tribal areas the local tribes have the right to administer construction contracts and are paid a percentage of the total fee as a commission. The neighbouring tribes will argue over length of road sections and the width of the road as this determines the size of the fee. These debates can slow down the contract award.

F.12.7 Loss of Trees - KKH

Villagers living adjacent to the Karakoram Highway have complained that the new road has given easier access to timber concessionaires to cut and remove the trees. Hill slopes are now totally bare and villagers make known their regret in not opposing the scheme.

F.12.8 Loss of Trees - Farm to Market Roads Sindh

Many roads in Sindh are tree lined to give shade protection to travellers. Widening requires removal of the trees by cutting and replanting. It is conventional when a road is widened to extend the road equally on both sides. If the road be extended on one side only then the number of trees to be cut and replaced can be halved.

F.12.9 Tree Planting

If trees are cut they must be replaced and this is the responsibility of the contractor. It is normally monitored by Forestry Department who check to see that the correct number of trees have been planted, and are flourishing. It is expected that some trees will die and a natural attrition rate is allowed in the contract (typically 5%). Many die, mainly from lack of water, but it is the contractor's responsibility to nurture them and replace as necessary to maintain the agreed number. Sometimes local people let their animals graze on the new saplings and goats in particular eat them. The question then arises who is responsible for replacement and this can lead to argument between the contractor, Forestry Department and locals. Invariably the completion of the job is delayed.

F.12.10 Road side Graves

It is common in rural areas for deceased villagers to be buried in graves which are located right by the side of the road. It is claimed that this is a favourable location and it is very difficult to disturb them for road widening. However, often these are placed there deliberately when it's known a road will be improved to increase compensation when the road is widened.

F.12.11 Houses Restricting Road Width

Sometime two houses opposite each other in a village can restrict the road width. Improvement of a road to the agreed specification width, complete with shoulders, may require demolition of the houses. The owners may protest. If the design specification can be relaxed to drop the need for shoulders, yet still allow two vehicles to pass, then it may not be necessary to knock down the houses. If highways department, or the funds provider, insist on full formation width as per specification, then demolition is necessary. There is a need to be flexible in insisting on design standards if undue delay is to be avoided. The housing regulations in rural areas lack clarity or are non-existent as a result houses are built to the edge of the owners land i.e. to the edge of the RoW of road. Thus causes problem during road widening.

F.12.12 By-passes.

By passes can be a good way to relieve inner city congestion, but often locals complain because their roadside businesses suffer. As they live over their shops or nearby their

businesses, they do not want to relocate to a ring road. They may protest and slow down land acquisition.

F.12.13 Village Children

Children in rural villages with light traffic often play a game where they test their courage by running between passing vehicles. Improvement of the road increases the speed of the vehicles but the children do not appreciate this, resulting in fatalities.

F.12.14 Foot bridges.

Foot bridges across busy roads only work if there is a central reservation to stop locals running across the road. When such reservations are made locals often break them down. Once this is done the locals may regard the masonry from the central reservation as a free supply of building materials. Apart from heightened risk of accidents, this increases maintenance costs.

F.12.15 Underpasses.

Underpasses are an alternative to foot bridges but are quickly used as public toilets. Local residents protest at such a disagreeable amenity in their locale.

F.12.16 Protected Monuments

Often no action is taken to evict encroachers or trespassers on historical monuments. One example is the case of a retired police officer who used the Delhi Gate, Lahore as his residence for the last 30-40 years. As part of the urban improvement the authorities were faced with evicting an ex-police officer.

F.12.17 Quarrying and Historical Structures

Stone quarrying, blasting and trucking in Taxila Valley are damaging the fragile structures of valuable archaeological sites. New roads may open up remote areas, but unplanned development may also occur. The Rohtas Fort was undisturbed by encroachments until a road was built connecting it to the Grand Trunk Road.

Annex G. Vehicle Operating Cost and Time Value

In this section, results of estimation of vehicle operating cost (VOC) and passenger travel time are explained for the reference.

G.1 Updating Vehicle Operating Cost (VOC)

G.1.1 Existing Data

Following two data sources were available from NTRC:

- 2001 price data updated from 1993 prices by NTRC with the same assumptions and parameters of NTRC previous study No.177 published in 1994 and “National Transport Plan, JICA, 1994”.
- 2005 (March) price data applied to “Vehicle Operating Cost Model Version 4.0 (HDM-VOC)”

G.1.2 Procedure for Updating VOC data

At first, this study basically adopted the same assumptions and physical parameters of the above NTRC study (1). Only the prices/wages and tax/duty structure were revised to November 2005 level. Some adjustments, however, were added so as to keep consistency with the results of HDM-VOC such as fuel/oil consumption rates at different speed.

G.1.3 Components and Conditions for Calculation of Vehicle Operating Cost

a) Vehicle Type (8 types)

The VOC has been computed for the following 8 types of vehicles.

- | | |
|--------------|---------------------|
| - Motorcycle | - Bus |
| - Car | - Truck (2-axle) |
| - Wagon | - Truck (3-axle) |
| - Minibus | - Truck Articulated |

b) Road Conditions

Road Type	Gradient (m/km)	Curvature (deg/km)	Roughness BIU (mm/km)		
Improved	10	100	2500		
Un-improved	20	200	3000	3500	4500
Shingle	20	200	5000	6000	7000

c) Components of VOC

- Fuel (Petrol/ Diesel)
- Lubricant Oil
- Tyre
- Maintenance Parts
- Maintenance Labor
- Depreciation
- Interest
- Crew time
- Overhead (for commercial vehicles)

d) Prices and Costs (November 2005)

[1] Average Vehicle Price and Tyre Cost

(in Rupees)

Vehicle Type	Financial Price		Economic Price	
	Vehicle	Tyre	Vehicle	Tyre
1. Motorcycle	56,465	393	38,871	279
2. Car (\leq 1000cc)	447,535	1,491	308,086	1,059
3. Car ($>$ 1000cc)	925,400	2,275	637,051	1,616
4. Wagon	1,669,400	2,650	1,036,894	1,882
5. Mini-Bus	2,355,283	4,175	1,774,996	2,966
6. Bus	3,282,750	7,250	2,457,408	5,150
7. Truck (2-Axle)	2,690,000	10,000	1,710,332	7,103
8. Truck (3-Axle)	3,365,250	10,875	2,140,299	7,725
9. Truck (Articulated)	3,085,500	11,750	1,961,795	8,346

Source: Capital Motors, Azeem Motors, Hino-Pak, Universal Autoes, General Tyres, Islamabad.

[2] Fuel Cost

(Rs./liter)

	Financial	Economic
Petrol (Gasoline Super)	56.37	37.79
Diesel (HSD)	37.26	27.93
Lubricant Oil		
for Petrol Vehicle	187.10	144.07
for Diesel Vehicle	193.30	148.84

Source: Shell Pvt, PSO Petrol Pump, Caltex Petrol Pump

e) Usage

Vehicle Type	Average Speed (km/hr)	Life (years)	Km Driven per year
Motorcycle	40	10	12,000
Car	50	12	22,500
Wagon	45	10	54,000
Mini-bus	45	10	54,000
Bus	50	10	60,000
Truck (2-axle)	40	10	70,000
Truck (3-axle)	40	12	70,000
Truck Articulated	40	12	70,000

Source: NTRC

f) Vehicle Cost Breakdown

Vehicle Cost Breakdown (November 2005)

VEHICLE TYPE AND COST ITEM			RATE	VEHICLE TYPE AND COST ITEM			RATE
MOTOR CYCLE, CAR (1300 CC) AND OTHER SMALL VEHICLES				WAGONS TOYOTA HIACE (14SEATS) (CBU)			
a	Cost, Insurance and Freight		100%	a	Cost, Insurance and Freight		100%
b	Custom Duty		35%	b	Custom Duty		45%
c	Port Charges		5%	c	Port Charges		5%
d	Sub-Total	(a+b+c)	140%	d	Sub-Total	(a+b+c)	150%
e	Mark-ups	(20 % of d)	28%	e	Mark-ups	(5 % of d)	8%
f	Sub-Total	(d + e)	168%	f	Sub-Total	(d + e)	158%
g	Sales Tax	(15 % of f)	25%	g	Sales Tax	(15 % of f)	24%
h	Factory Gate Price	(f + g)	193%	h	Factory Gate Price	(f + g)	181%
i	ECONOMIC COST	(a+c+e) / h	69%	i	ECONOMIC COST	(a+c+e) / h	62%
j	Taxes Ratio	(100 - i)	31%	j	Taxes Ratio	(100 - i)	38%
MINI ? BUSES (16 SEATS) (CKD)				BUSES			
a	Cost, Insurance and Freight		100%	a	Cost, Insurance and Freight		100%
b	Custom Duty		20%	b	Custom Duty		20%
c	Port Charges		5%	c	Port Charges		5%
d	Sub-Total	(a+b+c)	125%	d	Sub-Total	(a+b+c)	125%
e	Mark-ups	(20 % of d)	25%	e	Mark-ups	(15 % of d)	19%
f	Sub-Total	(d + e)	150%	f	Sub-Total	(d + e)	144%
g	Sales Tax	(15 % of f)	23%	g	Sales Tax	(15 % of f)	22%
h	Factory Gate Price	(f + g)	173%	h	Factory Gate Price	(f + g)	165%
i	ECONOMIC COST	(a+c+e) / h	75%	i	ECONOMIC COST	(a+c+e) / h	75%
j	Taxes Ratio	(100 - i)	25%	j	Taxes Ratio	(100 - i)	25%
TRUCKS (Single / Multi Axle)				ALL VEHICLES USING LOCAL PRODUCTS			
a	Cost, Insurance and Freight		100%	a	Cost and Mark-ups		100%
b	Custom Duty		50%	b	Sales Tax		15%
c	Port Charges		5%	c	Factory Gate Price		115%
d	Sub-Total	(a+b+c)	155%	d	ECONOMIC COST	(a / c)	87%
e	Mark-ups	(20 % of d)	31%	e	Taxes Ratio	(100 - i)	13%
f	Sub-Total	(d + e)	186%	USING IMPORTED TYRES			
g	Sales Tax	(15 % of f)	28%	a	Cost, Insurance and Freight		100%
h	Factory Gate Price	(f + g)	214%	b	Custom Duty		25%
i	ECONOMIC COST	(a+c+e) / h	64%	c	Port Charges		5%
j	Taxes Ratio	(100 - i)	36%	d	Sub-Total	(a+b+c)	130%
REMARKS CBU stands for Complete built-up vehicles. CKD stands for Complete Knock Down Kits.				e	Mark-ups	(5 % of d)	6.5%
				f	Sub-Total	(d + e)	137%
				g	Sales Tax	(15 % of f)	20%
				h	Factory Gate Price	(f + g)	157%
				i	ECONOMIC COST	(a+c+e) / h	71%
				j	Taxes Ratio	(100 - i)	29%

Source: NTRC

Tax and Duty Structure of Petrol, Diesel and Oil (March 2005)

No.		March 2005 Financial Price Structure				ECONOMIC	
		Petrol	%	Diesel	%	Petrol	Diesel
1	Ex-Refinery	21.77	100%	13.29	100%	21.77	13.29
2	Excise Duty (5% of No.1)	1.09	5.0%	0.66	5.0%		
3	Petroleum Development Levy	6.89	31.7%	1.89	14.2%		
4	(No. 1+2+3)	29.75	136.7%	15.84	119.2%		
5	Freight Charge (No.4 x 18.19% or 34.14%)	5.41	24.9%	5.41	40.7%	4.90	4.90
6	(No. 4+5)	35.16	161.5%	21.25	159.9%		
7	Distributor's Margin (No.6 x 4.35% or 7.2%)	1.53	7.0%	1.53	11.5%	1.38	1.38
8	Dealer's Margin (No.6 x 5% or 8.23%)	1.75	8.1%	1.75	13.2%	1.58	1.58
9	Price Before Sales (6+7+8)	38.44	176.6%	24.53	184.6%		
10	GST (15% of No.9 x 15%)	5.77	26.5%	3.68	27.7%		
11	Max.Ex Depot Sales Price (9+10)	44.20	203.1%	28.21	212.3%	29.63	21.15
12	ECONOMIC COST RATIO					67.0%	75.0%
13	Taxes Ratio (100-No.12)					33.0%	25.0%

ECONOMIC COST RATIO OF OIL	77.0%
----------------------------	-------

Source: NTRC

g) Fuel Consumption Rate and Oil Consumption Rate

Applied the same equations adopted by NTRC previous study.

h) Maintenance Parts

Motorcycle, Car	0.05% of vehicle value per 1,000 km
Wagon	0.11% of vehicle value per 1,000 km
Minibus	0.17% of vehicle value per 1,000 km
Bus, Truck	0.18% of vehicle value per 1,000 km

Source: NTRC

i) Maintenance Labor

Motorcycle	2 hours	Rs. 50 per hour
Car	3.8 hours	Rs. 50 per hour
Wagon	18.3 hours	Rs. 75 per hour
Minibus	18.3 hours	Rs. 75 per hour
Bus	21.9 hours	Rs. 100 per hour
Truck (2-axle)	21.9 hours	Rs. 50 per hour
Truck (3-axle)	21.9 hours	Rs. 60 per hour
Truck (Articulated)	21.9 hours	Rs. 150 per hour

Source: NTRC

j) Interest Rate = 12%

k) Crew Wages for Commercial Vehicles

Wagon, Minibus	Rs. 50 per hour
Bus	Rs. 100 per hour
Truck (2-axle)	Rs. 50 per hour
Truck (3-axle)	Rs. 100 per hour
Truck (Articulated)	Rs. 100 per hour

Source: NTRC

l) Overhead Cost

The overhead costs for commercial vehicles are taken as 10% of total cost.

G.1.4 Passenger Time Value

The travel time values were updated separately from the VOC components above. For the time value of passenger car, the previous JICA study set at Rs.21 per hour (after weighted by proportion of trip purpose of work and others). GDP per Capita has grown by 3.4 times in FY2004/05 compared to FY1993/04. Therefore, the time value for a car driver in 2004/05 was estimated at Rs.71 per hour/person. The time values of a passenger for wagon, minibus and bus were estimated at Rs.10 per hour/person based on Per Capita GDP in FY2004/05 (Rs.40,195). In addition to the above calculation, the opportunity cost of travel time was considered and detailed calculation process is given below:

(1) Car

1) Previous JICA Study (1993 price) : Time Value = **Rs. 21.02/hour/person**

2) Growth Rate of Per Capita GDP in current prices: 1993/94 = Rs. 11,912.6

2004/05 = Rs. 40,194.5

Growth Rate 1993/94 – 2004/05 = 3.4

3) Time Value in 2004/05 = 3.4 x Rs.21.02/person =

Rs. 71.5/hour/person = Rs.70/hour/person

(2) Bus, Minibus

1) GDP Per Capita 2004/05 = Rs. 40,194.5

2) Working hours per year = 12 months x 25 days x 8 hours = 2,400 hours

3) Rs.40,194.5/2400 hours = Rs.16.7/hour/person

4) Weighted by trip purpose =

Rs.16.7 x (work 20% x weight 1+ non-work 80% x (1/2))

= Rs.10/hour/person

(3) Consideration of Opportunity Cost of Travel Time

For the purpose of benefit calculation of time savings, consideration of Opportunity Cost of Time is necessary. (Not all the portion of saved time is used for other productive activities).

Opportunity Cost of Time = 50% of the above time value is assumed (=Rs.70 x 0.5 = **Rs.35/hour/person for Car**)

(Rs.10 x 0.5 = **Rs.5/hour/person for buses**)

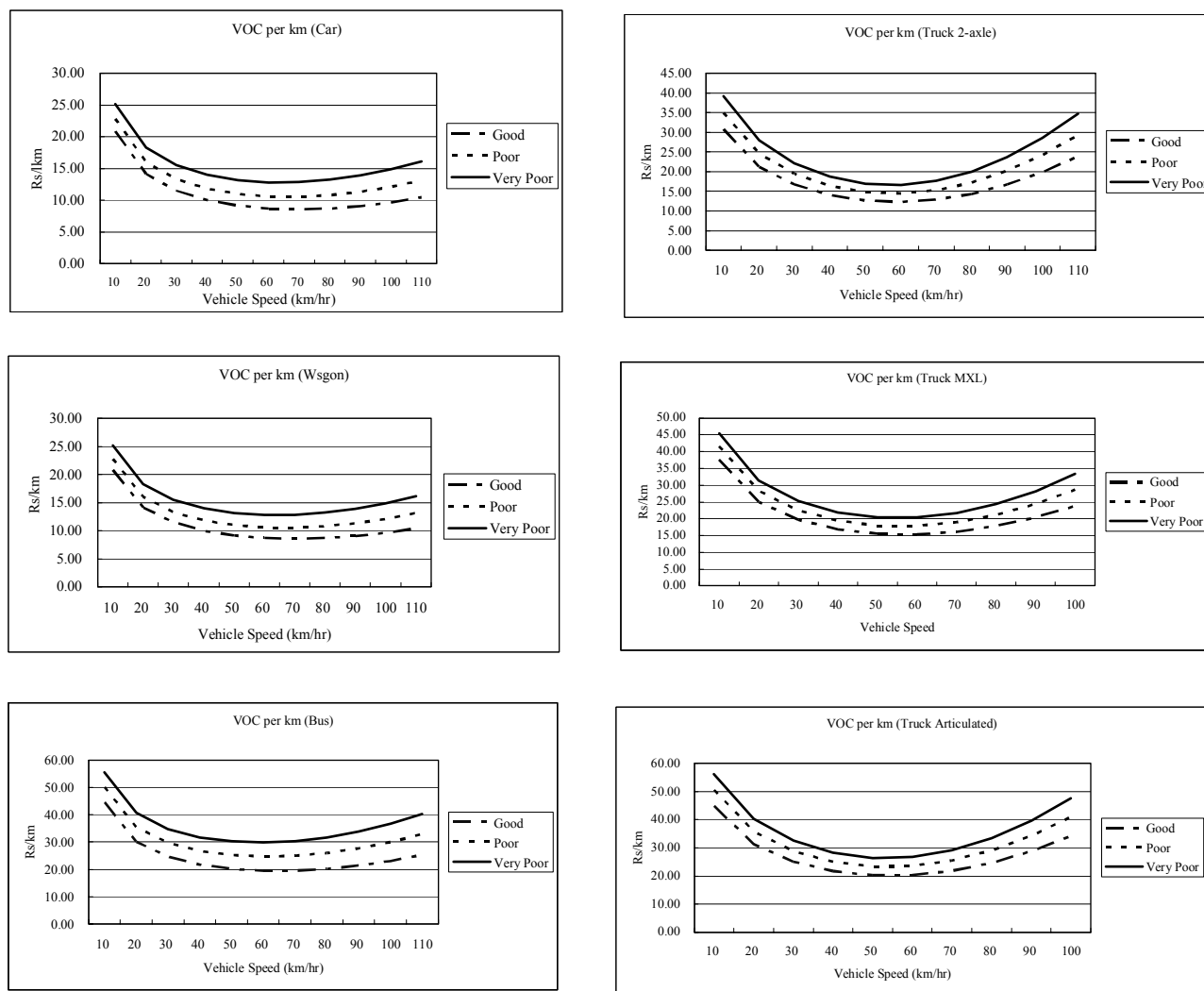


Figure G-1 Vehicle Speed and VOC by Surface Condition

Table G-1 Vehicle Operating Cost at Average Speed

Vehicle Operating Cost at Average Speed by Vehicle Type
(November 2005)

(Rs./km)

Vehicle Type	Average Speed Km / h	Financial Cost					Economic Cost				
		Road Condition (Roughness)					Road Condition (Roughness)				
		Very Good (r-2500)	Good (r-3000)	Fair (r-3500)	Poor (r-5000)	Very Poor (r-7000)	Very Good (r-2500)	Good (r-3000)	Fair (r-3500)	Poor (r-5000)	Very Poor (r-7000)
Motorcycle	40	2.07	2.08	2.09	2.34	2.61	1.45	1.46	1.47	1.65	1.84
Car	50	6.95	7.06	7.16	7.86	8.78	4.83	4.91	4.98	5.48	6.12
Wagon	45	12.46	12.96	13.48	15.41	18.47	9.24	9.59	9.96	11.41	13.58
Minibus	45	15.80	16.77	17.77	21.46	26.04	12.57	13.32	14.10	16.97	20.52
Bus	50	24.09	25.35	26.58	32.09	38.73	19.19	20.14	21.06	25.23	30.21
Truck (2-axle)	40	18.93	19.38	19.81	22.72	26.01	13.76	14.06	14.35	16.41	18.71
Truck (3-axle)	40	22.27	22.88	23.45	26.51	30.08	16.46	16.87	17.25	19.39	21.86
Truck (Trailer)	40	27.81	28.47	29.10	33.11	37.60	21.22	21.67	22.11	25.00	28.18

Source: JICA Study Team