IRC:SP:108-2015

GUIDELINES ON PREPARATION AND IMPLEMENTATION OF ENVIRONMENT MANAGEMENT PLAN

INDIAN ROADS CONGRESS
2015

https://irc.gov.in

GUIDELINES ON PREPARATION AND IMPLEMENTATION OF ENVIRONMENT MANAGEMENT PLAN

Published by:

INDIAN ROADS CONGRESS

Kama Koti Marg,
Sector-6, R.K. Puram,
New Delhi-110 022

June, 2015

Price : ₹ 600/-
(Plus Packing & Postage)

First Published : June, 2015

CONTENTS

PERSONNEL OF THE GENERAL SPECIFICATIONS AND STANDARDS COMMITTEE (GSS)

(As on 13th January, 2015)

1.	Das S.N. (Convenor)	Director General (RD) & Spl. Secretary, Ministry of Road Transport & Highways, New Delhi
2.	(Co-Convenor)	Addl. Director General, Ministry of Road Transport & Highways, New Delhi
3.	Prasad, Vishnu Shankar (Member Secretary)	Chief Engineer (R) (S&R), Ministry of Road Transport & Highways, New Delhi

Members

4.	Dhodapkar, A.N	Chief Engineer (Retd.), MORTH, New Delhi
5.	Datta, P.K.	Director-Corporate Development, M/s Trans Asia Infrastructure Pvt. Ltd., New Delhi
6.	De, Dr. D.C.	Executive Director, Consulting Engineering Services (India) Pvt. Ltd., New Delhi
7.	Duhsaka, Vanlal	Chief Engineer, PWD, Highways, Aizwal
8.	Joshi, L.K.	Vice Chairman, Central Administrative Tribunal, New Delhi
9.	Kadiyali, Dr. L.R.	Chief Executive, L.R. Kadiyali & Associates, New Delhi
10.	Kumar, Ashok	Chief Engineer (Retd.), Ministry of Road Transport & Highways, New Delhi
11.	Kumar, Dr. Kishor	Chief Scientist, CRRI, New Delhi
12.	Mandpe, P.S.	Chief Engineer (NH), PWD, Maharashtra
13.	Narain, A.D.	Director General (RD) & AS (Retd.), MOST, Noida
14.	Pandey, I.K.	Chief General Manager (Tech.), NHAI, New Delhi
15.	Patwardhan, S.V.	Managing Director, Madhucon Project, New Delhi
16.	Puri, S.K.	Director General (RD) & Spl. Secretary, MoRT&H (Retd.), New Delhi
17.	Rajoria, K.B.	Engineer-in-Chief (Retd.), Delhi PWD, New Delhi
18.	Rao, P.R.	Vice President, Soma Enterprises Ltd., Gurgaon
19.	Raju, Dr. G.V.S.	Engineer-in-Chief (R&B), Rural Roads, Director Research & Consultancy, Hyderabad, Andhra Pradesh
20.	Selot, Anand	Former Engineer-in-Chief, PWD, Madhya Pradesh
21.	Sharma, D.C.	Sr. Principal Scientist and Head Instrumentation Division, CRRI, New Delhi

22.	Sharma, D.D.	Chairman, M/s D2S Infrastructure Pvt. Ltd, New Delhi
23.	Sharma, Rama Shankar	Chief Engineer (Retd.), MORT&H, New Delhi
24.	Sharma, S.C.	Director General (RD) & AS (Retd.), MORT&H, New Delhi
25.	Shrivastava, Palash	Director, IDFC, New Delhi
26.	Singh, Nirmal Jit	Director General (RD) & Spl. Secretary, MoRT&H (Retd.), New Delhi
27.	Sinha, A.V.	Director General (RD) & Spl. Secretary, MoRT&H (Retd.), New Delhi
28.	Sinha, N.K.	Director General (RD) & Spl. Secretary, MoRT&H (Retd.), New Delhi
29.	Tamhankar, Dr. M.G.	Director-Grade Scientist (SERC-G) (Retd.), Navi Mumbai
30.	Tandon, Prof. Mahesh	Managing Director, Tandon Consultants Pvt. Ltd.
31.	Vasava, S.B	Chief Engineer (P) & Addl. Secretary, R&B Deptt. Gandhinagar, Gujarat
32.	Velayutham, V.	Director General (RD) & Spl. Secretary, MoRT&H (Retd.), New Delhi
33.	Verma, Maj. V.C.	Executive Director-Marketing, Oriental Structure Engineers Pvt. Ltd., New Delhi
34.	Rep of NRRDA	(Pateriya, Dr. I.K.) Director (Technical), NRRDA NBCC Tower, Bhikaji Cama Place, New Delhi
35.	The Dy. Director General	(Lal, B.B.) Chief Engineer, DDG D&S Dte. Seema Sadak Bhawan, New Delhi
36.	The Chief Engineer (NH)	PWD Jaipur (Rajasthan)

Ex-Officio Members

1.	President, Indian Roads Congress	(Bhowmik, Sunil), Engineer-in-Chief, PWD (R&B), Govt. of Tripura
2.	Honorary Treasurer, Indian Roads Congress	(Das, S.N.), Director General (Road Development) & Special Secreteary to the Govt. of India, Ministry of Road Transport & Highways
3.	Secretary General Indian Roads Congress	Nahar, Sajjan Singh

GUIDELINES ON PREPARATION AND IMPLEMENTATION OF ENVIRONMENT MANAGEMENT PLAN

1 INTRODUCTION

These Guidelines recommend the manner in which an Environment Management Plan (EMP) should be prepared, implemented, monitored and evaluated and cover the whole project life-cycle, starting from the preliminary planning and design to construction, maintenance and operation of the project. The procedures for Environment Clearance (EC), involving submission of Environment Impact Assessment (EIA) and Environment Management Plan (EMP) notwithstanding, these Guidelines aim at bringing environment in the forefront of project development, execution and operation and are recommended to be followed even where environment clearance is not statutorily mandatory. Where latter is the case, these Guidelines would aid the Project Authorities in preparing an EMP.

The Committee on Reduction of Carbon Footprint in Road Construction and Environment (G-3) deliberated on the draft "Guidelines on Preparation and Implementation of Environment Management Plan" in a series of its meetings. The G-3 Committee in its meeting held on 20th December, 2014 approved the document for placing it before the General Specifications & Standards Committee (GSS). The GSS Committee approved the Guidelines in its meeting held on 13th January, 2015. The Council in its 204th meeting held on 19th January, 2015 at Bhubaneshwar (Odisha) approved the "Guidelines on Preparation and Implementation of Environment Management Plan" after taking on board the comments offered by the members.

The Composition of G-3 Committee is as given below:

Joshi, L.K.	--------	Convenor
Sinha, A.V.	--------	Co-Convenor
Sharma, V.K.	--------	Member-Secretary

Members

Barar, Prathemesh	Malik, Deepak
Basu, S.B.	Mukhopadhyay, Dr. B.
Bhargava, Dr. (Mrs.) Renu	Nadeem, R.M.
Gautam, Parikshit	Rajvanshi, Ms. Asha
Gautam, Vinod Kumar	Sangal, M.M.
Gupta, D. Das	Sharma, S.P.
Juneja, Proff. S.S.	Shukla, Dr. Anuradha
Khitoliya, Prof. Dr. R.K.	Vyas, Ms. Neha
Kumar, Dinesh	Vishwanathan, R.
Mahajan, Girish	Rep. of CPCB

Corresponding Members

Goyal, Prof. Rohit	Mathur, Dr. Sanjay
Gupta, Dr. A.B.	Mathur, Dr. Y.P.

Ex-Officio Members

President, Indian Roads Congress	(Bhowmik, Sunil), Engineer-in-Chief, PWD (R&B), Govt. of Tripura
Honorary Treasurer, Indian Roads Congress	(Das, S.N.), Director General (Road Development) & Special Secreteary to the Govt. of India, Ministry of Road Transport & Highways
Secretary General Indian Roads Congress	Nahar, Sajjan Singh

2 SCOPE

2.1 The Scope of the Guidelines Cover

i) The object of environmental impact (land, air, water, forest resources, wild and aquatic life, human life and health and social impact)

ii) The principles on which EMP should be framed, implemented, evaluated and monitored

iii) The assessment of the impact of the project on these objects

iv) Specific standards and measures under different situations

v) Measures to ensure proper compliance of the environmental requirements

2.2 These Guidelines do not substitute or supplant the statutory requirements relating to environment including the compliance with the prescribed rules and procedures but only supplement them by facilitating better understanding of the problem by highway planners and professionals to help them deliver projects with minimal adverse impact on environment.

3 GENERAL

3.1 An Environment Management Plan is required to be prepared and implemented in compliance with the statutory Environment clearance for a highway project. The clearances are accorded on the basis of submission of the Environment Impact Assessment (EIA) by the Project Authorities. Promises made by the Project Authorities while submitting the EIA proposal and the conditions attached by the Ministry of Environment and Forest while according the clearance form the basis for the preparation of an Environment Management Plan (EMP), which is implemented during the project execution or operation by the contracting agencies and monitored by the Project Authorities.

3.2 The preparation of the Project Feasibility Report or the Detailed Project Report on the one hand and the EIA on the other, are usually taken up concurrently in parallel or at best, the latter closely following the former. EIA is thus based on the preliminary (or detailed) project design. At the EIA stage, however, many specific issues relating to environment cannot be

firmed up (e.g., the locations of quarries, borrow areas, camp sites, debris disposal sites, nature/type of land, soils, etc.). This is because either the studies of this nature are not part of Feasibility Studies or because these have to be finalized by the contractor/concessionaire after award of the contract. Accordingly, the specific solutions cannot be suggested at the EIA stage. These are proposed in the EMP subject to the standards and measures proposed in the approved EIA. Thus, EMP is an extremely important document containing specific measures and proposals aimed at preventing or mitigating the adverse impact of the project on the environment.

3.3 Adverse impact of projects on the environment are caused in several ways (air, water, noise pollution, degrading the land, wasting top soil, interfering with the natural habitats of wild and aquatic life, etc.), which are well known. It is also well known that degrading the environment imposes a huge cost on the society, which the economists prefer to call 'externalities' and strongly advocate that these be 'internalized' into the project costs (or usage charges), though a satisfactory and universally acceptable model for the assessment of externalities is still elusive. Also, there is no denying the fact that some production and construction processes and technologies are more energy intensive compared to some others and leave more carbon foot prints. It would be in the interest of the environmental cause that as far as possible, the less polluting technologies are used in construction in preference to more polluting conventional technologies. In this area as well the absence of a well-accepted model for quantitative evaluation of various technologies proves a handicap. There are procedures available, though, which enable earning of carbon credit for use of alternative less polluting technologies as opposed to conventional technologies thereby making the alternative technologies more attractive as well as cost effective.

3.4 Notwithstanding the limitations in the quantitative evaluation of the cost of externalities and relative merits of alternative technologies, these Guidelines would recommend that the Project Authorities should be prepared to accept higher than the usual cost (which, in any case, does not reflect the actual social cost) of projects to be accounted for (a) by provision of better environmental safeguards and (b) by use of environmentally safer less polluting technologies. The latter may not necessarily be more expensive because of its potential for earning carbon credits. These Guidelines would, therefore, recommend that the EMP should focus on technology issues as well with externalities in the perspective.

3.5 Even though preparation of an EMP assumes EIA as given, these Guidelines would recommend a fresh look at EIA as well. At the stage of preparation of Feasibility Studies or DPR (and hence at EIA stage), the technology question should be given due importance. Alternative technologies may be evaluated (from the first principle in the absence of standard procedures) vis-à-vis the conventional technology. After evaluation, there are two options to choose from (a) the technology option is frozen and the bidders are required to bid based on the technology chosen by the Project Authority; or (b) the choice of technology is left to the bidders: the bidder who bases his bid on the least polluting technology and promises the best possible measures in environment management should score the highest marks allocated for environmental factors during bid evaluation thereby improving his competitive position compared to other bidders. Option (a) is restrictive and might lead to technology monopolies

while option (b) is more open, competitive and consistent with the design-build or design-build-finance-operate philosophy. In any case, the technology option study at the EIA stage would not go waste because it would help evaluate option (b) in an informed and objective manner.

3.6 Who prepares the EMP and in what manner, whether it is adequately compliant with the conditions specified in the EIA approval and if not how to enforce compliance, how to evaluate and monitor the implementation of EMP and what if the implementation is not proper, are some other important questions, which these Guidelines intend to address and recommend that the Project Authorities may incorporate suitable provisions in the bid and contract documentation with regard to these questions. It is recommended that the EMP should be prepared by the contractor/concessionaire in accordance with these Guidelines, the bid conditions as well as in compliance with the conditions attached to the environment clearance. As a bidder, the contractor/concessionaire should submit his approach to environment management, which should be evaluated as a part of qualitative assessment of the bids along with other assessment parameters (e.g. time, quality, safety) and follow that approach during execution in preparing and implementing the EMP. Compliance with the EMP should be a contractual obligation. The evaluation and monitoring of the EMP by the Project Authorities (or by the Authority's Engineer) should be on the basis of measurable and objective criteria. Since the present procurement system does not permit this, the EMP prepared by the Contractor can be contractually enforced. (See para 4.4 below)

4 OBJECT OF ENVIRONMENT IMPACT

4.1 A project impacts on land, air, water, forest resources, wild and aquatic life, human health, life and society as a whole. The Environment (Protection) Act, 1986 empowers the Government to take any measures required for protection of environment. The Environment (Protection) Rules, 1986 under the Act prescribe the standards for emission or discharge of environmental pollutants from 'industries, operations or processes' and impose 'prohibition or restriction' on the latter by specifying for an 'area' the standards of quality and allowable limits considering factors such as topography and climate, biological diversity, environmentally compatible land use, adverse impact potential, proximity to 'protected areas' (under Ancient Monuments Act 1958, Wild Life Protection Act, 1972), proximity to human settlements and any other factor damaging to the environment by issuing notifications in the Gazette. The Rules further impose restrictions on handling of hazardous substances considering their substitution by local materials or technologically developed substitutes. The 'prohibition and restrictions' are governed by the procedures notified under MoEF notification of 14th September 2006 (EIA notification), which requires prior Environment Clearance (EC). The objects of impact as per the notification are briefly stated below. The factors that cause these impacts for highway projects are added in brackets.

- Air quality (emissions from plants, vehicles, dust, noise)
- Hydrology and water quality (drainage, runoff, siltation, erosion, effluent discharge)

- Site and its surroundings (landscape, land use, land degradation, loss of top soil, loss of vegetation cover)
- Occupational safety and health (fumes, dust, noise, blasting)
- Disposal of effluents (liquid, air and solid) and the methods of alternative uses (debris disposal, surplus/rejected construction material, spillage, leaching, junked equipment parts, effluent discharge from plants/camp sites, recycling the wastes, dust palliation, safety gears)
- Transportation of raw material and details of material handling (quarrying, air pollution and ground pollution through materials in transit)
- Control equipment and measures proposed to be adopted (noise mufflers, dust palliation, covered transit, ground water recharge, restoring the landscape, rehabilitating the degraded land)

Preparation of Environmental Management Plan is required for formulation, implementation and monitoring of environmental protection measures during and after commissioning of projects taking into account all the possible impacts.

4.2 The Table below lists the main objects of environmental impact as relevant to the highway projects and the standards and guidelines to be adhered to.

S. No.	Object	Standards
1.	General Environment	Environment Impact Assessment (EIA) notification of 14.09.2006 MoEF Manual on norms and standards for environment clearance of large construction projects as relevant
2.	Land	Environment Impact Assessment (EIA) notification of 14.09.2006 MoEF Manual on norms and standards for environment clearance of large construction projects as relevant Environment Impact Assessment (EIA) notification of 14.09.2006 Hazardous Wastes (Management, Handling and Trans boundary Movement) Rules, 2008
	a) Construction	
	b) Borrow areas	
	c) Stone quarries	
	d) Camp sites	
	e) Debris and waste disposal	
3.	Water	
	a) Surface runoff	Guidelines for Water Quality Management CPCB-2008,
	b) Effluent discharge from Plants and sewers	The Environment (Protection) Rules, 1986 [SCHEDULE – VI]
	c) Leaching of heavy metals	Hazardous Wastes (Management, Handling and Trans boundary Movement) Rules, 2008

S. No.	Object	Standards
4.	Air	
	Sulphur dioxide (SO_2) ($\mu g/m^3$)	MoEF notification dated 16.11.2009 on National Ambient Air Quality Standards
	Oxides of Nitrogen (NOx) ($\mu g/m^3$)	
	Particulate Matter (Size Less Then 10 µm) or PM_{10} ($\mu g/m^3$)	
	Particulate Matter (Size Less Then 2.5 µm) or $PM_{2.5}$ ($\mu g/m^3$)	
	Ozone O_3 ($\mu g/m^3$)	
	Lead (Pb) ($\mu g/m^3$)	
	Carbonmonoxide (CO) (mg/m^3)	
5.	Noise	Noise pollution (regulation and control) rules, 2000
6.	Forest resources	The Forest (Conservation) Act 1980, Forest Conservation Rules, and Local Laws under the said Act
7.	Wildlife habitats	The Wildlife Protection Act 1972, Directives of Hon'ble Supreme Court Environment Protection Act, 1986 EIA notification, 2006; Wildlife Protection Act, 1972
8.	Conservation of CRZ area and Mangroves	CRZ notification, 1991
9.	Utilisation of Fly Ash	The Fly ash Notification dated 3rd November, 2009.
10.	Biodiversity	Biological Diversity Rules, 2004
11.	The Ancient Monuments and Archaeological Structure and Sites	The Ancient Monuments and Archaeological Sites and Remains Act, 1958
12.	Social Impacts	EIA notification, 2006

4.3 The Appendix-I of this document presents the format required for preparation of EIA as per EIA notification of 2006, Appendix-IA suggests the EMP Action Plan for the main impacts and the preventive/mitigative measures and standards to be followed at various stages of work, viz., pre-construction, construction and operation. Appendix-II presents a

background note on Kyoto Protocol with regard to GHG emissions and policy measures for controlling them. The measures suggested in this document are indicative as a detailed treatment of each of these is beyond the scope of this document. Detailed project specific measures can be prepared with the help of the MoEF Manual on norms and standards for environment clearance of large construction projects (to the extent relevant to highways) of Central Pollution Control Board (CPCB), National Building Code (NBC) and Central Ground Water Board (CGWB). Annexes 1 to 8 present the guidelines for various actions including the monitoring of the EMP.

4.4 While the standards indicated in para 4.1 above are mandatory, these Guidelines recommend other proactive features to be included in EMP, such as recycling of wastes, conservation of natural materials, less energy intensive construction and use of clean technology. Initiative for this has to come from the Contractors, who have the freedom to choose any technology in EPC (i.e Design-Build) or DBFOT type of construction. This initiative will be forthcoming if incentives are offered or are available to the Contractors for adopting the best methods and technology suited to the cause of environment. One form of incentive that is already available is earning carbon credit for using less polluting technology. The other major incentive that could be offered to the Contractors is giving preference to such bidders who promise the best environmental measures (along with other value delivering factors like time, quality and safety) in their bid. EMP should, therefore, not confine itself to meeting the minimum requirements alone but go beyond it. Since the present bidding system does not permit the contracting authorities to offer such incentive, the only way to ensure this is through contractual means. The bid condition should specify certain bench marks to be met in energy reduction/GHG emission or conservation of materials compared to standard methods of construction and enforce it contractually.

5 PRINCIPLES OF ENVIRONMENTAL MANAGEMENT PLAN

5.1 Procedures Apart, the Principles on which an EMP Should be Based are Briefly as Under:

i) Adverse impact on environment is an externality, which needs to be internalized

There is a social cost to the adverse impact of projects on environment in terms of hazards to human health due to exposure to pollutions of various kinds, damage to eco system and biodiversity due to interference with the eco system, reduced opportunities to posterity due to faster depletion of resources, contribution to climate change and global warming caused by emission of Green House Gases during construction and operation, loss of agricultural output due to degradation of land and shrinking arable area, loss of livelihood to persons and communities due to their displacement from project sites and involuntary relocation elsewhere, impaired social bonding due to severance of communities caused by projects, etc. The society as well as individuals suffer

the costs of these externalities, but these are not factored in cost of projects, which, therefore, do not reflect their real cost. Similarly, the usage charges for the projects do not reflect the real price that needs to be paid for the use of the projects. Artificially reduced costs (and hence the price for their use) causes a spurt in demand for projects and multiplies the adverse impact on environment if the supply matches the demand. While the economists agree that these externalities have to be internalized in the project cost or project use charges a satisfactory model for this has not emerged, mainly because it is not merely a question of economics but also one of public policy on which Governments may have different views. (For example, reducing demand by increasing the cost or price may be counterproductive to growth). These Guidelines do not intend to enter into a debate on an appropriate model. Nevertheless, it is strongly recommended that the fact of the externalities should be recognised and appreciated and the cost of projects should include the cost of effective preventive and mitigative measures to counter the adverse impact of projects on environment even if that means a higher than usual cost.

ii) Construction technology should be less energy intensive to reduce GHG emissions

All construction would need energy. The main source of energy are the fossil fuels, burning of which releases GHGs causing pollution and health hazard in the short run and climate change and global warming in the long run as these gases continue to remain in the atmosphere for all time to come, keep on absorbing radiation from the sun and warming the atmosphere. The long term effect of global warming is catastrophic and may endanger the human existence itself. For example, melting of polar ice may submerge large areas of the land mass, unpredictable spells of floods and drought in unexpected areas may upset human habitation, and their combined effect may result in huge migration of population. Besides, vegetation and plants as well as natural habitats of animal and aquatic life may be seriously affected causing extinction of many plants and animal species throwing ecological balance and biodiversity totally out of gear. So long as fossil fuels continue to remain the main energy source and are not replaced by cleaner fuels (which does not appear likely in the foreseeable future), global warming with the attendant risks would continue. Even though highway construction is not the main polluter through GHG emission in the overall transportation sector (95% pollution is caused during operation), it needs to do its bit to arrest the global warming by using less energy-intensive technologies.

Road construction uses both natural and manufactured materials. Bulk of the natural material is crushed rock because of their inherent crushing strength and resistance to deformation by developing inter-granular friction. Rocks have very high embodied energy due to the nature of their formation (heat in case of igneous and metamorphic rocks and mechanical compression due to millions of

years of sedimentation in case of sedimentary rocks). Breaking and crushing of the rocks, therefore, consumes huge energy. This energy requirement can be reduced by reducing the need for breaking and crushing, which is possible by:

(a) recycling the already-crushed-rock of the past which is now in disuse (e.g. in demolished concrete structures, in failed bituminous and concrete pavements, in the in-situ pavements by milling the top failed layers and relaying);

(b) substituting the crushed rocks with low embodied energy materials (like soil and low grade aggregates) after chemically treating them for achieving the strength and durability

(c) developing standards, specifications, design procedure and technology for use of wastes and alternative materials

The main manufactured materials in road construction are cement, steel and bitumen. The raw materials for cement and steel are in the form of rocks (lime stone in case of cement and hematite in case of steel). Breaking and pulverization of the rocky raw materials requires energy, which releases GHG. In addition, the manufacturing process itself releases GHG (CO_2 on calcination of lime stone and CO_2 and SO_2 on reduction of Fe_3O_4). Thus, both cement and steel production processes involve emission of GHG, which needs to be reduced by making more efficient use of these materials: reducing their quantity and enhancing their performance by proper design procedure and technology (e.g. high strength concrete, high performance concrete, blended cement, high performance steel).

Bitumen is a refinery by-product, which will continue to be produced as long as the petrol and diesel are produced as fuels for vehicles. Another construction material, fly ash, is a by-product of coal-based power plants and is used in various ways, such as blending of cement, stabilization of soil, construction of embankment. There is yet another by-product, blast furnace slag, which is used in blending of cement. These by-products including bitumen have zero GHG emission potential in their production (because the emission is caused for production of petrol/diesel or generation of power or production of steel, which have to be produced any way, bitumen or fly-ash or slag being only by products of these production processes) and their use should be encouraged, otherwise their disposal would create environmental problems of gigantic proportion.

iii) Earning carbon credit by reducing GHG emissions should be targeted

GHG emission can be reduced mainly in three ways, viz., by making a choice of less polluting construction technology, by use of clean fuel (which are not fossil fuels), and by developing carbon sinks to absorb CO_2. The technology options are discussed in Section 6 of this document. Clean energy sources are solar, wind, hydro, biomass and bio fuel. Any of these clean energy sources can be harnessed to meet at least part of the energy requirement of the project (e.g.

requirement of electricity, heating, air conditioning in construction camps can be met from solar powered plant). Increasing the share of cleaner energy in the total energy mix can be achieved either by generating and using the energy locally or by generating and feeding the energy into the grid. Carbon sinks, which absorb CO_2 mainly through the carbon sequestration process (i.e the growing vegetation taking CO_2 under sun light from the atmosphere and releasing O_2 as a result of photo synthesis) can be created by growing plantation on degraded land within the project influence area. There are various carbon calculators available, which can calculate emissions under different types and conditions of energy use. Difference of GHG emission between 'doing business as usual' and 'with emission control measures' would lead to entitlement of carbon credit. The credit can be claimed and earned on certification of any international Carbon Emission Regulator. The credits earned can be internationally traded. The potential buyers are those entities, especially in the developed countries, which cannot meet their international obligations on emission control for various reasons (e.g. no scope for innovation and change from 'business as usual' operation for legacy reasons, or technical innovations to bring down emission levels are too expensive). India at present has no international obligations under Kyoto Protocol (ref Appendix II) to reduce the emission level, but has great potential for innovation and change and hence for earning carbon credits. The contractors and concessionaires who bring these innovations and earn carbon credits can, to a great extent, get compensated for their efforts in this regard.

iv) No indiscriminate exploitation of natural resources

While rocks have taken millions of years to form and once extracted cannot be replenished, some natural materials used in construction, such as sand and water, are continuously formed in nature and are replenished: sand as sediments carried by rivers due to erosion of hills, banks and beds; water in the form of water cycle of precipitation, infiltration, transpiration, run off and evaporation. Ideally, the rate of exploitation of such materials should not exceed the rate at which they form in nature. This does not always happen because these resources are contaminated and rendered useless for construction as soon as they are formed in nature (e.g. contamination of surface water and sand by pollutants discharged into the rivers). The advantage of natural replenishment of these resources thus disappears, and one turns to legacy resources formed in the past as a result of cleaner processes (e.g. deeper sand deposits, clean ground water formed centuries ago when pollutants were non-existent). Indiscriminate exploitation of the cleaner resources can cause their depletion at an alarmingly fast rate and pose serious problem to human existence. For example, sand beds of rivers hold the surface water and act as natural filter for recharge of ground water below river bed permitting clean water to enter the ground water aquifer. Thicker the sand bed cleaner and larger is the recharge. Construction requires clean sand and water, which are hard to

get on the top surface of river beds because of pollutants getting their way into the rivers, forcing one to go subsurface (to extract sand) and underground (to draw clean water). Denuding the river beds, formed by hundreds of years of deposition, by deeper dredging does just the opposite of what is required for recharging the ground water aquifers. Besides, drawing underground water (because polluted surface water is not fit for use) depletes the ground water aquifer and lowers the water table. Thus, while the use of the new resources formed by natural processes is inhibited by man-made processes (discharging pollutants in the river), the legacy resources are exploited indiscriminately.

v) Disposal of debris and wastes should not pollute land, air and water

Road construction generates construction debris right from the stage of site clearance which requires removal of vegetation along with scraped ground surface and generates debris to be safely disposed. Other forms of debris may be dismantled structures (stone, concrete, steel, bricks, bituminous materials, aggregates), surpluses from cutting (soil, gravel, rock), unsuitable materials requiring removal from site (domestic wastes, plastics, biodegradable materials), spillage of oil, bitumen, cement slurry from concrete batching plants and hot mix plants, non-conforming or rejected concrete or bituminous mixes, other solid wastes like kitchen wastes, paper, plastic and metallic containers/packing materials, machinery or its parts including vehicle tyres, etc. Most of the debris is likely to be inert debris and can be dumped at suitable land fill sites. However, it is desirable that the debris be segregated, useful materials (e.g. stone, rock, aggregates, plastics, rubber) recycled and the residue dumped at designated sites. Usefulness of these materials does not lie in the price it can fetch, but the value these can generate by protecting the environment.

In no circumstances, debris in any form should be allowed to be dumped anywhere except the designated places and left uncovered as it can degrade the land, obstruct the channels and water courses, present unsightly landscape and increase dust pollution. The dump sites should be covered with suitable local vegetation.

Effluent generated from sewerage system (from construction camps) and plant operations should be tested before discharging into water courses. Where use of certain chemicals (e.g. chemical stabilization, curing compounds, bitumen modifiers, other chemical additives, etc.)is a part of construction process, the leachability of the constituents of these chemicals and potential contamination of land and ground water must be ascertained.

vi) Landscape should be improved rather than defaced

Construction activity should not deface the landscape or leave it scarred, which is the most likely situation in the absence of suitable intervention on borrow areas, quarry sites, cut slopes, debris dump locations, construction camp locations (especially after demobilization), and in general, along the construction sites.

The project should aim at improving the surrounding landscape and attempt landscaping even those areas not directly part of the project but which present an unsightly landscape while travelling on the project highway. With proper intervention value can be added to the land surface and quarry ditches, e.g., by converting them into water storage areas or picnic spots or other recreational spot. The quarrying from hill slopes should be done in slopes consistent with the natural slopes of the hill and the same species as existing should be planted so that over time the cut slopes merge with the original landscape. Exposed cut faces of slope in the roadway should be planted with tufts of grass or creepers or any other suitable plant species. Camp sites should be planted with vegetation and nursed during the project duration so that vegetation survives on its own after demobilization. Borrow areas should be restored and vegetated. Value can be added by developing some community facility like water tank or fish ponds or some other facility useful to the local community.

vii) Recycling of wastes in general for use in construction for helping the larger cause of environment

The perspective of management of environment should not remain confined only to the project specific damages and mitigation measures. A larger view should be taken by asking the question how the project in question can help achieve the greater and global environmental goals. One of the serious global environmental problems is disposal of some of the industrial non-biodegradable wastes. Satisfactory disposal of these wastes is not possible through any of the conventional processes (e.g. dumping in land fill, incineration, discharge into rivers), which adversely impact the environment. Apart from fly ash and blast furnace slag (already discussed above, though not as waste but as industrial by-product, the problems of disposal remaining grave notwithstanding the difference), two more waste products generated in an industrial society are plastic and used rubber tyres of vehicles, which keep on piling up in the absence of satisfactory disposal methods. Incidentally, both these products have great potential for being used in road construction and this potential needs to be exploited. There are technologies and standards available for their use and discussed in Section 6 below.

viii) Communities should not suffer construction

Communities living close to the project highway are the worst sufferers of the adverse impact of environment in terms of noise and dust pollution, increased emissions, restrictions on access to their properties or work place, delays in travel time, community severance, visual intrusion caused by unsightly construction sites and high banks or structures in their backyard, etc. One of the most important principles on which an EMP should be based is to have community focus to environment problems. Measures to control dust (e.g by removing construction debris immediately when generated, mulching the areas around construction, water sprinkling to help the dust settle), noise (e.g. by

attenuation measures like noise screens or barriers) and visual intrusion (e.g by blocking the construction site views by barriers and screens) should invariably be the part of EMP. Alternative access to properties or community facilities necessitated due to construction should be as good as the existing access, if not better, and that should also apply to situations where communities are severed due to construction.

6 CHOICE OF TECHNOLOGY

6.1 Choice of technology would depend upon (a) evaluation of the relative merits of the alternative technologies on certain objective criteria, (b) availability of design standards and procedures and (c) availability of equipment and technology vendors. Indian Roads Congress (IRC) has published a number of Guidelines for use of alternative materials and technology, which are more environment friendly, and is in the process of finalizing some more in a very near future. The main methods, technologies and measures, which can help introduce cleaner less polluting construction, use recycled wastes and minimize drawing of natural resources from the environment, are briefly discussed below.

i) Substitution of crushed rock by stabilized low grade aggregates and soil

The Guidelines for Design of Flexible Pavement IRC:37 have been modified in 2012 and the revised Guidelines now permit stabilized low grade aggregates and soils in substitution of the crushed rock. The Guidelines also provide the modified design procedures and material standards. The new design procedure is based on the mechanistic empirical design, which relies on the stresses and strains developed in various pavement layers and the strength of these layers in terms of elastic moduli and durability. The earlier design procedure was based on the strength of the pavement layers generated by inter-granular friction, which made the use of crushed rocks mandatory.

ii) Economy in cement and steel consumption by producing high strength concrete and modified design procedures

IRC has revised its concrete code in 2012, which is based on the 'limit state design' concept as opposed to the 'working stress design' principles in the earlier version. The code permits design and production of very high strength concrete approaching almost 100 MPa, nearly twice as much as that permitted under the previous versions. This brings economy in consumption of cement and steel, two of the most polluting manufactured construction materials.

iii) Use of fly ash in construction

There are several IRC Guidelines on the use of fly ash, the polluting waste of thermal power plants. These can be used in embankment construction (replacing soil), as a stabilizing material in combination with lime to give strength to soil and low grade materials (replacing crushed stone), as a blending agent with cement (replacing cement).

iv) Use of warm mix asphalt technology

Most bituminous mixes are produced at a very high temperature (nearly 160ºC), mainly because bitumen is very viscous at low temperatures and cannot coat the aggregates unless heated to high temperatures. There are technologies available, which can facilitate the coating at low temperatures by increasing the surface area of bitumen (foaming) or by reducing the surface tension at the aggregate bitumen interface with use of certain additives, thereby making the mixing possible at much lower temperature (typically 110ºC), saving energy and releasing less pollutants in the atmosphere. IRC has recently published Guidelines on the subject.

v) Use of waste plastic in bituminous construction

IRC has also recently published a set of Guidelines on the use of waste plastic, which does not provide any dramatic functional advantages to the bituminous mix but has great compatibility with bituminous mixes. The only aim is the safe disposal of these non-biodegradable wastes polluting the environment. Cleaned and shredded plastic pieces are fed into the plant after the aggregates are heated. The plastic in contact with hot aggregates melts, coats the aggregates and mixes with bitumen.

vi) Recycling of bituminous pavement

The failed and damaged bituminous pavements have valuable aggregates and bitumen in them. It is desirable to extract value out of the waste bituminous pavements by reclaiming and recycling these materials and using them in construction instead of dumping it in landfills, which will use up scarce land resources and contaminate the soil. Use of such materials in a construction layer has been permitted in the revised Pavement Design Guidelines (IRC:37-2012). Detailed Guidelines on the practice of Recycling technologies are at present being developed by IRC. These technologies essentially involve reclaiming the damaged or unserviceable pavement materials by milling, mixing fresh materials with reclaimed materials, and producing mixes that can be laid on the road. The mixing process can be either in-situ or in plant.

vii) Gap-graded bituminous mixes using crumb rubber

The technology involves converting the used and discarded rubber tyres of vehicles into crumbs and mixing them with aggregate and bitumen to produce a strong and durable mix. The grading (or packing of various sizes of aggregates) is not close but leaves gaps to accommodate the crumbs in the mix, which after absorbing oil in the bitumen expand and make the mix dense, durable and more flexible. IRC is in the process of developing standards and guidelines on this technology, the twin aims of which are to improve the pavement design as well as utilize the rubber waste in construction rather than disposing it into landfills and use land resources for disposal of waste or by disposing it by the crude method of burning, which is highly polluting. The technologies available for waste tyre disposal (e.g. pyrolysis) are at present too expensive. Use of these wastes in bituminous construction is extremely environment

friendly and makes economic sense as well (because of higher performance, durability and less maintenance needs).

7 CRITERIA FOR EVALUATION OF RELATIVE MERITS OF ALTERNATIVE TECHNOLOGIES

7.1 These Guidelines recommend two criteria for evaluation of the relative merits of the alternative technologies from the point of view of environment; (a) the GHG emission potential of the technology assuming functional merits of each of the technologies permitted in IRC Guidelines is considered acceptable, and (b) the environment friendliness of the technology assuming GHG potential of the alternatives are of the same order.

7.2 GHG emission potential directly depends upon the energy intensity of the technologies based on a fair assumption that the energy requirement is presently met predominantly by burning fossil fuels and that the proportion of clean energy in the total energy is rather small. It is recognized that comprehensive and reliable energy consumption data may not be readily available. There are standard carbon calculators, which can predict GHG emission potential in various construction technologies. Besides, such data can be generated by energy audit of the completed projects also. The aim should be to calculate the emissions in the 'business as usual' case as well as in the alternative cleaner technology option. The extent of decrease in GHG emission would give an idea how clean and less polluting the alternative technology would be. A clean technology should be one of the important criteria for choice of a construction technology.

7.3 The GHG emission criteria suggested above excludes from its purview the other benefitting factors of a technology (e.g. reduction of wastes in the environment) and puts all technologies, which consume more or less the same amount of energy on par while disregarding the environment friendliness of a particular technology compared to the others. In such cases, the qualitative assessment of environment friendliness of the technologies having similar energy intensity should decide the preferred option. For example, a technology that uses wastes after processing should be preferred to one that does not, even if the energy intensity (and hence polluting potential) is of similar level in both cases.

8 ENVIRONMENTAL MONITORING PROGRAMME

The Environmental Monitoring Programme has been detailed out in Annex-8. Successful implementation of the Environmental Monitoring Program is contingent on the following:

- All the initial tests for monitoring ambient environmental parameters should be carried out in the early stages of the project life cycle, to establish 'base data' prior to impacts from the construction activities.
- A schedule of subsequent periodic tests to be carried out is prepared and adhered to.
- All the environmental monitoring tests and analysis of results are carried out.

- Where indicated by test results, and any other relevant on-site conditions, appropriate steps are taken to:
  - Modify the testing schedule (dates, frequency)
  - Modify (add to or delete) testing locations
  - Verify testing results with additional testing as or if required
  - Recalibrate the testing equipment as necessary
  - Withdraw from site, modify or defer the deployment of specific construction equipment, processes, etc., as necessary, which significantly contribute to the monitoring readings being in excess of the permissible or safe levels.

9 RESPONSIBILITIES AND ACCOUNTABILITIES

9.1 There is no denying the fact that the ultimate responsibility and accountability for environmental safeguards rests with the Project Proponent, which is usually the Project Authority. The Project Authority seeks various approvals like EC, EIA and EMP from the MoEF and monitors and evaluates the implementation of the safeguard measures. Without in any way diluting the responsibility of the Project Authority these Guidelines propose certain changes in the implementation mechanism with a view to bringing in fairness, competition and effectiveness in implementation of the environmental safeguard measures. Project Authorities can themselves bring about these changes where Environment Clearance is not a mandatory requirement and bring them in consultation with MoEF where such clearance is mandatory. These changes and the rationale for them are discussed in the succeeding paragraphs.

9.2 As brought out in Section 3 of this document, the specifics of the EMP (where, what and the extent) are not known at the bidding stage, and therefore, the EMP can only be generic and not specific at that stage. The perceptions and interpretation of the contractor and the Project Authorities are, therefore, different with regard to the responsibility of undertaking the measures and cost involved therein. The difference in perception after award of contract would result in either contractual disputes or compromising the requirements. This can be avoided by:

a) Bringing about changes in the procurement system, which requires the bidders to submit with their bids (i) an EMP suggesting the specific measures they would take in specific situations envisaged in EIA clearance (which after award of contract would be modified by him to include specific locations, quantities, areas as well) in accordance with the generic EMP submitted with EIA, and (ii) the specific technologies that would be used by him, which would be evaluated objectively from GHG potential and environment friendliness criteria with reference to the bench mark technology (the 'business as usual case') and that the one with better technology would be offered some preference in award.

b) Rejecting the bid in Technical Evaluation (or evaluating him poorly in comparison with other bidders) if the EMP proposal is not satisfactory, thereby making the contractors submit serious proposal after due diligence on costs as well as committing the implementation of the specific measures.

c) Enforcing the implementation of the specific commitments in the EMP contractually by the Project Authorities

9.3 The need for preparation of EMP by the contractor is also consistent with the design-build or design-build-finance-operate models of contracting where the contractors are offered choice of design and technologies. Accordingly, it is the contractor who would be in the best position to prepare and implement the EMP depending upon his technology and material choice. There should, therefore, be an understanding of and commitment to the EMP by the contractor as relevant to his way of working. He should submit an outline of EMP (at the time of bidding) and the detailed EMP (post award) and implement it. The implementation should be monitored by the Project Authorities. In short, the following should be the delineation of responsibilities:

EIA: The Project Authorities

EMP:

i) At the stage of environmental clearance: Project Authority

ii) At the stage of bidding: The bidder

iii) At the stage of execution: The contractor

iv) At the stage of implementation: The Contractor

Monitoring of EMP: The Project Authority.

9.4 An EMP framed in accordance with these Guidelines, costed, committed and implemented by the bidder/contractor and monitored by the Project Authorities has a much better chance of delivering on environmental safeguards than one in which there is ambiguity with regard to the scope, the roles and responsibilities, and which can be interpreted in more than one way.

Appendix-I

Check List

(Refer EIA notification 2006)

Title of the Project:

Inventory of Project Road				
Sr. No.	**Particulars**		**Existing**	**Proposed (Design)**
1)	Length			
2)	Carriageway			
3)	ROW			
4)	Land use Pattern			
	a)	Within PROW		
	b)	Area impacted of water body, if any		
	c)	10 Km either side of road		
5)	Whether passing through wildlife area/Protected area/CRZ area/mangroves area/critically polluted area/Interstate or International boundary			
6)	Details of monuments and protected structures			
7)	Land Acquisition/Diversion:			
	a)	Govt:		
	b)	Private		
	c)	Forest (type of forest)		
	d)	Water body, if any		
8)	Tree inventory with girth size and species (proposed ROW)			
9)	Number of tree felling per km			
10)	Details of water bodies: (quality, quantity and competitive users)			
	Surface Water			
	a)	Perennial river		
	b)	Seasonal river		
	c)	Canal		
	d)	Lake		
	e)	Reservoir		
	f)	Wet land		
	g)	Ponds		
	Ground Water			
	a)	Cluster (exploited/critical/over exploited etc.)		
	b)	Water table		
	c)	quality and quantity of aquifer from which water shall be abstracted		
11)	Traffic Data			
12)	Pedestrian			

Inventory of Project Road			
Sr. No.	**Particulars**	**Existing**	**Proposed (Design)**
13)	Accident		
14)	No. of structures to be dismantled		
15)	No. of families/persons affected		
16)	Quantity of waste generation/disposal/re-use/treatment		
17)	Bypasses (study of alternative)		
18)	Tunnels (length, seepage, emergency exit, drilling/blasting, etc.)		
19)	Re-alignment		
20)	Junctions		
21)	ROB		
22)	RUB		
23)	Flyover		
24)	Major bridges		
25)	Minor bridges		
26)	Slab/box/arch culverts		
27)	Pipe culverts		
28)	**Underpass:**		
	a) Pedestrian		
	b) Cattle		
	c) Vehicular		
	d) Animal (wild and domestic)		
	e) Overpass		
29)	Service/slip road		
30)	Foot path		
31)	Drainage		
32)	Safety aspects		
33)	Slope protection		
34)	Raw materials Aggregates Sand Borrow Water Fly ash (if available within 100 km)		
35)	Details of IRC/MORTH Code/Guidelines		
36)	Green belt development		
37)	Impact		
38)	Mitigation measures		
39)	EMP cost		
40)	R&R cost		
41)	Total project cost		

Appendix-1A
Environment Management Action Plan

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
Preconstruction stage (PC)					
PC 1.	Land Resources	PC 1.1 Loss of productive soil	Borrow Pits Construction camps, storage gowdowns	Borrow areas should not, as far as possible, be selected on productive agricultural land. Where it is unavoidable, the top soil must be stripped, stored and reused either to rehabilitate (a) the borrow area itself later and make it suitable for agriculture or (b) any other already degraded area and make it suitable for agriculture, plantation, landscaping, etc. The rehabilitation measures should be planned in consultation with agriculture or horticulture specialists Haul roads for accessing borrow areas shall avoid agricultural areas as far as possible use the existing village roads. b) Construction camps shall be located with adequate provisions as per the guidelines in Annexure II. The construction camps shall be located at least 500 m away from habitations at identified sites and 200 m away from water sources to avoid contamination and spread of water-borne diseases. Sufficient measures shall be taken in the construction camps, i.e. provision of garbage tanks and sanitation facilities.	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				Waste in septic tanks shall be cleared periodically. Garbage shall be collected in a tank and disposed off daily.	
			Hot mix plants and batching plants	c) Hot-mix plants and batching plants shall be located sufficiently away from habitation, agricultural operations or industrial establishment. Such plants shall be located at least 1000 m away from the nearest habitation preferably in the downwind direction.	Refer Table in para 4.2 and these Guidelines
		PC 1.2 Land Use Change	Locations of temporary land require-ments	Where land is leased for temporary use such as for construction sites/ hot mix plants/traffic detours/borrow areas etc., it should be restored to its original condition after construction by dismantling all temporary structures and clearing all debris, removing junked parts of plant and equipment, proper leveling of the site and other measures required for restoration. In case vegetation had been removed for clearing the site for setting up the plant, it should be replenished by planting trees, plants and shrubs. Where public land is used for the purpose, it should be improved from its original condition by suitable measures such as landscaping, plantation, etc. Where private land is used, it should be restored as per	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				the terms of the lease to a condition not inferior to the original condition.	
PC 2.	Ambient Air Quality	PC 2.1 Dust and odour generation	Entire stretch	Suspended Particulate Matters should be maintained within the specified limits along the entire stretch, quarry sites, camp sites, and access or haul roads for construction by appropriate methods, such as - Water sprinkling - Prompt surfacing of un-surfaced areas like under construction road, shoulders, diversion and slip roads - Covered dust generating transportation - Grassing bare areas - Mulching camp areas - Mechanical brooming of surfaced areas - Prompt removal of all dust generating dumps and debris - Use of suitable dust palliatives Pollution Masks to be provided to transporting vehicle drivers. Construction camps shall be located and managed so as to prevent odour in the nearby habitation.	
		Fly ash		Fly ash shall be transported in wet form to avoid fugitive dust. Proper care shall be taken to cover the vehicles transporting fly ash.	

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				There shall be no dumping of fly ash on agricultural land or near water body.	
PC 3.	Water Resources	PC 3.1 Contami-nation of water resources	Areas around construction camp Entire stretch	a) Construction camps shall be located at least 200 m away from any sensitive water resources like surface water bodies. b) Toxic wastes and solid wastes generated at camp sites shall not be dumped/discharged into water bodies c) Sewage discharged into the water bodies should be checked for BOD	Refer Table in para 4.2 and these Guidelines
		PC 3.2 Loss of community and private water resources	Entire stretch Sourcing water for construction	Community and private water sources to shall not be affected by project and where it is unavoidable, alternative sources shall be provided in consultation with village communities. c) The requirement of water shall preferentially be met from ground water after getting approval from State and Central Ground Water Board. Where surface water sources are to be tapped, it shall be ensured that the water supply is not affected. The possible sources could be abandoned ponds, tanks or wells, specially created tanks or ponds, nearby perennial rivers subject to approval of village and local administration	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
PC 4.	Flora	Loss of trees	Entire stretch	Vegetation to be removed from the corridor of impact shall be transplanted, and if not possible, then cut and removed. Every tree or plant cut shall be with the approval of Forest Department and compensated by planting at least twice the number or the number specified/EIA & EMP. The trees and plants thus planted shall be maintained for three years. Tree clearing within ROW would be only those required for enabling construction or to reduce accidents. Trees to be cut shall be clearly marked. Measures required as per Wild Life Clearance shall be taken	Refer Table in para 4.2 and these Guidelines
	Fauna	Loss of wildlife habitat	Stretch falling in wildlife area/eco-sensitive zone		
PC 5.	Land Resources	PC 5.1 Acquisition of Land	Corridor of impact	Measures shall be taken to avoid disturbance/inconveneince to the people staying near the corridor of impact	Refer Table in para 4.2 and these Guidelines
		PC 5.2 Relocation of Community Property	Corridor of impact	All community properties lost due to the project shall be relocated with prior approval of the concerned agencies and with the consent of the owner before construction starts, on any section of the project corridor.	Refer Table in para 4.2 and these Guidelines
		PC 5.3 Relocation of Cultural Property Resources	Corridor of impact	Sites for relocation of religious structures shall be identified in accordance with the choice of the community. Relocation shall be completed before construction starts.	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
Construction stage (C)					
C 1.	Land	C 1.1 Loss of Topsoil	Borrow Pits, Construction sites, etc.	a) Borrow location, shape and size shall be such that these can be put to some social and community use after construction, such as water tanks, fish ponds, recreation, etc. and shall be restored accordingly. b) Topsoil up to a depth of 0.15 m from all permanently covered areas (construction sites etc.) and borrow areas shall be stockpiled for productive reuse such as rehabilitation of degraded land into agricultural land, landscaping, turfing of slopes, etc. At least 10% of the acquired area for construction purposes shall be kept for stockpiling of fertile topsoil. Precautions shall be taken while stockpiling. Slope of stockpile shall not exceed 1:2 (V:H) to retain soil & allow percolation of H2O and edges of the pile shall be protected by silt fencing. The piles shall be covered with gunny bags/ tarpaulin. The maximum height of the stockpiles shall be kept less than 2 m. Construction on the cleared soils shall begin as soon	

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				as possible to avoid soil erosion. Top soil shall not be unnecessarily trafficked either before stocking or when in stockpiles. Slope stabilisation shall be done by turfing and planting bush grass.	
			Quarry sites	Stockpiled top soil shall be returned to cover the disturbed area & cut slopes. Residual top soil shall be used for redevelopment of borrow areas, landscaping along slopes, medians etc. Quarrying shall be done only after obtaining proper permit or license from the Department of Mining and quarrying operations shall comply with the requirements of the State Pollution Control Boards Extraction of materials from quarries shall be done in regular slope, size and depth instead of gouging the hill slope or face that leaves a scarred landscape	Refer Table in para 4.2 and these Guidelines
		C 1.2 Soil Erosion	Entire stretch	All exposed un-surfaced areas within the ROW such as earthen shoulders, slopes, median fills, and the space between the toe of embankment and the ROW boundary remains prone to erosion by wind or surface runoff causing air pollution, siltation of drains and discharge of silt loads into rivers and streams. These areas shall be	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				made erosion proof by various measures such as: - pitching or turfing the embankment slopes - turfing the shoulders - turfing or vegetating the cut slopes	
				- desilting the drains and using the silt material, wherever possible - vegetating or mulching the un-surfaced areas and the medians with plants and shrubs Soil shall be monitored for erosion at select locations as per the monitoring plan mentioned in General EMP.	
		C 1.4 Contami-nation of Soil	Near construction site, asphalt plants etc.	Fuel shall be stored in proper bounded areas. All spills of petroleum products during operation, maintenance and repair of vehicles, plants and equipment shall be disposed of in accordance with the Guidelines of Ministry of Environment & Forests, New Delhi and respective State Pollution Control Board. An "Oil Interceptor" shall be provided for wash down and refuelling areas. Debris generated due to the dismantling of the existing road shall be either straightway used in the proposed construction, subject to the suitability or	Refer Table in para 4.2 and these Guidelines Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				used after recycling of using appropriate technology - Aggregates from dismantled pavement can be sieved and graded for use in service roads or haul roads - Bituminous materials can be recycled and reused as base/subase - Spalls of dismantled concrete structures cab be crushed and graded to be used in low grade concrete, e.g. levelling course concrete - Cut slope material should be used as embankment fill or, where rock cutting is involved, as aggregates for subbase/base The remaining unsuitable materials shall suitably dispose of in a suitable manner such as - Filling up of borrow area located in wasteland or at pre-designated dump locations, - Dumping at dump sites Dumping shall be carried out over a 60 mm thick layer of rammed clay so as to eliminate the possibility of leaching of wastes into the ground water. The surface area of such dumping pits shall be covered with a layer of preserved topsoil	

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				and planted with local species of shrubs. The pre-designated dump locations shall be a part of comprehensive solid waste management plan. Debris generated from pile driving shall not be allowed to flow into the surface water bodies or form mud puddles in the area and shall be promptly collected and dumped at selected dump site.	
				No fly ash shall be disposed in any disposal site. Care shall be taken to return the remaining fly ash after construction work to the source or to use it in construction of embankment elsewhere with proper construction measures. No new disposal sites shall be created as part of the project, except with prior approval of the Engineer. All waste materials shall be completely disposed and the site shall be fully cleaned before handing over. Soil shall be monitored for contamination as per the monitoring plan at locations to be identified by the Engineer.	
C2.	Ambient Air Quality	C 2.1 Generation of Dust	Entire Project Stretch	All crushers identified to be used in construction shall conform to relevant dust emission control legislation of the respective SPCB.	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				Clearance for siting shall be obtained from the respective SPCB. Alternatively, only those crushers that are already licensed by the SPCB shall be used. All Hot mix plants shall be fitted with dust extraction systems. SPM value at a distance of 40 m from a unit located in a cluster should be less than 500 g/m^3. The monitoring is to be conducted as per the monitoring plan. Excavation and transport of earth shall be done during the daytime only to minimize risks of the spills etc. from the earthwork on the community. Transport of the soil/earth shall be done by covering the haulage vehicles with tarpaulin or any other good quality material. Dust suppression measures in the form of water sprinkling on the lime/cement and earth mixing sites, asphalt mixing site and temporary service and access roads. All construction workers shall be provided with pollution masks to mitigate the effect of dust generation on the health of workers. Fly ash shall be transported in covered dump trucks to the project site and shall be directly	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				dumped on the embankment. This shall not be stock piled at the project site.	
		C 2.2 Generation of Exhaust Gases	Entire Project Stretch	All vehicles, plants and machinery used during construction shall conform to the emission standards promulgated under the Environment (Protection) Act, 1986. Regular maintenance and pollution control measures shall be undertaken for all the vehicles, equipment and machinery used during construction. Traffic detours and diversions shall be designed such as to minimize bottlenecks and ensure smooth traffic. Air pollution monitoring shall be carried out at specified locations as described in the monitoring plan to verify that air pollution norms are being followed by the contractor and the air quality at the construction site does not exceed the prescribed limits.	Refer Table in para 4.2 and these Guidelines
C3	Water Resources	C 3.1 Contami-nation of Water Resources	Ponds Rivers, canals, ponds etc.	Silt fencing shall be provided along ponds within the direct impact zone intercepting highway to prevent siltation in water body. Such ponds shall not be getting impacted during construction. Temporary drains shall be prepared to dispose off the eroded sediments and to	

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				prevent them from entering the surface water bodies. To prevent contamination of water resources due to contaminants from construction camps, adequate sewage disposal measures shall be taken care of at construction camps. Contaminated discharges containing oil/grease contributed by vehicle parking/ repair areas and workshops and construction sites shall be collected and treated using oil interceptors. Construction work close to water bodies shall be avoided during monsoon. All construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance and refuelling sites shall be located at least 1000 m from rivers and irrigation canal/ponds Both ground and surface water quality shall be monitored as per the monitoring plan at select locations.	
		C 3.2 Loss of Community Water Resources	Community Ponds and Wells	Pond enhancement measures shall be provided for community ponds getting impacted to slight degree and falling within the right of way as per the design provided in annexure of specific EMP. The enhancement measures shall	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				include provision for stepped access to the edge of water, providing flat boulders for washing, stone pitching for slope stabilisation etc. Roadside wells shall also be enhanced as per the design general EMP. Adequate water-harvesting structures shall be made part of the project design, all along the storm water drains, at appropriate intervals.	
		C 3.3 Water logging		RCC covered drains should be provided in urban locations or in areas with high water table for storm water runoff management. The drains shall be connected to proximal culverts.	Refer Table in para 4.2 and these Guidelines
		C 3.4 Disruption to other users		While working across or close to the rivers, the flow of water shall be so regulated as not to affect the down stream users Construction work expected to disrupt users and impacting community water bodies shall be taken up after serving notice on the local community. No access to a public road or public or private property shall be blocked during construction without providing alternative convenient facility.	Refer Table in para 4.2 and these Guidelines
C 4.	Noise Environ-ment	Increase in Sound Levels	Entire Stretch	The plants and equipment used for construction shall strictly conform to Central Pollution Control Board (CPCB) noise standards.	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				Vehicles, equipment and construction machinery shall be monitored regularly with particular attention to silencers and mufflers. Construction activities such as crushing, concrete mixing, batching shall not be allowed between 9 PM to 6 AM where the villages and residences are located within 150 m from construction sites. Noisy construction shall not allowed upto a distance of 100 m from sensitive receptor locations between 9 AM to 6 PM. Workers in the vicinity of high noise levels must wear ear plugs, helmets and should be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 90 dB(A). Blasting operations shall be undertaken in a manner so as to produce minimum vibrations in sensitive areas. Traffic management plans prepared during construction mobilization period shall also be implemented during construction stage. Effective traffic management shall especially be taken care of in sensitive locations, major built-up areas and along important highway junctions.	

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				Asphalt mixing sites and the batching plants should be at a distance of at least 200 m from sensitive receptor locations. Noise limits for construction equipment used in this project (measured at one meter from the edge of the equipment in free field) such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB(A), as specified in the environment (Protection) Rules, 1986. Contractor shall provide noise barriers at selected sensitive receptor locations. Details of noise barriers shall be as provided in Annexure III of the EMP. Monitoring shall be carried out at equipment yards and other select locations as per the monitoring plan.	
C5.	Flora	Loss of Roadside Plantation	Entire Project Stretch	Compensatory plantations shall be done @ 1:3 (for every tree cut, three trees to be planted along the highway) This clause is applicable for trees cut outside forest areas. For forest areas, compensatory afforestation shall be done as per the clearance conditions.	Refer Table in para 4.2 and these Guidelines
C6.	Fauna	Poaching of animals, fishes, accidents	Entire Project Stretch	A all works shall be carried out without causinge any damage or disruption to the fauna. Strict enforcement of rules	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
		involving domesti-cated animals etc.		regarding unauthorized poaching of animals and fishing shall be carried out to ensure it. In case any rare/endangered animal species are sighted the wildlife protection authorities in the area shall be suitably intimated.	
C7.	Human Health & Safety	C 7.1 Increased Accident Risks due to High Speeds, Increase in Vehicular Pollution and other work related risks.	Entire Project Stretch	Detailed Traffic Management Plans prepared prior to commencement of works on any section of road shall be executed. The contractor shall make sure that adequate traffic management plans are available especially near sensitive receptors in the direct impact zone. The contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marking flags, lights and flagmen as may be required by the Engineer for the information and protection of traffic approaching or passing through the section of the highway under improvement. Before taking up any construction, an agreed phased programme for the diversion of traffic or closer of traffic on the highway shall be drawn up.	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				One-way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of temporary traffic signals or flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns/lights. Temporary diversion shall be constructed with the approval of the Engineer. The contractor shall ensure that the running surface is always properly maintained, particularly during the monsoon so that no disruption to the traffic flow occurs. The contractor shall take all necessary measures for the safety of traffic during construction. Care shall be taken to ensure that the working conditions for the workers in stone quarries are up to the required standards.	
				Construction related activity resulting in direct release of criteria pollutants (CO, HC, NO_X, SO_2, SPM, RSPM, Pb) to be avoided at busy locations at night during winters.	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
		C 7.2 Deteriora-tion of indoor air quality and risk of water borne diseases	Labour camp and entire project stretch	Adequate provisions for workers at labour camps under the Factories Act, 1948. Dwelling units shall be supplied with clean fuel for domestic purpose. Generation of carbon monoxide under any circumstance shall not be allowed. No water stagnation happens in the vicinity of construction camp as well as anywhere along the project stretch to prevent spread of malaria & other water borne diseases.	Refer Table in para 4.2 and these Guidelines
		C 7.3 Loss of Access		Temporary access shall be built at the interchange of the highway and other roads. Safe and convenient passage for vehicles, pedestrians and livestock to and from side roads and property access connecting the project road shall be provided. The construction activities that shall affect the use of side roads and existing access to individual properties shall not be undertaken without providing adequate provision. The construction works shall not interfere with the convenience of the public or the access to use and occupation of public or private roads, railways and any other access footpaths to or of properties, whether public or private. It is contemplated that the work – zone shall remain access-able	

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				throughout the construction period if otherwise, then access across the work-zone should be provided for two slots every day during construction (2 hours in the morning and 2 hours in the afternoon). For this purpose the contractor shall maintain a strip of pavement across the work zone of such quality that Light Motor Vehicles (LMV) can pass without difficulty or danger of breaking down.	
		C 7.4 Health and Hygiene Impacts on Constructi-on Camps		The contractor shall provide erect and maintain necessary (temporary) living accommodation and ancillary facilities for labour up to living standards and scales approved by the SC at the locations identified foe such facilities in pre-construction phase. Guidelines for provision of these facilities shall be followed as provided in Annexure II. The contractor shall also guarantee the following: Supply of sufficient quantity of potable water (as per IS) in every work place/labour campsite at suitable and easily accessible places and regular maintenance of such facilities. If any water storage tank is provided it shall be kept at a distance of not less than 15 m from any latrine drain or other sources of pollution.	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				If water is drawn from any existing well which is within close proximity of any latrine, drain or other source of pollution the well shall be disinfected before water is used for drinking. All such wells shall be entirely covered and provided with a trap door, which shall be dust proof and waterproof. A reliable pump shall be fitted to each covered well. The trap door shall be kept locked and opened only for cleaning or inspection, which shall be done at least once a month. Testing of water shall be done every month as per parameters prescribed in IS 10500:1991. Engineer shall be required to inspect the labour camp once in a week to ensure the compliance of the EMP.	
				Proper functioning and management of sanitation and sewage system shall be as per the guidelines provided in Annexure II. All latrines shall be provided with dry-earth system (receptacles), which shall be cleaned at least four times daily, and at least twice during working hours and kept in a strict sanitary condition. Receptacles shall be tarred inside and outside at least once a year.	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
				Adequate health care is to be provided for the work force. On completion of the works, all such temporary structures shall be cleared, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy.	
		C 7.5 Risk from Electrical Equipment (s)		Adequate precautions shall be taken to prevent danger from electrical equipment. No material on any of the sites shall be so stacked or placed as to cause danger or inconvenience to any person or the public. All necessary fencing and lights shall be provided to protect the public. All machines to be used in the construction shall conform to the relevant Indian Standards (IS) codes, shall be regularly inspected and properly maintained as per IS provision.	Refer Table in para 4.2 and these Guidelines
		C 7.6 Impacts on Archaeolo-gical Property		Adequate precaution shall be taken to prevent the workmen or any other persons from removing and damaging any article or thing of archaeological importance and upon discovery thereof work shall be stopped 100 m all directions from the site of discovery direction from the Archaeological Society of India (ASI).	Refer Table in para 4.2 and these Guidelines

S. No.	Environ-mental Parameter	Assessed Impact	Location	Avoidance, Mitigation and Enhancement Measures	Reference Document
		C 7.7 Impacts on Cultural Property		All necessary and adequate care shall be taken to minimize impact on cultural properties which includes cultural sites and remains, places of worship including temples and shrines, etc., graveyards, monuments and any other important structures as identified during design. All conservation and protection measures shall be taken up as per design. Access to such properties from the road shall be maintained clear and clean.	Refer Table in para 4.2 and these Guidelines
C 8.	Orientation need of Implemen-ting Agency and Contractor			The Project authorities should organize orientation sessions during all stages of the project for staff of Environmental Cell, field level implementation staff, Engineer and Contractor.	Refer Table in para 4.2 and these Guidelines

Operation Stage (O)					
O1.	Ambient Air Quality	Increase in Concentration of Pollutants in Ambient Air	Project Stretch	Periodic monitoring of the ambient air quality shall be done at select locations as per the monitoring plan.	Refer Table in para 4.2 and these Guidelines
O2.	Water Resources	Contamination of Water Resources	Project Stretch	All drains should be periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and to avoid flooding. Monitoring shall be done at flooding locations, water bodies etc. as per the environmental monitoring plan provided in the EMP.	Refer Table in para 4.2 and these Guidelines
O3.	Noise Environment	Increased Noise due to High Speeding Vehicles	Sensitive Receptor Locations	Ambient noise levels shall be periodically monitored as per the environmental monitoring plan at select sensitive receptor locations to check the efficacy of the proposed noise barriers at these locations.	Refer Table in para 4.2 and these Guidelines
O4.	Soil	O 4.1 Soil erosion	Entire Project Stretch	Soil erosion shall be monitored at select locations for silt load as per the environmental monitoring plan of the EMP.	Refer Table in para 4.2 and these Guidelines
		O 4.2 Soil contamination	Entire Project Stretch	Soil contamination shall be monitored at accident or spill locations as per the environmental monitoring plan of the EMP.	Refer Table in para 4.2 and these Guidelines
O5.	Flora	Loss of Flora		Survival rate of plantations shall be monitored regularly.	Refer Table in para 4.2 and these Guidelines
O6.	Changes in Land Use Pattern	Ribbon development along the bypass	Entire Stretch	Necessary hoarding shall be erected including the availability of ROW and legal charges for encroachment of ROW.	Refer Table in para 4.2 and these Guidelines

Appendix-II

Background Note on Carbon Footprint

There is a near unanimity among the scientific community that global warming is for the real. The evidence of it can be found in the rising air and ocean temperatures and reducing ice caps in the arctic regions, which are being monitored by some of the world's most reputed institutions, e. g. National Aeronautics and Space Agency (NASA) of the USA, Intergovernmental Panel on Climate Change (IPCC). If there is some debate on global warming and its impact, it is about the extent of this impact rather than its existence. Some discordant voices dub some of the global warming predictions as alarmist, but even they do not deny that the temperature of the earth's surface is rising and this can have serious impact on the ecosystem and the human existence. There is unanimity on the causes of global warming as well. It is due to existence of greenhouse gases (GHG) and aerosols in the earth's atmosphere, which trap the heat radiating back from the earth's surface warmed by sun's radiation.

Greenhouse gases remain permanently in the atmosphere unlike water vapour, which gets recycled in the form of precipitation and eventually finds its way to the ocean. As a result, the blanket of GHG goes on becoming thicker and thicker causing more and more warming over time. Reference years for global warming have been accepted as 1750, i.e., the pre industrialization era; 1990, when the first major efforts on climate change were initiated; and, 2000, the beginning of the new millennium. In the pre-industrialized era, the global average temperature is reported as 15ºC and the CO_2 concentration as 280 parts per million (ppm). In the last 100 years, the global temperatures rose by 0.85ºC and the rate of rise as 0.2º per decade. The concentration of CO_2 increased to 379 ppm by 2005. By the turn of century, the best estimate of temperature rise varies from 1.8ºC to 4ºC, with upper range being 6.5ºC. The level of CO_2 emission by the turn of the century is likely to be 882 ppm. This is going to have far reaching consequences on the climate, causing melting of ice caps in the arctic and glaciers, rise in sea levels, more frequent heat waves, floods, droughts and threat to extinction of species.

The possible response to the global warming can be either to live with it (adaptation) or to reduce the emissions (mitigation). In either case, or in a combined adaptation-mitigation strategy expensive measures have to be taken. For example in adaptation strategy, flood protection infrastructure has to be created, resettlement of people affected by flood has to be provided for, system of conservation of water in drought prone areas have to be created. In mitigation strategy, the emission levels have to be reduced through expensive technological upgradation of industry, which may cause national GDPs to reduce. In other words, financing of these measures is a major issue. Besides, climate change being a global problem countries have to join hands, negotiate and commit themselves to an agreed reduction target and cooperate in the monitoring of the measures taken.

United Nations Framework Convention on Climate Change (UNFCCC)

UNFCC is the first major international effort in restricting Global warming. In the First World Climate Conference held in 1979, the problem came into focus but no concrete progress was made until 1988 when an Intergovernmental Panel on Climate Change (IPCC) was set up jointly by World Meteorological Organization (WMO) and United Nations Environment Programme

(UNEP). IPCC's first assessment report and the Second World Climate Conference held in 1990 called for a global treaty on climate change. Following up on this, an Intergovernmental Negotiating Team (INC) was set up. INC after negotiations adopted the treaty known as United Nations Framework Convention on Climate Change (UNFCCC) at the UN Headquarters, New York on 9th May 1992. The Treaty was kept open for signature at the Earth Summit held in the same year in Rio de Jeneiro and thereafter at the UN headquarters. By June 1993, 165 countries including India had signed the Convention, which came into force on 21st March 1994, after 90 days of ratification of the Convention by the fiftieth Country. India signed the Convention on 10th June 1992 and ratified it on 1st November 1993. At present, 195 countries are party to this Convention (Annex I Parties to UNFCCC). The Parties hold Conferences at regular intervals called Conference of Parties (COP) to further negotiate the issues relating to climate change.

The objective of the Convention is defined in its Article 2, which is extracted below:

Quote:

The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provision of this Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystem to adapt naturally to climate change, to ensure that food production is not threatened and to allow economic development to proceed in a sustainable manner."

Unquote

Accordingly, the Convention sets an overall framework for intergovernmental efforts to tackle the challenges posed by climate change while recognizing the climate system as a shared resource whose stability can be affected by industrial and other anthropogenic (i.e. caused by humans as opposed to natural causes like solar, volcanic, etc) emissions of carbon dioxide (CO_2) and other green house gases (GHG). Under the Convention Governments have to share information on GHG emissions and national policies thereon, launch strategies for addressing GHG emissions and adaptation to the expected impacts, and cooperate in preparing for adaptation to these impacts. It needs to be appreciated that climate change is a complex problem, which does not remain confined to environment alone but also has consequences on global issues like poverty alleviation, economic development, population growth, sustainable development and resource management.

Kyoto Protocol (first commitment period 2008-12)

In the third Conference of Parties (COP3) at Kyoto in December 1997, the well-known Kyoto Protocol (KP) was adopted. It came into force only in February 2005 after ratification by the Parties. Kyoto Protocol is what operationalizes the UNFCCC. With the objective of restricting the global warming to 2 degrees Celsius above the pre-industrialized era, KP set legally binding emission reduction targets to 37 industrialized countries for reduction in GHG emission between 2008 and 2012 (called the first commitment period), which in overall terms meant a 5 percent reduction in the emission level compared to that prevailing in 1990. The

countries which agreed to the targets are Australia, all members of European Union, Belarus, Croatia, Iceland, Kazakhstan, Norway, Switzerland and Ukraine.

Doha Amendments to Kyoto Protocol (second commitment period 2013-20)

In Doha Amendment of 2012 to KP further reduction in targets for the second commitment period (2013- 2020) has been adopted to bring the emission level down by 20 percent of the 1990 level. Some countries such as Japan, Soviet Union and Russia, who participated in the first round of KP have not accepted the second round targets. United States of America did not ratify the KP and hence is not a party to KP. Canada, who earlier ratified the KP, withdrew from the Protocol in 2011. While the industrialized countries including economies in transition (referred to as Annex I parties to KP) have legally binding emission targets, the developing countries (referred to as non-Annex I parties) have no binding targets but are committed under the treaty to reduce their emission levels. This is a sore point with some industrialized countries. The developing world, on the other hand, feels that the industrialized nations have contributed most to the global warming and hence more stringent measures are required from them.

Kyoto Protocol Mechanism

KP devises three mechanisms for emission reduction and targets all parties to the treaty irrespective of their development status, viz. the industrialized countries including economies in transition, the developing countries and the least developed countries. Collectively, the mechanisms are aptly called ‘flexible mechanism’. The three mechanisms are International Emission Trading (IET), Clean Development Mechanism (CDM) and Joint Implementation (JI).

The underlying principle in KP mechanism is that emission of GHG, irrespective of the part of the globe it originates from, only contributes to global warming and has to be reduced. Secondly, the emission of GHG is the undesirable consequence of development affecting the global community at large, and hence is an ‘externality’ in terms of economics. The ‘externality’ has to be ‘internalized’ by putting a cost to it to arrive at the true price of goods and services produced and consumed in a perfect global market. Thirdly, the cost of marginal reduction in GHG emission (i.e. reduction of 1 tonne of GHG emission from the present level) will vary in different countries. Some industrialized countries can do it in a more cost effective way than the others, exceed their protocol commitments and thereby generate an emission reduction surplus. This surplus can be traded with other industrialized countries which miss their targets for whatever reasons (IET mechanism). Fourthly, even though no emission reduction target is set for the developing countries, their emission levels are bound to rise with time while meeting their development needs. At their present stage of development, they can leap-frog to cleaner technologies, either on their own or in collaboration with industrialized nations, and thereby reduce their emissions relative to what would have been in the ‘business as usual’ situation. This reduction certified by a regulator, Certified Emission Reduction (CER), can be traded with countries struggling to meet their emission reduction commitments (CDM mechanism). Lastly, the industrialized countries can shift their production bases to developing countries or the LDCs with cleaner technologies, earn credits for reduced emissions and thereby meet their commitments while, at the same time, helping economic development of developing countries and LDCs (JI mechanism).

Annex-1

Guidelines for Identification of Debris Disposal Sites

The locations of dumping sites have to be selected such that:

- No residential areas are located downwind side of these locations,
- Dumping sites are located at least 1000 m away from forest areas and water bodies
- Dumping sites do not contaminate any water sources, rivers etc.
- Dumping sites have adequate capacity equal to the amount of debris generated.
- Public perception about the location of debris disposal site is positive

Precautions to be adopted during dumping of debris/waste material

The following precautions shall be taken while disposing off the waste material:

- During the site clearance and disposal of debris, full care shall be taken to ensure that public or private properties are not damaged/affected and that the traffic is not interrupted.
- The disposal of debris is done only on to the identified places in consultation with Environmental Specialist
- Disposal off the debris for the improvements of public utilities can be permitted after the proper consent of villagers and approval of Environmental Specialist
- In the event of any spoil or debris from the sites being deposited on any adjacent land, the same concessionaire and contractor shall be immediately removed and the affected area is restored to its original state
- The entire existing stream courses and drains within and adjacent to the site shall be are kept safe and free from any debris.
- Effective water sprays during the delivery and handling of materials when dust is likely to be created and to dampen stored materials during dry and windy weather.
- Materials having the potential to produce dust shall not the loaded to a level higher than the side and tail boards and shall be covered with a tarpaulin in good condition.
- During disposal of debris, proper warning signs to be installed
- Any diversion required for traffic during disposal of debris shall be provided with traffic control signals and barriers after the discussion with local people and in consultation with the Environmental Specialist.
- During the debris disposal, care shall be taken of surrounding features and avoiding any damage to them.
- While disposing debris/waste material, the wind direction and location of settlements shall be taken into account to ensure against any dust problems.
- The report on debris disposal shall be prepared periodically and records maintained

Annex-2

Guidelines for Rehabilitation of Dumpsites, Quarries and Borrow Areas

Dumpsites

The dumpsites filled rehabilitated by planting local species of shrubs and other plants so that the landscape is coherent only up to the ground level shall be rehabilitated as per guidelines below:

- The dump sites have to be selected suitably and should be is in harmony with the surrounding environment and landscape.
- Dump site is near to human settlements shall be restored in a manner useful to the community, e.g. converting it into a play field by spreading the dump material evenly on the ground and covering it with top soil, planting trees and shrubs along its periphery.
- Some of the dumpsites could be used either for plantation or for growing agricultural produce.
- Care should always be taken to maintain the hydrological flow in the area.

Quarries and Borrow Areas

- The borrow pit sites shall be restored to a safe and secure area usable to the public enabling safe access and entry to the restored site by filling the quarry/borrow pit floor to approximately the access road level.
- It is important to plan restoration from the outset and coordinate restoration with quarrying activities. Quarry rehabilitation objective should include creation of wetlands and natural reserves or recreation areas.
- Special quarry/borrow pit rehabilitation plan should be specified according to the location and shaping of the mining slopes after exploitation and overburdened dump, with different subsequent uses e.g. forest, meadow, water body and replanting methods.

Other criteria which should be followed for rehabilitation of quarry/borrow pits are as given below:

- Quarries and borrow pits shall be backfilled with rejected construction wastes and shall be given a vegetative cover. If this is not possible, then slopes shall be smoothed and depression shall be filled in such a way that it looks more or less like the original ground surface.
- Ensuringe preservation of trees during piling of materials; spreading of stripping material to facilitate water percolation and allow natural vegetation growth; reestablishment of previous natural drainage flows; improvement of site appearance; digging of ditches to collect runoff; and maintenance of roadways where a pit or quarry

is declared useable water source for livestock or people nearby shall be important considerations during construction.

- The requirements in terms of "The Mines and Quarries Act" with regard to maintaining a naturally stable slope, adequate fencing to prevent access to the quarry area including top and bottom of the faces, etc shall be fulfilled.
- Depending on the location of the site its potential to be converted into a permanent lake must be exploited
- Choice of plant species for the planting programme shall be made in consultation with ecological consultant and local forest department. Depending on the limitations on the availability of appropriate plant material, harsh growing conditions (lack of irrigation and hot summer) and ongoing quarry rehabilitation operations there may be substantial loss of plantation and the planting programme may have to be continued for over 3-5 years. As plantings are progressively established they should be monitored before undertaking the next stage to ensure maximum plant survival rates.
- The quarry or borrow pit immediate surroundings should be developed as a low maintenance reserve, with significant areas of native trees and shrubs and areas of longer grass and tussocks forming the open spaces. Walkways around the borrow site may be constructed. Provision for a future drive-in picnic area and car parking area may be developed.

Annex-3

Guidelines for New Quarry Management

A quarry management plan for operation of new quarries shall be prepared, which shall include but not limited to the following:

A. Quarry Location Plan

Location and layout of the quarry site on dimensioned Quarry Area Site Plans supplemented by appropriate photographs showing details as follows:

- the earmarked areas where material is to be extracted from, stocked, processed or moved, workers are to be accommodated, charges are to be stored, machineries are to be repaired, water is to be sourced from
- installations of plants and equipment (e.g. rock breakers, excavators, loaders, processing plants such as crushers) at the quarry site,
- facilities for logistics of handling and movement of the quarried material (e.g. on dump trucks/trucks/conveyors, etc. to the processing plants, stock yards, work sites) within the quarry site
- access of the quarry site to and from public or private road,
- haul roads for transportation of quarried materials from the quarry site to plants/work sites

B. Quarry Site Documentation

Selection Criteria

- A brief statement as to how the site was chosen.
- Alternative sites that were considered to be mentioned.
- Record any public consultations involved while choosing and what the public concerns were, if any.

Agreement with landowners

- Statement of ownership of the land along with lease/purchase agreements.

Licenses and permits

- Concessionaire to state the licences and permits that are necessary for operation, and attach them as appropriate.

C. Quarry Operation Plan

Method of extraction

- A brief method statement of extraction indicating the techniques to be used, use of explosives if any, if so how are the charges laid, how often the blasting shall be done and precautions taken during blasting, etc.

- A safety manual for operation.
- A copy of the operator's licence to handle explosives

Loading and haulage

- Processes involved and planning of logistic

Crusher plant commissioning

- Type, manufacturer, model and principal specifications of the plant, requirements of testing and commissioning

Storage of explosives

- Source to be procured from, their safety and security

Testing and quality assurance

- A Quality Assurance Plan for Quarry operations including testing, acceptance, reprocessing

Safety

- A Safety Manual for Operations, including briefing of the workers on safety and debriefing after incidents, arrangements for first aid and protocol for trauma care

E. Environmental Management during Operation

Removal of trees and plants

- Number and species (identified by local names) of trees to be cut .

Overburden

- The manner of removal and disposal of overburden.

Silt management

- How silt arising from quarry operations shall be managed, e.g. (silt retention pond, re-use, dumping including that of dredged pond materials)

Surface water drainage

- If drainage channels are required in and around quarry area how the channels would be prevented from carrying the silt load and discharging into water courses,

Soil and water contamination

- List sources of possible contaminants to the soil (fuel spillage, overburden and debris dumps on productive soils, drainage channels) and measures to control contamination

Air pollution

- What are the sources of air pollution (dust, emissions and others, if any)?
- Details of air pollution control measures in each case.
- Details of worker protection equipment along with appropriate reference to the safety plan.

Noise

- Sources of noise, distance from settlement, labour camp and proposed mitigation to the population/workers exposed.

Traffic

- Impact of quarry operations on traffic and how this may be controlled.

Approach road

- Clearing of material spillage affecting other users and its maintenance.

D. Environmental Management at Closure of the site

Dismantling and removal of machinery

- Measures to restore the ground.

Slope stabilisation and/or protection

- Measures taken to protect the slope and to guard against any possible serious rockfall, slope failure or its collapse trapping humans and animals.

Rehabilitation

- Rehabilitation plan of the quarry (alternative use, restoring/improving the landscape).

Hand-over

- Terms of hand-over of the quarry site to the owner/authority at the end of its use.

Removal of debris and solid waste

- The proposal for removal of debris and disposal of solid wastes at a suitable site and basis for its selection.

Quarry Management Plan shall be documented as follows for each quarrying site (rock and sand)

Sl. No.	Item	Unit	Details
1.	Name/identity of the location		
2.	Nearest project road Chainage.		
3.	Name of the owner		
4.	Area involved	m^2	
5.	Existing land use (verification from land records with revenue department)		
6.	Land use of the area surrounding the proposed site including a map		

Sl. No.	Item	Unit	Details
7.	Access roads – existing conditions, proposed development and maintenance		
8.	Tree cutting and vegetation clearance if any, along with compensation measures	Nos.	
9.	Arrangement with the owner (agreement with land owner should be attached as an Annexure)		
10.	Quantity of material to be quarried	Cum	
11.	Machinery & equipment to be used		
12.	Copy of the consents to establish and operate should be attached as an Annexure.		
13.	Copy of the license from Mining & Geology, Police & Fire dept.		
14.	Conditions laid down in the clearances/licenses and plans to ensure compliance		
15.	Information on whether or not the quarry shall be closed under this project. If yes, the proposed closure & restoration plan.		
16.	Concerns of the local people living in the immediate/near vicinity (through dialogue/consultation)		
17.	Photographs showing before and after conditions as well as during operations at regular intervals)		
	Plans		
18.	Quarry Site Plan		
19.	Quarry Operation Plan		
20.	Quality Plan		
21.	Safety Plan		
22.	Waste Management Plan		
23.	Restoration and Rehabilitation Plan		
24.	Monitoring Plan		

Annex-4

Guidelines for Siting, Operation, and Re-development of Borrow Areas (Earth and Gravel)

Siting

Specific locations of borrow areas to be used shall be identified in accordance with EIA report. The selection borrow areas site shall be based on environmental considerations apart from civil engineering considerations. Environment considerations dictate that:

- The borrow areas are located away from human habitation (not within 800 m from the village boundary) to avoid breeding of mosquitos and other organisms during monsoon when the borrow areas are flooded.
- These should be generally on degraded land unsuitable for any productive purpose. Government or community land should be preferred to private land. Productive agricultural land should not, as far as possible, be used for borrowing earth, and where it is used, the productive top soil must be stored and reused.
- These should not, as far as possible, obstruct the natural drainage of the ground and bunds and/or boundary drains should be created on their periphery to restore the flow of natural run off.
- Community consultation is desirable before drawing materials from the borrow areas and the community needs (e.g deepening of ponds, levelling of high grounds, requirements of water storage tanks, development of fish ponds, etc.) should be taken into account before finalizing the borrow area sites.
- These should not be located too close to the toe of any embankment (natural or man-made), which could trigger land slide or slip. As a general rule, it should be away from the toe by a distance equal to four times the embankment height plus 5 m.
- Borrow areas should not be selected near sensitive locations such as banks or beds of rivers or channels, which can adversely affect the river hydrology and hydraulics, or along the road or rail embankment, which, apart from threatening the embankment may enhance the severity of accidents if these happen, or close to public structures such as transmission towers whose foundation can be endangered.
- Borrow area sites must be authorised sites. If located on private land, there should be written consent of the owner a lease agreement permitting the use of the land for borrowing earth. If located on Government or community, land the permission should be of the appropriate authority.

Borrow Area Operations

- Excavation in the borrow areas should be planned keeping in view the end use of the borrow area land. The shape and dimensions of the area to be excavated from

(length, breadth and depth) should be accordingly decided. Generally the depth of excavation should not be deeper than 2 m from the consideration of safety of the humans or animals against accidental fall into the ditch.

- The eventual slope of the excavation should be 2 (H):1(V) from the consideration of safety of the slopes as well as humans.
- There should be safe access to the earth moving equipment and transport vehicles into the borrow areas
- The approach to the borrow areas from the public or private haul roads should have a reasonable design to withstand the movement of transport vehicles.
- Dust palliation measures should be taken to minimise dust pollution on the approach roads (e.g. watering, spraying of lime or cement slurry or bitumen emulsion, etc)
- Spillage of materials under transit on to the haul roads or main roads through gaps in the transport vehicles should be guarded against buy plugging such gaps. Similarly, wind blowing of the materials in transit should be checked by suitable covers.
- Where productive agricultural land is used for borrow areas, the top soil in 150 mm thickness should be scrapped, stock piled and re-used for rehabilitation of borrow areas. At least 10% of the temporary land should be earmarked for stockpiling. The top soil should be seeded and mulched to cover the slopes, or any degraded area in thickness between 75-150 mm.

Borrow Area Rehabilitation Plan

The borrow area must be rehabilitated after completion of the work and rehabilitation plan should be prepared in advance in consultation with the community. Some indicative rehabilitation measures could be community water storage facility, pisciculture ponds, recreational spots, landscape enhancement, or rehabilitation by re-vegetation of the borrow area. Where re-vegetation is done, it should be ensured that:

- Vegetative cover is established on all affected land.
- Topsoil is placed, seeded, and mulched within 30 days of final grading if it is within a current growing season or within 30 days of the start of the next growing season.
- Vegetative material to be used are grasses, legumes, herbaceous, or woody plants or a mixture thereof.
- Plant material must be planted during the first growing season following the reclamation phase.

- Selection and use of vegetative cover should take into account soil and site characteristics such as drainage, pH, nutrient availability, and climate to ensure permanent growth.
- The vegetative cover is acceptable if within one growing season of seeding:
- The planting of trees and shrubs results in a permanent stand, or regeneration and succession rate, sufficient to assure a 75% survival rate;
- The planting results in 90% ground coverage.
- The site should be inspected when the planting is completed and again at one year to ensure compliance with the reclamation plan.

Borrow Area Documentation

i) Location reference and potential yield: The information as per the Table below should be contained in the documentation:

Sample No.	Name of Village	Material type	Site identification		
			Nearest Chainage (Km.)	Left/Right	Offset from nearest Chainage (m)
1	2	3	4	5	6

Approximate Quantity (Cum)				Available Land/ Terrain	Surrounding Land/Terrain	Remarks
Length (m)	Breadth (m)	Depth (m)	Total (Cum)			
7	8	9	10	11	12	13

ii) Land use and vegetative cover (exiting)

- Existing land use (agricultural/barren/scrub/grazing/any other type)
- Vegetation/trees to be removed
- Erosion/degradation potential
- Distance and name of the nearest settlement
- Distance from the nearest surface water body
- Drainage pattern of the area
- Distance of the nearest reserve forest (if any)
- Distance of the nearest sacred tree (if any)

- Distance from the nearest school/hospital/primary health center
- Daily/occasional use of borrow area by the community
- Any schemes or avenues for generation of income for adjoining community

iii) Borrow area and community features

- Area (in Sq m)
- Type of Access/width/kutcha/puccaetc from carriageway
- Soil type
- Slope/drainage characteristics
- Water Table of the area or identify from nearest well etc/ask people
- Land-use type such as barren/agricultural/grazing land
- Social features of settlement/community and its proximity to
- Present use of the borrow area by the community
- Identification of any other community facility in the vicinity of the borrow pit

iv) Plans and photographs

- Borrow area site plans showing the land use, habitation, drainage pattern and structures and other physical features such as access roads, haul roads, existing community facilities (roads, schools, play grounds, community facilities, religious places, etc)
- Before and after photographs of the borrow areas.

Annex-5

Guidelines for Sediment Control

Right at the initial stage of the work, the operations such as clearing and grubbing, roadway and drainage excavation, embankment/sub-grade construction, bridges and other structures across water courses, pavement courses and shoulders are undertaken. These activities generate huge wastes and debris, which should not find their way into drainage channels and water courses nor should remain exposed to wind at the site and allowed to erode and contaminate productive soils or generate wind blown dust particles in the atmosphere.

Erosion and sediment control measures shall, therefore, be planned to prevent soil erosion and sedimentation. These measures may involve temporary measures at construction stage, such as construction of temporary berms, dikes, sediment basins, slope drains, use of temporary mulches, fabrics, mats, seeding, or other control devices. Permanent erosion control measures aim at preventing erosion during the project life cycle and should be planned as a part of the project design. These may involve turfing or pitching the embankment slopes, turfing/mulching/vegetating the exposed areas, vegetating or reinforcing the cut slopes by appropriate methods such as shot-creting, rock bolting, soil-nailing, gabions, etc.

Sediment control, whether temporary or permanent, would be mostly project and site specific. However, some of the generic measures shall be as follows:

- Debris generated at construction site must be removed immediately and dumped at the designated dump sites after useful recyclable materials are sorted out, and properly stocked or stacked.
- The site cleared after removal of debris would usually be prone to erosion. These areas should be treated by mulching and other dust palliation measures.
- There could be many mulching options such as seeding top soil and spreading the mulch (organic) to permit growth of grass, or other methods like mulches of tiles, brick bats, stone chips, or any other non-erodible wastes, which cover the exposed soil, allow moisture to be retained within soil and prevent erosion.
- Dust palliation measures by any suitable commercially available dust palliatives, application of water, cement, lime or bitumen emulsion in thin application to bind the dust particles together
- Drains, channels, water courses blocked by debris must be dredged and the dredged materials dumped at the designated dump sites.
- All slush at construction sites, which after drying up become erodible must be either dredged and removed or treated appropriately in-situ (say by mulching)
- Temporary drains combined with sedimentation tanks should be created at the periphery or edge of the work sites to arrest the sediments brought by rains or construction activities requiring water (e.g curing of concrete) and discharge only sediment free water into the water courses.

Annex-6

Guidelines for Siting and layout of Construction Camp

Siting

The following guidelines shall be followed while siting the construction camps:

- The construction camps shall be located at least 500 m away from habitations. The living accommodation and ancillary facilities for labour shall be erected and maintained to approved standards and scales.
- Non-agricultural land should be used , as far as possible
- Not within 1000 m of either side of locations of Forest areas.
- All sites used for camps must be adequately drained. They must not be subject to periodic flooding, nor located within 300 feet of pools, sink holes or other surface collections of water unless such water surface can be subjected to mosquito control measures.
- The camps must be located such that the drainage from and through the camps shall not endanger any domestic or public water supply.
- All sites must be graded, ditched and rendered free from depressions such that water may get stagnant and become a nuisance.

Layout

A conceptual layout of a typical construction site has been presented in **Fig. A**. The Contractor during the progress of work shall provide, erect and maintain necessary (temporary) living accommodation and ancillary facilities for labour to standards and scales approved by the engineer. All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. Safe drinking water should be provided to the dwellers of the construction camps. Adequate washing and bathing places shall be provided, and kept in clean and drained condition. Construction camps are to be sited away from vulnerable people and adequate health care is to be provided for the work force.

Sanitation facilities: Construction camps shall be provided sanitary latrines and urinals. Sewerage drains should be provided for the flow of used water outside the camp. Drains and ditches should be treated with bleaching powder on a regular basis. The sewage system for the camp must be properly designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place. Compliance with the relevant legislation must be strictly adhered to. Garbage bins must be provided in the camp and regularly emptied and the garbage disposed of in a hygienic manner

Shelter at workplace: At every workplace, there shall be provided free of cost, four suitable shelters, two for meals and two others for rest, separately for use of men and women labourers. The height of shelter shall not be less than 3 m from floor level to lowest part of

the roof. Sheds shall be kept clean and the space provided shall be on the basis of at least 0.5 m^2 per head.

Canteen facilities: A cooked food canteen on a reasonable scale shall be provided for the benefit of workers wherever it is considered necessary and should generally conform to sanitary requirements of local medical, health and municipal authorities including such precautionary measures as necessary to prevent soil pollution of the site.

First aid facilities: At every workplace, a readily available first-aid unit including an adequate supply of sterilized dressing materials and appliances shall be provided as per the factory rules. Workplaces remote and far away from regular hospitals shall have indoor health units with one bed for every 250 workers. Suitable transport shall be provided to facilitate taking injured and ill persons to the nearest hospital. At every workplace an ambulance room containing the prescribed equipment and nursing staff shall be provided.

Health care facilities: Health problems of the workers should be taken care of by providing basic health care facilities through health centres temporarily set up for the construction camp. The health centre should have at least a doctor, nurses, duty staff, medicines and minimum medical facilities to tackle first-aid requirements or minor accidental cases, linkage with nearest higher order hospital to refer patients of major illnesses or critical cases.

The health centre should have MCW (Mother and Child Welfare) units for treating mothers and children in the camp. Apart from this, the health centre should provide with regular vaccinations required for children.

Day crèche facilities: At every construction site, provision of a day crèche shall be worked out so as to enable women to leave behind their children. At construction sites where 20 or more women are ordinarily employed, there shall be provided at least a hut for use of children under the age of 6 years belonging to such women. Huts shall not be constructed to a standard lower than that of thatched roof, mud walls and floor with wooden planks spread over mud floor and covered with matting. Huts shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the places clean. There shall be two maidservants (or aayas) in the satisfaction of local medical, health, municipal or cantonment authorities. Where the number of women workers is more than 25 but less than 50, at least one hut and one maidservant should be provided to look after the children of women workers. Size of crèches shall vary according to the number of women workers employed.

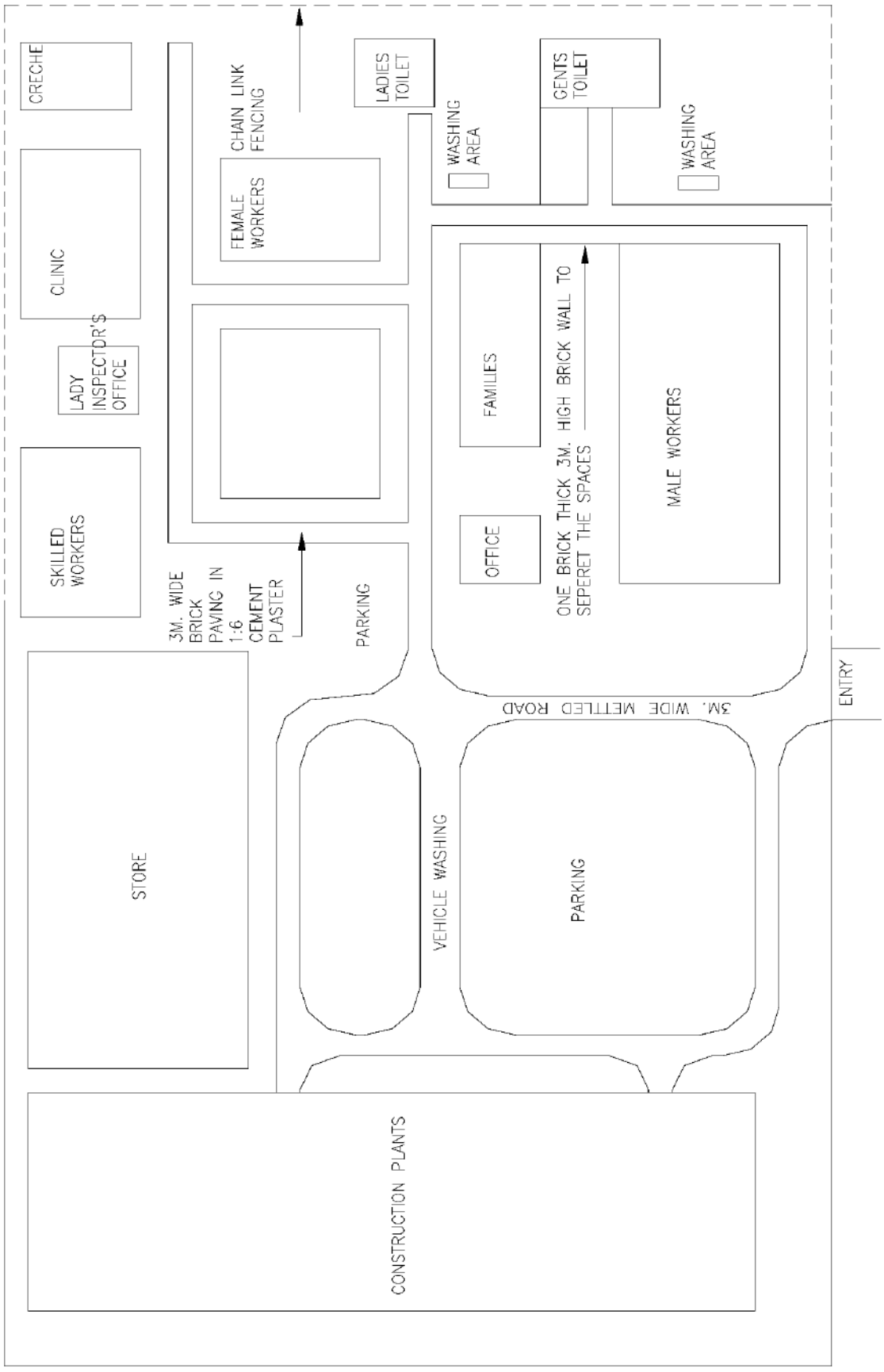

Fig. A Typical Layout of Construction Camp

Annex-7

Guidelines for Mitigation of Impacts on Protected Areas

1. Areas, such as national parks, wildlife sanctuaries, biosphere reserves, coastal areas, and other eco-sensitive areas have been designated by law as Protected Areas (PAs). Any impact on PAs would mean to include impact on the human communities dependent on these areas. Special mesures are required to be taken when the projects are located in or near PAs.

2. The common impact of the project on the wild life in PAs are habitat loss and fragmentation, visual alterations on the landscape, alteration of surface drainage, spread of invasive alien species, loss of vegetation, increased incidence of fires, animal injury and mortality, changes in animal behaviour (including reproductive behaviour), increased human pressure, increase in pollution, and various other disturbances. The negative impacts on human communities is in the form of disturbances in their social fabric, market pressures, loss of land and relocation.

3. Presented in the following paragraphs are a framework of specific guidelines for design and implementation of road development projects passing through Protected Areas as applicable to wildlife issues without covering any design and engineering solutions, which have to b project specific.

The decision protocol for the design stage

4. Essentially, the following decision-making protocol must be followed in deciding the new highway alignment, and for any augmentation in the existing alignment. Arriving at the most feasible and acceptable option shall largely depend on a comprehensive 'Analysis of Alternative', backed by socio-economic and environmental studies.

Avoidance of impacts

5. The first and the best option for any development activity in protected areas is - to avoid undertaking any such activity in such areas. This is likely to increase the length of the highway alignment but is worth considering if the objective of the project does not involve providing connectivity to any obligatory point situated within the protected area but the alignment merely passes through it.

Minimisation of unavoidable impacts

6. In cases where re-alignment options are not available or socio-economically not viable, options may be considered with a view to affect minimum possible impacts on the protected area. Such option may include selecting the least sensitive route, augmenting the width of the alignment, imposing restrictions on traffic flow, and various engineering options.

Mitigation of impacts

7. As the last and unavoidable option mitigation should be considered only where the above options have be examined and overruled, with adequate justification.

Guiding principles to be followed at the project development stage.

Banned activities

8. The following activities are generally banned by regulatory authorities, and hence not allowed:

1. Dumping of wastes (all wastes should be segregated and carried to nearby townships or cities for safe disposal)
2. Soil or water pollution and open burning of wastes
3. Dumping of solids and any wastes, including waste water, oils, and liquids from washing and domestic uses, into rivers, streams, or any water bodies
4. Planting of non-forestry species and species not indigenous to the area.
5. Camping of workers and parking of vehicles inside natural areas,
6. Washing vehicles and equipment at or along streams, rivers, or water bodies,
7. Cutting of firewood within the natural areas,
8. Siting of labour camps within a specified distance from the protected area

Recommended activities

9. The following activities are generally required to be undertaken as part of pre-conditions imposed by regulatory authorities while granting clearance:

1. Road removal through ripping, re-contouring or other intensive methods must follow best practices.
2. Construction of the linear intrusions should be in a manner that minimises, with adequate design and technology, the long-term impacts, e,g by using prefabricated and special methods to reduce the time taken in the erection/ construction of the intrusions.
3. Use of diverse mix of local species native to the corresponding natural vegetation type
4. Ensuring that restoration minimises any additional temporary disturbance, particularly soil erosion and loss of adjoining regenerating natural vegetation
5. Rehabilitation works, including slope stabilisation using native species, and natural ‘green’ methods involving natural regeneration of native species and ground cover instead of hard ‘cement and stone’ engineering approaches.
6. Avoiding work during nights to facilitate movement of many species, especially large mammals and carnivores.
7. Avoiding camping of people/workers and use of domestic animals.
8. All vehicles delivering loose construction material and any such material

gathered at the site must be covered by appropriate material such as tarpaulins to prevent dust spreading, pollution, or wastage.

9. Movement of vehicles should be strictly restricted to existing roads and tracks, and creation of new roads and tracks or off-roading shall be prohibited in connection with roads and power lines in natural areas.

10. Movements of vehicles and use of heavy machinery along riverine areas and water courses should also be avoided. Speed limits should be defined and enforced within all roads passing through protected areas, depending upon the prevailing conditions.

11. Continuous retention walls, fences or other structures that can act as barriers to animal movement should not be installed along roads, especially in hilly terrain.

12. Structures permitted to be installed or already installed along existing roads in natural areas should have sufficient gaps incorporated at regular intervals. The height of such structures should be such that movement of wildlife across the structures is not hindered. As far as possible, crash-guards with single bar (at 0.6 – 1 metre height) should be preferred over continuous sidewalls, with periodic gaps. This shall facilitate movement of both smaller animals under the bars and larger species through gaps.

Designing animal crossings

10. The effectiveness of animal crossings dependents on a variety of factors. In order to design effective wildlife passage structures, attention needs to be paid to following features that affect their utilization:

Placement

11. Placement of animal crossings is the most important factor requiring careful consideration. In general, the local forest staff is aware of the corridors used by the wild animals for their diurnal and seasonal movements. As a thumb rule, the natural drainages in forest areas can be developed as animal crossings, with little changes in the design of culverts and bridges. Travel distance (to reach a passage way) may be especially important for small animals. Mammals are generally capable of learning to use underpass or overpass systems and may transfer that knowledge to succeeding generations. This learning may result in improved mitigation success over time for more mobile species, even for underpasses that are not placed at traditional crossing points.

Size

12. It is difficult to determine critical size thresholds for passage structures because these size thresholds undoubtedly vary from species to species. In general, tunnel layouts that allow animals to see the opposite end of a wildlife passage are positively correlated with utilization. As a thumb rule, tunnelling effect should be reduced to minimum possible, the bigger the size, the better.

Ambience

13. As far possible, the ambience of animal crossings should match with the surroundings. Any drastic change in ground conditions, lighting, moisture, species composition, etc., should be avoided.

Noise

14. Traffic noise can be a problem for some mammals, especially those sensitive to human disturbance. Effective noise mitigation measures must be undertaken along with the animal crossings, to lead to minimum disturbance to animals.

Fencing

15. Although some species may utilize underpass or overpass systems without fences, some form of fencing does appear to be necessary for most species. Fences help guide animals to passage systems and prevent wildlife from circumventing the system.

16. The above suggestions are generic in nature. However, some sensitive protected areas, especially housing some flagship species may require specific considerations suited to the requirement of the species. Elephant corridors, for example, would require to be designed with adequate vertical clearance (Not less than 6.5 m). Tunnelling effect, especially in sensitive areas, can be reduced by splitting the highway width in two or more parts with open- to-sky gaps.

Annex 8

Environmental monitoring programme

Monitoring Parameters and Standards

The Environmental monitoring of the parameters involved and the threshold limits specified are discussed below:

A.1 Ambient Air Quality Monitoring (AAQM)

The air quality parameters viz: Sulphur Dioxide (SO_2), Oxides of Nitrogen (NOX), Carbon Monoxide (CO), Hydro-Carbons (HC), Suspended Particulate Matter (SPM) and Respirable Particulate Matter (RPM) shall be regularly monitored at identified locations from the start of the construction activity. The air quality parameters shall be monitored in accordance with the National Ambient Air Quality Standards as given in Table below. The location, duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan Table.

National Ambient Air Quality Standards

S. No.	Pollutants	Time-weighted average	Concentration in Ambient Air		Methods of Measurement
			Industrial, Residential, Rural & other Areas	Ecologically Sensitive Areas (notified by Central Government)	
1	Sulphur Dioxide (SO_2) µg/m^3	Annual*	50	20	- Improved West & Gaeke - Ultraviolet fluorescence
		24 hours**	80	80	
2	Nitrogen Dioxide (NO_2) µg/m^3	Annual*	40	30	- Modified Jacob and Hochheiser (Na-Arsenite) - Chemilumiscence
		24 hours**	80	80	
3	Particulate Matter (size less than 10 µm) or PM10 µg/m^3	Annual*	60	60	- Gravimetric - TOEM - Beta attenuation
		24 hours**	100	100	
4	Particulate Matter (size less than 2.5 µm) or PM2.5 µg/m^3	Annual*	40	40	- Gravimetric - TOEM - Beta attenuation
		24 hours**	60	60	
5	Ozone (O_3) µg/m^3	8 hours**	100	100	- UV photometric - Chemilumiscence - Chemical Method
		1 hours**	180	180	

S. No.	Pollutants	Time-weighted average	Concentration in Ambient Air		Methods of Measurement
			Industrial, Resi-dential, Rural & other Areas	Ecologically Sensitive Areas (notified by Central Government)	
6	Lead (Pb) µg/m^3	Annual*	0.50	0.50	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
7	Carbon Monoxide (CO) (mg/m^3)	8 hours**	02	02	- Non Dispersive Infra Red (NDIR) spectroscopy
		1 hours**	04	04	
8	Ammonia (NH_3) µg/m^3	Annual*	100	100	- Chemilumiscence - Indophenol Blue Method
		24 hours**	400	400	
9	Benzene (C_6H_6) µg/m^3	Annual*	05	05	- Gas chromatography based continuous analyser - Adsorption and Desorption followed by GC analysis
10	Benzo(a) Pyrene Particulate Phase only ng/m^3	Annual*	01	01	- Solvent Extraction followed by HPLC/GC analysis
11	As ng/m^3	Annual*	06	06	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

S. No.	Pollutants	Time-weighted average	Concentration in Ambient Air		Methods of Measurement
			Industrial, Residential, Rural & other Areas	Ecologically Sensitive Areas (notified by Central Government)	
12	Ni ng/m^3	Annual*	20	20	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual Arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

** 24 hourly/8 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed but not on two consecutive days.

Source: Central Pollution Control Board

A.2 Noise Quality Monitoring

The noise levels shall be monitored at already designated locations in accordance with the Ambient Noise Quality standards given in Table below. The location, duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan Table.

National Ambient Noise Quality Standards

Category of Area/Zone	Limits in dB(A) Leq	
	Day Time	Night Time
Industrial area	75	70
Commercial area	65	55
Residential area	55	45
Silence Zone	50	40

Notes:

1) Day time shall mean from 6.00 a.m. to 10.00 p.m.

2) Night time shall mean from 10.00 p.m. to 6.00 a.m.

3) Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority

4) Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

A.3 Water Quality Monitoring

Water quality parameters such as pH, BOD, COD, DO, coliform count, total suspended solids, total dissolved solids, Iron, Fluorides etc. shall be monitored at all identified locations during the construction stage as per standards prescribed by Central Pollution Control Board and Indian Standard Drinking water specifications IS 10500, 1991, presented in Tables below. The location, duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan table.

Primary Water Quality Standards

S. No.	Designated Best Use	Class of Water	Criteria
1	Drinking Water source (with conventional treatment)	A	• Total Coliform MPN/100 ml shall be 50 or less • pH between 6.5 to 8.5 • Dissolved Oxygen 6 mg/1 or more • Biochemical Oxygen demand (BOD) 5 days 20ºC 2 mg/1 or less
2	Outdoor bathing (organised)	B	• Total Coliform MPN/100 ml shall be 500 or less • pH between 6.5 to 8.5 • Dissolved Oxygen 5 mg/1 or more • Biochemical Oxygen demand (BOD) 5 days 20ºC 3 mg/1 or less
3	Drinking Water source (without conventional treatment)	C	• Total Coliform MPN/100 ml shall be 5000 or less • pH between 6 to 9 • Dissolved Oxygen 4 mg/1 or more • Biochemical Oxygen demand (BOD) 5 days 20ºC 3 mg/1 or less
4	Propagation of Wildlife	D	• pH between 6.5 to 8.5 for fisheries • Dissolved Oxygen 4 mg/1 or more • Free Ammonia (as N) 1.2 mg/1 or less
5	Irrigation, Industrial Cooling, Controlled Waste	E	• pH between 6.0 to 8.5 • Electrical Conductivity at 25ºC µmhos/cm Max. 2250 • Sodium absorption rations Max. 26 • Boron, Max.2 mg/1

Ref: CPCB (1999). Bio mapping of rivers, Parivesh New Letter, 5 (iv), Central Pollution Control Board, Delhi, PP.20.

Indian Standard Drinking Water Specifications : IS 10500:1994

S. No.	Substance/ Characteristics	Requirement (Desirable limit)	Undesirable Effect Outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
Essential Characteristics						
1	Colour, Hazen Units, Max.	5	Above 5, consumer acceptance decreases	25	3025 (part 4) 1983	Extended to 25 only if toxic substances, in absence of alternate sources.
2	Odour	Unobjectionable	-	-	3025 (parts 5): 1984	A test cold and when heated. Test at several dilution
3	Taste	Agreeable	-	-	3025 (part 8): 1984	Test to be conducted only after safety has been established
4	Turbidity NTU, Max.	5	Above 5, consumer acceptance decreases	10	3025 (part 7): 1984	
5	PH value	6.5 to 8.5	Beyond this range the water shall not effect the mucous membrane and/or water supply system	No relaxation	3025 (part 11): 1984	
6	Total hardness (as $CaCo_3$) mg/1, Max.	300	Encrustation in water supply structures an adverse effect on domestic use	600	3025 (part 21): 1983	

S. No.	Substance/ Characteristics	Requirement (Desirable limit)	Undesirable Effect Outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
7	Iron (as Fe) mg /l Max.	0.3	Beyond this limit taste/appearance are affected has adverse effect on domestic uses and water supply structures and promotes iron bacteria	1	3025 (part 21): 1983	
8	Chlorides (as Cl) mg/1 Max.	250	Beyond this limit, taste corrosion and palatability are affected	1000	3025 (part 32): 1988	
9	Residual, free chloride, mg/1 Min.	0.2			3025 (part 26): 1986	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be Min. 0.5 mg/1
Desirable Characteristics						
1	Dissolved solids mg/1 Max.	500	Beyond the palatability decreases and may cause gastro intestinal irritation	2000	3025 (part 16): 1986	

S. No.	Substance/ Characteristics	Requirement (Desirable limit)	Undesirable Effect Outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
2	Calcium (as Ca) mg/1 Max.	75	Encrustation in water supply structure and adverse effects on domestic use	200	3025 (Part 16) 1986	
3	Magnesium (as Mg) mg/1, Max.	30	Encrustation in water supply structure and adverse effects on domestic use	1.5	16,33,34 of IS 3025: 1964	
4	Copper (as Cu) mg/1 Max.	0.05	Beyond taste, discoloration of pipes, fitting and utensils shall be caused beyond this	0.3	35 of 3025: 1964	
5	Manganese (as Mn) mg/1, Max.		Beyond this limit taste/appearance are affected, has adverse effect on domestic uses and water supply structures.	0.3	35 of 3025: 1964	
6	Sulphate (as 200 So_2), mg/1, Max.	200	Beyond this causes gastro intestinal irritation when magnesium or sodium are present	400	3025 (part 24): 1986	May be extended up to 400 provided (as Mg) does not exceed 30
7	Nitrate (as No2) mg/l, Max.		Beyond this methaemo globinemia take place	100	3025 (part 24): 1988	To be tested when pollution is suspected

S. No.	Substance/ Characteristics	Requirement (Desirable limit)	Undesirable Effect Outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
8	Fluoride (as F) mg/1, Max.	1	Fluoride may be kept as low as possible. High fluoride may cause fluorosis	1.5	23 of 3025:1964	To be tested when pollution is suspected
9	Phenolic compounds (as C_6H_5OH) mg/1, Max.	0.001	Beyond this it may cause objectionable taste and odour	0.002	54 of 3025:1964	To be tested when pollution is suspected
10	Mercury (as Hg) mg/1, Max.	0.001	Beyond this the water becomes toxic	No relaxation	(See not mercury ion analyses)	To be tested when pollution is suspected
11	Cadmium (as cd), mg/1, Max.	0.01	Beyond this the water becomes toxic	No relaxation	(See note)	To be tested when pollution is suspected
12	Selenium, (as Se). mg/1, Max.	0.01	Beyond this the water becomes toxic	No relaxation	28 of 3025:1964	To be tested when pollution is suspected
13	Arsenic (As) mg/1, Max.	0.05	Beyond this the water becomes toxic	No relaxation	3025 (part 37); 1988	To be tested when pollution is suspected
14	Cyanide (as CN) mg/1, Max.	0.05	Beyond this the water becomes toxic	No relaxation	3025 (part 27) 1988	To be tested when pollution is suspected
15	Lead (as Pb), mg/1, Max.	0.05	Beyond this the water becomes toxic	No relaxation	(See note)	To be tested when pollution is suspected

S. No.	Substance/ Characteristics	Requirement (Desirable limit)	Undesirable Effect Outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
16	Zinc (as Zn) mg/1, Max.	5	Beyond this limit it can cause astringent taste and an opalescence taste and an opalescence in water	15	39 of 3025:1964	To be tested when pollution is suspected
17	Anionic detergents (as MBAS) mg/1, Max.	0.2	Beyond this it can cause a light froth in water	1	Methylene-blue extraction method	To be tested when pollution is suspected
18	Chromium (as Cr6+) mg/1, Max.	0.05	May be carcinogenic above this limit	No relaxation	38 of 3025:1964	To be tested when pollution is suspected
19	Poly nuclear aromatic hydra carbons (as PAH) mg/1, Max.	-	May be carcinogenic above this limit	-	-	-
20	Mineral oil mg/1, Max.	0.01	Beyond this limit undesirable taste and odour after chlorination take place.	0.03	Gas Chromato-graphy method	-
21	Pesticides mg/1, Max.	Absent	Toxic	0.001	-	-
22	Radioactive material	-	-	-	58 of 3025:1964	-
23	Alpha emittersbq/1, Max.	-	-	0.1	-	-

S. No.	Substance/ Characteristics	Requirement (Desirable limit)	Undesirable Effect Outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
24	Beta emitter pci/1, Max.	-	-	1	-	-
25	Aluminium (as Al) mg/1, Max.	200	Beyond this limit taste becomes unpleasant	600	13 of 3025:1964	-
26	Aluminium (as Al) mg/1, Max.	0.03	Cumulate effect is reported to cause dementia	0.2	31 of 3025:1964	-
27	Boron mg/1, Max.	1	-	5	29 of 3029:1964	-

Source: Indian Standard Drinking Water Specification - IS 10500, 1994

A. MONITORING PROTOCOL

The monitoring protocol is given in table below:

Environmental Component	Project Stage	Monitoring					
		Parameters	Special Guidance	Standards	Location	Frequency	Duration
Air	Construction Stage	PM10, PM2.5, SO_2, NOX, CO, O_3, Fugitive emissions from Hot mix plants	High volume sampler to be located 50 m from the plant in the downwind direction. Use method specified by CPCB for analysis	Air (Prevention and Control of Pollution) Rules, CPCB, 1994	Hot mix Plant/ Batching Plant, Quarry sites	Three seasons annually for three years	As per MoEF notification on Ambient Air Standard dated 16th November 2009 or its subsequent amendments
	Construction Stage	PM10, PM2.5, SO2, NOX, CO, O3	High volume Sampler to be located within 4 m in downwind direction. Use method specified by CPCB for analysis	Air (Prevention and Control of Pollution) Rules, CPCB, 1994	As directed by the Engineer and as mentioned in the Baseline chapter of the EIA report	Moves with progress of construction during the three years but not less than three seasons annually for three years	As per MoEF notification on Ambient Air Standard dated 16th November 2009 or its subsequent amendments

Environmental Component	Project Stage	Monitoring					
		Parameters	Special Guidance	Standards	Location	Frequency	Duration
	Operation Stage	PM10, PM2.5, SO2, NOX, CO, O3	High volume Sampler to be located within 4 m in downwind direction. Use method specified by CPCB for analysis	Air (Prevention and Control of Pollution) Rules, CPCB, 1994	As directed by the Engineer and as mentioned in the Baseline chapter of the EIA report	Once a year for one season for 8 alternate years	As per MoEF notification on Ambient Air Standard dated 16th November 2009 or its subsequent amendments
Water Quality	Construction Stage	pH, Turbidity, TSS, TDS, COD, BOD, DO, Chlorides, Hardness, Oil & Grease, TSS, TDS, Total Coliform, Iron, Fluorides, Nitrates, E. coli, Total coliform, faecal coliform etc. as per IS 10500:1991	Grab sample collected from source and analyse as per Standard Methods for Examination of Water and Wastewater	Water quality standards by CPCB	As directed by the Engineer and as mentioned in the Baseline chapter of the EIA report	End of summer / before the onset of monsoon every year for 3 years	-

Environmental Component	Project Stage	Monitoring					
		Parameters	Special Guidance	Standards	Location	Frequency	Duration
	Operation Stage	pH, Turbidity, TSS, TDS, COD, BOD, DO, Chlorides, Hardness, Oil & Grease, TSS, TDS, Total Coliform, Iron, Fluorides, Nitrates, E. coli, Total coliform, faecal coliform etc. as per IS 10500:1991	Grab sample collected from source and analyse as per Standard Methods for Examination of Water and Wastewater	Water quality standards by CPCB	As directed by the Engineer and as mentioned in the Baseline chapter of the EIA report	End of summer / before the onset of monsoon for 8 alternate years	-
	Construction Stage	Noise levels on dB (A) scale	Free field at 1 m from the equipment whose noise levels are being determined.	Noise standards by CPCB	At construction yards	As required by the Engineer	Readings to be taken at 15 seconds interval for 15 minutes every hour and then averaged

Environmental Component	Project Stage	Monitoring					
		Parameters	Special Guidance	Standards	Location	Frequency	Duration
		Noise levels on dB (A) scale	Equivalent Noise levels using an integrated noise level meter kept at within a distance of 5 m from edge of Pavement	Noise standards by CPCB	As directed by the Engineer and as mentioned in the Baseline chapter of the EIA report	Thrice a year for 3 years during the construction period	Readings to be taken at 15 seconds interval for 15 minutes every hour and then averaged.
	Operation Stage	Noise levels on dB (A) scale	Equivalent Noise levels using an integrated noise level meter kept within a distance of 5 m from edge of Pavement	Noise standards by CPCB	As directed by the Engineer and as mentioned in the Baseline chapter of the EIA report	Once a year for 8 alternate years	Readings to be taken at 15 seconds interval for 15 minutes every hour and then averaged.
Soil Erosion	Construction Stage	Turbidity in Storm Water Silt load in water courses	-	Water quality standards	At locations identified by the engineer	Pre-monsoon and post-monsoon seasons for 3 years	-

Environmental Component	Project Stage	Monitoring					
		Parameters	Special Guidance	Standards	Location	Frequency	Duration
Construction Sites and Construction Camps	Construction Stage	Monitoring of: Storage Area Drainage arrangements Sanitation in Construction Camps	The parameters mentioned are further elaborated in the reporting formats. These are to be checked for adequacy.	To the satisfaction of the NHAI and the standards given in the reporting form.	As storage area and construction camps	Quarterly in the construction stage	-
Plantation & Transplantation	Construction Stage	Planting of trees & shrubs as per in the median and ROW & monitoring of survival	Plantation should start by the end of 2nd year before monsoon so that the saplings & trees survive. Data to be collected, analysed && filed with IE & NHAI	IRC guidelines	ROW & Median	Quarterly	-
	Operation Stage	Survival of saplings and transplanted trees	Survival data to be collected and analysed & filed with NHAI	IRC guidelines	ROW & Median	Quarterly	-

(The amendments to this document will be published in its periodical, 'Indian Highways' which shall be considered as effective and as part of the code/guidelines/manual, etc. from the date specified therein)