STANDING COMMITTEE OF NATIONAL BOARD FOR WILDLIFE

TWENTY FIRST MEETING

24th JANUARY 2011

AGENDA NOTES

GOVERNMENT OF INDIA MINISTRY OF ENVIRONMENT AND FORESTS

INDEX

5	**Agenda Item No.5.** Any other item with the permission of the Chair	

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AGENDA NOTES FOR THE TWENTY FIRST MEETING OF THE STANDING COMMITTEE OF NATIONAL BOARD FOR WILD LIFE

Date: 24th January 2011 **Venue: Paryavaran Bhawan, New Delhi.**

AGENDA ITEM NO.1

Confirmation of the minutes of the 20th meeting of Standing Committee of National Board for Wild Life held on 13th October, 2010.

The minutes of the 20th meeting of Standing Committee of NBWL, held on 13.10.2010 were circulated to the members on 28th October 2010. Certain comments have been received from Ms. Prerna Bindra and Dr. A.J. T. Johnsingh on the minutes of the last meeting of Standing Committee of NBWL. Some suggestions/modifications and typographical errors have been indicated by both the members jointly. Response of the Ministry to Ms. Prerna Bindra on the matter has been sent on 11th November 2010. Copy of the same is attached herewith as **ANNEXURE-1 (Page to).**

The following are the important additional suggestions indicated by Ms. Prerna Bindra:

Under the agenda item No. 3.1 (f) regarding Central funding to be restricted to Protected Areas directly under the Wildlife Wing and managed by trained officers, the following be added:

"Ms. Prerna Bindra suggested that one point which is of relevance here is the whole funding system. It has been seen in the field that the fund situation of sanctuaries, even the most critical wildlife areas is pathetic. Funds are not sufficient and hugely delayed. One would like to see before the board when funds are released by the centre and then later by the State to understand the time lags and delays. It is thought to be advisable to have a similar kind of structure as followed by NTCA to try streamlining both provisions of funds on time and accountability of the states."

Under the agenda item No. 4.1 (8) regarding proposal for maintenance/repair work in Tikamgarh-Orcha road, SH-37, passing through Orcha Wildlife Sanctuary, M. P, the following be added:

"*Dr. Divyabhanusingh Chavda strongly disagreed. He stressed that roads in sanctuaries have a devastating impact and since it was a decision that there should be no black topped roads in sanctuaries, black topping should not be allowed as it destroyed the integrity of the reserve, opened up the reserve. He gave examples of previous cases in the case of Gujarat where such permission was rejected.*".

Under the agenda item No. 4.1 (9) regarding construction and upgradation of 12 existing Rural roads under PMGSY to provide all weather road connectivity to the villages in Bagdara Wildlife Sanctuary, M. P., the following be added:

"*Ms. Prerna Bindra expressed concern on the large number of roads that would criss-cross the sanctuary, which may lead to honey combing effect. She also pointed out that no clear maps had been made available for any of the road proposals in Madhya Pradesh. These were circulated just minutes before the meeting making it virtually impossible to make a studied decision. This applied to all proposals. Maps must be made available beforehand as the location of the diversion sought/proposed activity was of vital importance and a must to base any decision. It was suggested that the GPS location be given so that the location could be placed on google map.*".

Under the agenda item No. 4.1 (24) regarding permission for the Sela Urthing HEP(230 MW) from Askot Musk Deer Sanctuary, Uttarakhand, the following be added:

" *It was pointed out by Ms. Prerna Bindra that the clearances of two hydroelectric dams i.e, Rupsiya Bagad and Khasia Bara in the Pithoragarh district have been cancelled by the MoEF, Forest Advisory Committee on the grounds of it being eventually being located in a highly ecologically sensitive habitat and will impact the flow of the Gori Ganga which eventually flows into the ganga river.*".

The Standing Committee of NBWL may take a view on the above suggestions while confirming the minutes of meeting held on 13.10.2010.

AGENDA ITEM NO.2

The Action Taken Report on the decisions of the Standing Committee of NBWL taken in its 20th meeting held on 13.10.2010 is as appended below:

Agenda Item No.	Action Taken
4.2(4): Diversion of 7.2871 ha of forest land for construction of Ropeway from Bhavnath Taleti to Ambaji Temple in Girnar Wildlife Sanctuary by Usha Breco Ltd, Ahmedabad, Gujarat.	The proposal for diversion of 7.2871 ha of forest land for construction of Ropeway from Bhavnath Taleti to Ambaji Temple in Girnar Wildlife Sanctuary by Usha Breco Ltd, Ahmedabad, Gujarat was considered by the Standing Committee of NBWL in its 20th meeting held on 13th October 2010, wherein the Chairman desired that he would himself visit the proposed project area during the month of November 2010. He also desired that Dr Divyabhanusinh Chavda and Dr Nita Shah accompany him during the visit. **The site inspection report submitted by Dr Divyabhanusinh Chavda is attached as ANNEXURE-2. (Page to)**
4(B)(12) Proposal for denotification from Radhanagri Sanctuary for Savarde minor irrigation project.	The proposal for denotification of 14.12 ha area (10.98 ha submerged area and 3.14 ha dam construction) from Radhanagri Sanctuary for Savarde minor irrigation project, was considered by the Standing Committee of NBWL in its 20th meeting held on 13th October 2010, wherein the Chairman requested the Chief Wildlife Warden, Maharashtra to examine the recommendations within 3 weeks time and submit his observations to the Ministry. The Committee would, thereafter, take a final view of the proposal. **The Chief Wildlife Warden has informed that he would make a site visit himself after the Assembly Session was over. His comments are still awaited.**

4(2) Proposal seeking permission for construction of fencing and patrol road along the Indo-Bangladesh Border in Dampa Tiger Reserve, Mizoram.	The proposal seeking permission for construction of fencing and patrol road along the Indo-Bangladesh Border in Dampa Tiger Reserve, Mizoram was considered during the last meeting of Standing Committee of NBWL held on 13th October 2010, wherein Dr Rajesh Gopal, Member-Secretary, NTCA informed that site inspection could not be carried out due to the rains and that he along with Dr Ranjitsinh would be conducting the site inspection soon. The Chairman requested Dr Rajesh Gopal to expedite the site inspection at the earliest. **Site inspection report is awaited.**

Agenda item No. 3.1: Wildlife Conservation Issues **(a) Framing ecologically sound policy for dealing with linear intrusions.**	After discussions, the Chairman requested Dr Shankar Raman to prepare a background paper on the issue which could be discussed during the next meeting of the Standing Committee of NBWL. **The background paper in this regard is awaited from Dr Shankar Raman.**
(b) Need to take different sub-states bodies like Tribal and District Councils in the Northeast, on board in matters relating to conservation.	During the discussions in the last meeting of the Standing Committee of NBWL held on 13th October 2010, Ms. Prerna Bindra, was of the opinion that no blanket permission should be granted in such matters. She desired the issue to be discussed in detail to facilitate a rational decision. In view of this, the Committee decided to take up this matter for detailed discussion in the next meeting of the Standing Committee of NBWL. **The Standing Committee may like to reconsider the matter and take a view.**
(c) Measures to check damage to environment on account of extraction of minerals.	In the discussions of last meeting of the Standing Committee of NBWL held on 13th October 2010, the Committee felt that an opinion/discussion paper could be sought from the NTCA Committee, which could thereafter, be discussed in detail in the next meeting of the Standing Committee of NBWL. **Member Secretary NTCA may like to brief the Standing Committee on the issue.**

(f) Central funding to be restricted to Protected Areas directly under the Wildlife Wing and managed by trained officers	This agenda item was proposed by Dr M.K. Ranjitsinh. In the discussions of the last meeting of the Standing Committee of NBWL held on 13th October 2010, it was decided that since Dr M.K. Ranjitsinh was not present, the item could be discussed in the next meeting. **The Standing Committee may like to take a view in the matter.**
4.1(9) Construction and upgradation of following 12 existing Rural Roads under PMGSY to provide all weather road connectivity to the villages in Bagdara Sanctuary, Madhya Pradesh.	During the 20th meeting of the Standing Committee of NBWL held on 13th October 2010, proposals for construction and upgradation of 12 existing Rural Roads under PMGSY to provide all weather road connectivity to the villages in Bagdara Sanctuary were considered. The Committee, after discussions, had decided that a team comprising Ms. Prerna Bindra, Shri Kishore Rithe, Satpuda Foundation, Amravati and Dr T.R. Shankar Raman, NCF, Mysore would conduct a site inspection and submit a report to the Committee. The Committee would, thereafter, take a final view on the proposals. **Site inspection report of the team is awaited.**
4.1(13) Maintenance/repair work of 17.15 km from Indwar-Tala-Parsi passing through Panpatha Wildlife Sanctuary and Bandhavgarh National Park, M.P.	During the 20th meeting of the Standing Committee of NBWL held on 13th October 2010, proposal for maintenance/repair work of 17.15 km road from Indwar-Tala- Parsi passing through Panpatha Wildlife Sanctuary and Bandhavgarh National Park, Madhya Pradesh was considered.

	The Committee, after deliberations had decided to recommend the proposal subject to certain conditions. One of the conditions was that Dr A.J.T. Johnsingh would visit the site and suggest mitigatory measures including the speed breakers. **Dr A.J.T. Johnsingh has conducted the site inspection and has submitted his report, which is attached as ANNEXURE-3 (Page to)**
4.1(14) Construction and upgradation of rural road being part of the existing road, under PMGSY connecting the habitations to an all weather BT road from Kerkeli Raipur Bagdari to chechariya, Madhya Pradesh.	During the 20th meeting of the Standing Committee of NBWL held on 13th October 2010, the proposal for construction and upgradation of rural road being part of the existing road, under PMGSY which is connecting habitations to all weather BT road from Kerkeli Raipur Bagdari road to Chechariya, Madhya Pradesh falling within Bandhavgarh National Park was considered. After deliberations, the Committee decided that since Dr A.J.T Johnsingh would be undertaking a visit to Bandhavgarh National Park, he may also alongside visit this site also and suggest mitigatory measures. The Committee also felt that as black topping inside Protected Areas was prohibited, only gravel road repair/upgradation work could be allowed. However, in case the road had been black topped, the Committee would take a final view based on the suggestions made by Dr A.J.T.

	Johnsingh after his site visit. **The site inspection report of Dr Johnsingh is awaited.**
4.1 (17) Diversion of 0.205 ha of forest land from Fambonglho Wildlife Sanctuary for construction of Sang Naya Bazar water supply scheme from Lalichok to Sang in East Sikkim. **4.1 (18) Diversion of 1.9718 ha of forest land from Pangolakha Wildlife Sanctuary for construction of water supply scheme from Mithuney to Rhenock in (South) Sikkim.** **4.1 (19) Diversion of 0.50 ha of forest land from Pangolakha Wildlife Sanctuary for construction of water supply scheme from Jelep la stream to Kupup in (North) Sikkim.**	During the 20th meeting of the Standing Committee of NBWL held on 13th October 2010, it was informed that there were **three** proposals for construction of drinking water supply line passing through Fambonglho and Pangolakha Wildlife Sanctuaries in Sikkim. The Committee decided that a team comprising Ms. Prerna Bindra and Dr A.J. T. Johnsingh would conduct a site inspection and submit a report to the Committee. A final view on the three proposals would be taken on receipt of the report of the team. **The site inspection report of the team is awaited.**
4.1(23) Permission for construction of an Embankment on the Left Bank of River Ganga from village Sherpur to village Thet falling in the Hastinapur Wildlife Sanctuary, Uttar Pradesh.	The permission for construction of an Embankment on the Left Bank of River Ganga from village Sherpur to village Thet falling in the Hastinapur Wildlife Sanctuary, Uttar Pradesh was considered during the last meeting of Standing Committee of NBWL held on 13th October 2010. The Committee decided to refer the proposal to the State Board for Wildlife for opinion, before a final view on the proposal could be taken by the Standing Committee. **The State Government has informed that the said proposal has been recommended by the State**

	Board for Wildlife in its meeting held on 8th September 2010. **In view of this, the Standing Committee of NBWL may like to reconsider the proposal and take a view.**
4.1 (25) Diversion of 6.07 ha of forest land from Rajaji National Park for establishment of Ayush Gram, Uttarakhand.	The proposal for diversion of 6.07 ha of forest land from Rajaji National Park for establishment of Ayush Gram, Uttarakhand was considered during the last meeting of Standing Committee of NBWL held on 13th October 2010. The Committee after discussions decided that a team comprising the Director, Wildlife Institute of India and Dr A.J.T. Johnsingh would conduct a site inspection and submit a report to the Committee. A final view would be taken based on the report of the team. **Site inspection report is at ANNEXURE-4. (Page to). Standing Committee may take a view in the matter based on the report.**
4.2 (1) Enhancing the capacity of cement plant by M/s Parashakti Cements ltd.	The proposal for enhancing the capacity of cement plant by M/s Parashakti Cements Ltd-was reconsidered during the last meeting of Standing Committee of NBWL held on 13th October 2010, wherein the Chief Wildlife Warden, Andhra Pradesh had requested that the matter be postponed for the next meeting. In view of this, the Committee decided to defer the matter to the next meeting. **The Standing Committee of NBWL may like to**

	take a view in the matter.
4.2 (5) Diversion of 879.666 ha (840.00 ha of forest land & 39.666 ha of Revenue forest land) for Mandla North underground mining coal block for M/s Jaiprakash Associates Ltd, Distt. Chhindwara, Madhya Pradesh	The proposal is for diversion of 879.666 ha (840.00 ha of forest land and 39.666 ha of Revenue forest land) for Mandla North underground mining coal block for M/s Jaiprakash Associates Ltd, Distt.Chhindwara, Madhya Pradesh was considered during the last meeting of Standing Committee of NBWL held on 13th October 2010. The Committee had decided that the proposal be referred back to the NTCA for its comments within 1 month's time. The Director, Wildlife Institute of India and Shri Kishore Rithe, Satpuda Foundation, Amravati, would also examine the proposal and give their suggestions to the NTCA. The Standing Committee would take a final view on the proposal after receipt of the consolidated report of NTCA, Wildlife Institute of India and Shri Kishore Rithe, Satpuda Foundation, Amravati **The report is awaited.**
4.2 (6) Diversion of land for lime stone mines due to location of Son Gharial Crocodile Sanctuary within 10 km of the Mining lease, Madhya Pradesh. **(i) Badgawna Revenue, Distt. Sindhi-68.910 ha. (Revenue land)** **(ii)Majhigawan Extension, Distt. Sidhi-54.825 ha (Forest land)** **(iii) Hinauti Extension, Distt. Satna, 258.864 ha (Forest land).**	Three proposals involving mining in area falling within 10 Kms from Son Gharial Sanctuary was considered in the last meeting of Standing Committee of NBWL held on 13th October 2010. The Committee decided to have a site inspection by Dr Asad Rahmani, and to take a final view on the proposal based on the inspection report of Dr Rahmani.

	Site inspection report of Dr Rahmani is awaited.

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AGENDA ITEM NO.3

3.1.

Inclusion of Jerdon's Courser (*Rhinoptilus bitorquatus*) as one of the species for Recovery Plan under the Centrally Sponsored Scheme 'Integrated Development of National Parks and Sanctuaries'

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Jerdon's Courser (*Rhinoptilus bitorquatus*), one of the world's rarest birds (IUCN Category: CR), was rediscovered in 1986 in Andhra Pradesh, as it was thought to be extinct till then. The site where it was rediscovered was designated as the Sri Lankamaleswara Wildlife Sanctuary by the Government of Andhra Pradesh.

2. The Jerdon's Courser is endemic to scrub jungle habitats in the state of Andhra Pradesh and is listed in the Schedule-I of the Wildlife (Protection) Act, 1972. However, scrub jungle clearance for farming and plantations and development projects in and around Protected Areas have been posing serious threat to the species. Since the year 2000, the Bombay Natural History Society along with Royal Society for the protection of Birds (RSPB), University of Reading and supported by the Andhra Pradesh Forest Department, have been conducting research on the species as well as its habitat and has also made considerable progress in developing standard survey techniques. However, more research on the species and its habitat is required, especially with respect to baseline information on the species, habitat preference, behavior, etc.

3. In order to have a planned programme for conservation of the species, the State Government of Andhra Pradesh in consultation with the Bombay Natural

History Society has proposed a species recovery plan for the Jerdon's Courser **ANNEXURE-5 (Page to)** and has requested the recommendation of the Standing Committee of NBWL for inclusion of this species along with the other 15 species identified by the Government of India under the Recovery programme component of the Centrally Sponsored Scheme 'Integrated Development of Wildlife Habitats' (IDWH).

4. Under the Scheme of 'Integrated Development of Wildlife Habitats', there are three major components, viz, Assistance to Protected Areas; Assistance to Outside Protected Areas and Assistance for initiating Recovery Plans for identified species. Presently following fifteen species alongwith their habitats have been included for assistance under the IDWH scheme

1. Snow leopard
2. Bustard (including floricans)
3. Dolphins
4. Hangul
5. Nilgiri tahr
6. Marine turtles, dugongs and corals
7. Edible nest swiftlets
8. Asian wild buffalo
9. Nicobar megapode
10. Manipur brow antlered deer
11. Vultures
12. Malabar civet
13. Great one horned or Indian Rhinoceros
14. Asiatic lion

15. Swamp deer

5. The Ministry has also brought out guidelines to this effect for easy implementation of the scheme. As per the said guidelines, depending upon the requirements from time to time, the Director, Wildlife Preservation, in consultation with the Wildlife Institute of India or the relevant scientific institution/organization and **with the approval of the Standing Committee of National Board for Wildlife can initiate recovery programmes in respect of additional species or wind up ongoing programmes.**

In view of the above, the Standing Committee may like to consider inclusion of Jerdon's Courser under the IDWH scheme of the Ministry.

3.2.

Constitution of a National Tri-State-Chambal Sanctuary Management and Coordination Committee for conservation of Gharial. (NTRIS-CAS MACC)

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The Chambal River is a tributary of the Yamuna River in central India, and forms part of the greater Gangetic drainage system. The 960 km long Chambal River originates from the Singar Chouri peak in the northern slopes of the Vindhyan escarpment, 15 km West-South-West of Mhow in Indore District in Madhya Pradesh State. The river flows first in a northerly direction in Madhya Pradesh (M.P.) for a length of about 346 km and then in a generally north-easterly direction for a length of 225 km through Rajasthan. The Chambal flows for another 217 km between M.P. and Rajasthan and further 145 km between M.P. and Uttar Pradesh (U.P.). It enters U.P. and flows for about 32 km before joining the Yamuna River in Etawah District at an elevation of 122 m, to form a part of the greater Gangetic drainage system. In this reach, it is bounded by the Aravalli mountain ranges on the North and the Vindhyan hill range on the south.

2. Chambal river has 2 species of crocodilians – the mugger and gharial, 8 species of freshwater turtles, smooth-coated otters, gangetic river dolphins, skimmers, black-bellied terns, sarus cranes and black-necked storks, amongst others.

3. The **National Chambal Sanctuary** consists of the large arc described by the Chambal between Jawahar Sagar Dam in Rajasthan and the Chambal-Yamuna confluence in Uttar Pradesh.

4. Financial assistance under the Centrally Sponsored Scheme of 'Integrated Development of Wildlife Habitats' is provided to the National Chambal Ghariyal Sanctuary to the three States of Madhya Pradesh, Rajasthan and Uttar Pradesh, for the conservation of gharial and its habitat within the Sanctuary.

5. However, it was felt that since this is a unique river Sanctuary in the entire country, which runs across three States providing habitat to the critically endangered gharial, a better coordination amongst the three States as well as improved monitoring and guidance from the Centre were needed to facilitate concerted conservation initiatives aimed at recovery of gharial.

6. In view of the aforesaid, the MoEF has constituted the National Tri-State-Chambal Sanctuary Management and Coordination Committee for conservation of Gharial **(NTRIS-CAS MACC)** to enhance and improve coordination and monitoring of efforts of the Central Government and the three participating States aimed at recovery of the critically endangered species of gharial. The main oobjectives of the NTRIS-(CAS MACC) are:-

(i) To look into the entire gamut of issues related to conservation of Gharial in National Chambal Gharial Sanctuary and make recommendations to bring about a more effective conservation and management regime for the species in India with due focus on participation of local communities.

(ii) To devise an institutional framework covering the action at the Centre and State level with the objective of ensuring proper coordination among all stakeholders in implementing the conservation programmes and actions for Gharial.

(iii) To develop a 'Conservation Strategy and Action Plan for Gharials and their habitats in India'.

(iv) To examine socio-economic issues relating to community-Gharial interface and recommend appropriate short-term and long-term measures aimed at enhancement of livelihood support of the local communities and to enthuse in them the sense of ownership of efforts for gharial conservation.

(v) To recommend appropriate methodology and institutional framework for monitoring the status of Gharial and their habitats.

(vi) To achieve better coordination amongst the three States and the Centre for more concerted conservation initiatives, including for census of important species like Gharials, Dolphins etc in the entire stretch of the River and/or in case of identification of causes for any mortality of the animals and ameliorative steps to be taken.

7. With a view to achieving above objectives, following strategy will be adopted:

7.1 (a) Creation of a National Tri - State – Chambal Sanctuary Management and Coordination Committee (NTRIS – CASMACC) with Director, WWF as convenor as a prelude to formation of a tri-state National Chambal Sanctuary Management Authority (NCSMA) in due course, with

representatives from the three States including government officials, experts and relevant NGO partners with experience in research and socio-economic issues related to conservation and management of wildlife specifically gharial. Functioning of the Coordination Committee will be facilitated, overseen and guided by the Steering Committee for Gharial Conservation in the MoEF under the Chairmanship of ADG(WL).

(b) Establishment of a protocol that identifies the minimum required flow and guarantees sufficient compensatory water flow to maintain ecologically viable conditions for all aquatic fauna. The protocol will be formulated and agreed upon by River Authority representatives, river fauna experts and hydrologists.

(c) Once the minimum required flow is identified, ongoing coordination via an MOU, between the Forest Department and relevant Water Authorities will be put in place to ensure that this flow is maintained through planned releases.

7.2. Improving enforcement by augmenting and strengthening wildlife infrastructure by training and inducting additional field staff to guarantee comprehensive protection of nesting and basking areas throughout the breeding season from January to July. Modern equipment including boats (engines and sufficient allotment of fuel), vehicles, arms and ammunition and field kits to ensure and end to large-scale sand mining and fishing operations by mafias inside the National Chambal Sanctuary and to enhance the general level of protection.

7.3. Undertake socio-economic evaluation of human populations and explore/implement alternative livelihoods of riparian communities. Facilitate social, health, educational initiatives in villages along the river with appropriate incentives to increase the level of involvement local communities have with the conservation of the river, e.g., introduction of a new 'River Guardian' initiative in villages along the river to bring local people on board and involve them in the conservation of gharial and other river fauna. This can tie-in with and augment the current ongoing employment of guards and watchers from local communities.

7.4. Prioritize and develop a comprehensive research programme for recovery

of gharial.

7.5. The above programmes and actions are to be funded as a sub-scheme of the Ministry's 'Integrated Development of Wildlife Habitats' Scheme.

8. Description of NTRIS – CASMACC

The Authority will function through a three tier decentralised mechanism, as follows:

- **1st Tier** **National Steering Committee chaired by ADGF (WL)**
  Members : CWLWs of three States
  : Representatives of WII, WWF, GCA, Dev Alts, Representatives of Ministry of Water resources, Ministry of Rural Development

- **2nd Tier** **NTRIS – CASMACC**
  Convenor :Director, WWF
  Co-Convenor: Mr. B.C. Choudhury, WII
  Members: Representatives of Ministry of Water Resources, State Departments of Irrigation & Power, WII (Mr. Bivash Pandav), Gharial Conservation Alliance / Madras Crocodile Bank Trust, Chennai (Tarun Nair and Samir Whitaker), ATREE, Bangalore (Jagdish Krishnaswamy), Development Alternatives, New Delhi (Social Scientists), WWF (Parikshit Gautam), DFOs from all three States. The Coordination Committee can coopt any other official or expert as per requirement.

- **3rd Tier** Convenor : DFO
  Members: Representative of Panchayat, JFMC, RD, Irrigation, Industry, Revenue, local NGO, Education, Health, Agriculture, Animal Husbandry

9. Development and adoption of Tri-State Management Plan for Recovery of Gharial (TRIS – MAP Gharial).

The NTRIS-CASMACC will create, develop and implement a model tri-state management plan for the National Chambal Sanctuary with inputs, *inter-alia*, from the Gharial Species Recovery Plan of GCA. The Management Plan may, among others, address the following issues:

(i) **Protection of suitable habitats:** The National Chambal Gharial Sanctuary (NCGS) should be accorded effective protection from illegal activities that threaten all wildlife, and Gharial in particular, by improving enforcement programmes. The habitats contiguous with NCGS, e.g., the Yamuna below it, need to be included in management zones, as these areas are also important for long-term survival of the species, and to increase Gharial habitat. In future, the Girwa (Katerniaghat WLS), with the second most viable gharial population as well as the Son, Ken, Ramganga, Ghagra, Gandak, Brahmputra and other identified suitable river stretches should be added to the gharial recovery initiative.

(ii) **Maintenance of the integrity of River Ecosystem**: The integrity of river ecosystem needs to be maintained so that it continues to harbor aquatic fauna. This includes controlling the pollution of rivers, esp. Yamuna, by industry, development of infrastructure, and river fishing.

(iii) **Monitoring of existing population**: A programme of continuous monitoring of Gharial population should be established, so that in the event the population faces a rapid decline due to any reason, immediate measures may be initiated to identify and eliminate the cause. Nesting and basking sites should be identified, pinpointed and mapped; census techniques need to be refined so that they are scientifically credible. Proposals submitted to the Forest Advisory Committee/National Board for Wildlife will also be addressed in the tri-state management plan to ensure continuity.

(iv) **Identification and minimisation of negative anthropogenic influences**: A wide ranging action plan which includes all the stakeholders such as the Ministry of Irrigation and Water Resources,

river development, local fishing methods, sand mining and general human/livestock disturbances of Gharial habitat. The activities that negatively impact the entire riverine ecosystem need to be identified, pinpointed and mapped.

(v) **Ensure that conservation programmes involve local people**: Major threats to Gharial include accidental drowning in fishing nets, and often, animals found entangled are intentionally killed or de-beaked by fishermen. Collecting Gharial eggs for local consumption is also a threat. A comprehensive programme for involving local people in the conservation of Gharial is vital to ensure long-term and continuing success of the programme. The management plan must include educational materials, signs, and instill pride amongst the locals in having such a rare crocodile in their river.

(vi) **Alternative livelihoods for local community**: The plan may seek to address the issue of alternate livelihoods for the very poor river dwellers dependent on local resources. The State Governments and NGOs may implement social welfare programmes as part of NCGS activities so that the pressure on natural resources may be minimized.

(vii) **Promoting Ecotourism**: Ecotourism has the potential to bring additional income to the local population which may shift their current antagonism to sympathy for the Gharial. The CASMACC may initiate measures to promote ecotourism in NCGS which ensures that affected communities are the main beneficiaries of the income and employment generated and tied to other programs that involve bird watching, village tourism, home-stays, etc..

(viii) **Research:** Research, encouraged by the Ministry of Environment and Forests and State Wildlife Authorities, needs to address key management issues such as the Gharial's role in the ecosystem, fish ecology, relationship between Gharial and Mugger (*Crocodylus palustris*), establish minimum water flow needed for the survival of Gharial and other river fauna as well as investigate the genetic relationship of remnant populations. Socioeconomic studies are also needed to better understand the impact of local anthropogenic pressures on the habitat. The research findings may be utilized in

redrafting/modifying the management plan. The research plan may, inter alia, include the following actions:

(a) Determining the minimum required water flow and establishing a protocol that guarantees sufficient compensatory water flow to maintain ecological services;
(b) Prioritize and develop a comprehensive research programme based on the Gharial Species Recovery Plan, including:
(c) Review and collate existing data on population abundance, nesting and basking habitat and spatial ecology in order to concentrate protection and enforcement on key areas of the sanctuary
(d) To study water and habitat requirements, including water quality and minimum flow
(e) Standardization and refinement of gharial population assessment and monitoring
(f) Gharial biology: population biology, hatchling ecology/survival, nesting, diet and parental care
(g) Effects of anthropogenic pressures on gharial
(h) Gharial health and the origins of the 2007/2008 die off
(i) Assess and create rational science-based guidelines for the egg collection/captive breeding, rearing and release programmes of the three states.

(ix) **Development of interstate coordination for Gharial management and conservation between the three States**: Since the NCGS spans three States, independent conservation programmes are in effect in each State. Coordinated management of this shared population, which includes joint surveys, training, comparison of population trends and coordinated regulations and protection would enhance conservation effectiveness.

(x) **Creating public awareness:** The management plan should incorporate measures to raise media and public awareness.

10. Roles and responsibilities of participating Ministries, Departments and Organisations.

It will be the responsibility of the Ministry of Water Resources, State Irrigation/Power Departments to ensure safe and regulated flow of water in Chambal. Ministry of Environment and Forests will provide the guidance and financial support for functioning of NTRIS-CASMACC. State Forest Departments will be responsible for implementation of actions, plans and programmes originating from CASMACC. State RD, Agriculture, Animal Husbandry etc. Departments will dovetail their schemes into the project action focusing on livelihood support to local communities. State Fisheries Department will provide guidance for conservation and development of fish in Chambal to maintain adequate feed for gharial.

11. Budgetary Resources:

Budgetary support for NTRIS-CASMACC will be mobilized by the MoEF to the tune of Rs. 5-8 Crores every year as a sub-scheme of "Integrated Development of WL Habitats".

12. Future Strategy

It is proposed to initiate NTRIS – CASMACC as a specialized initiative which may eventually get transformed into National Gharial Conservation Authority (NGCA) with river stretches of Girwa, Son, Ken, Ramganga, Ghagra, Gandak, Brahmaputra and other rivers identified as suitable for gharial to be covered in addition to Chambal.

The Standing Committee may kindly take note of the action taken by MoEF in creating the NTRIS-CASMACC.

3.3.

Policy on taking up black topping, cementing of roads etc inside National Parks and Wildlife Sanctuaries

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National Parks and Wildlife Sanctuaries provide the best home for the wildlife including several rare and endangered species, and also are the repositories of rich biodiversity. Such areas are, therefore, managed in a scientific manner so that the balance of nature is maintained. However, changes in land use, exploitation and a fast-eroding natural resource base threaten the structure and function of ecosystems that support the world's biological wealth. Roads have been closely linked to many of these processes and impacts, often as a fundamental cause. Vehicles on high-speed highways pose the greatest threat to wildlife. Unpaved roads, particularly when "unimproved", are less dangerous. Road kill usually increases with volume of traffic. Snakes are particularly vulnerable to road kill, as the warm asphalt attracts them. An immediate impact of road construction is noise from construction equipment, and noise remains a problem along highways with heavy traffic. Animals respond to noise pollution by altering activity patterns, and with an increase in heart rate and production of stress hormones. Birds and other wildlife that communicate by auditory signals are at great disadvantage near roads. Thus, roads contribute to the major threat to biological diversity:

The above case is also relevant with respect to the maintenance of existing roads and roadsides. The impact of road construction includes displacing animals and plants that may not be recovered and the long-term consequences limit productivity of roadsides due to exposure of sub-soils reduction in water holding

capacity by the soils, and compacting soil materials difficult for regeneration of vegetation on the roadside. In addition, the construction makes the slopes on the roadsides vulnerable to landslides and erosions.

The Standing Committee of National Board for Wildlife has been considering several proposals for construction/upgradation of roads inside National Parks and Sanctuaries. Earlier in the year 2000, the than Standing Committee of Indian Board for Wildlife had decided not to permit any black topping of roads inside the National Parks and Sanctuaries so as to minimize the impacts on the wildlife therein. However, there have been several proposals, for consideration of the Standing Committee of NBWL, for upgradation of existing roads, i.e., from gravel road to a concrete/cemented road (as black topping was not permitted). Further proposals requesting permission for maintenance of already black topped roads are also being received.

In view of the above, a considered view may be taken in the matter of allowing upgradation of gravel roads to concrete/cemented roads and also for allowing maintenance of already black topped roads.

The Standing Committee may like to take a view in the matter.

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AGENDA ITEM NO.4

4.1. Proposals for diversion of PAs

FRESH PROPOSAL FOR DIVERSION OF NATIONAL PARKS AND SANCTUARIES.

After the 20th meeting of the Standing Committee of National Board for Wildlife held on 13th October 2010, **fourteen proposals** have been received in the Wildlife Division.

The details of the proposals are at **ANNEXURE- 6 (page to)**

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4.1.

Proposals for taking up activities outside the Protected Areas

After the 20th meeting of the Standing Committee of National Board for Wildlife held on 13th October 2010, **four proposals** have been received in the Wildlife Division with respect to taking up activities outside the Protected Areas

The details of the proposals are at **ANNEXURE-7 (page to)**

AGENDA ITEM NO.5

ANY OTHER ITEM WITH THE PERMISSION OF THE CHAIR

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ANNEXURE-6

LIST OF PROPOSALS TO BE CONSIDERED BY THE STANDING COMMITTEE OF NBWL

S. NO.	STATE	FILE NO.	SUBJECT
1.	Gujarat	6-106/2010 WL –I	Proposal for diversion of 0.430 ha of forest land in Narayan Sarovar Sanctuary for laying of Optical Cable line by Reliance Communication Ltd., Ahmedabad, Gujarat.
2.	Jammu & Kashmir	6-88/2010 WL –I	Proposal for construction of four laning of National Highway (NH-1A) from Jammu to Udhampur passing through Ramnagar (7.97 ha) and Nandni Wildlife Sanctuary (13.40 ha) in Jammu region by NHAI.
3.	Jharkhand	6-95/2010 WL –I	Diversion of 145.26 ha of forest land falling in Dalma Wildlife Sanctuary for Subarnrekha Multipurpose Irrigation Project, Jharkhand.
4.	Rajasthan	6-100/2010 WL-I	Diversion of 6.38 ha of forest land from Umarthuna/Bassi Wildlife Sanctuary for construction of road Tejpur-Nandwai-Charcha Km 13 to Umarthuna (0/0 to 8/500) under PMGSY, Rajasthan.
5	Rajasthan	6-104/2010 WL-I	Diversion of 3.0 ha of forest land from Basssi Wildlife sanctuary for upgradation of road Mahesara-Chhota-Kheda to Jhariya Mahadev road km 4/0 to 8/0 under PMGSY, Rajasthan.
6.	Rajasthan	6-101/2010 WL-I	Permission for 330 MW Dholpur Gas based combined cycle thermal power project stage-II from National Chambal Ghariyal Sanctuary at Dhlopur, Rajasthan. **(Area not mentioned in the proposal)**
7.	Rajasthan	6-102/2010 WL-I	Diversion of 0.5076 ha of forestland from Kumbalgarh Wildlife Sanctuary for laying of optical fiber cable from Sayara to Sadri by M/s Bharti Airtel Ltd., Rajasthan.
8.	Rajasthan	6-103/2010 WL-I	Diversion of 1.12 ha of forest land in Ramgarh Wildlife Sanctuary for repair and black topping of existing approach road for high power transmitter for Doordarshan, Bundi.
9.	Rajasthan	6-105/2010 WL-I	Diversion of 1.65 ha of forest land from Nahargarh Wildlife Sanctuary for construction of aerial ropeway from Kanak Vrindavan to Jaigarh Rajasthan.

10.	Rajasthan	6-20/2010 WL -I	Diversion of 11.541 ha of forest land from Todgarh-Raoli Wildlife Sanctuary for clearance of converting earthern shoulder into hard shoulders of existing Beawar (km 58.245) to Ghomti chauraha (km 177.00) section from km 58/245 to km 177/000 of NH-8 in
11.	Uttar Pradesh	6-107/2010 WL -I	Diversion of 0.7416 ha of forest land from Kachhua Wildlife Sanctuary for construction of well foundations in Ganga River at Samneghat, Varanasi for 200 KV Sahupuri-Bhelupur Transmission line passing through, Varanasi, Utter Pradesh.
12.	Uttar Pradesh	6-108/2010 WL -I	Diversion of 6.925 ha of forest land in Hastinapur Wildlife Sanctuary for strengthening and widening to four lane road of the existing NH-24 from Hapur to Moradabad KM 93 to KM 104.700 in J.P. Nagar District, Uttar Pradesh.
13.	Uttar Pradesh	6-109/2010 WL -I	Diversion of 3.9892 ha of forest land in Hastinapur Wildlife Sanctuary for widening of existing 2 lane of NH-24 to 4 lane road from KM 86.00 to KM 93 in Gaziabad District, Uttar Pradesh.
14.	Uttarakhand	6-97/2010 WL-I	Diversion of 7.116 ha of forest land from Askot Wildlife Sanctuary for widening/improvement of Pithoragarh-Tawagat motor road km.62.00 (Jauljibi) to km.72.00-(Biniyagaon/Dungatoli), Uttarakhand.

1	**Name of the Proposal**	Proposal for diversion of 0.430 ha of forest land in Narayan Sarovar Sanctuary for laying of Optical Cable line by Reliance Communication Ltd., Ahmedabad, Gujarat.
2	**Name of the protected Area involved**	Narayan Sarovar Sanctuary
3	**File No**	6-106/2010 WL –I
4	**Name of the state**	Gujarat
5	**Whether proposal is sub-judice**	No
6	**Area of the protected area**	444.23 Sq. Km.
7	**Area proposal for diversion/Denotification**	0.430 ha
8	**Name of the applicant agency**	Reliance Communication Ltd.
9	**Total number of tree to be felled**	Not mentioned in the proposal.
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for Wildlife** The State Board for Wildlife has recommended the proposal 4th meeting on 04.07.2009.	
12	**Brief justification on the proposal as given by the applicant agency.** The proposal is for laying optical fiber cable with the road land boundary of PWD and passing through the Narayan Sarovar Chinkara Sanctuary, Gujarat. The Optical Fiber cable proposed to be laid is carrying defence, industrial and other public communication messages and cannot be laid in the private land /property. The cable will be laid by excavating a narrow trench of 45 cms width. The cable alignment will be suitably diverted to avoid any cutting of trees. The same strip of trench will be reinstated to its original condition and the land area in question will not be required to be handed over to Reliance Communication Limited for its exclusive use. The applicant will not have any right other than that of the user. It is also intimated that no structure will be erected on the cable route.	
13	**Rare and endangered species found in the area** Chinkara, Golden Jackal, Caracal etc.	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden has recommended the proposal with the following conditions: 1. All the debris generated as a result of construction works including waste materials shall be removed and the area shall be brought to the original position immediately after the completion of work of lying of optical fiber cables. 2. Labour camp during construction stage shall be kept away from the sanctuary area and necessary fuel wood and other requirement shall be met with purchase from market. In no case, the sanctuary shall be burdened with such requirements.	

	3. Deployment of staff and vehicles shall be kept minimum in the area requisitioned and use of area other than that demanded in the proposal shall not be permitted. 4. The user agency shall strictly ensure that no damage is caused to flora and fauna in the area. 5. All the activities pertaining to laying of the cable line shall be restricted to 45 cms wide strip proposed and the forest land shall not used for any purpose other than that specified in the project proposal. The material for the construction will be obtained from non-forest area falling outside the sanctuary. 6. Any other condition that may be imposed by the Chief Wildlife Warden/ Government and/or the Standing Committee of the National Board for Wildlife will be strictly compiled with. 7. The legal status of the forest land shall remain unchanged. 8. During execution of work, no damage or disturbance to wildlife sanctuary and wildlife will be done, no tree will be cut and there shall not be any obstruction to the flow of water. 9. Approval under Forest Conservation Act will be obtained separately for use of forest land. 10. User Agency shall contribute 5% of the project cost towards wildlife management in the region. 11. The Chief Wildlife Warden of any officer authorized or working under him may monitor the compliance of conditions mentioned above and any non compliance partly or wholly, may lead to cancellation of this permission.
15	**Comment of Ministry** The Sanctuary is also the habitat of Bustard species and digging may have an impact on its eggs. Therefore, non intrusive means of laying the cable should be opted for. The Standing Committee may like to take a view on the proposal.

1	**Name of the Proposal**	Proposal for construction of four laning of National Highway (NH-1A) from Jammu to Udhampur passing through Ramnagar (7.97 ha) and Nandni Wildlife Sanctuary (13.40 ha) in Jammu region by NHAI.
2	**Name of the protected Area involved**	Ramnagar and Nandni Wildlife Sanctuary
3	**File No**	6-88/2010 WL-I
4	**Name of the state**	Jammu & Kashmir
5	**Whether proposal is sub-judice**	No
6	**Area of the protected area**	12.50 sq.kms (Ramnagar WLS) 33.34 sq.kms (Nandni WLS)
7	**Area proposal for diversion/Denotification**	7.97 ha (Ramnagar WLS) 13.40 ha (Nandni WLS)
8	**Name of the applicant agency**	National Highway Authority of India
9	**Total number of tree to be felled**	117 trees (Ramnagar WLS) 247 trees (Nandni WLS)
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for wildlife** Yes, recommended on 2nd June 2010.	
12	**Brief justification on the proposal as given by the applicant agency.** **(a) <u>Ramnagar Wildlife Sanctuary</u>** The proposed project road is passing in about 1.65 km length through this sanctuary located along Jammu by pass km 19.00 to 20.30 and main road Jammu Udhampur km 9.35 to 9.70, where it is proposed to be widened from 2 lane to 4 lane. **<u>(b)Nandni Wildlife Sanctuary</u>** The proposed project road is passing in about 4.40 km length from km 21.80 to 26.20 of Jammu Udhampur road, through this sanctuary. Existing 2 lane road 4.40 km will be abandoned and new 4 lane road through 4 tunnels about 2.2 km long is proposed. This new alignment is proposed through 4 no. new tunnels. The proposed road is part of the NH-1A and traverses through Jammu and Srinagar. The NH 1A connects important Army and Air bases in the State of J & K. It also serves as the main pilgrimage route to Vaishno Devi and Amarnath. However, due to the present two laning of the road with poor geometrics, sharp curves and steep hair pin bends, lot of accidents occur on the road. The proposed 4-laning will improve the poor geometrics and will ease the sharp curves and would provide improved road conditions.	
13	**Rare and endangered species found in the area** Although not mentioned in the proposal, it is mentioned that Ramnagar Sanctuary has been identified as one of the Important Bird Areas in India (compiled by BNHS & Birdlife International) and has Khaleej Pheasants, Peafowl, Gyps Vultures etc apart from leopards, barking deer etc. The important species found in Nandini Wildlife Sanctuary include Leopard, Goral, etc.	

14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden has recommended the proposal with the following conditions:- (a) The status of the land shall remain unchanged. (b) As per the decision in the Standing Committee meeting of State Board for Wildlife 42.74 hectares of forest land in compartment No. 5/Tunnel has been proposed to be added to the Nandni Wildlife Sanctuary. (c) The User Agency will pay 5% of the cost in proportion to the length falling in the sanctuary area of Jammu-Udhampur section of National Highway to the Wildlife Department. (d) The User Agency, while implementing the road construction project, will abide by the orders to be issued by the Hon'ble Supreme Court and follow provisions of the Jammu and Kashmir Wildlife (Protection) Act, 1978 (Amended upto 2002) strictly. (e) The User Agency shall also pay NPV charges to the extent of Rs. 7.77 crores on the land to be diverted as per Hon'ble Supreme Court orders. (f) The portion of the project being used for haulage (approach roads) for excavation of muck form tunnels shall be restored to the Wildlife Department after completion of works. (g) The existing road falling in the sanctuary that shall be abandoned due to realignment shall be restored to the Wildlife Department. (h) The right of way shall be 60 meters. (i) The User Agency shall secure environmental clearance if required under rules and the environmental clearance shall be implemented as per rules and regulations in vogue. (j) The User Agency will follow the eco friendly engineering practices during the construction. (k) The project staff & laborers involved in the construction of the road will be informed about the do's & don'ts in Ramnagar Nandni Wildlife Sanctuaries. (l) Warning/ informatory sign boards and hoardings shall be provided on the road sections passing through the Wildlife Sanctuary. (m) No borrowing of soil/ earth shall be carried out within boundary of the wildlife sanctuary. (n) No quarrying /mining operations shall be carried out within boundary of the wildlife sanctuary. (o) For control of dust emissions water sprinkling shall be carried out regularly on the road sections under execution. (p) "No Horn" signage shall be provided by the user agency at the spots where the road passes through the wildlife sanctuary. (q) Noisy construction works shall be scheduled to coincide with the period when wildlife would least likely be affected. No construction works shall be carried out during night time. (r) Monitoring of air, noise and water quality shall be carried out along the road to ensure the effectiveness of the environmental management measures. (s) Any form of poaching by anyone, particularly by the road construction workers, will be strictly prevented. In the event of any case of poaching noticed during the construction of the roads, the user agency would be held responsible. (t) The construction debris generated due to the construction of road will be disposed off in an environmental friendly manner outside the limits of the sanctuary. (u) The User Agency will ensure that littering of any kind is strictly avoided by its staff and also by construction workers. All waste material such as plastics, tar barrels, gunny sacks, bottles, tin cans etc. would be properly disposed off. No waste material will be left either near or away from the road in the Sanctuary.

	(v) The User Agency will ensure that minimum damage is done to the local flora. Cutting of local flora by construction workers would be strictly prohibited. The concerned officials of the user agency would conduct surprise checks, in collaboration with the Conservator of Forests (Wildlife), Jammu or his representative to see that no damage is caused to the flora and fauna.
15	**Comment of Ministry** The Standing Committee may like to take a view on the proposal.

4.1(3)

1	**Name of the Proposal**	Diversion of 145.26 ha of forest land falling in Dalma Wildlife Sanctuary for Subarnrekha Multipurpose Irrigation Project, Jharkhand.
2	**Name of the protected Area involved**	Dalma Wildlife Sanctuary
3	**File No**	6-95/2010 WL –I
4	**Name of the state**	Jharkhand
5	**Whether proposal is sub-judice**	Yes (I.A.no.35 of 2003 in W.P. (C) No.337/95)
6	**Area of the protected area**	193.22 sqkm
7	**Area proposal for diversion/Denotification**	145.26 ha
8	**Name of the applicant agency**	Subarnrekha Multipurpose Irrigation Project
9	**Total number of tree to be felled**	Nil
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for Wildlife** The State Board for Wildlife has recommended the proposal on 07.10.2010.	
12	**Brief justification on the proposal as given by the applicant agency.** The proposal for diversion of 145.26 ha of forestland falling in Dalma Wildlife Sanctuary for Subarnrekha Multipurpose Irrigation Project, Jharkhand was recommended by the Standing Committee of NBWL in its meeting held on 25th August 2004 with certain conditions. The present proposal is for consideration of the compliance of the conditions specified by the Standing Committee of NBWL.	
13	**Rare and endangered species found in the area** Elephant, sloth bear, mouse deer, python etc.	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden has recommended the proposal.	
15	**Comment of Ministry** The proposal for diversion of 146. 26 Ha of forest land was considered by the Standing Committee of NBWL earlier. As per the decision of the Standing Committee, a site inspection was conducted by Ms. Dilnawaz Variava and Shri S.C. Sharma, both members of Standing Committee of NBWL. The Site Inspection Team had recommended the proposal subject to certain conditions. A copy of the site inspection	

	report is attached as **APPENDIX-1 (Page to).** The report was considered by the Standing Committee of NBWL in its meeting held on 25th August 2004 wherein the Standing Committee had decided that final clearance for the project would be subject to the compliance of the conditions suggested by the Site Inspection Team. Hon'ble Supreme Court while hearing the I.A. No. 35 in Writ Petition (Civil) No. 337/1995, on 23rd November 2005 had disposed of the matter with a rider that diversion would be only on fulfillment of the conditions that have been imposed by the Standing Committee of NBWL. The Government of Jharkhand has now submitted a compliance report on the conditions suggested by the Standing Committee. The details of the conditions suggested vis-à-vis the compliance made is attached as **APPENDIX-2 (Page to)** The Standing Committee may like to take a view on the proposal.

4.1(4)

1	**Name of the Proposal**	Diversion of 6.38 ha of forest land from Umarthuna/Bassi Wildlife Sanctuary for construction of road Tejpur-Nandwai-Charcha Km 13 to Umarthuna (0/0 to 8/500) under PMGSY, Rajasthan.
2	**Name of the protected Area involved**	Umarthuna/Bassi Wildlife Sanctuary
3	**File No**	6-100/2010 WL –I
4	**Name of the state**	Rajasthan
5	**Whether proposal is sub-judice**	No
6	**Area of the protected area**	138.69 Sq. Kms
7	**Area proposal for diversion/Denotification**	6.38 ha
8	**Name of the applicant agency**	Executive Engineer, PWD Dn, Begun
9	**Total number of tree to be felled**	Nil
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for Wildlife** The State Board for Wildlife has recommended the proposal on 22.09.2010.	
12	**Brief justification on the proposal as given by the applicant agency.** The proposal is for diversion of 6.38 ha from Bassi Wildlife Sanctuary for construction of road Tejpur-Nandwai-Charcha Km 13 to Umarthuna (0/0 to 8/500) under PMGSY. The construction of proposed gravel road is situated in the Nandwas-B & Amjhariya reserve forest Block on the periphery of the Sanctuary and not likely to bring any negative impact. The proposed road is fulfils the bonafide need of local villagers.	
13	**Rare and endangered species found in the area** Panther, Hyena etc.	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden has recommended the proposal with the following conditions: 1. No night camping shall be allowed during the construction of road by labour and construction activity will be permitted only during daytime only. 2. Speed breakers will be constructed at an interval of 500 mts. in sanctuary area by user agency. 3. No tree cutting will be allowed. 4. The construction material for road will be brought from the area outside the Sanctuary. 5. The User Agency will not create barrow pit in Sanctuary area, for the construction of road. 6. User Agency will clear all the debris left after construction activity. 7. The User Agency will put and maintain sign board at every two kilometers distance on both sides of the road mentioning that the road is passing through Darrah Wildlife Sanctuary and drivers should be watchful about Wildlife and drive cautiously.	

15	**Comment of Ministry** Although the Chief Wildlife Warden has recommended that proposal with certain conditions, he has under the 'ANNEXURE "C" of the proposal certified that there will be a negative impact on the protected area as it will increase human interference resulting in negative impact on protection and propagation of flora and fauna of the protected area as the project area is situated in the heart of the sanctuary. In addition, a justification on the requirement of these roads in view of the priority of relocation of villages would be helpful for decision making. The Standing Committee may like to take a view on the proposal.

1	**Name of the Proposal**	Diversion of 3.0 ha of forestland from Basssi Wildlife sanctuary for upgradation of road Mahesara-Chhota-Kheda to Jhariya Mahadev road km 4/0 to 8/0 under PMGSY, Rajasthan.
2	**Name of the protected Area involved**	Bassi Wildlife Sanctuary
3	**File. No**	6-104/2010 WL-I
4	**Name of the state**	Rajasthan
5	**Whether proposal is sub-judice**	No
6	**Area of the protected area**	138.69 Sq. Km.
7	**Area proposal for diversion/De-notification**	3.0 ha
8	**Name of the applicant agency**	P.W.D. Dn.II, Chittorgarh
9	**Total number of tree to be felled**	
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for Wildlife** Yes, Recommended on 22.9.2010.	
12	**Brief justification on the proposal as given by the applicant agency.** The proposal is for construction of gravel road from Maesara-Chota Kheda to Jhariya Mahadev Km 4/0 to 8/0. The construction of proposed gravel road is situated in the Mahesara reserve forest block & in the mid of the sanctuary. The construction of proposed gravel road involves only 3.0 ha land of Bassi Wildlife Sanctuary and the proposed Gravel road is fulfils the bonafide need of local villagers.	
13	**Rare and endangered species found in the area** Panther, Indian Gazelle, Hyena, etc.	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife has recommended the proposal with the following condition:- 1. No night camping should be allowed during the construction of road by labour and construction activity will be permitted only during daytime only. 2. Speed breakers will be constructed at an interval of 500 mts. In sanctuary area by user agency. 3. No tree cutting will be allowed. 4. The construction material for road will be brought from the area outside the sanctuary. 5. The user agency will not create barrow pit in sanctuary area, for the construction of road. 6. User agency will clear all the debris left after construction activity. 7. The user agency will put and maintain sign board at every two kilometers distance on both sides of the road mentioning that the road is passing through Darrah Wildlife Sanctuary and drivers should be watchful about wildlife and drive cautiously.	

	Comment of Ministry Although the Chief Wildlife Warden has recommended that proposal with certain conditions, he has under the 'ANNEXURE "C" of the proposal certified that there will be a negative impact on the protected area as it will increase human interference resulting in negative impact on protection and propagation of flora and fauna of the protected area as the project area is situated in the heart of the sanctuary. The Standing Committee may like to take a view on the proposal.

4.1(6)

1	**Name of the Proposal**	Permission for 330 MW Dholpur Gas based combined cycle thermal power project stage-II from National Chambal Ghariyal Sanctuary at Dhlopur, Rajasthan.
2	**Name of the protected Area involved**	National Chambal Ghariyal Wildlife Sanctuary
3	**File. No**	6-101/2010 WL-I
4	**Name of the state**	Rajasthan
5	**Whether proposal is sub-judice**	no
6	**Area of the protected area**	280 Sq. Km
7	**Area proposal for diversion/De-notification**	**(Area not mentioned in the proposal)**
8	**Name of the applicant agency**	Rajasthan Rajya Vidyut Utpadan Nigam Ltd.
9	**Total number of tree to be felled**	Not mentioned in the proposal
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	yes
11	**Recommendation of State Board for Wildlife** Yes, Recommended on 22.9.2010.	
12	**Brief justification on the proposal as given by the applicant agency.** The Government of Rajasthan had sanctioned a 330 MW Gas based Thermal Power Project, Dholpur Stage-II during April 2004. The Stage-I of the project has already been commissioned. The **Stage-II project requires 10 cusec water from the Chambal River.** The proposed Dholpur combined Cycle Power project-II does not require any fresh land of sanctuary and forest but requires a pipeline to be laid parallel and above the existing water supply pipeline of stage-I. The proposed project is for power generation and it will improve the economy of the area.	
13	**Rare and endangered species found in the area.** Ghariyal, Dolphins, Turtles etc.	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife has while recommending the proposal indicated that Dholpur combined cycle power project Stage-I was sanctioned earlier and in that proposal 0.5429 Ha of Sanctuary land was used for the purpose. Now the proposed Dholpur combined Cycle Power Project –II does not require any fresh land of Sanctuary and forest but only requires 10 cusecs water from the National Chambal Sanctuary. The proposal has been recommended with the condition:- 1. User agency should pay 5% amount of the project cost for the better management of National Ghariyal Sanctuary.	

15	**Comment of Ministry** The Standing Committee of NBWL in its meeting held on 12th April 2010 while considering the proposals pertaining to the Dholpur Lift Irrigation Project and 4 Hydro-Power projects involving National Chambal Ghariyal sanctuary, had decided that a study be conducted by the Wildlife Institute of India, Bombay Natural History Society and World Wide Fund for Nature-India, within 9 months and submit a report. The Wildlife Institute of India has intimated that the field studies have since been completed and the final report would be submitted by first week of February. The Standing Committee may like to take a view in the matter.

4.1(7)

1	**Name of the Proposal**	Proposal for laying of optical fiber cable from Sayara to Sadri in Kumbalgarh Wildlife Sanctuary by M/s Bharti Airtel Ltd., Rajasthan.
2	**Name of the protected Area involved**	Kumbalgarh Wildlife Sanctuary
3	**File No**	6-102/2010 WL-I
4	**Name of the state**	Rajasthan
5	**Whether proposal is sub-judice**	No
6	**Area of the protected area**	-
7	**Area proposal for diversion/Denotification**	0.5076 ha
8	**Name of the applicant agency**	M/s Bharti Airtel Ltd.
9	**Total number of tree to be felled**	Not mentioned in the proposal
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for Wildlife** The State Board for Wildlife has recommended the proposal on 22.09.2010.	
12	**Brief justification on the proposal as given by the applicant agency.** The laying of proposed optical fiber cable is laid along S.H. 32 in Udaipur district and in Pali district over the length of 11.28 kms which is passing through Kumbalgarh Wildlife Sanctuary area. The laying of proposed OFC require only 0.50765 ha forestland of Kumbalgarh Wildlife Sanctuary area. The OFC will be laid along the road and having no rare endangered/unique species of Flora and Fauna.	
13	**Rare and endangered species found in the area** Leopard, Wolf, Sloth Bear etc.	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden has recommended the proposal with the following conditions: 1. No tree cutting will be allowed. 2. No night camping should be allowed by labour during laying of OCF in Sanctuary area. 3. Work will be done during the day time only. 4. Appropriate protection measures for trees/roots of trees will be provided at user agency's cost. 5. The trenches will be refilled by user agency. 6. 5% of the project cost (in sanctuary area) will be deposited for the development of the Sanctuary area by user agency.	
15	**Comment of Ministry** The Standing Committee may like to take a view on the proposal.	

4.1(8)

1	**Name of the Proposal**	Proposal for repair and black topping of existing approach road to Taragarh fort (Ramgarh Wildlife Sanctuary),Bundi, Rajasthan.
2	**Name of the protected Area involved**	Ramgarh Wildlife Sanctuary
3	**File. No**	6-103/2010 WL-I
4	**Name of the state**	Rajasthan
5	**Whether proposal is sub-judice**	no
6	**Area of the protected area**	300 Sq. Km.
7	**Area proposal for diversion/De-notification**	1.12 ha
8	**Name of the applicant agency**	High Power Transmitter, Doordarshan Kendra, Bundi
9	**Total number of tree to be felled**	Not mentioned in the proposal
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	yes
11	**Recommendation of State Board for Wildlife** Yes, Recommended on 22.9.2010.	
12	**Brief justification on the proposal as given by the applicant agency.** The proposed existing road is in a length of 2.7 km and 4.6 meter width passing through Ramgarh Wildlife Sanctuary. The existing approach road for which black topping is proposed shall have negligible adverse impact on wildlife habitat.	
13	**Rare and endangered species found in the area.** Black Buck, Indian Wolf etc.	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife has recommended the proposal with the following condition:- 1 A check post should be erected at the cost of User agency at the point where the proposed road meets with main road. 2 Speed breakers should be established by user agency at regular intervals of 500 mtrs. 3 User agency will put and maintain sign boards on both sides of the road mentioning that the road passing through the sanctuary. 4 No tree cutting would be allowed. 5 No night camping should be allowed during the repairing of road. 6 No construction material should be stored in sanctuary area. 7 User agency will clear all the debris left after construction activity.	
15	**Comment of Ministry** The Standing Committee may like to take a view on the proposal.	

4.1(9)

1	**Name of the Proposal**	The proposal is for construction of aerial ropeway from Kanak Vrindavan to Jaigarh Nahargarh Wildlife Sanctuary, Rajasthan.
2	**Name of the protected Area involved**	Nahargarh Wildlife Sanctuary
3	**File. No**	6-105/2010 WL-I
4	**Name of the state**	Rajasthan
5	**Whether proposal is sub-judice**	No3
6	**Area of the protected area**	50 Sq. Km.
7	**Area proposal for diversion/De-notification**	1.65 ha
8	**Name of the applicant agency**	Jaipur Development Authority
9	**Total number of tree to be felled**	
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	yes
11	**Recommendation of State Board for Wildlife** Yes, Recommended on 29th August 2002.	
12	**Brief justification on the proposal as given by the applicant agency.** The proposal is for construction of an aerial ropeway from Kanak Vrindavan to Jaigarh Nahargarh road involving 1.65 ha of Nahargarh Wildlife Sanctuary. The rope way would facilitate the visitors of Nahargarh fort and Jaigarh fort so that the tourists can get knowledge of rich architecture and heritage of Jaipur. At present there is only one approach road to the historic monuments at Jaigarh, which is always overcrowded and is susceptible to accidents of Wild animals. The project covers only 0.4% of the total sanctuary area.	
13	**Rare and endangered species found in the area** The proposal mentions that the Sanctuary is the habitat for Peacock, Partridges, China Coot, Great Hornbill etc.	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife has recommended the proposal with the following condition:- 1. No night camping should be allowed during the establishment of Ropeway. 2. Rope way will be operated during day time only (10 am to 6 pm) in summer and (10 am to 5 pm) in winter.	
15	**Comment of Ministry** The User agency had submitted a proposal seeking recommendation of the Standing Committee of NBWL for carrying out survey for the proposed ropeway project. The Standing Committee had considered the proposal in its 11th meeting held on 22nd May 2008 and had recommended the proposal. Now the User agency has completed the survey and has now approached the Standing Committee for recommendation. A copy of the survey report is attached as **APPENDIX-3. (Page to)** The Standing Committee may like to take a view on the proposal.	

4.1(10)

1	**Name of the Proposal**	Proposal for clearance of converting earthern shoulder into hard shoulders of existing Beawar (km 58.245) to Ghomti chauraha (km 177.00) section from km 58/245 to km 177/000 of NH-8 in Todgarh-Raoli Wildlife Sanctuary.
2	**Name of the protected Area involved**	Todgarh-Raoli Wildlife Sanctuary
3	**File No**	6-20/2010 WL -I
4	**Name of the state**	Rajasthan
5	**Whether proposal is sub-judice**	No
6	**Area of the protected area**	495.27 Sq. kms
7	**Area proposal for diversion/Denotification**	11.541 ha
8	**Name of the applicant agency**	Ministry of Road Transport & Highways (MORT & H)/PWD Rajasthan.
9	**Total number of tree to be felled**	If necessary clearing of only small bushes required at some places.
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for wildlife** The State Board for Wildlife has recommended the proposal on 22.09.2010.	
12	**Brief justification on the proposal as given by the applicant agency.** The proposal is for widening of NH-8 existing road which is already in use. The Ministry of Road Transport & Highways (MORT & H), Government of India has decided to take up the improvement of Beawar (km 58.245) to Gomti Chauraha (km 177.00) section of NH-8 having length of 118 km where the intensity of traffic has increased significantly and there is requirement of augmentation of capacity for safe and efficient movement of traffic. Improvement of Beawar (km 58.245) to Gomti Chauraha (km 177.00) section includes conversion of earthen side shoulders into paved shoulders of existing two lane road within existing Right of Way of PWD. The project road stretch between Bheruguda village (km 148.0) and Bassi village (km 160.44) having length of 12.44 km is passing through Tadgarh-Raoli Wild Life Sanctuary in Rajsamand district. Between chainage 152.5 km and 152.650 km for a length of 150m at Chhapli village, protected Forest exists on both sides of project road under Chhapli forest block. Hence, a minor forest area of 0.3450 ha is required for proposed project. The strip in the form of notified protected forest (P.F) exists along the project road from km 148.0 km to 160.44 within sanctuary area, which is required for the widening. The area required for clearance under notified protected forest within sanctuary area is 11.196 ha. Therefore, proposal for forest clearance within sanctuary (11.541 ha) is submitted. Hence, total area for clearance within sanctuary is 11.541 ha.	
13	**Rare and endangered species found in the area** Leopard, Sloth bear, Wolf, Hyena, etc.	

14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden while recommending the proposal has indicated that the NH-8 Section from Bheraguda village (148 Km) to Bassi village (160.44 km) falls in Todgarh Raoli Sanctuary and the upgradation and widening of NH-8 in this stretch requires forest area of 11.541 ha from the Sanctuary. The proposal has been recommended with the following conditions: 1. No night camping shall be allowed during the construction of road by labour and construction activity will be permitted only during day time only. 2. No construction material should be stored in Sanctuary boundary. 3. No construction material should be taken from sanctuary or Forest area like sand, soil and stone etc. 4. User agency should pay 5% amount of the project cost for the better management of Sanctuary. 5. To check the speed of vehicles, speed breakers will be constructed at an interval of 500 mts in Sanctuary area by user agency 6. The Underpass should be constructed by User agency at an interval of 1 km. 7. The User agency will put and maintain signboard on both sides of the road mentioning that the road is passing through Sanctuary. 8. Plantations in three rows on both sides along the road should be maintained by User Agency. 9. On the both sides of road boundary, pucca wall of about 1.8 mts height should be constructed by the User agency with the consultation with PA in charge (DCF). 10. No tree cutting will be allowed. 11. The User agency will not create barrow pit in Sanctuary area, for the construction of road. 12. User agency will clear all the debris left after construction agency.
15	**Comment of Ministry** The proposal was considered by the Standing Committee of NBWL in its meeting held on 12th April 2010 wherein the Committee decided that the recommendation of the State Board for Wildlife be obtained before taking a view. The State Government has now conveyed the recommendation of the State Board for Wildlife. The Standing Committee may like to take a view on the proposal.

1	**Name of the Proposal**	Proposal for construction of well foundations in Ganga River at Samneghat, Varanasi for 200 KV Sahupuri-Bhelupur Transmission line passing through Kachhua Wildlife Sanctuary, Varanasi, Utter Pradesh.
2	**Name of the protected Area involved**	Kachhua Wildlife Sanctuary
3	**File No.**	6-107/2010 WL -I
4	**Name of the state**	Uttar Pradesh
5	**Whether proposal is sub-judice**	No
6	**Area of the protected area**	
7	**Area proposal for diversion/Denotification**	0.7416 ha
8	**Name of the applicant agency**	Power Transmission Corporation Ltd. (U.P.)
9	**Total number of tree to be felled**	Nil
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for wildlife** The State Board for Wildlife has recommended the proposal on 08.09.2010.	
12	**Brief justification on the proposal as given by the applicant agency.** The proposal is for the construction of well foundation in Ganga river Samneghat, Varanasi for 220 KV Sahupuri-Bhelupur Transmission Line acrossing of the river Ganga. Passing through Kachhuwa Wildlife Sanctuary, Ramnagar, in District Varanasi.	
13	**Rare and endangered species found in the area** Not mentioned in the proposal.	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden has recommended the proposal with the following conditions: 1. Protection and mitigation measures for wildlife should be ensured as per guidelines of Government of India. 2. Uttar Pradesh Power Transmission Corporation Ltd. should provide the funds for reduction in negative impact for conservation and Eco development activities of wildlife and habitate as per guide lines of Government of India. 3. The land shall not be used for any purpose other than that specified in the proposal. The Chief Wildlife Warden has also suggested the following mitigation measures:- 1. During construction work, intense patrolling will be carried out for which logistic support from the user agency, like motorized fiber boat, search lights, life jackets, wages for the daily wage workers etc shall be provided. 2. Construction waste materials under any circumstances will not be thrown into the river, neither the debris will be left on the banks of the river. 3. Any kind of pollution specially due to lack of sanitary facilities and light and sound will be kept under control to the permissible limits. 4. User agency will ensure that none of their workers will indulge into any kind of anti-wild life activities. If this happens user agency will be held responsible. 5. During the construction period, a temporary forest Chowki with a temporary employee will be established, for which necessary payments will be provided by the user agency. 6. It should be required to take the necessary action for adopting suitable compensatory technical measure of negative impact relating water pollution.	

	7. No work shall be allowed between sun set to sun rise. 8. No labour camp shall be established in Sanctuary area.
15	**Comment of Ministry** The Sanctuary is also the habitat of the Gangetic Dolphins. As per the map enclosed with the proposal, construction of a well is proposed in the river, which may have an impact on the Dolphin movement and on its habitat. However, it may require expert opinion. The Standing Committee may like to take a view on the proposal.

1	**Name of the Proposal**	Diversion of 6.925 ha of forest land in Hastinapur Wildlife Sanctuary for strengthening and widening to four lane road existing NH-24 from Hapur to Moradabad KM 93 to KM 104.700 in J.P. Nagar district, Uttar Pradesh.
2	**Name of the protected Area involved**	Hastinapur Wildlife Sanctuary
3	**File No.**	6-108/2010 WL-I
4	**Name of the state**	Uttar Pradesh
5	**Whether proposal is sub-judice**	No
6	**Area of the protected area**	2079.00 Sq. Km.
7	**Area proposal for diversion/Denotification**	6.925 ha
8	**Name of the applicant agency**	National Highways Authority of India
9	**Total number of tree to be felled**	630
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	No
11	**Recommendation of State Board for wildlife** The State Board for Wildlife has recommended the proposal on 08.09.2010.	
12	**Brief justification on the proposal as given by the applicant agency.** The National Highway Authority of India has approved a scheme of strengthening & widening to 4 lane Standards the existing NH-24 from Hapur to Moradabad with a total length of 91.25 km. the existing NH-24 are situated on the Southern boundary of Hastinapur Wildlife Sanctuary where the widening on LHS is unavoidable:- Km 92.800 – 93.200 – 0.400 km Km 99.800 – 99.900 – 0.100 km Km 101.100- 101.600- 0.500 km Km 102.360 – 104.700- 2.340 km Total- 3.340 km In these chainages in all 630 trees and an area of 6.92 ha of protected forest is effected due to the unavoidable widening on LHS. Cutting of these 630 trees standing over an area of 6.92 ha of NH land in J.P. Nagar District is absolutely necessary to complete this project. As on date the tree cutting and land transferred proposal of RHS from Km 93.000 to 104.700 has already been approved by the Competent Authority and tree cutting work is in progress. However, the tree cutting and land transfer in the above mentioned chainages on LHS is essential to connect the widened highway on either side of these chainages. It is certified that there cannot be any other alternative to make the 4 lane highway through with minimum involvement of the area adjoining the Hastinapur Wildlife Sanctuary on LHS.	
13	**Rare and endangered species found in the area** Leopard etc	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden has recommended the proposal with suggested the following mitigation measures:- 1. Speed breakers with florescent paint warring signage's shall be constructed erected in areas where the wild animals cross the path way. The places where such works shall be carried out will be decided by the concerned DFO. 2. Melting storage and mixing of coal tar should be only inside the diverted. Any requirement of firewood for melting of coaltar by the user agency shall be met by purchasing it from the Forest Corporation and no firewood shall be collected from the nearby forest area. 3. No labour camps shall be established inside the forest/sanctuary area.	

	4. No work shall be allowed between sunset to sunrise. 5. No crushing/breaking of stone shall be allowed inside sanctuary/forests area. 6. Construction debris will be disposed outside the sanctuary area. 7. There should be safeguard measures against noise pollution. 8. The above measures in item 2 to 7 shall be taken while carrying out maintenance and repair works.
15	**Comment of Ministry** The Standing Committee may like to take a view on the proposal.

4.1(13)

1	**Name of the Proposal**	Diversion of 3.9892 ha of forest land in Hastinapur Wildlife Sanctuary for widening of existing 2 lane of NH-24 to 4 lane road from KM 86.00 to KM 93 in Gaziabad district, Uttar Pradesh.
2	**Name of the protected Area involved**	Hastinapur Wildlife Sanctuary
3	**File No.**	6-109/2010 WL -I
4	**Name of the state**	Uttar Pradesh
5	**Whether proposal is sub-judice**	No
6	**Area of the protected area**	2079.00 Sq. Km.
7	**Area proposal for diversion/Denotification**	3.9892 ha
8	**Name of the applicant agency**	National Highways Authority of India
9	**Total number of tree to be felled**	919
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for wildlife** The State Board for Wildlife has recommended the proposal on 08.09.2010.	
12	**Brief justification on the proposal as given by the applicant agency.** The existing 2 lane highway in this stretch has become too congested on account of the multi fold increase in traffic. The proposed project of widening of existing 2 lanes to 4 lanes has become absolutely essential to facilitate smooth and safe flow of traffic in the stretch. The National Highway Authority of India has approved a scheme of 4 laneing of existing 2 lane NH-24 from Km 58 to Km 149.25 i.e. Happur to Moradabad with a total length of 61.25 kms. the part of this stretch from Km 86 (Garhmukeshwar chopla) to Km 104.700 (Gajraula chopla) has the boundary of Hastinapur Wildlife Sanctuary adjoining on its Left Hand Side (LHS) and cutting of trees on LHS in scattered locations in this stretch is absolutely inescapable to compete this important project. The tree cutting on LHS involved in Ghaziabad District is in a total area of 3.9892 hectares. This project cannot be completed unless the trees in an area totaling 3.9892 ha on LHS of NH-24 adjoining the boundary of Hastinapur Wildlife Sanctuary in Ghaziabad District.	
13	**Rare and endangered species found in the area** Leopard etc	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden has recommended the proposal with suggested the following mitigation measures:- 1. Speed breakers with florescent paint warring signage's shall be constructed erected in areas where the wild animals cross the path way. The places where such works shall be carried out will be decided by the concerned DFO. 2. Melting storage and mixing of coal tar should be only inside the diverted. Any requirement of firewood for melting of coaltar by the user agency shall be met by purchasing it from the Forest Corporation and no firewood shall be collected from the nearby forest area. 3. No labour camps shall be established inside the forest/sanctuary area. 4. No work shall be allowed between sunset to sunrise. 5. No crushing/breaking of stone shall be allowed inside sanctuary/forests area. 6. Construction debris will be disposed outside the sanctuary area. 7. There should be safeguard measures against noise pollution. 8. The above measures in item 2 to 7 shall be taken while carrying out maintenance and repair works.	

15	**Comment of Ministry** The proposal was considered by the Standing Committee of NBWL in its meeting held on 17th July 2009. The Committee had decided that the proposal be resubmitted for consideration after the recommendation of the State Board for Wildlife. Now the State Government of Uttar Pradesh has conveyed the recommendation of the State Board for Wildlife. The Standing Committee may like to take a view on the proposal.

4.1(14)

1	**Name of the Proposal**	Diversion of 7.116 ha of forest land from Askot Wildlife Sanctuary for widening/Improvement of Pithoragarh-Tawagat motor road km.62.00 (Jauljibi) to km.72.00-(Biniyagaon/Dungatoli), Uttarakhand.
2	**Name of the protected Area involved**	Askot Wildlife Sanctuary
3	**File. No**	6-97/2010 WL-I
4	**Name of the state**	Uttarakhand
5	**Whether proposal is sub-judice**	Yes (I.A.No.1789 W.P No. 202/95)
6	**Area of the protected area**	-
7	**Area proposal for diversion/Denotification**	7.116 ha
8	**Name of the applicant agency**	Border Roads Organization
9	**Total number of tree to be felled**	3047
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for Wildlife** Not mentioned in the file	
12	**Brief justification on the proposal as given by the applicant agency.** The widening of proposed motor road is of high importance for National security as it will ensure surface connectivity and transport facility to armed forces upto Indo-China Border.	
13	**Rare and endangered species found in the area** Snow Leopard, Musk Deer etc	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden has recommended the proposal with the following conditions: 1. For use of the forest land, approval under the F.C. Act will be obtained. 2. NPV at the present rate will be deposited in the Compensatory Afforestation Fund alongwith an undertaking to pay additional amount as per directions of this Hon'ble Court. 3. 5% of the project cost will be deposited in the Compensatory Afforestation Fund for undertaking conservation and protection works in the Askot Wildlife Sanctuary. 4. Labour camps will be established only in the locations approved by the Chief Wildlife Warden. 5. No dumping of the debris will be allowed inside the sanctuary. The dumping will be done outside the sanctuary at the places approved by the Chief Wildlife Warden. 6. The condition imposed by the Chief Wildlife Warden for undertaking the works will be strictly complied with.	
15	**Comment of Ministry** The Standing Committee may like to take a view on the matter.	

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ANNEXURE-7

LIST OF PROPOSALS <u>FALLING OUTSIDE PROTECTED AREAS</u> TO BE CONSIDERED BY THE STANDING COMMITTEE OF NBWL

S. NO.	STATE	FILE NO.	SUBJECT
1.	Maharashtra	6-43/2009 WL-I	Proposal for construction of Funicular Trolly system and approach road at Malanggad, Ambernath, Maharashtra.
2.	Uttar Pradesh	6-86/2010 WL-I	Proposal for development of 8 lane access controlled expressway on right bank of Upper Ganga Canal (UGC) from Sanauta Bridge (Bulandshahar) to near Purkazi (Distt. Muzaffarnagar) before Uttar Pradesh-Uttarakhand border.
3.	Uttar Pradesh	6-98/2010 WL –I	Clearance for expansion of Jaypee Super Cement Plant from clinker production 2.01 MTPA to 2.50 MTPA in area of 71.96 ha of forest land in Kaimur Wildlife Sanctuary, Uttar Pradesh.
4.	Uttarakhand	6-89/2010 WL-I	Naitwari Mori HEP (60 MW) in Uttarakhand District, Uttarakhand by M/s Satlej Jal Vidyut Nigam Ltd.

1	**Name of the Proposal**	Proposal for construction of Funicular Trolly system and approach road at Malanggad, Ambernath, Maharashtra.
2	**Name of the protected Area involved**	Matheran Eco-Sensitive Zone
3	**File No**	6-43/2009 WL-I
4	**Name of the state**	Maharashtra
5	**Whether proposal is sub-judice**	No
6	**Area of the protected area**	214.73 Sq. kms (Area of Matheran Eco-sensitive zone)
7	**Area proposed for diversion/Denotification**	4.979 ha from Matheran Eco-Sensitive Zone
8	**Name of the applicant agency**	Public works Department, Government of Maharshtra
9	**Total number of tree to be felled**	Clearing of vegetation in 4.979 ha area
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for Wildlife**	Yes, approved by State Board for Wildlife in its meeting held on 20th February 2009.
12	**Brief justification on the proposal as given by the applicant agency** It has been mentioned that M/s Supreme –Suyog Funicular ropeway has been awarded a project for installing a funicular ropeway between Malangwadi to Hajimalang gad on a BOT basis by public works Department of Maharashtra Govt. Further, that there will be four carriages in two group, each group consisting of two carriages one behind the other. When one group goes upwards the other goes downwards. There will be a 1 meter wide walkway along the track for use by the maintenance staff and for use of passengers in case of an emergency. An area of 5meters on either side of the track will be fenced with chain link fencing giving a total width of 10 meters all along the track. There will be a large base station which will include a large parking area that will be constructed from the current road. Space has been allotted for putting up shops. The base station is located at an elevation of approximately 175 metres above sea level and the railway will make a total climb of 320 metres to reach the station at the top situated at 495 msl. Since the topography is hilly and uneven the funicular track will not follow the ground closely. At some points where the track elevation matches the ground elevation it will touch the ground. At points where the track elevation is below ground level there will have to be some cutting and excavation. At points where the track elevation is above ground level the track will be elevated on piers. The forest land required for the project is 5.21 ha. The duration of the entire project is 1.5 years.	
13	**Rare and endangered species found in the area** The proposal indicates the presence of wildlife species like Mouse deer, Barking deer, Leopard cat and occasionally leopards, in the area under consideration.	

14	**Opinion of the Chief Wildlife Warden:** The Chief Wildlife Warden has recommended with the following conditions:- 1. The suggestion made in it for mitigating the impact of the project on the vestigeous vegetation and Wildlife should be accepted. 2. The boundaries of the notified area of the ESZ should be demarcated remove any doubt or anomaly about inclusion or otherwise of an area on the fringes within the ESZ. 3. The Zonal Master Plan for the ESZ showing areas which are sensitive from the biodiversity aspects should prepared without any further delay.
15	**Comment of Ministry** The proposal was considered by the Standing Committee of NBWL in its 16th meeting held on 16th September 2009. During the discussions it was observed that *as per the Matheran Eco Sensitive Zone Notification, Matheran Eco Sensitive Zone Committee is in place. However, this proposal has not been shown to the Matheran Eco Sensitive Zone Committee. It is necessary that before the Standing Committee considers this proposal, recommendation of Matheran Eco Sensitive Zone Committee should also be obtained by the project proponents. With this observation, Committee unanimously directed the project proponents to do the needful and resubmit the proposal for consideration of the Standing committee after obtaining the recommendation of the Matheran Eco Sensitive Zone Committee.* It has been mentioned by the project proponents that the proposal was considered by the Matheran Monitoring Committee and was recommended in their meeting held on 15th May 2010. The Standing Committee may like to take a view on the proposal.

1.	**Name of the Proposal**	Proposal for development of 8 lane access controlled expressway on right bank of Uppar Ganga Canal (UGC) from Sanauta Bridge (Bulandshahar) to near Purkazi (Distt. Muzaffarnagar) before Uttar Pradesh-Uttarakhand border.
2.	**Name of the Protected Area involved**	The proposed project is **outside** the Hastinapur Wildlife Sanctuary
3.	**File No.**	6-86/2010 WL-I
4.	**Name of the State**	Uttar Pradesh
5.	**Whether proposal is sub-judice**	No
6.	**Area of the Protected Area**	406.32 sq km.
7.	**Area proposed for diversion/denotification**	Not indicated. However, the site is outside the Hastinapur Sanctuary.
8.	**Name of the applicant agency**	Uttar Pradesh Expressways Industrial Development Authority (UPEIDA)
9.	**Total number of tree to be felled**	-
10.	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11.	**Recommendation of State Board for Wildlife**	The State Board for Wildlife has recommended the proposal on 08.09.2010.
12.	**Brief Justification on the proposal as given by the applicant agency** The proposed project is 8 lane access controlled expressway on right bank of Uppar Ganga Canal (UGC) from Sanauta Bridge (Bulandshahar) to near Purkazi (Distt. Muzaffarnagar) before Uttar Pradesh-Uttarakhand border. The nearest boundary point of Hastinapur Sanctuary is situated more than 650 m away on left bank side of Upper Ganga Canal at Canal Chainage (km 71.040 at Belra).	
13.	**Rare and endangered species found in the area** Leopard, etc	
14.	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden has recommended the proposal with the following conditions:- 1. During construction phase, User agency will ensure that none of their employees and workers shall indulge into any kind of anti-wildlife activities through prohibitory measures and awareness programmes. 2. A green belt along the highway should be developed to abet air and noise pollution. 3. Suitable underpasses should be constructed to enable wildlife movement.	

15.	**Comments of the Ministry** The State of Uttar Pradesh has not forwarded proposal for declaration of Eco-Sensitive Zones around its Protected Areas. A proper Master Plan for the management of the Eco-sensitive zones as envisaged under the Environmental Protection Act would be required for any activity within an Eco-sensitive zone. However, it is a general comment. The Standing Committee may like to take a view on the proposal.

4.2(3)

1	**Name of the Proposal**	Permission for expansion of Jaypee Super Cement Plant from clinker production 2.01 MTPA to 2.50 MTPA in Kaimur Wildlife Sanctuary, Uttar Pradesh.
2	**Name of the protected Area involved**	2.1 Kms outside the boundaries of Kaimur Wildlife Sanctuary
3	**File No**	6-98/2010 WL –I
4	**Name of the state**	Uttar Pradesh
5	**Whether proposal is sub-judice**	No
6	**Area of the protected area**	500.73 sq km
7	**Area proposal for diversion/Denotification**	The project is 2.1 Kms outside Kaimur Wildlife Sanctuary
8	**Name of the applicant agency**	M/s Jaiprakash Associates Ltd.
9	**Total number of tree to be felled**	Nil
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for Wildlife** The State Board for Wildlife has recommended the proposal on 08.09.2010.	
12	**Brief justification on the proposal as given by the applicant agency.** The project site is 2.1 km away from the boundary of Kaimur Wildlife Sanctuary. The project is to utilize the mineral reserves of the area optimally for projection of clinker and cement, thereby setting in motion the process of rapid industrialization and growth in the region. The project will generate substantial direct and indirect employment the benefits of which will percolate to the inhabitants of the surrounding area resulting in improvement in the overall socio economic development of the area.	
13	**Rare and endangered species found in the area** Chinkara, black buck, leopard, etc	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden has recommended the proposal with the following conditions: 1. It shall be ensured that strict measures are taken to control emissions including particulate matters within the permissible limits. Monitoring of ambient air quality with the permission of Sanctuary Management, shall be carried out in the sanctuary every 3 months on regular basis and the report be submitted to the Sanctuary Manager. 2. Effluent from the plant in no case should be discharged in the river Son. 3. A green belt should be developed around the plant outside the Sanctuary, so as	

	to abet the air pollution. 4. User agency will ensure that none of their employees and workers shall indulge into any kind of anti-wildlife activities through prohibitory measures and awareness programmes.
15	**Comment of Ministry** The State of Uttar Pradesh has not forwarded proposal for declaration of Eco-Sensitive Zones around its Protected Areas. A proper Master Plan for the management of the Eco-sensitive zones as envisaged under the Environmental Protection Act would be required for any activity within an Eco-sensitive zone. However, it is a general comment. The Standing Committee may like to take a view on the proposal.

4.2 (4)

1	**Name of the Proposal**	Naitwari Mori HEP (60 MW) in Uttarakhand District, Uttarakhand by M/s Satlej Jal Vidyut Nigam Ltd.
2	**Name of the protected Area involved**	0.5 Kms from Govind Wildlife Sanctuary
3	**File. No**	6-89/2010 WL-I
4	**Name of the state**	Uttarakhand
5	**Whether proposal is sub-judice**	No
6	**Area of the protected area**	472.08 Sq. Km.
7	**Area proposal for diversion/Denotification**	47.0365 ha
8	**Name of the applicant agency**	M/s. Satlej Jal Vidyut Nigam Ltd.
9	**Total number of tree to be felled**	Nil
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for Wildlife** Not mention in the proposal	
12	**Brief justification on the proposal as given by the applicant agency.** The proposed project is located 0.50 kms outside Govind Wildlife Sanctuary with is likely to have minimal impact on the PA. The CAT Plan includes afforestation, soil conservation measures, capacity building and extension, water conservation, treatment of agricultural land, fire management, habitat improvement, eco development works such as livelihood improvement etc. The impact of the project is same as the area proposed for diversion/acquisition. The submergence area of 4.90 ha, which is in private and Civil soyam land is also included in the total area of the proposed project. This being a 'run of the river' hydro electric project will have no impact on the adjoining area. Out of total area proposed for diversion/acquisition the area of tunnel and power house are under ground and will have no impact on the surrounding area after the project is completed.	
13	**Rare and endangered species found in the area** Leopard, musk deer, snow leopard, Barking deer etc.	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden has recommended the proposal.	
15	**Comment of Ministry** The State of Uttarakhand has not forwarded proposal for declaration of Eco-Sensitive Zones around its Protected Areas. A proper Master Plan for the management of the Eco-sensitive zones would be required as envisaged under the Environmental Protection Act for any activity within an Eco-sensitive zone. However, this is a general comment. The Standing Committee may like to take a view.	

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Suggested additional agenda for 21st Standing Committee meeting, 24th January 2011.

There should be a provision for the NBWL members to check/monitor in the field whether the recommendations are properly implemented:
Dr. A.J.T.Johnsingh.

Eradication of *Ipomoea carnea* from Indian fresh water landscape*: I .carnea*, like *Lantana* has come from the American tropics as an ornamental plant. Because of its large pink flowers it is called as Pink Morning Glory. Its leaves are toxic to cattle and therefore it should be the case with all wild ungulates. In India the problems caused by this noxious plant are many fold. Toxicity of this plant may affect fish abundance also. We don't have any information on this. Smaller water bodies get totally encroached by this weed leading to drying up and desiccation of the water bodies. When this weed grows along the edge of the tanks it denies habitat to species like waders that feed along the edges and ducks and teals that like to rest on the shores. When the growth of the plant around the tank is rampant the open waters in the middle of the tank are avoided by species like pelicans and ducks. While we talk about fresh water conservation and declining water table, a major problem in our country, surprisingly there are no discussions about the need to totally eradicate this useless and problem species from Indian freshwater landscape. **Dr. A. J.T. Johnsingh**

Eradication of *Cassia spectabilis* from Bandipur and Bhadra landscape:
C. spectabilis is a fast growing small to medium size tree. It is a species of the family Fabaceae (legume family) and is native to American tropics. Its golden yellow flowers come in clusters and when the tree is in full bloom it looks spectacular and hence the name *spectabilis*. Its conical bunch of abundant and conspicuous flowers and compound leaves with pointed leaflets can help anyone identify the species. I became aware of this species during my recent visits to Bandipur TR where the species is invading the Reserve from the tourism complex where a few trees have been planted for ornamental purposes. Wild pigs, which frequent the tourism complex, possibly disperse the species by feeding on the fruits and dispersing the seeds. The problem

with the species is it is not eaten by any ungulate even by the versatile sambar. Therefore the species spreads rapidly and in Bandipur it has already spread for a kilometer radius around the tourism complex. It grows forming dense thickets and below which growth of other plants is negligible.

I have observed the similar phenomenon happening in Bhadra TR where the species has invaded the Muthodi Range from the abandoned nursery at the site where the translocated Muthodi village once stood. In both the places I have urged the forest officials to eradicate the species from the Reserves as early as possible. There should be a ban on planting this species in the forest areas and if found in forest areas the species should be immediately eradicated by digging and uprooting the entire sapling/tree. **Dr A.J. T.Johnsingh**.

Eradication of *Opuntia dillenii* and *Prosopis juliflora* from Mudumalai-Sathyamangalam landscape: *Opuntia dillenii*, commonly known as Erect Prickly Pear, is another native of tropical America and was possibly introduced in India as an ornamental plant for its lemon-yellow flowers and purplish-red fruits. Possibly the seeds get dispersed by frugivorous birds which may feed on the fleshy pulp-coated seeds. *Opuntia* is a xerophytes (a species of the dry habitat), has sharp long thorns and is abundant in the the Masinagudi Range of Mudumalai WLS, Singara and Sigur Ranges of Nilgiri North Forest Division and the newly established Sathyamangalam Blackbuck Sanctuary. The area occupied by this unwanted species could easily be around 100 sq.km. Eradication of this unwanted species from these forests would significantly improve the quality of the habitat for chital and blackbuck as its total removal will create open areas preferred by these ungulates. We are not sure what harm it is causing to the soft-padded tiger and leopard which also occur in these forests. A machine like a smaller form of JCP fitted with tractor tyres, which can be driven in the *Opuntia* habitat, which fortunately is not very hilly, should be fabricated and used for uprooting this weed. In places where the machine can't go a properly equipped team of men and women with strong gloves, boots and tools for uprooting, pulling and cutting, should remove the remnant *Opuntia*.

Eventually all the collected *Opuntia* should be piled and dried up in different places and burnt.

P. juliflora causes problem by invading the habitat profusely and by making the vegetation dense it reduces the quality of the habitat for blackbuck which prefers a habitat with large meadows for yarding as well as for sexual displays. Although its fruits are eaten by almost all ungulates (leaves are not very much relished) its sharp and powerful thorns can be a deterrent to both large herbivores and predators. At a great cost and effort it has been controlled in protected areas such as Velavadar NP and in Keoladeo Ghana NP where this problem species has invaded every nook and corner of the NP. *P juliflora* should be eradicated from the newly proposed Sathyamangalam Tiger Reserve. **Dr. A.J.T. Johnsingh**.

Conversion of 0.22 air rifles as .22 rifles: Prof. Peter Selvaraj from Tamil Nadu reports that some wealthy youth in south India modify .22 air rifle as 22 rifle and use them to poach animals like chital and blackbuck. reports that one can buy .22 air rifle for Rs. 5000 and convert it into 22 rifle by giving Rs 3000 to a lathe worker. His suggestion is the country should cancel all licenses for 0.22 rifles and ban the use of 0.22 air rifles by the public. This may be discussed: **Prof. Peter Selvaraj, PhD, Lady Doak College, Madurai, Tamil Nadu**

Death Trap on the Panaji-Belgaum National Highway: Bhagawan Mahavir WLS & NP are divided by a 13 km stretch of Panaji-Belgaum National Highway which has heavy traffic of trucks carrying iron ore and other speeding vehicles. The road has a climb of 79 m from the Goan side to 220 m at the Goa-Karnataka border. Possibly to keep the vehicles cool there is much of the driving is done at night. This Ghat Section is accident prone and hence the Highway Authorities have fenced the valley portion with 40cm high corrugated plates, supported by iron beams, to prevent rolling down of vehicles from the road. This fence, however, has a 50 cm gap between the ground and the fence. Animals like chital jump over the fence, get trapped on the road and get killed. Smaller animals like porcupine and mouse deer go

below the fence and often get killed. As per the local information 30 to 40 road kills are noticed every year and sometimes injured animal run down the track and die unnoticed. All along the 13 km stretch of road there are in total 15 locations where the animals can cross. The suggestions are the gap below the fence should be closed; the height of the fence should be increased and in locations where the animals can cross there should be no fence but good speed breakers on the road on either side of the potential point for crossing: **Suneel Korajjkar, President, Green Cross, Goa**

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Dear Shri Jairam Ramesh,

You would recollect my writing to you some 4 months ago regarding the need to declare Mansinghdeo, which is adjacent to the Pench Tiger Reserve, as a Sanctuary. You had promptly written to the Chief Minister of Maharashtra in this regard, as a result of which the Sanctuary was notified on 2nd November, 2010, an action that had been pending for more than 2 decades.

However, a very disturbing news has appeared in the Times of India on 11-01-2011, a scanned copy of which I am herewith enclosing. This report has been further endorsed by very reliable sources who have gone to this spot and have taken pictures of the damage done, which also I am enclosing.

Both you and the rest of us are aware of the misuse that is made of the forest under the guise of "silvicultural operations" and I would beseach you to kindly issue necessary directions that all such permissions, if indeed any really need to be granted, must be done under the supervision of the Regional Office of the MoEF and at the end of it the latter must certify that the work has been scientifically carried out as per the norms of the working plan and there is no over exploitation. We all know what has been going on in the Buxa Tiger Reserve under the pretext of habitat management and that is why when the Wild Life (Protection) Act was amended in the past, I had made a provision that all material extracted under the provision of the Act which allows habitat manipulation, must be given to the local communities and not sold commercially.
Even then the FD still finds ways to bypass this proviso.

In the instant case of Mansinghdeo Sanctuary, I refuse to believe that the FDCM was not aware that the Sanctuary had been notified on the 2nd of November and was not aware of this occurance till the 20th of December, by which time they had already done the extraction from 23 compartments of the Sanctuary. As I had explained to you personally, the reason why Mansinghdeo was not being declared as a Sanctuary since my 2nd tenure as Director of Wildlife in the late 1980s despite the efforts of many of us, was that the FDCM wanted to continue its exploitation. Now that they could not prevent its notification any longer, they could not resist the temptation of taking their last pound of flesh.

I feel that an enquiry is needed in this regard. What is more, an enquiry is

also called for as to why MoEF gave the permission on Sept. 9, 2010, for "Thinning" the forest in this region, which had already been declared as a part of the 583 sq.kms buffer of the Pench TR of Maharashtra and is in fact on the very border of this TR. Did the MoEF consult the NTCA before giving this clearance to thin and extract forest produce from a buffer of a TR ? Some policy decisions need to be taken with regard to any clearances pertaining to the buffer areas of tiger reserves and Natioanal Parks, if they have not been taken already.

I would request that these issues be taken up for discussion in the forthcoming 21st meeting of the Standing Cmmittee of the NBWL, which regrettably I will not be able to attend as I am travellng abroad and would request you to give me leave of absence.

Dr. M K Ranjitsinh

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Agenda items for the proposed meeting of the Standing Committee of National Board for Wildlife to be held on 24th January,2011 at MOEF, New Delhi.

1) **Declaration of ESA:** I support the agenda item proposed by Ms. Prerna Bindra in this regard that no development projects etc in ten km around PAs will be entertained by the standing committee till the states declare the Ecologically Sensitive Areas (ESAs.)

2) **Need for a sub committee to frame special guidelines for wildlife protection in rural areas due to electrocution threat :**

The St. Committee should form a sub committee comprising of members from NBWL, Power Ministry, CEA to study threats and frame guidelines for protective measures/safety features to be installed in rural electrification distribution systems to protect wildlife,

Justification :
Under the Rajiv Gandhi Grameen Vidyutkaran Yojana (RGGVY) , the Ministry of Power, Govt. of India has provided massive funds to states to boost the rural power network to enable remote villages to get electricity including . While such a program is welcome to provide the rural residents with power, without adequate safeguards, this shall result in huge loss of wildlife, especially the highly endangered elephants. Already Orissa has lost **87 elephants due to electrocution during the last 10 years** most of which could have been avoided if adequate safety guidelines had been adopted and followed. During field observations in some forest areas of Orissa, we noticed the under mentioned lack of safety measures in the rural electrification projects.....

- Ø The supply poles were often installed in paddy fields or soft ground areas without adequate concrete foundations which can lead to poles leaning during the monsoon thereby leading to wire sag which could electrocute passing elephants.

- Ø None of the supply poles have a barbed wire shield which would prevent elephants from rubbing against them and causing them to fall.

- terminals of the pole mounted step down (from 440V to 220 V) transformers are close to each other and are not insulated. Perching birds especially large predators like owls, hawks, eagles, vultures shall be instantaneously electrocuted if they try to perch on such terminals. All such species are protected under the Wildlife Protection Act, 1972 and hence we need to save them from electrocution. We also need to insulate the transformer terminals, lead wires and the distribution bus conductor that connects to the 220 V supply wires.

We believe safety features for protecting elephants need to be in place in every electricity system within any forest area or PA and also within 10kms of forest boundary or a PA of every elephant range division of India. Similarly safety features for providing insulation to prevent electrocution of birds need to be installed in all rural electrification schemes irrespective of whether the villages are within or near forest areas since birds are found everywhere.

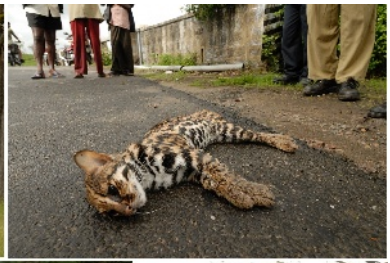
We request you to kindly place these two agenda items before the Standing Committee for deliberation.

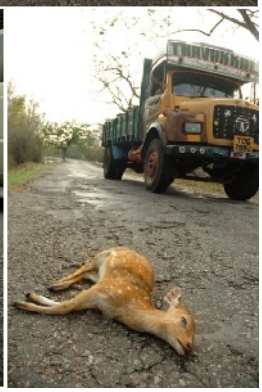
Framing ecologically sound policy on linear intrusions affecting wildlife habitats

Background paper for the National Board for Wildlife








Prepared by
T. R. Shankar Raman
Nature Conservation Foundation, Mysore
20 January 2010

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Cover photographs

Clockwise from top left:
Railway line through Hollongapar Gibbon Wildlife Sanctuary (Narayan Sharma)
Penstock pipes to Sholayar power house Anamalai Tiger Reserve (T. R. Shankar Raman)
Wildlife on the road: elephant crossing and raodkills (Kalyan Varma)
Canal from Bhoothathankettu (Thattekkad) to Kalady (James Zacharias)
Hgh-tension powerline fragmenting rainforest in Vazhachal Reserved Forest (T. R. Shankar Raman)
Tetrapods along the coast in Lakshadweep (Kartik Shanker)

Framing ecologically sound policy on linear intrusions affecting wildlife habitats

1 INTRODUCTION

Man-made linear infrastructure such as roads, highways, powerlines, railway lines, canals, pipelines (water, gas, petroleum), electric fences, and firelines, are now widely recognised to have many highly detrimental ecological effects in both terrestrial and aquatic natural ecosystems. Such linear intrusions into natural areas cause habitat loss and fragmentation, spread of invasive alien species, desiccation, windthrow, fires, animal injury and mortality (e.g., roadkill), changes in animal behaviour, increased developmental, tourist and hunting pressures, increase in pollution, garbage, and various disturbances. They may also have negative effects on indigenous and marginalised people, rural and forest-dwelling communities both directly through exposure to new social and market pressures, loss of land and relocation, as well as by inequitous distribution of costs and benefits from infrastructure projects. In present-day India, infrastructure expansion and proliferation of linear intrusions without heed to ecological and social impacts is creating immense pressures on natural areas, thereby compromising the long-term value of these areas, their ecosystem services, and imperilling the prospects for more holistic and sustainable development.

Most of the linear intrusions implicated in such ecological and social impacts are considered crucial infrastructure for economic sectors such as transportation, power, and irrigation. Modern improvements, incorporating landscape and ecological considerations, on the design and placement of linear infrastructures are available but remain virtually ignored. Many infrastructure projects are also frequently implicated in poor and unlawful practices in relation to project development, implementation, monitoring, and appraisal. While a range of legal stipulations, orders and guidelines exist, these are not well organised, often ignore important ecological and social science considerations, are poorly enforced by authorities, and frequently flouted by project proponents. Affected parties seek redressal through litigation, activism, or media pressures resulting in revisions, cancellations, or delays in project implementation. This situation urgently requires the formulation of a comprehensive and broadly applicable national policy and appropriate rules for implementation of ecologically sound practices and alternatives to harmful linear intrusions in natural areas.

2 THE NATIONAL BOARD FOR WILDLIFE INITIATIVE

During the 5th meeting of India's National Board for Wildlife (NBWL) held on 18 March 2010, under the Chairmanship of the Honourable Prime Minister, it was decided that there is a need to evolve guidelines to mitigate the growing impact of various linear intrusions such as roads, pipelines, transmission lines, etc., in wildlife habitats. It was also decided that project authorities would be actively encouraged to provide alternative alignments to bypass Protected Areas. Earlier, at a meeting convened by the Secretary, Ministry of Environment and Forests on 22 December 2008, the non-official members of the NBWL presented that most highway projects were trying to force a *fait accompli* by making huge public investments and starting work on non-forest land and then approaching the Ministry for permissions for sections passing through Protected Areas. The members suggested that grants of *ex post-facto* approvals must be stopped and that the Regional Office must prosecute violations. It was also suggested that every proposal must contain a detailed report on alternatives explored and reasons why it is not feasible along with a signed undertaking that work has not been started on forest land or non-forest land. The matter was referred to the Standing Committee of the NBWL for deliberation.

In the 20th meeting of the Standing Committee of the NBWL held on 13 October 2010, it was discussed that linear intrusions were a serious issue and a sound policy needs to be framed consulting various experts. The Chairman requested the member of the Standing Committee from the Nature Conservation Foundation, Mysore, to prepare a background paper that could be discussed at the next meeting to move towards the formulation of a policy on linear intrusions at the national level. An effort was then made by the member to collate existing information, consult subject experts and other members of the NBWL. This background paper summarises findings and key concerns and proposes an outline of urgently-needed policy measures, rules for practice, implementation and monitoring.

3 GOALS AND MISSION STATEMENT

GOAL: To establish, as an essential part of long-term sustainable development in India, ecologically-sound policy and practice in the creation, maintenance, removal, and realignment of linear infrastructures in order to avoid or minimise the negative impacts on natural areas and biodiversity.

MISSION: To re-design and re-engineer ecologically-sound policy and praxis to protect and restore the ecology of natural areas threatened or negatively affected by linear intrusions such as roads and highways, canals, pipelines, transmission powerlines and electric fences, railway lines, firelines, sea walls, and other such man-made structures and clearings.

Challenge: To meet the requirements of a growing economy and need for reliable and safe transportation, communication, power, and irrigation infrastructure while avoiding or minimising negative impacts on nature conservation and ecological sustainability.

Opportunity: To integrate the best knowledge from ecology, engineering, and other sciences including the social sciences to ensure that biological and physical systems in the landscape are considered along with human needs and applied to shape and preserve our landscapes and communities into the future in an ecologically-sound, cost-efficient manner.

Road through forest with speed breaker (Photo: A. J. T. Johnsingh)

4 IMPACTS OF LINEAR INTRUSIONS: THE SCIENTIFIC BASIS

4.1 Roads and highways

With over 3.3 million kilometres of roads, India has second largest road network after the USA. This is also poised to expand rapidly due to targets sets by the Ministry of Road Transport. This extensive network of roads and the associated vehicular traffic cause a number of impacts on natural areas and wildlife species. The effects of roads is now a serious global concern, spawning hundreds of research studies in the emerging field of road ecology that focusses on the interaction of organisms and the environment linked to roads and vehicles (Spellerberg 2002, Forman *et al.* 2003).

Wildlife populations often decline due to the cumulative impacts of roads over time. It is important to note that it is not merely the length of the road (or area under the road surface itself) that is of relevance in assessing impact but many additional factors (Rajvanshi *et al.* 2001). As these different impacts can affect varying extent of areas on either side in the habitats that they pass through, the cumulative impact of roads and the road network can be substantial and severe or more detrimental than other effects such as forestry or land-use conversion. **The area of forest habitat affected by roads (ecological footprint) may be much larger than the actual cleared footprint due to negative edge effects that penetrate the forest to varying distances** (Goosem *et al.* 2010). Broadly, the various impacts of roads be categorised as:

- Roads as cause for wildlife mortality (roadkill)
- Roads as cause for habitat loss and degradation
- Roads as barriers, and cause for habitat fragmentation
- Roads as conduits for invasive alien species
- Roads and genetic effects on animals
- Roads as cause for landslides and soil erosion
- Roads through closed-canopy forests: effects on arboreal animals and vegetation
- Road impacts on aquatic ecosystems
- Roads as ecological traps
- Roads and change in animal behaviour
- Roads, people and pollution
- Road impacts on local and indigenous peoples
- Roads as a drain on public money and economic valuation of roads

Roads as cause for wildlife mortality (roadkill)

Perhaps the most obvious direct effect of existing roads is the effect on faunal mortality and injury due to collisions with vehicles. The few studies that are available from India, indicate a grave situation already (**Annexure 1**). A wide variety of species are affected, ranging from invertebrates and herpetofauna, to many birds and mammals, including large mammals such as Asian elephants and sambar and carnivores such as tiger and leopard. A study from Mudumalai Tiger Reserve, found road mortality of 40 animal species, including amphibians, reptiles, birds, and mammals (Baskaran and Boominathan 2010). Reptiles and amphibians are amongst the most severely affected taxa. In Kaziranga, a survey revealed 21 species of reptiles to suffer from road mortality (Das *et al.* 2007).

Studies also reveal that rates of road kill, measured on a per kilometre or per km/day basis can also be substantial. In Sharavathi river basin **amphibian kill rate on roads averaged around 10 kills/km per day on a National Highway** during the monsoon (Seshadri *et al.* 2009). A study in Nagarahole – Bandipur in southern India, with traffic intensity of 50 – 100 vehicles/hour around noon, found 40 kills/10 km per day of insects such as butterflies and dragonflies, doubling over the weekends with increased traffic. A rough calculation indicates that vehicles here kill around 15,000 insects every year in just that 10 km of road (Rao and Girish 2007). In the Anamalai hills of southern

India, a study of road kills of reptiles and amphibians found that around 6 were killed per 10 km of road every day during the monsoon (Vijayakumar *et al.* 2001). Conservative extrapolation would suggest that a 100 km stretch of road through forests here witnesses an annual kill of around 10,000 amphibians and reptiles, a large proportion being species endemic to the Western Ghats. This estimate, based on a study carried out 10 years ago when traffic volumes were lower, may need to be revised upwards following widening of roads and unregulated, ill-planned tourist influx in recent times (Raman 2009). Rajvanshi *et al.* (2001) also reported **numbers of large mammals, including species such as tigers, lions, leopards, and sambar in roadkills within Tiger Reserves, National Parks and Wildlife Sanctuaries.** Nation-wide figures for these and many other threatened mammal species are not available.

Even when dead animals on the road are noticed, other pervasive problems related to the road within forest areas are overlooked. This includes animals killed during road construction, earthwork and annual maintenance operations, particularly slow-moving and burrowing species such as turtles, snakes, and soil fauna. Direct impacts include plant and animal death caused by road construction equipment (Goosem *et al.* 2010).

No study has yet comprehensively addressed all animal taxa from invertebrates such as snails and ants to large creatures such as peafowl and elephants in a given location. Even the studies carried out so far may underestimate the true damage. Many animals are struck and badly wounded by vehicles along roads but manage to flee or drag themselves away from the road corridor to die unseen and unrecorded by researchers some distance away. It is not unusual for road-killed animals to be removed off the road or consumed by scavengers, including people, and thereby the kills go unrecorded. Another compounding factor is the attraction of animals to road-killed carcasses, which may lead to further deaths from speeding vehicles until the carcass is safely disposed away from the road.

Some forest managers and highways engineers erroneously believe that the number of animals killed on roads is an indicator of a healthy animal population (T. R. S. Raman, pers. obs.), despite no scientific evidence for such a claim. Available evidence strongly points to the contrary. The additional mortality on roads can tilt the demographic scales against a population that already grapples with various natural factors and human-caused disturbances for survival. Studies from elsewhere have revealed that the negative effects of high traffic density can be as serious as direct loss of forest cover for amphibians, with a need to avoid or regulate traffic at low density for up to 2 km around breeding ponds if frog diversity is to be conserved in the landscape (Eigenbroda *et al.* 2008). Another study estimates that if 10% or more of the adults annually risk being killed by vehicles along roads near breeding areas, the population will eventually perish (Gibbs and Shriver 2005). While estimates of population-level mortality rate are unavailable from India, studies from other areas have revealed that these can be severe and approaching critical thresholds of survival. A study in Denmark, by Hels and Buchwald (2001) showed that in a road with a traffic load of 3207 vehicles/day, probability of an amphibian being killed ranged from 34% to 61%, increasing up to 98% while crossing a motorway. In the same study, it was found that annually 10% of the entire adult population of three frog species was being killed on the road.

Fahrig and Rytwynski (2009) performed a comprehensive review of the empirical literature on effects of roads and traffic on animal abundance and distribution. Of 79 studies, with results for 131 species and 30 species groups, **the number of documented negative effects of roads on animal abundance outnumbered the number of positive effects by a factor of 5.** In total, 114 responses were negative, 22 were positive, and 56 showed no effect. Amphibians and reptiles tended to show negative effects, birds mainly negative or no effects, with a few positive effects for some small birds and for vultures. Small mammals generally showed either positive effects or no effect, mid-sized mammals showed either negative effects or no effect, and large mammals showed predominantly negative effects. The authors conclude that **the evidence for population-level effects of roads and**

Roadkill of animals due to collisions with speeding vehicles is a direct and increasing threat to wildlife in natural areas of the country. Clockwise from top: lion-tailed macaque in a road through rainforest fragment in the Anamalai hills (Photo: Kalyan Varma), sambar killed in Bijnor Forest Division, Uttarakhand (Photo: A. J. T. Johnsingh), monitor lizard roadkill (Photo: Kalyan Varma), pit viper killed on rainforest road (Photo: T. R. Shankar Raman), two red foxes killed on road, probably while trying to scavenge on a langur killed on the same spot (Photo: A. J. T. Johnisngh)

traffic is already strong enough to merit routine consideration of mitigation of these effects in all road construction and maintenance projects. In a related study, Rytwynski and Fahrig (*in press*) found that among mammals, those species with lower reproductive rates, larger home ranges, or body size were more vulnerable and suggest that *priority should be placed on mitigating road effects on large mammals with low reproductive rates*.

A key concern in India is that a large number of Protected Areas have existing State Highways (SH) and National Highways (NH) and other roads passing through them. The *laissez faire* approach to existing roads and highways, as well as all proposed expansion and widening, pose serious threats to wildlife that need to be addressed.

Roads as cause for habitat loss and degradation

There is direct loss of habitat during establishment and maintenance of roads and highways. This may happen due to clearing of vegetation, dumping of excavated earth and materials, movement of heavy vehicles and earth-movers, creation of labour camps etc. The effects of these disturbances may persist in the landscape for years to decades.

The road surface and clearing on either side represent direct habitat loss (Photos: NCF)

No study has yet catalogued the extent of roads through natural areas, especially forests, across India or the loss of forest cover due to roads. A notable exception, from Garo Hills in Meghalaya, showed that just in this region, an area of 456 ha of biodiversity-rich forest was lost to roads between 1971 and 1991 (Bera *et al.* 2006).

In four tiger reserves in Karnataka, a geographic information system analysis showed that they have a high **road density**: around one km of forest road per square kilometre of forest (Gubbi 2010). This network of roads increases in tourism zones. The tourism zone in Bandipur Tiger Reserve has a road density 2.25 km of road per square kilometre of forest, and the road density is so high that the distance between one road and another is less than 50 m in some places (Prasad 2009). Taking just the 800 km of road in Bandipur Tiger Reserve (Gubbi 2010), and assuming an average width of 10 m of the road itself, this translates into 800 hectares (8 km²) of direct habitat loss.

Clearing on either side of these roads as 'viewlines' for wildlife resulting in a cleared width of 30 – 40 m, imply that the direct loss of habitat due to associated roadside clearing can be even higher. Prasad (2009) also found that **tree death is 250% higher along roads than forest interior**. Besides the direct cleared area of the road and viewline, we need to consider the physical and biotic (plant and animal communities) characteristics such as weed invasion and tree death, which are **added edge effects spreading on either side of the cleared area**. Laurance *et al.* (2009) in a review state that tropical forests within 50 – 100 m of edges experience greater diurnal fluctuations in light, temperature and humidity, being typically drier and hotter than forest interiors, with elevated tree mortality, numerous canopy gaps and a proliferation of disturbance-adapted vines, weeds and pioneer species. In such a situation, the impacted area is likely to be at least 100 m wide along roads (even higher in wider roads, highways, and tourist roads with viewlines). An average width of 100 m of impacted zone along roads implies that **in Bandipur, direct road-related habitat loss and degradation covers around 8000 hectares or 80 km² (~10% of the total park area)**. **In other words, each kilometre of road directly and detrimentally affects at least 10 ha of habitat** (comparable figures for federal highways in the US are 13.5 ha per km of road, Goosem 1997, 2007).

Eagle's eye-view of Bandipur Tiger Reserve dissected by linear intrusions such as roads, viewlines, and powerlines (Courtesy: Google Earth)

Indirect impacts of habitat loss also include displacement of individuals that may eventually die from predation or the greater competition and less resources for each animal in the adjacent habitats into which animals are forced. Some species with high fidelity to home range will be detrimentally affected as they resist shifting and are forced to continue in the same cleared or degraded location. In an example from Australia, the fate of several tree kangaroos was dramatically affected by clearing as described by Newell (1999). During his study of radio-collared individuals in a rainforest fragment, half of the study area was unexpectedly cleared. All of the individuals returned to their original home range shortly after the clearing and continued to reside amongst the fallen debris for up to a year. In the long-term, only those individuals whose home range was largely unaffected survived, while canine predators gradually killed the others.

In forest areas, road-related clearing may also result in higher wind-speeds that may negatively affect trees, increase stress due to desiccation and damage and mortality from wind-throw. Goosem *et al.* (2010) note that increased wind speeds can generate greater wind shear damage to trees, especially those which are no longer supported by the canopy interconnections found in intact forest (Laurance *et al.* 2000). Recent research has shown similar reductions in large trees near highway edges in the Wet Tropics World Heritage rainforests of Australia (Pohlman 2006).

Tall dipterocarp and other trees windthrown along a road through rainforest in Western Ghats (Photos: NCF)

A serious related concern in terms of habitat degradation is also **off-roading by vehicles** in sensitive habitats, including the use of off-road vehicles (ORVs) such as mountain bikes and sports-utility vehicles (SUVs). In locations ranging from montane grasslands of the Western Ghats to various forest types in the plains, beaches, and cold deserts of Ladakh, off-roading is emerging as an 'outdoor sport', leading to much destruction of vegetation, soil erosion, and destruction of habitat such as feeding and nesting grounds. Roads provide access and delivery of people and vehicles to such locations where off-roading occurs.

A recent review of the effects of roads and other infrastructure on populations of 234 mammal and bird species (from 49 studies) showed that density declined with their proximity to infrastructure. **The effect of infrastructure on bird populations extended over distances up to about 1 km, and for mammal populations up to about 5 km. Mammals and birds seemed to avoid infrastructure in open areas over larger distances compared to forested areas, which could be related to the reduced visibility of the infrastructure in forested areas (Benítez-López *et al.* 2010).**

Roads as barriers, and cause for habitat fragmentation

While the effects of large-scale land-use change such as agriculture on habitat fragmentation are widely recognised, the impacts of "**internal fragmentation**" of remaining continuous and remnant forests subdivided by internal clearings for highways, roads, railways, powerlines and pipelines is often overlooked (Goosem 1997, 2007). Roads and their verges can be barriers to the movements and seasonal migration of wildlife. The factors contributing to barrier effects are: loss of habitat; avoiding the altered habitat in the road corridor and on the edge of the forest; road clearing width; physical barriers such as fences, cuttings, fill batters and culverts with drop structures; and altered light, temperature and humidity regimes (Goosem *et al.* 2010).

Top: The highway and sidewall can be an insurmountable barrier for this turtle; middle: long sidewall on a hill road; bottom: busy 4-laned highways act as barriers and fragment habitats

If wildlife-friendly design considerations are not incorporated, the building of culverts, fencerails, barricades, chain-link and barbed-wire fences, and other concrete and metal structures along roads makes the crossing even more difficult for many species. Parapet-like walls running without a break for hundreds of metres or kilometres along roads, especially on hill roads, become insurmountable obstacles for species such as porcupines, pangolins, turtles, young birds and mammals, to name just a few. On hill slopes where such roads exist, even large animals such as sambar and elephants have to negotiate the upper slope, cross the road, and try to somehow step or jump over roadside walls and culverts to step or land safely on the steep lower slope.

As roads become wider and busier, the number of animals crossing and the rate of roadkill usually increases, but beyond a point it may actually begin to decrease (Seiler 2003). This usually happens when roads become four-laned highways or expressways catering to tens of thousands of vehicles every day. The reduction may be due to the decimation of wildlife populations along the road as well as a 'barrier' effect, where many animals actively avoid the road and avoid crossing it. A road like this passing through a forest or key natural habitat

essentially cleaves it into two pieces. For many species, this is an added fragmentation of an already fragmented habitat (Goosem 2007).

Roads and genetic effects on animals

The effect of roads as a barrier to individual movements may add another indirect impact: the genetic alteration due to reduced exchange between populations (Goosem *et al.* 2010). A recent review by Holderegger and Di Giulio (2010) reported that, although most roads and highways have only recently been built and only few generations might thus have passed since road construction, several studies have found negative effects of roads on genetic diversity and genetic differentiation in animal species, especially for larger mammals and amphibians. Roads may thus rapidly cause genetic effects and wildlife crossing or passage structures may be required to stave off such population genetic effects.

Roads as conduits for invasive alien species

The increased light levels, exposure, and micro-climatic effects of roads such as heating and drying, produce conditions that favour the establishment of alien (exotic) weed species. A road also provides a movement corridor for the dispersal of weeds. This often results in the development of exotic grasslands or shrubby swathes of woody weeds along verges which enables the penetration of more weeds and animal pests alien to the surrounding forest habitat (Goosem and Turton 2002).

Roads and roadside clearing helps weeds to spread; top: Mikania micrantha *and other weeds along a rainforest road; bottom:* Lantana camara *along a road in dry forest*

Maintenance practices along road verges such as herbicide spraying, burning, mowing, grading and removal of overhanging branches can act as ongoing habitat disturbance which encourages weed colonisation (Goosem *et al.* 2010). Invasive alien weed species may spread into adjoining natural ecosystems and affect the natural recruitment of native plant species. Roadside weeds, including species such as *Lantana camara, Chromolaena odorata (Eupatorium)* may also increase fuel loads, resulting higher risk or intensity of fire. Fire can strongly alter plant composition by allowing greater infestation of species that are more prone to burning (Milberg and Lamont 1995, Goosem *et al.* 2010). In moist forests, these effects may be more pronounced and accompanied by the proliferation of smothering vines and creepers, including invasive alien species such as *Mikania micrantha*, which can suppress plant regeneration (Laurance *et al.* 2009, Goosem *et al.* 2010).

A combination of higher road width and greater infestation by invasive alien species (*Lantana camara*) in Bandipur Tiger Reserve has been shown to have an impact both on tree death as well as tree community composition (Prasad 2009). Road 'improvements' such as widening, improved surface, paving, and grading, carried out without attention to ecological aspects, often result in greater invasion by alien species and declines in native vegetation in a range of ecosystems from grasslands and semi-arid habitats to forest (Gelbard and Belnap 2003, Prasad 2009).

Besides plants, many animal species of other vegetation types, including feral and domestic species may spread along roads into natural ecosystems (Goosem 2007).

Roads as cause for landslides and soil erosion

Road construction is associated with increased frequency of landslides and other forms of erosion in steep forested landscapes (Goosem *et al.* 2010). Road drains divert water from the normal processes of overland runoff and underground seepage, which instead passes into the substrate of the road zone perched on the hillslope (Jones *et al.* 2000). Therefore, slopes and verges need to be protected from concentrated flows and erosion.

In a review, Sidle *et al.* (2006) point out that **roads contribute the largest surface erosion and landslide losses (per unit area disturbed) compared to other land uses**. **Along roads on steep hillslopes, landslide and surface erosion fluxes are typically ten to more than 100 times higher compared to undisturbed forests.** High storm runoff from roads is caused by the generation of infiltration-excess overland flow on compacted surfaces and the interception of subsurface flow at road cuts. These altered pathways increase surface erosion and accelerate the delivery of storm runoff to streams.

Research from the Indian Himalaya also corroborates the increase in erosion that results from road-building and repair (Heimsath 2000, Anonymous 2010). In reserved forest areas, natural vegetation on either side of the road helps in slope-stabilisation, resulting in negative correlation between forest cover and landslide activity (Haigh *et al.* 1995). Road construction and dumping of resulting debris result in the loss or reduction of this forest cover, increasing erosion, thereby creating a need for additional repair work (Haigh *et al.* 1995, see also **Annexures 2, 3**).

In another 2-year study on hillslopes, grass cover, pebbles, and sand content were shown to increase runoff and erosion; whereas slope value, tree cover percentage, structural stability and organic matter content were negatively correlated with runoff and soil losses (Descroix *et al.* 2001). Road construction and maintenance work, especially in forest areas, often results in the creation of the more surface area prone to erosion. In forest areas, slashing of all vegetation, including regenerating trees and saplings, on either side of the road (ostensibly for widening, clean appearance, or better visibility), and removable of overhanging branches, results in the tree canopy cover breaking over the road, and colonisation of roadsides by grasses and rank growth of weeds (Raman 2009). Besides loss of natural vegetation and native species typical to each area, this causes increased soil erosion and landslides. This also leads to further expenditure in road maintenance—providing further opportunity for ecological damage—a vicious cycle leading to considerable wastage of public money due to lack of ecological understanding in road planning, contruction, and maintenance.


From left to right: Widening and earth dumping on road to Tawang near Pakke Tiger Reserve (Photo: Shashank Srinivasan); landslip on E-W Road in Great Nicobars (Photo: Manish Chandi); hard engineering methods are poor replacement for natural vegetation to prevent erosion and slips (Photo: NCF)

Roads through closed-canopy forests: effects on arboreal animals and vegetation

Slender loris killed while crossing road (Photos: Kalyan Varma)

Closed canopy forests (tropical and sub-tropical forests such as semi-evergreen and wet evergreen rainforests) are particularly affected by roads and other linear clearings (Laurance *et al.* 2009) because of:

1. their high biodiversity and complex structure,
2. diversity of species that depend exclusively on presence and connectivity of high tree canopy, and
3. more drastic alteration of environment due to roads when compared to intact forest interiors.

The roadkill threat is particularly acute for many tree-dwelling species that do not normally cross on the ground. When roads slice through our forests and government departments and road contractors widen roads and slash all vegetation, including regenerating trees and saplings on either side, the tree cover breaks over the road. Besides habitat loss, degradation, invasion by weeds and other changes , this destroys the tree canopy connectivity that would have allowed many species to safely cross the road overhead.

Unable to cross overhead using the overlapping branches of intact forest canopies, the animals now face a permanent problem—a serious, life-threatening challenge—of a gap caused by the break in tree cover over the road. In the absence of tree cover, arboreal animals are sometimes forced to use electric wires of powerlines to cross, leading to the double jeopardy of electrocution deaths for species such as lorises and lion-tailed macaques (Radhakrishna and Singh 2002). The roads and powerlines through our forests are increasingly turning into graveyards of tree-dwelling species such as monkeys, lorises, civets, squirrels, and tree shrews (Raman 2009).

Maintaining canopy cover over roads, at least periodically is thus considered critical for roads passing through closed canopy forests. **Besides benefits to wildlife, maintaining canopy cover over the road may benefit the road itself and reduce maintenance costs.** A study of erosion on unsealed rainforest roads (Bacon 1998) found that less erosion and road damage occurred where canopy cover was maintained above the road surface. Erosion was probably reduced because rainfall was intercepted by the multilayered canopy and funneled away from the road along branches and trunks (Goosem and Turton 1999, 2000). Maintaining canopy overhead also reduces costs as it suppresses dense growth of shrubby weeds (thereby reducing the need for roadside vegetation clearing), temperature (reducing energy use for air-conditioning for passing vehicles), and favours growth of favourable native plants such as ferns and herbs. Studies have shown that roadside fern growth plays important ecological roles in reducing road runoff, mitigating splash and surface erosion, trapping sediment where plant seeds can germinate, providing nutrient-enriched throughfall, and moderating harsh surface temperature environment (Negishi *et al.* 2006). When opened-up roadsides are colonised by invasive plants, such benefits are lost leading to ecological and economic costs.

When roads break the forest canopy, threatened species like the Nilgiri langur can jump small gaps but risk death when the canopy is broken completely and they have to cross the road on the ground (Photos: NCF)

Road impacts on aquatic ecosystems

Pollution and sedimentation of rivers due to roads often begins from the first-order streams itself (Photo: Robin Abraham)

The impacts of roads on aquatic ecosystems is seldom recognised, with roads being considered a mainly terrestrial feature. Adjoining aquatic habitats may, however, be affected by erosion and landslides, sedimentation, flow patterns and channelisation, with subsequent impacts on aquatic and stream bank life both up- and down-stream from the clearing (Eaglin and Hubert 1993, Brown 1994, Trombulak and Frissell 2000, Goosem *et al.* 2010). Alteration of stream flow, siltation and sediment loading, and pollution are some main degradation concerns. Alteration of stream flow regime is both caused and indicated by stream siltation (Harris 1995).

Goosem *et al.* (2010) note that run-off from roads also can create turbid water that enters existing waterways. Turbidity reduces the process of photosynthesis in aquatic plants and algae. This, in turn, limits the supply of dissolved oxygen which is essential for fish, tadpoles and other aquatic life. The sediment suspended in turbid water has also been found to irritate the gills of fish. In extreme cases, chronic fine sediment loads can alter the diversity and composition of invertebrate species and dramatically change food web structure within streams (Luce 2002). Runoff from hot rainforest roads can also significantly alter the water temperature in nearby streams with an immediate reduction in the amount of dissolved oxygen in receiving waters.

Considerable deposition of solids into rivers and streams may occur during road construction and repair work. It is also a common sight to see stream and river waters used for consumption, letting-out of wastewater, washing of vehicles and machinery. Improper design of embankments and drain channels may lead to increased water and sediment entering into some stream catchments, corresponding declines in other catchments, and changes in groundwater infiltration and retention. There is a need to reduce such impacts through proper design. Also, the use of buffers of native vegetation along all water courses and sediment and pollutant traps for drain channel waters is essential to minimise negative impacts of roads on aquatic ecosystems (Zeigler *et al*. 2006).

As noted by Goosem *et al.* (2010), when cut through hillslopes or wetlands, roads can intercept shallow ground water flow, potentially causing death of vegetation upstream through ponding and downstream due to reduced availability of groundwater. Groundwater can be concentrated through the compaction of the road base and fill batters, and by trenching for roadside drainage and stabilisation of cut batters. Water that is redirected into surface streams may potentially remove a source of water that was originally destined for a wetland or a spring. Hard bitumen surfaces increase runoff compared to unhardened surfaces, and this additional water can result in channelisation of streambeds and increasing erosion and sedimentation within other sections of the waterway. Road and the kind of road network in mountain landscapes may also affect floods and debris flows and thereby disturbance dynamics in streams and rivers (Jones *et al*. 2000).

Roads built across wetlands often create a barrier or affect flow regimes leading to wetland fragmentation, and other changes including the spread of water weeds. Other associated impacts of roads are the loss of aquatic habitat area and diversity, obstruction of free movement for aquatic life, and degradation of the riparian (stream bank) vegetation. Even when road crossing structures exist, they may impede or prevent fish movement if (Goosem *et al.* 2010) the:

- Water velocity or turbulence is too great;
- Culvert is too dark, long or narrow;
- Water is too shallow;
- Crossing is full of debris; and/or
- Stream has a drop on the upstream or downstream side of the crossing (Cotterell 1998).

In India, during the monsoon, many first order streams come alive from the mountain slopes and provide nurseries for frogs, many insects and certains species of fish. Many forest roads (mostly mud-roads) and firelines have been made along the slopes of the mountains and they cut across several such first order and occasionally second-order streams. In places where the stream order is higher, rock bridges have been constructed to prevent the road from being washed away. But, the lower order streams would definitely be affected by (i) presence of the roads and firelines by increasing silt and sediment load input into these small streams, hence decreasing dissolved oxygen crucial for many specialist fish and tadpoles and (ii) by vehicular traffic (transporting labourers who clear trek roads and firelines, workers in plantations inside some Protected Areas (PAs), Forest Department personnel, and eco-tourists), which cause mortality of many organisms that use these first and second order streams (R. Abraham, pers. comm.).

Roads as ecological traps

In most cases, the road surface and verges are of little use to most animals. Some species, usually common and commensal species such as doves, mynas, and rodents, may be attracted to roads for scraps of food. Some reptiles such as lizards and snakes may be attracted to bask on the hot road surface, as to a rock on a sunny day. Dragonflies and mayflies may be attracted to the polarized light emanating from the asphalt, a form of light pollution that fools them into believing that they are over the surface of a water body. As they fly around to feed or defend territories or even try to lay eggs on the 'water-road', they imperil their own survival. In these cases, the road becomes an ecological death-trap, where the very adaptations evolved over millenia to enable these species to locate their food and thrive in their environment now propel them to their death (Raman 2009).

Roads and change in animal behaviour

Most of the animals that are killed on roads are, like the proverbial chicken, merely trying to cross to the other side. Yet road crossing can be a perilous affair, and many species are behaviourally predisposed to avoiding roads and road-crossings (e.g., Goosem 2001, Laurance *et al.* 2004). Animals may also be seriously stressed or change their behaviour in the vicinity of roads. Studies from Africa on elephants and chimpanzees, have shown how they tend to avoid roads and change their behaviour, due to the associated risks as one would expect from such highly intelligent species (Hockings *et al.* 2006, Blake *et al.* 2008). In areas where hunting of wildlife is frequent and roads are used to gain access, many species whose populations are affected by hunting also show high avoidance of roadsides (Laurance *et al.* 2006). Weekly spurts in vehicle movement over weekends as people leave urban areas for the countryside may also cause change in the activity/movement cycles of birds of prey resulting in their decreased occurrence over weekends in certain areas (Bautista *et al.* 2004). In African rainforests, Laurance *et al.* (2008) also found that the species richness and abundance of several nocturnal primates, smaller ungulates, and carnivores, many of which are affected by changes in forest structure, were significantly depressed within approximately 30 m of roads.

Roads, people and pollution

Another long-term aspect is the issue of increased access: people visiting, passing through, or settling in otherwise remote or inaccessible natural areas. This results in various forms of pollution (solid waste, chemicals and heavy metals from vehicles and road construction, garbage from tourists, noise pollution, air pollution with vehicular exhaust). Waterways may also be polluted by storm water runoff from roads (heavy metals and other contaminants). Burgeoning tourism, including nature-oriented tourism, is increasing the entry of vehicles and people into many protected areas in the country, bringing with it several concerns related to human disturbance and pollution. Laurance *et al.* (2009) note in a review:

> "Roads and highways can be a large source of chemical pollutants. Dust, heavy metals, nutrients, ozone and organic molecules are often elevated within 10–200 m of road surfaces. Lead pollution from car exhausts can be especially problematic, particularly in developing nations that still allow leaded gasoline. Effects of chemical pollutants and nutrient runoff are likely to be especially serious for streams and wetlands near roads, with major pulses of waterborne pollutants and nutrients entering aquatic ecosystems with heavy rains at the onset of the wet season. Such contaminants can have wide-ranging effects: for example, many aquatic invertebrates and vertebrates are sensitive to water pollution; waterborne nutrients can promote harmful eutrophication; and heavy metals are often biomagnified in aquatic food chains."

The role of labourers who are staying within protected areas during road construction is also a serious concern. In the Himalaya, roads are sometimes made in a way or in such an alignment that labourers have to permanently stay there for maintainence (e. g. Maling, many passes). The impacts of labour camps (hunting, disturbance, erosion, garbage) can be severe. In Hemis NP, a 20 km stretch to Rumbak village has been under construction for over 10 years now and labourers are semi-permanently resident in the park. Similar problems are rife in the Eastern Himalaya and north-east hill states (Y. V. Bhatnagar, S. Srinivasan, pers. comm., and pers. obs., see **Annexures 2 and 3**).

Roads bring people and pollution into natural areas. Top row: tourists, vehicles, and garbage along road in Anamalai Tiger Reserve (Photos: NCF)
Bottom: Chital in Nagarahole with plastic bag in its mouth (Photo: P. Bhargav); construction work and labour camps (Photo: Y. V. Bhatnagar) add to disturbance and pollution in natural areas.

Road impacts on local and indigenous peoples

Roads can also lead to negative impacts on local and indigenous peoples, as well as social imbalances resulting from market penetration or inequitous distribution of benefits. Proponents of roads take it as 'given' that any road is a beneficial road, yet proper assessments of benefits are rarely carried out. A road leading into a village, for instance, may benefit a small number of traders or merchants, without substantial benefits to agriculturists, or a road through the hills, may primarily benefit distant tourists for motor vehicle-based access, without bringing benefits to local populations *en route*.

In the case of indigenous peoples who have established self-sustaining local communities in remote areas, roads can also lead to many negative effects as seen in the case of roads in the Andaman and Nicobar islands.

Andaman Trunk Road (ATR)

Jarawa contact with people and traffic on ATR, despite Supreme Court order

The 340 km long ATR was constructed across the three main Andaman islands between the mid 1970s and 1989, but became fully operational only by the early 1990s (Sekhsaria and Pandya 2010). The indigenous people, Jarawa (known as the 'Ang' amongst them), who were a hostile community until the last decade, are today in peaceable contact with villages neighbouring the forested region they inhabit. Their livelihood based on hunting and gathering is under influence by the cultural contacts. Today they number close to 325 people, and over this decade have experienced the ATR as a means of contact with contact missions as in the past, with large numbers of people who travel on the ATR on a daily basis, as well as of their own free choice. Incidents of transfer of food items from tourists and passers-by to Jarawa have been noticed, there is risk of disease spread as noticed in a measles outbreak. Disturbance to forest habitat by road presence and maintenance, spread of feral animals along the road (leading to additional environmental impact), contact with road labourers, are other serious issues. Despite recognition of these issues and **despite orders by the Supreme Court for the closure of the Andaman Trunk Road, it continues to remain open for daily traffic** (Sekhsaria and Pandya 2010).

Great Nicobar Island East – West road

A shompen after bartering with a road labourer in Great Nicobar (Photo: Manish Chandi)

A multiethnic population of largely ex-service men and their families were settled on Great Nicobar Island by the early 1970s, where the elusive Shompen live in the interior forests. While a north – south road is constructed for the use of those in the settlements from Campbell bay on the east coast to Shastri Nagar closer to the southern tip upto a distance of 35 km, another road, the east – west road runs right through the Great Nicobar Biosphere reserve virtually dividing two National Parks: Campbell Bay and Galathea. This road was never used in full with no real reason for its use except for the few inhabitants who used to inhabit the west coast before the 2004 tsunami, though more often boats and canoes were used to reach the settlement. Today no settlement exists along the west coast and the reconstruction of the E – W road was initiated, ostensibly for defence purposes. While this road has been subject to yearly landslides, during every heavy downpour of rain, it has only fuelled construction work and financed contractors with the

road virtually being never put to use by vehicles for defence or administrative purposes. The road has been a means of contact between road labourers who barter with the Shompen, a shy and elusive hunter-gatherer population spread in small clans across the thick rainforests of Great Nicobar Island. The labourers in exchange for articles such as honey and lemons from the Shompen barter chewing tobacco and alcohol, affecting their health and negatively influencing their otherwise self-sufficient lives (M. Chandi, pers. comm.).

Roads as a drain on public money and economic valuation of roads

A widespread view about roads is that they are synonymous with progress and development. Yet, in cases where social benefits of roads are themselves debatable (previous sub-section), if environmental impact and costs of annual maintenance and repair (e.g., following landslides) are taken into account, the economic value of roads may in fact be negative and represent a drain of public money. For instance, the Andaman Trunk Road is estimated to use Rs 45 crores (Rs 450,000,000) on annual maintenance with an additional Rs 3.5 crore worth of firewood (some cut illegally), and involving 38 tonnes of bitumen and considerable movement of workers and labourers in otherwise undisturbed forests (Sekhsaria and Pandya 2010). At considerable cost to indigenous people and rainforest environment, this road primarily benefits outside traders and tourists, in effect representing a public subsidy of select private interests and unsustainable tourism.

Another similar scenario of wastage of public money in road maintenance is seen in many hill roads passing through closed-canopy forest types of the Western Ghats (Raman 2009). Here, the clearing of vegetation on either side, leads to canopy breakage and openings, leading to proliferation of undesirable invasive weed species. This creates need for additional labour periodically for clearing the weeds. As the workers and managers are unable to distinguish useful native vegetation from invasive weed speices, all vegetation is cleared and the removal only creates open, disturbed conditions for weed proliferation in a self-sustaining, ecological and financial loop. Also, erosion-related landslips and landslides are becoming more frequent due to such clearing of vegetation on either side of roads; again leading to additional cost of repair, including expensive and ecologically undesirable stone and concrete revetments to replace the 'green-revetments' of natural native vegetation that earlier protected the soil from erosion but have been whittled away by inappropriate roadside clearing. **The lack of attention to regeneration of native plants, need for canopy closure, and appreciation of the role of native plant species in safeguarding soils along roads through such forest areas, has resulted in this unhappy situation of considerable annual loss of money to the public exchequer.**

At present there appears to be no national or commonly-used method to assess the total economic value of roads, taking into account social and environmental valuation, incorporating the multiple known and emerging aspects highlighted in this document. As Aldo Leopold remarked in a famous essay 'Marshland Elegy' in *The Sand County Almanac* (Leopold 1949)*: To build a road is so much simpler than to think of what the country really needs.*

Clearing all vegetation on roadsides (left) favours growth of invasive alien weeds (right, photos: NCF)

4.2 Railway lines

Top to bottom: railway line cleaving through Gibbon Wildlife Sanctuary (Assam) and kills of capped langur and python along the tracks (Photos: Narayan Sharma); elephant killed along rail track.

The effects of railway lines on wildlife habitats has received attention due to the death of large animals such as Asian elephants, rhinos, tigers, and gaur. The recent report of the Elephant Task Force has analysed salient aspects related to elephant deaths and provided useful recommendations (Rangarajan *et al.* 2010).

Railway lines are linear intrusions, and like roads, cause a multiplicity of ecological problems that deserve attention besides direct mortality of wildlife. In natural areas, these include, besides animal kills, habitat and population fragmentation, habitat loss and degradation, spread of invasive alien species, pollution and garbage accumulation.

Although there are fewer studies on the effects of railway lines on these aspects, the alteration of habitat and the inadequate attention paid to ecological aspects during construction and maintenance, create many conditions similar to roads with resultant similar impacts, including:

- Canopy-breakage when passing through closed canopy forest areas
- Higher light penetration and desiccation
- Higher daytime temperatures, greater diurnal fluctuation in temperatures
- Spread of invasive alien species
- Higher wind speeds and resultant windthrow
- Cutting of all trees and vegetation on either side resulting in second growth and weeds
- Pollution (noise, air, and solid wastes, including food waste from trains along the tracks)
- Steep embankments with stones and concrete (artificial substrate avoided by many species)
- Construction- and maintenance-related disturbance and movement of people

The Elephant Task Force report notes that since 1987, 150 elephants have died due to train hits. These deaths are distributed in the states of Assam (36%), West Beengal (26%), Uttarakhand (14%), Jharkhand (10%), Tamil Nadu (6%), Uttar Pradesh (3%), and Orissa (2%). Many more have died since the submission of the report, including the ghastly tragedy where seven elephants were killed in a single incident near Binnaguri, Jalpaiguri district, West Bengal, on 23 September 2010.

The report identifies various contributing factors to train hit deaths: ecological (food, water, shelter, vegetation and movement routes), physical (steep embankments and turnings), technical (train speed, frequency and time, unmanaged disposal of edible waste), and lack of awareness among drivers, passengers, and planners. It also provides specific recommendations (Rangarajan *et al.* 2010). In Rajaji National Park, scientific study (Singh *et al.* 2001, Menon *et al.* 2003) followed by joint implementation of recommendations has resulted in reducing train hit deaths to zero since 2002, indicating the opportunity for similar efforts nation-wide.

Internal fragmentation: railway track through Gibbon wildlife Sanctuary, Assam (Courtesy: Google Earth)

An illustrative case of other effects of railway lines is seen in the Hollongapar Gibbon Wildlife Sanctuary that was split into two unequal halves by a railway line constructed in the 1930s. The line has fragmented the tropical wet evergreen forest, the home of threatened tree-dwelling primates such as the hoolock gibbon, capped langur, stump-tailed macaque, and slow loris. While train-hit deaths of capped langurs have been noticed on the line, species such as gibbons, stump-tailed macaques, and loris probably never cross the line resulting in habitat fragmentation and population isolation (Sharma 2009). It may be necessary to create passageways for willdlife species in areas where railway lines pass through natural areas. One would need to assess the efficacy of existing non-widlife passages as well as the distribution and provision of natural vegetation and substrate cover in the vicinity of and within passages (Yanes *et al.* 1995, Rodriguez *et al.* 1996).

4.3 Transmission powerlines

With the Government of India instituting the *Power for All by 2012* program there has been a renewed emphasis on power generation, transmission, and distribution in India. Power generation, and distribution and related aspects including maintenance are guided by the Electricity Act (2003, with amendments as on 2007), and the Indian Elecricity Rules 1956 (amendments up to 2000). **The Electricity Act of 2003 has among its stated objectives the 'promotion of efficient and environmentally benign policies'.**


Transmission lines double up with a road through forests in Karnataka (Photo: NCF)

For the present purpose, we are concerned primarily with overhead transmission lines that are part of the national grid. These are primarily alternating current (AC) lines, although some long-distance high voltage direct current (HVDC) lines are also operational. Based on voltage under normal conditions, the lines are classified as:

- **Low:** voltage does not exceed 250 volts,
- **Medium:** voltage above 250 V up to 650 volts,
- **High:** voltage above 650 V and up to 33,000 volts (33 kV),
- **Extra high:** voltage above 33 kV to at least 800kV
- **Ultra high:** voltage greater than 800 kV

In natural areas from grasslands and wetlands to forests, it is mostly high and extra high voltage lines that are established along long linear clearings.

The main ecological problems associated with these linear intrusions are:

Ecological concerns shared with other linear intrusions such as roads

- Canopy-breakage when passing through closed canopy forest areas
- Higher light penetration and desiccation
- Higher daytime temperatures, greater diurnal fluctuation in temperatures
- Spread of invasive alien species
- Higher wind speeds and resultant windthrow
- Cutting of all trees and vegetation on either side resulting in second growth and weeds
- Construction- and maintenance-related disturbance and movement of people

Ecological concerns unique to transmission powerline

- Risk of electrocution
- Clearance of vegetation even when very distant from lines (when passing over valleys)
- Cutting through very inaccessible areas (as straight lines even over difficult terrain)

A transmission powerline fragmenting rainforest in Vazhachal, Kerala; weeds spreading along powerline clearing; double trouble of road and powerline each cutting its own swath through the forest (Photos: NCF)

Electrocution: Large animals such as elephants have suffered electrocution deaths due to sagging of powerlines (86 elephant deaths in the last 10 years, B. Mohanty, pers. comm.). Where canopy is broken due to powerlines and roads, arboreal mammals such as primates may use the powerlines to cross from one side to another; this has also lead to animal mortality.

The Elephant Task Force has noted this problem and proposed recommendations (Rangarajan *et al.* 2010). Powerlines are also known to be a big hindrance for large birds such as cranes resulting in bird collisions and deaths (P. Trivedi, K. S. Gopi Sundar, pers. comm.). Bevanger (1994) traces problems related to bird deaths from powerlines with useful recommendations.

A lion-tailed macaque electrocuted while trying to use a powerline to cross a canopy gap across a road through a rainforest fragment in the Anamalai hills (Photo: M. Ananda Kumar)

According to Bevanger, **route planning should include careful mapping** of:

(1) topographical features which are leading lines and flight lanes for migrating birds and/or are important for local movements of resident species,
(2) topographical elements such as cliffs and rows of trees that force birds to fly over power lines,
(3) primary ornithological functions or uses of the area to avoid key areas for birds and avoid separating these areas and
(4) local climatic conditions (including seasonal variations) like fog frequency and prevailing wind direction.

The outcome depends largely on a combination of these factors. Objective assessment of the effects of mitigating measures, in particular wire marking, is required.

Vegetation clearing: Another main reason for impacts on natural habitats (loss, degradation, fragmentation) is the clearing of vegetation below and on either side of these powerlines along their entire length. This is particularly the case where the powerlines pass through forest areas. In practice, vegetation below these lines is completely clear-felled annually over a wide swath ranging from 30 m to over 50 m width. This creates serious negative effects due to habitat fragmentation, disturbance, degradation, spread of invasive species, fires etc. The presence of multiple lines passing through an area accentuates the 'internal fragmentation' effects (Goosem 2007, Laurance *et al.* 2009).

Wide swaths of vegetation are cut below high tension lines, even when the lines go high overhead across valleys. Besides fragmenting forest, these are often overrun by invasive alien weeds (Photo: T. R. Shankar Raman)

Electricity Act and Rules: The Electricity Act 2003 has provision for the Government to make rules specifically for 'the avoidance of public nuisance, environmental damage and unnecessary damage to the public and private property by such works' (Section 67-2-k). Rule 29(1) generally stipulates attention to safety for humans, animals, and property, and rules have been also framed for vertical clearance of lines above buildings and streets and other powerlines. **No rules have been framed so far related to environmental aspects for construction and maintenance by government authorities or licencees.** Such rules, which may be incorporated into Chapter VIII of the Electricity Rules of 1956 are urgently required.

4.4 Canals and lift irrigation

Impacts of canals and lift irrigation schemes are probably underestimated as few reports or studies carried out exist for freshwater systems in India. This is in addition to the effects of other linear disturbances in the proximity of aquatic ecosystems (described in section on roads), diversion canals, or water abstraction mechanisms. Many dams and reservoirs have interlinking tunnels running between them and transferring water resources. Such interlinking, in the case of existing links as well as many proposed links, probably affect the natural distribution of species and aquatic ecosystems. Noting the high diversity of aquatic fauna, including 230 endemic fishes (31%) of a total of 750 species found in India, Daniels (2004) notes:

> Interlinking of rivers will affect, besides other aquatic life, fish diversity throughout the project area and beyond, by changing the depth, flow and turbidity of water, creating barriers to those species that migrate upstream to spawn, encouraging the spread of alien invasive species such as tilapia (*Oreochromis mossambica*), permitting the invasion of the hardier species of carps from the northern rivers that tend to out-compete the endemic ones or even hybridize with them and carrying disease-causing parasites and pathogens through water.

Large scale water-abstraction projects such as the Dholpur Lift Irrigation Project, aimed at supplying water to Bharatpur (75 km away) and to 999 other villages, like many earlier projects are likely have severe repercussions to the river (and the life it supports) during the annual dry season, as water is diverted at large scale. The effects of such projects on river water availability and endangered species in the system are yet to be studied. Postel (1998) notes

Canals cleaving through forests. Top to bottom: Chilla power channel and Malayatur canal (Photos: A. J. T. Johnsingh), Canal from Bhoothathankettu (Thattekkad) to Kalady (Photo: James Zacharias)

"Large dams and river diversions have proven to be primary destroyers of aquatic habitat, contributing substantially to the destruction of fisheries, the extinction of species, and the overall loss of the ecosystem services on which the human economy depends. Their social and economic costs have also risen markedly over the past two decades." Diversion canals from irrigation dam reservoirs can turn ponds and lakes from being a source of water to a drainage sink, a process that has killed many traditional ponds (*kulams*) in southern India.

Canals, specifically can also impact natural river tracts negatively by:

- introduction of exotic plants, animals, toxins
- create avenues for riverine species and their young to disperse to unsuitable habitats
- extraction of ecologically unsustainable quantities of water

As a consequence of excessive water use or diversion, many species may be affected by the resultant low flow with impacts such as:

- Habitat fragmentation for aquatic species (species affected: dolphins, gharial, larger fish species)
- Creation of isolated pools vulnerable to netting, dynamiting (species affected: Fish, turtles, crocodilians)
- Fish stocks limted bty low water carrying capacity of deep pools (species affected: Fish and fish predators)
- Increased access to people for river crossing by foot and tractor, fishing, sand mining (species affected: all)
- Reduced number of inaccessible islands (species affected: Indian Skimmer, gharial, turtles, terns, pratincoles)

Steep-sided canals can also be a significant barrier to animal movement and cause of animal mortality. This is known from areas such as the Segur flume channel in Mudumalai Tiger Reserve or the 52 km long (with 4 tunnels) contour canal in the Anamalai Tiger Reserve in Tamil Nadu. In the former case, collaborative effort between the Tamil Nadu Forest Department and the TN Electricity Board was required to ensure that sections were not repaired or made more steep in order to facilitate crossings (A. Udhayan, pers. comm.). An expert committee noted that "*Obstructions to free movement of elephants occur in the shape of penstocks and trolley. Lines loading to the Singara and Moyar power houses and the flume channel connecting the two and patta lands*." (http://www.forests.tn.nic.in/graphics/Expert_Committee_Report.pdf).

4.5 Electric fencing and trenches

Thousands of kilometres of electric fencing (power fences) and trenches have been established across India in efforts ostensibly geared to reduce the incidence of human-wildlife conflict. The fences or trenches are usually meant to keep out species such as elephants, gaur, wild pig etc. from agricultural fields. While the cost of establishment is substantial (around INR 100,000 per km for trenches and INR 125,000 per km for power fences), these often do not have the desired impact due to faulty creation, poor design, or lack of maintenance (Fernando *et al.* 2007). The Elephant Task Force in its report has recommended that there is a need to evaluate past efforts in terms of costs, quality of application, and effectiveness and develop a best practices manual whose guidelines must be mandatory for erection of any barrier (Rangarajan *et al.* 2010). Taking cognisance of these pervasive problems, the report suggested a moratorium on trenches and on expensive electric fences established without community involvement in maintenance.

While such fences and trenches may or may not work for the target species depending on the above factors, they remain a major influence on the landscape in many other ways. They may act as barriers and causes for electrocution deaths of various non-target species (e.g., some ungulates, small mammals, reptiles). In landscapes such as tea and coffee plantations adjoining or within protected areas, extensive deployment of fences can accentuate habitat fragmentation. Cordoning- off large areas of estates, including water sources, although a common practice is inadvisable (Rangarajan *et* al. 2010). This may lead to increase in conflict by deflecting or concentrating animal movements in vulnerable, unprotected areas.

An Asian elephant at an electric fence along a road through plantations (Photo: Nisarg Prakash)

Extensive digging or vegetation slashing along trenches and fences are also forms of disturbance that lead to proliferation of invasive alien species and weeds.

4.6 Firelines

Very little research has directly addressed the effects (positive or negative) of firelines in forest areas, despite the fact that this is considered an important task and one that demands substantial annual labour and fund allocation in many protected areas in India. Firelines can occupy considerable stretches in Indian protected areas. For example, the 334 km² Wynaad Wildlife Sanctuary in Kerala, has about 400 km of fireline (excluding an equal length of roads, Moosvi and Mutch 2000). As these are also long linear intrusions, involving clearing of vegetation for anywhere between 10 m to 40 m width and burning of piled-up biomass in the early dry season, they can have several negative effects on adjoining vegetation as noted in the case of roads and powerlines.

In Bandipur Tiger Reserve, for example, there is a total length of 2000 km of firelines, requiring an annual cost of Rs 37,00,000 for maintenance plus another Rs 37,37,400 for fire watchers, supplies, and tower maintenance (more than 10% of the entire Park budget as per the 2010 – 2011 Annual Plan of Operations and sanction order available on the Project Tiger website, http://projecttiger.nic.in/sanction/S2010/Sanction_Bandipur_2010_11.pdf). Fires, nevertheless, affect anywhere up to 25% of the protected area iin bad years, with higher incidence and impacts in and around the tourism zone (Somashekar *et al.* 2009). In Mudumalai Wildlife Sanctuary, which has seen a 3-fold increase in fire frequency in recent times compared to the historical past (Kodandapani *et al.* 2004), a GIS-based study by Srivastava (2006) suggested that firelines may not be the most effective factor to consider in fire management strategies. This study showed the main factor that may help in reduction of fire incidence was the deployment of manned fire-watching camps, with riverine forest areas being the next best (natural) means.

Firelines are also sometimes cut through closed-canopy evergreen forests where the risk of fire is low or absent, and where alternative approaches would be preferable. Over 30 m wide firelines have been established cutting through the rare low-elevation wet evergreen dipterocarp forest in Chimmony Wildlife Sanctuary, for instance, leading to habitat fragmentation and weed invasion effects (T. R. S. Raman, pers. obs.).

4.7 Other structures

A number of other linear structures may exist in terrestrial and aquatic ecosystems ranging from rubble walls and embankments, dykes and groynes, to various kinds of fencing. There has been little research on the impacts of these, although common principles and effects may apply. Attention is drawn here to one such intrusion, seawalls, in the case of coastal and marine ecosystems for which some research input and policy implications are presently available, and a few other linear structures.

Seawalls: Seawalls, touted as a hard-engineering solution to problems of coastal erosion, are constructed with extensive deployment of stone and concrete structures. However, available evidence suggest various negative effects (Shareef 2007, Rodriguez *et al.* 2008) including:

Tetrapods along the coast in Lakshadweep (Kartik Shanker)

- altered littoral and estuarine dynamics: resultant change in configuration of shoreline and estuarine banks
- obstruction of natural littoral drift of sand and sediment, leading to erosion on the one side and accretion on the other
- loss of beach space for indigenous fishing communities

In contrast to suggestions, including from the Swaminathan Committee and recommendations in the Coastal Regulation Zone (CRZ), hard engineering options like seawalls are often the preferred first option over more natural and eco-friendly options. The seawall option is also the more expensive. The state of Kerala has already built seawalls along its coast—for 386 km of the total 560 km coastline of Kerala. The government has sought funding assistance to wall the remaining 92 km and demanded INR 2,16,000,000 from the centre (Rodriguez *et al.* 2008).

Bridges and pipelines: when established across rivers, these need to address environmental impact from the perspective of the entire spectrum of riparian taxa that may be affected including plants, fish, reptiles, mammals, birds in all categories of which are Threatened, Endangered, and Critically Endangered species (IUCN Red Data Book) and many species on Schedules I to III of the Wildlife Protection Act. The impacts may include (R. Whitaker, pers. comm.):

Atli river bridge and underpass on Panjim - Belgaum highway (Photo: A. J. T. Johnsingh)

Pipelines in Anamalai Tiger Reserve (Photo: A. J. T. Johnsingh)

a) construction in an ecologically-sensitive or species-specific optimum habitat for basking, nesting, feeding, reproduction
b) pollution via erosion/siltation and chemicals during construction
c) alteration, erosion, accretion due to the placement, size and design of the construction
d) obstruction to natural movement/migration of riverine animals
e) permanent disturbance in the case of road/railway bridges

Trek paths: Created ostensibly for facilitating patrolling and access for tourists, these are usually maintained at a width of around 4m (2 m path, 2m clearing for visibility). In most areas, including in sensitive habitats such as evergreen forest and shola-grasslands, the width can be brought down to say 1.5 m. Moreover, only regular paths need to be maintained. Trek paths should not be created in primary grasslands like Grass hills and Eravikulam National Park or alpine meadows as intensive use results in soil erosion, spread of invasives, and loss of aesthetic and biotic attributes. Options such as minimising width, avoiding creation of new paths, maintaining natural native vegetation on either side, ground cover and canopy overlap, establishment of board walks (using wood from plantations of alien tree species such as *Eucalyptus, Acacia,* or planted pines) should be considered.

Trek paths in grasslands can become severely eroded and conduits forspread of invasive alien species (Photo: T. R. Shankar Raman)

Chain-link fencing and rubble walls: Often established at high cost (e.g., around protected areas, shola patches), these can act as barriers for a wide-range of species. In the vicinity of villages, domestic dogs often chase wild prey toward fences for a kill. However, due to poor maintenance, some may also be ineffective, representing a wastage of funds.

Chain-link fencing and road through plantation and rainforests in Nelliampathy hills (Photo: NCF)

5 LINEAR INTRUSIONS: CURRENT POLICY AND LEGAL ENVIRONMENT AND LIMITATIONS

Presently, in terms of legal and policy environment, linear intrusions in natural areas primarily come under the purview of the following:

- Forest Conservation Act (related: Forest Advisory Committee)
- Wildlife Protection Act (related: National Board for Wildlife and its Standing Committee)
- Forest Rights Act (provisions related to road construction, implications not explored)
- Supreme Court (forest cases and orders, Central Empowered Committee)
- High Courts (specific cases and orders)
- Park management (occasionally in Management Plans, impacts often overlooked)

The Supreme Court in an important order dated 25 November 2005 in I. A. No. 1220 (interim report of CEC in I. A. No. 548) and I. A. No. 994 stipulated various activities that may be permitted in protected areas including the following related to linear intrusions:

- Maintenance of fair weather non-tar forest roads not exceeding 3 m width
- Clearing and burning of vegetation for firelines
- Weed removal
- Digging
- Laying underground drinking water pipelines up to 4 inches in diameter
- Laying of 11 kV power transmission lines
- Laying of telephone lines and optical fibre cables

It however, stipulated, that the order of 14 February 2002 would not be applicable to the above activities if they are undertaken as per management plan, are consistent with the Wildlife Protection Act and National Wildlife Action Plan, in conformity with the guidelines issued for PA management, and that the construction and related activities merge with the natural surroundings. However, no specific instructions or guidelines were provided on practice or on minimising environmental impact of these construction and maintenance of linear intrusions.

In practice, proposals for linear intrusions are sent for clearance to the Central Committees mentioned above and based on various considerations these are either rejected or permitted with specific conditions imposed on a case by case basis (for an example, see **Annexure 4**). Various other Supreme Court and High Court orders exist on forest cases that may have a bearing on linear intrusions policy and management; these are yet to be compiled.

Lacunae, Loopholes, and Limitations

The above system has several severe lacunae, limitations, and loopholes. This has resulted in the continuation of various negative impacts and undesirable practices in natural areas in the country. There has been widespread criticism of the system of the clearances for projects, inadequacy of environmental assessment, poor planning and illegal installation or expansion of linear intrusions in many cases. Some of the salient aspects are:

- There is no national policy yet on linear intrusions (the present effort is the first of its kind). Although a publication by the Wildlife Institute of India has addressed issues related to roads, in particular, and suggested environmental guidelines (Rajvanshi *et al.* 2001), this has been virtually ignored in most ongoing road projects.
- The strategy of forcing a *fait accompli* by starting work on sections of roads or linear intrusions outside Protected Areas and invoking already incurred expenditure as a reason for completion of project (the Concorde fallacy) needs to be addressed. Policy and legal provisions are required to prevent such situations and deal with existing situations. A current example, is the attempt by the National Highways Authority of India (NHAI) in forcing a *fait accompli* by commencing land acquisition proceedings for four-laning NH 13 outside Kudremukh National Park.

- There are cases of *ex post-facto* approvals that have been granted by the Ministry in the past, which has aggravated the matter. This system must be stopped and all serious cases must be re-opened and investigated for environmental impact under the proposed policy and in relation to issues raised here.
- There are cases of road construction, widening, black-topping or concrete-topping, or other linear intrusions established in protected areas without National Board for Wildlife approval. These need to be investigated and suitable action devised. No such violations have been prosecuted including, for example, a clear case of widening of NH 212 through Bandipur on which a complaint was lodged in 2008 by NBWL member, Wildlife First.
- Often, projects are steam-rollered and stipulations set are ignored or strongly resisted by project proponents or construction proceeds even without necessary permissions. An example is the current stand-off between the Forest Department and District Administration against the National Highway Authority regarding NH 38 that slices through the important Golai elephant corridor. The NHAI is pressurising to push the road through without the modifications recommended by the commitee set up by D. C., Tinsukia, in June 2009. Other examples include road through reserved forests of Kadamakal within the limits of the Pushpagiri Wildlife Sanctuary (2008), NH 212 through Bandipur Tiger Reserve, roads through Anamalai Tiger Reserve, to mention just a few examples.
- The metrics used in proposals seeking diversion for projects require to be changed and clarified. Besides the extent of land in hectares (which may appear insignificant), the distance through the Protected Area, length of the new edge, and the width of the intrusion must be insisted upon. Also, the assessment of impact needs to consider potential edge effects on the ecosystem in order to quantify the actual impacted area.
- Applications for maintenance or enhancement of existing linear intrusions should also include details of the legal status of the original intrusion (e.g., availability of legal and environmental clearance in case of road-widening projects).
- The present system of marking linear intrusions on topo sheets is insufficient for analysis of fragmentation or other impacts. This needs to be supported by high-resolution satellite imagery with elevation and site photographs as standard supporting evidence so that the Standing Committee of the National Board for Wildlife (NBWL) can obtain a better understanding of the impact.
- Inadequate justification is provided for the specific alignment chosen. Details of alternative alignments that do not pass through natural areas are neither considered nor provided for deliberation.
- Although black-topping is not permitted in roads through protected areas, as it was not specifically stipulated that this is meant to include surfacing by other means such as using concrete, some roads in protected areas have been constructed with cement/concrete.

A section of road concrete-topped through montane shola in Anamalai Tiger Reserve (Photo: NCF)

- No project should be cleared without a field assessment by members of the NBWL or Standing Committee of NBWL and site inspection report. Projects are sometimes executed without such assessment.
- It has been suggested that proper screening of proposals has not been effected as members of the Standing Committee of the NBWL are 'overwhelmed' by the proceedings wherein proposals are presented at the last minute, are provided little time for detailed assessment, and that there is a lack of an indepth understanding of legal issues involved. There have been allegations of attempts to hustle the members through proposals that have already been agreed upon by senior Government officials during Track II negotiations.
- In cases where prevention and realignment are deemed impossible, specific mitigation measures are not proposed as part of the project conception and design. These are usually imposed as conditions, which are rarely complied with by project authorities or independently verified.
- When permission is given with conditions (e.g., **Annexure 4**) it is not clear how some aspects will be verified or enforced such as: 'tree felling will be to the barest minimum', 'speed limit within the Sanctuary shall be restricted to 20 kmph', 'collection of firewood shall be prohibited'. Others conditions are also vague (and open to varied interpretation by project proponents and enforcers) such as: 'The agency should ensure that no damage to any flora or fauna is caused during the course of the execution of the work' or 'all the trees along the road shall be protected'.
- There is usually no system of subsequent field assessment or monitoring to ensure that conditions laid down are actually implemented. In case of new problems discovered, there should be scope for revision of implementation.
- There is no system of positive incentives for wildlife-friendly implementation or of punitive sanction in cases of damaging structures or poor implementation.

6 THE 'ROAD' AHEAD: PREVENTION, RESTORATION, REALIGNMENT, MITIGATION

Given the over-arching evidence for the range of deleterious impacts that linear intrusions have on natural areas, policy and rules for practice should ideally emphasise prevention and the precautionary principle. This is particularly because the effects on natural ecosystems such as forests and grasslands are long-lasting and virtually irrevocable. The past approach to deal with this, of levying compensation amount (Net Present Value estimation of lost forest) or compensatory afforestation efforts (mostly using few non-native species), fail to address the real loss of high quality, diverse, native vegetation and animal populations and communities. Efforts at mitigation should therefore really be the last resort and not serve as an excuse to push projects through.

It is therefore proposed that the policy on linear intrusions adopt the following **schema for evaluation of projects in order of priority:**

6.1 Prevention

The first option should be to prevent linear intrusions: the 'Primacy of Prevention' principle. Prevention of projects through Protected Areas or other designated critical habitats should be the foremost option. Until all issues raised by this background paper are comprehensively addressed, there should also be a moratorium on any new linear intrusions such as roads and powerlines in these areas.

- Prevention should have primacy over permission or sanction-with-mitigation, where alternatives including realignment have not been explored or considered for implementation.

New projects that disregard this should be prohibited and not treated as a site-specific project.

- Linear intrusions such as open canals and low powerlines should be banned in wildlife areas.
- Use of underground power cables along existing road alignments must be carefully considered, which may avoid opening up an intact area.
- Off-roading should be strictly banned in all Protected Areas and critical habitats, grasslands, meadow habitats, including open habitats (e.g., Kas plateau, montane grasslands of Western Ghats, thorn forest and semi-desert, and hot and cold desert areas)
- Complete ban on night traffic can be achieved in Tiger Reserve as there are existing provisions in the law for this (Section 38V of the Wildlife Protection Act, 1972).
- Projects that do not explicitly incorporate wildlife-friendly designs and required crossing structures should not be permitted in designated protected areas and critical habitats. These should be included in main budget of project at planning stage itself.
- Ban on certain kinds of activities (cutting of old trees such as banyan and other native species, planting of alien species, pollution and waste dumping, burning, cutting of firewood etc). As far as new roads are concerned, it must be made clear to not allow destruction of any native standing tree that is mature (say, more than 20 yrs old) and list protected plant and animal species, species useful for local and village communities as reserved, so that these cannot be destroyed in road-construction and widening operations.
- Prevention of labour residing in wildlife areas during construction and repair work. Transport may be provided to bring worforce to site everyday from outside camps.

6.2 Restoration

A nation-wide effort is required to identify linear intrusions that are disused, defunct, abandoned, or particularly harmful for conservation, and begin the process of ecological restoration. The restoration should follow international principles (Society for Ecological Restoration International Science and Policy Working Group 2004) and use local and diverse species native to the corresponding vegetation type and proper guidelines.

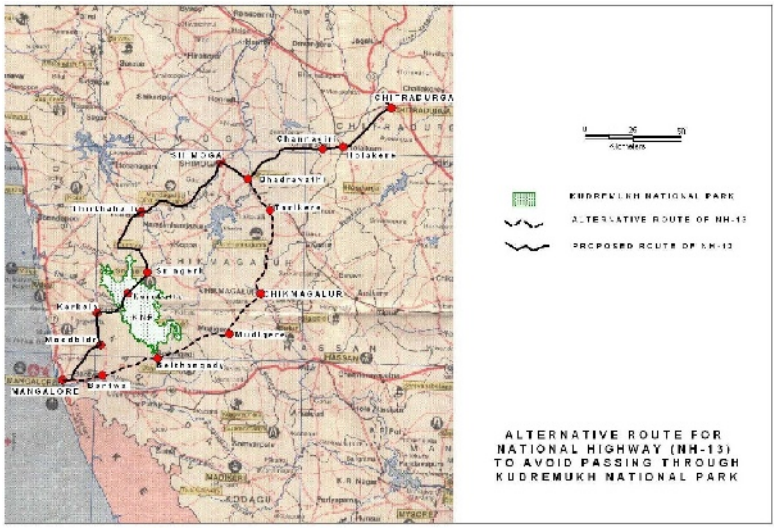
- Road removal and restoration is known to have many ecological benefits in wildlife protected areas (Switalski *et al.* 2004). Removal/ripping and restoration of defunct and disused roads, tramways, powerlines, and other disused structures should be undertaken on a nationwide basis. Currently, while no cases of targetted restoration are known, there are many abandoned roads, particularly unsurfaced roads (e.g., old logging coupe roads) that are gradually regenerating and recovering their wildlife and conservation values.
- During the planning and Environmental Impact Assessment (EIA) phase, mitigation efforts and improvements to the Protected Area or critical habitat need to be addressed in terms of the Compensatory Afforestation fund Management and Planning Authority (CAMPA) requirements.
- Ecological restoration and natural recovery of native tree species or other natural vegation by roadsides and along other kinds of linear clearings is an important aspect that needs to be encouraged
- Rehabilitation guidelines, including slope stablisation using native species, after roadworks and other linear infrastructure installations is an important consideration. Priority should be given to natural 'green' methods, rather than hard engineering 'cement and stone' approaches.

- There needs to be a reevaluation of the existing roads and railway lines in Protected Areas and realigning/closure of these detrimental structures after necessary studies. For example, in Gir National Park existing studies have noted that linear intrusions have lead to animal deaths, smuggling of timber, poaching and habitat disturbance, and recommended closure and realignments. This may be followed by natural regeneration and ecological restoration.
- All roadside, canal-bank plantations could have clear guidelines regarding proportion of native species to be planted with suggestions on which native species should be used in the different ecoregions / biogeographic zones of India.

6.3 Realignment

Realignment is the second choice to be considered after prevention. As deliberated at the National Board for Wildlife meeting chaired by the Honourable Prime Minister, projects passing through or impacting any Protected Area or identified critical habitat should perforce consider realignment to avoid these areas.

- Presently, few proposals contain a detailed analysis or exploration of alternative alignments and credible justification as to why the alignment proposed is the only option.
- A new mandate is needed that ensures that highways departments and authorities such as the National Highways Authority of India (NHAI) can and should try to deviate to save critical wildlife areas. For example, when a national highway of 3000 km is aligned, there should be flexibility to deviate by a few hundred kilometers around critical sites, as suggested in the case of NH7 and the Kanha – Pench corridor. If this policy change is effected, upgradations can follow alternate alignments that already exist outside PAs and critical habitats.
- The wildlife conservation community should be involved in planning alignments where least damage occurs for putting in linear infrastructures. Once this is done and such areas are identified, all linear formations such as roads, gas pipes, power lines should use the same alignment, wherever possible. At the moment each type of the linear intrusion is cutting its own swathe through areas like Western Ghats, quite independently of one another. The impact is magnified multiple times over that of a single alignment.
- The cumulative impact of the various prohects fragmenting a particular Protected Area or landscape must be carefully factored in while considering the alignment.



An example of alternate alignment of National Highway to prevent passing through Kudremukh National Park (Courtesy: Wildlife First)

6.4 Mitigation

Mitigation should be considered, subject to requisite approvals from the MoEF and NBWL, only for existing roads and other linear intrusions and new cases where the above options have been comprehensively considered and overruled with adequate justification. In cases where, for convincing reasons, linear intrusions cannot be prevented, there are no alternatives, and realignments are impossible, it is imperative that mitigation measures are considered and included in the project planning, design, budget, implementation, and monitoring stages.

Given the serious consequences, such mitigatory measures are now increasingly incorporated in infrastructure projects worldwide, leading to many examples. A recent publication synthesises examples of mitigating roads and wildlife (Beckmann *et al.* 2010) and websites such as <http://www.wildlifeandroads.org/> also provide additional useful information. **An excellent model** of science-based planning and practice in various infrastructure projects is available from the Australian World Heritage Management Authority publications specifying the scientific basis, codes of practices, field guides, and detailed implementation guidelines for roads, powerlines, and water infrastructure in the region, including through tropical rainforests, available from: <http://www.wettropics.gov.au/media/med_cop.html> (and) <http://www.wettropics.gov.au/media/med_Library.html>. Other mitigation related to railways and transmission lines appears in the primary scientific literature (references cited earlier).

While some general principles of design are gradually emerging, it is noted that **case-specific considerations** emerge due to the variations of each particular landscape and the ecological requirements of the component plant and animal species. Therefore, **while implementing mitigation, technical inputs from ecologists and wildlife scientists may be required for each area in all stages of the project process.** In the Indian context, a few good recent examples of the joint engagement of conservation biologists, administrators, and managers in this process are from Rajaji National Park (railways: Singh *et al.* 2001), Assam (railways: Sarma *et al.* 2006), Nagarahole National Park (Mysore – Manathavadi road: Hosmat and Gubbi 2009), and Lumding Reserved Forest, Assam (NH 54E, Singh *et al.* 2010). Some possible general considerations for mitigation are provided here:

Identifying relevant mitigation

- Carry out environmental impact assessment by competent independent agencies or personnel familiar with the ecology, natural vegetation and wildlife of the region
- Addition of adjoining forest blocks to the same PA or other PAs/corridors in the landscape by the State Government must be made a pre-condition for grant of permission.
- Carry out field survey to identify specific locations requiring interventions

Reducing human presence and disturbance

- The construction of the linear intrusions should be in a manner (quick, with minimum disturbance) and with adequate design and technology to minimise the long-term impacts.
- Prefabricated and special methods to reduce the time taken in the erection/construction of the intrusions should be adopted.
- Work during the nights must totally be avoided as the movement of many species, especially large mammals and carnivores, is greater during the nights.
- The camping of people/workers must also be avoided. No domestic animals to be allowed. Waste must be carried away from site and not dumped on site. Fuelwood collection and use from the site should not be permitted. Such measures should also be implemented for roads through non-forest ecosystems, such as in the Himalaya, montane grasslands, alpine meadows, etc.

Reducing animal fatalities

Speed breakers, humps, rumble strips deployed at intervals and crucial locations can check speeding and avert many roadkills (Photo: A. J. T. Johnsingh)

- In case of road vehicles, **speed reduction is a key measure** that will definitely reduce the number of accidents and these are being implemeted in several cases (e.g., speed breakers on the Mysore – Ooty road passing through Mudumalai Tiger Reserve). This needs to be accompanied by measures to prevent unauthorised stopping within Protected Areas.
- Specify height of powerlines through new Rules (Central Electricity Authority) to prevent deaths of species such as elephants.
- For powerlines, removing earth wires (and modifying earthing methods), modifying line, pole and tower design, installing underground cables and conspicuous marking of lines, poles and towers are important measures (Bevanger 1994). Marking of powerline wires with reflectors or other items that will prevent bird collisions and deaths must be attempted and effectiveness monitored.
- For railway lines, existing recommendations such as those of Sarma *et al.* (2006) and Rangarajan *et al.* (2010) may be adopted and implemented. The speed of trains can however be reduced in crucial sections to minimise the accidents.

Wildlife crossing structures

A lion-tailed macaque crosses on an canopy bridge over a road through a rainforest fragment (Photo: Kalyan Varma)

- **Natural crossings:** wherever possible natural crossings existing across linear intrusions should be retained or encouraged. For instance, overlapping tree canopy in closed canopy evergreen forests is an essential attribute that is a low-cost, efficient and durable solution for the movement of arboreal species. One can also encourage ground, shrubby, or tree growth at periodic, designated points (say, every 100 – 200 m) along linear intrusions to provide for habitat cover and facilitate animal crossings.
- **Underpasses:** well-designed tunnels, culverts, pipes, and other structures can function as underpasses below roads and bridges, for a wide-range of terrestrial and aquatic species, especially frogs, turtles, fish etc. It is important to also have underpasses below penstocks in wildlife areas. Underpasses can also be deployed below railway lines (e.g., as has been suggested in the Raiwala – Haridwar section).
- **Overpasses** and flyways: structures that go above the linear intrusion (besides natural ones such as tree canopy cover) can be considered. These tend to be expensive and may be applicable in limited areas. (For

Effectiveness of exsiting underpasses such as this one below Dudhsagar railway track should be evaluated (Photo: A. J. T. Johnsingh)

instance, Jones and Bond 2010 report on the effectiveness of such a vegetated overpass across a busy highway in Brisbane used by many bird species that rarely cross over the open road). Construction of overpasses and overhanging vegetation at periodic intervals along penstock and other pipelines should also be mandatory.

An overpass above a busy highway used by forest birds in Brisbane (Jones & Bond 2010)

- **Canals:** As far as possible, canals should be covered and made to run underground through pipes to avoid disrupting the habitat of wildlife. Else, canals could be aligned to act as the demarcation line of the PA wherever feasible. Canals should be shallow to allow wildlife to wade through. The side slope of the canal should be gentle to allow wildlife to climb up. There should be a limit on the water speed of the water being discharged. Even with the existing canals, provisions like over and underpasses to help animals cross the canal more frequently needs to be constructed. To help animals that fall into the canals, steel nets at intervals with less steep banks needs to be constructed to reduce accidental deaths. Grill mesh across canals and bridges may also allow crossing of some wildlife species.

Management options

- Along roads through Protected Areas and critical habitat promote public transport, and work to reduce influx of private vehicles, including tourist vehicles.
- Strong regulations controlling timing and traffic volumes need to be built in from the outset for all roads through Protected Areas and critical habitats. Although convoy systems have been suggested for movement of vehicles, these have tended to fare poorly both in wildlife mitigation as well as in locations like the Andaman Trunk Road, where they have not helped prevent environmental and social problems.
- High differential toll during late evening and early morning hours (along with night closure) may be added as a disincentive for use of roads passing through critical areas.
- For trains, automatic speed detection stations should be installed at important areas known to be crossing points of species such as elephants. Regular monitoring of the data downloaded would help monitor and prevent overspeeding by train drivers.
- For seawalls, policy and management recommendations related to seawalls proposed by Rodriguez *et al.* (2008) may be adopted.
- Management strategies to detect and prevent encroachments or construction of new structures and homesteads along linear intrusions need to be adopted. In the case of existing structures such as households and lands, possibilities of using CAMPA and other funds to purchase these should be explored as has been suggested for areas such as the Kotavasal – Thenmala corridor along the Shencottah pass, or along the Golai corridor in Assam (just to give a couple of examples).
- Minimise width of vegetation clearings along roads and powerlines, firelines and other linear intrusions. Explore options to restore connectivity by natural means.
- Speed restrictions and other guidelines that spell out rules and avoidance of disturbance to wildlife and habitats along roads in natural areas must be prominently conveyed through well-designed signboards at entry and exit points and all other relevant locations.

7 CONCLUDING RECOMMENDATIONS

Consultations and drafting of policy

Based on the present background paper, the NBWL could work towards a draft National Policy on Linear Intrusions in Natural Areas. Besides the goals and mission statement proposed here, the policy can adopt the broad principles and precautionary approach ranging from prevention as the primary choice, through realignment, and mitigation. Where possible or imperative, ecological restoration should also be carried out.

A sub-committee of NBWL with invited subject experts may be constituted, and hold stakeholder consultations around India to identify and frame the policy and appropriate guidelines and rules after visiting sites and interacting with Forest Department officers,NGOs and local communities.

Rules for linear intrusions through Protected Areas and Critical Habitats

A key suggestion is that all roads and linear intrusions passing through any designated Protected Area and critical habitats (defined as Wildlife Sanctuary, National Park, Reserved Forests, Tiger and Elephant Reserves, and a 10-km radius around their boundaries, as well as designated community and conservation reserves, wetlands, and grasslands of conservation value) should have special and specific rules that supersedes and supplements existing rules for roads, powerlines, railways, and other linear intrusions, in all other areas. Chief among these are:

ROADS: Rules involving Ministry of Shipping, Road Transport, & Highways
Specifications for road and bridge works (Indian Roads Congress)
Upgradation, 4-laning, 6-laning of highways etc

POWERLINES: Rules under the Electricity Act
Location of overhead / underground powerlines
Height and design criteria and specifications regarding vegetation clearing

RAILWAYS: Rules for railway sections passing through Protected Areas and critical habitats
Wildlife crossings
Speed limits in designated sections
Waste disposal from trains

Guidelines for field assessment (and checklist)

There is a need for a comprehensive set of guidelines and a handbook for use in assessments of linear intrusions. This could include:

- A full set of relevant Supreme Court orders and MoEF order on linear intrusions collated for use. Proposals must be deliberated upon to see whether and how each order applies.
- A detailed, well-designed checklist for use in field assessment prior to sanction of any project and for subsequent monitoring

Tolls, sanctions, and incentives

- Punishments/sanctions against managers and black-listing of contractors for failures
- All roads, railway lines and other linear structures that go through a protected area could charge a small contribution from the user/traveller (so that it either discourages the use or helps the PA raise funds). This could be called a Conservation Contribution Charge (not tax or toll). For pipelines and powerlines, it could be taken from the developer (including other Government Departments) for specific period with scope for revision.

- System of incentives for innovations and management measures to reduce road-related animal mortality, garbage and plastic regulation, deployment of speed breakers and provisions for wildlife crossings

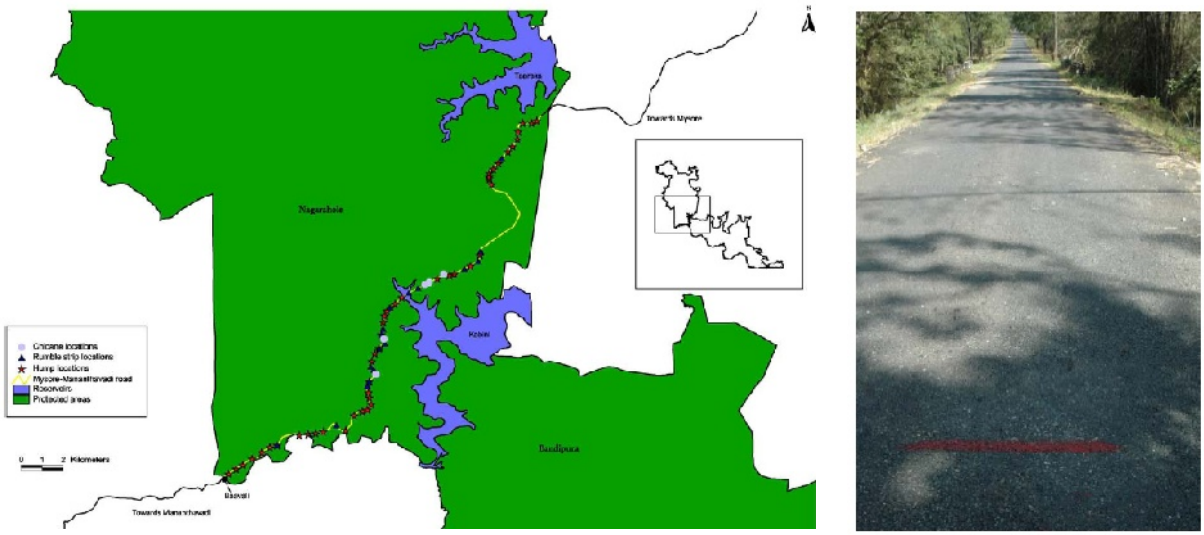
Legal

- Amending the Electricty Act and Rules to include guidelines for powerlines in protected areas to prevent electrocution deaths of wildlife, and reduce habitat fragmentation and degradation threats.
- Establishing rules for implementation of appropriate mitigation such as speed-breakers, width and wildlife crossings including maintenance of natural vegetation on either side and overhead canopy cover in closed canopy forests for roads, in particular.
- Identifying and enacting suitable provisions under other Acts related to Railways and Water diversion stipulating criteria for establishment of these other kinds of linear intrusions.
- A new system where draft affidavits of the Ministry must be placed/circulated to the non-official members of the NBWL before they are filed before the Supreme Court or other courts in various cases of linear intrusions.
- A system of public consultation may be instituted for large linear infrastructure projects (e.g., recent Karnataka High Court decision related to infrastructure projects in urban areas in WP 13241/2009). Provision may be made for constitution of local committees for each natural area with scientists, civil society and community representatives for overseeing linear intrusion establishment, maintenance, and management.
- Establish rules under the Forest Rights Act (FRA) that provides for permission at the level of the DFO for activities like electric and communication lines, drinking water supply and water pipe lines, minor irrigation canals and roads (Sec.3(2) (e), (g), (i) and (l)). Under the FRA, it is preferable to use alternatives like decentralised renewable energy sources (instead of powerlines from the main grid), developing local health traditions and clinics (rather than emphasise road connectivity to access distant health centres). For forest-dwelling communities, especially in remote areas, these will be more useful and will be under their own control and management to a greater extent, besides being less ecologically damaging.
- Cases need to be brought to NBWL attention through consultation with Forest Departments, civil society groups, and others. If deemed necessary, for all such intrusions the NBWL must be empowered to order the ecological restoration of those sections or modifications established illegally (e.g., removal of linear intrusion, road-ripping and regeneration of native vegetation). In cases of determined violations, all further proposals from the respective State seeking permissions for other projects should be held in abeyance till ecological restoration is complete. To monitor such violations, the NBWL must constitute committees under Section 5B (3) of the Wildlife Protection Act and to "carry out or causing to be carried out impact assessment …" as provided for under Section 5C (2)(c).

Framing guidelines documents

In view of the fact that negative impacts of linear Intrusions have been scientifically established, projects such as roads, highways, pipelines, power transmission lines must be diverted or re-aligned to avoid Protected Areass, Reserved Forests, wetlands and such other ecologically sensitive areas and the **'primacy of prevention' principle must be strictly adhered to**. Such projects in other less sensitive areas outside these protected areas may be considered only if the user agency agrees to follow the guidelines and implement best practices.

Around the world, case studies and examples are emerging of better practices related to linear intrusions (e.g., Beckmann *et al.* 2010, Goosem *et al.* 2010a,b, Singh *et al.* 2010, Codes of Practice related to power and water infrastructure of the Wet Tropics Management Authority,



An example of targetted planning and implementation of interventions using inputs from wildlife research and management. Map of locations where interventions are required (left) and marking on the road for deployment of speed hump (right; From Hosmat and Gubbi 2009)

Australia). A brief set of guidelines have also been issued under the Governance for Sustaining Himalayan Ecosystems (G-SHE) program (Anonymous 2009, **Annexure 3**). Therefore it is reiterated that while it is sometimes useful to have guidelines for certain aspects of linear infrastructure projects, it is worth noting that the preparation and availability of these guidelines:

1. should not be misued for approval of projects that agree to adhere to guidelines, when such projects should not be allowed in the first place, under the 'primacy of prevention' principle or for other reasons related to anticipated negative impacts on wildlife areas
2. should not be applied in a blanket fashion to diverse ecosystems and locations without considering that site-specific measures may be necessary and may require separate technical advice or attention of experts familiar with the natural ecosystem and native species (e.g., Hosmat and Gubbi 2009, Singh *et al.* 2010).

Keeping the above factors in mind, the following guideline documents may be developed in future under the auspices of the NBWL:

- Recommendations for wildlife-crossing structures
- Design and deployment of power fences and elephant-proof trenches
- Vegetation maintenance and restoration guidelines along roads and linear intrusions
- Prevention of erosion and sedimentation and mitigation of impacts on aquatic habitats
- Ecological restoration of defunct and unwanted roads and other linear intrusions
- Environmental impact assessment of roads and estimation of total economic value

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9 REFERENCES

Anonymous (2009) *Governance for Sustaining Himalayan Ecosystem (G-SHE): Guidelines and Best Practices.* Ministry of Environment and Forests and the G. B. Pant Institute of Himalayan Environment and Development, India. <http://gbpihed.nic.in/G-SHE_Book.pdf>

Bacon, T. (1998) Erosion on unsealed roads in Queensland's Wet Tropics World Heritage Area. M. App. Sci thesis, Tropical Environment Studies and Geography, James Cook University, Cairns.

Baskaran, N. and D. Boominathan (2010) Road kill of animals by highway traffic in the tropical forests of Mudumalai Tiger Reserve, southern India. *Journal of Threatened Taxa* 2(3): 753-759.

Bautista, L. M., García, J. T., Calmaestra, R. G., Palacín, C., Martín, C. A., Morales, M. B., Bonal, R. and Viñuela, J. (2004) Effect of Weekend Road Traffic on the Use of Space by Raptors. *Conservation Biology* 18: 726–732

Beckmann, J. P., Clevenger, A. P. Huijser, M. P., Hilty, J. A. (Eds) (2010) *Safe passages–highways, wildlife, and habitat connectivity*. Island Press, Washington, D. C.

Behera, S., & Borah, J. (2010) Mammal mortality due to road vehicles in Nagarjunasagar-Srisailam Tiger Reserve, Andhra Pradesh, India. *Mammalia* 74: 427–43.

Benítez-López, A., Alkemade, R., and Verweij, P. A. (2010) The impacts of roads and other infrastructure on mammal and bird populations: a meta-analysis. *Biological Conservation* 143: 1307-1316.

Bera, S. K., Basumatary, S. K., Agarwal, A. and Ahmed, M. (2006) Conversion of forest land in Garo Hills, Meghalaya for construction of roads: a threat to the environment and biodiversity. *Current Science* 91: 281–284.

Bevanger, K. (1994) Bird interactions with utility structures: collision and electrocution, causes and mitigating measures. *Ibis* 136: 412–425.

Blake, S., Deem, S. L., Strindberg, S., Maisels, F., Momont, L. Isia, I., Douglas-Hamilton, I.,Karesh, W. B., and Kock, M. D. (2008) Roadless wilderness area determines forest elephant movements in the Congo Basin. *PLoS ONE* 3(10): e3546.

Brown, K. J. (1994) River-bed sedimentation caused by off-road vehicles at River Fords in the Victorian Highlands, Australia. *Water Research Bulletin* 30: 239-250.

Chhangani, A. K. (2004a) Killing of Hanuman Langur (*Semnopithecus entellus*) in Road Accidents in Kumbhalgarh Wildlife Sanctuary, Rajasthan, India. *Primate Report* 69:49-57.

Chhangani, A. K. (2004b) Frequency of avian road-kills in Kumbalgarh Wildlife Sanctuary, Rajasthan, India. *Forktail* 20: 110-111.

Cotterell, E. 1998. *Fish passage in streams: Fisheries guidelines for design of stream crossings.* Queensland Department of Primary Industries, Brisbane.

Daniels, R. J. R. 2004. Interlinking of rivers: ecologists wake up! *Current Science 87*: 1030-1031.

Das, A., Ahmed, M. F., Lahkar, B. P., and Sharma, P. (2007). A prelimnary report on reptilian mortality on road due to vehicular movements near Kaziranga National Park, Assam, India. *Zoos' Print Journal* 22(7):2742-2744

Descroix, L., Viramontes, D., Vauclin, M., Barrios, J. L. G., and Esteves, M. (2001) Influence of soil surface features and vegetation on runoff and erosion in the Western Sierra Madre (Durango,

Northwest Mexico). *Catena* 43: 115-135.
Eaglin, G.S. and Hubert, W.A. (1993) Effects of logging and roads on substrate and trout in streams of the Medicine Bow National Forest, Wyoming. *North American Journal of Fisheries Management* 13: 844 846.
Eigenbroda, F. Hecnarb, S. J., and Fahrig , L. (2008) The relative effects of road traffic and forest cover on anuran populations. *Biological Conservation* 141: 35–46.
Fahrig, L., and Rytwinski, T. (2009) Effects of roads on animal abundance: an empirical review and synthesis. *Ecology and Society* 14(1): 21.
Fernando, P., Kumar, M. A., Williams, A. C., Wickramanayake, E., Aziz, T. and Singh, S. M. (2008) *Review of human - elephant conflict mitigation measures practised in South Asia.* AREAS technical support document submitted to World Bank. World Bank—WWF Alliance for Forest Conservation and Sustainable Use, AREAS, Centre for Conservation and Research, Nature Conservation Foundation.
Forman, R. T. T., Sperling, D., Bissonette, J., Clevenger, A., Cutshall, C., Dale, V., Fahrig, L., France, R., Goldman, C., Heanue, K., Jones, J., Swanson, F., Turrentine, T., and Winter, T. (2003) *Road Ecology: Science and Solutions.* Island Press, Washington, D. C.
Gelbard, J. L. and Belnap, J. (2003) Roads as conduits for exotic plant invasions in a semiarid landscape. *Conservation Biology* 17: 420–432.
Gibbs, J. P. and Shriver, W. G. (2005) Can road mortality limit populations of pool-breeding amphibians? *Wetlands Ecology and Management* 13: 281–289 .
Goosem, M. (1997) Internal fragmentation: The effects of roads, highways and powerline clearings on movements and mortality of rainforest vertebrates. In: Laurance, W.F. and Bierregaard Jr, R.O. (eds.) *Tropical Forest Remnants*. University of Chicago Press., Chicago, Illinois.
Goosem, M. (2001) Effects of tropical rainforest roads on small mammals: Inhibition of crossing movements. *Wildlife Research* 28: 351-364.
Goosem, M. (2007) Fragmentation impacts caused by roads through rainforests. *Current Science* 93: 1587-1595.
Goosem, M. and Turton, S. (1999) I*mpacts of roads and powerlines on the Wet Tropics World Heritage Area: Stage I*. Cooperative Research Centre for Tropical Rainforest Ecology and Management (Rainforest CRC), Cairns.
Goosem, M. and Turton, S. (2000) *Impacts of roads and powerlines on the Wet Tropics World Heritage Area. Stage II Report.* Wet Tropics Management Authority and Cooperative Research Centre for Rainforest Ecology and Management, Cairns, 210 pp.
Goosem, M. and Turton, S. (2002) *Weed incursions along roads and powerlines in the Wet Tropics of Queensland World Heritage Area: Potential of remote sensing as an indicator of weed infestations.* Report to the Wet Tropics Management Authority published by the Cooperative Research Centre for Tropical Rainforest Ecology and Management, Cairns.
Goosem, M., Harding, E. K., Chester, G., Tucker, N. and Harriss, C. (2010) *Roads in Rainforest: Science Behind the Guidelines.* Guidelines prepared for the Queensland Department of Transport and Main Roads and the Australian Government's Marine and Tropical Sciences Research Facility. Reef and Rainforest Research Centre Limited, Cairns (76pp.).
Gubbi, S. (2010) Are conservation funds degrading wildlife habitats? *Economic and Political Weekly* 45(26&27): 22-25.
Haigh, M. J., Rawat, J. S., Rawat, M. S., Bartarya, S. K., and Rai, S. P. (1995) Interactions between forest and landslide activity along new highways in the Kumaun Himalaya. *Forest Ecology and Management* 78: 173-189.
Harris, J. (1995) The use of fish in ecological assessments. *Australian Journal of Ecology* 20: 65-80.
Heimsath, A. M. 2000. Himalayan erosion. *Seminar* http://www.india-seminar.com/2000/486/486%20heimsath.htm

Hels, T. and Buchwald E. 2001. The effect of road kills on amphibian populations. In: *Proceedings of the 2001 International Conference on Ecology and Transportation.* Irwin C. L., Garrett P., and McDermott K. P. (Eds) Center for Transportation and the Environment, North Carolina State University, Raleigh, NC: pp. 25-42.

Hockings, K. J., Anderson, J. R., and Matsuzawa, T. (2006) Road crossing in chimpanzees: A risky business. *Current Biology* 16: R668-670.

Holderegger, R., and Di Giulio, M. (2010) The genetic effects of roads: A review of empirical evidence. *Basic and Applied Ecology* 11: 522-531.

Hosmat, B. J. and Gubbi, S. (2009) I*nterim report for implementation of speed calming measures on the Mysore-Mananthavadi road in Nagarahole National Park.* Submitted to Principal Secretary (Forests, Ecology and Environment), and Chairperson, Mysore-Mananthavadi Road Monitoring Committee, Government of Karnataka, Bangalore.

Jones, D. N., and Bond, A. R. F. (2010) Road barrier effect on small birds removed by vegetated overpass in South East Queensland. *Ecological Management and Restoration* 11: 65-67.

Jones, J. A., Swanson, F. J., Wemple, B. C. and Snyder, K. U. (2000) Effect of roads on hydrology, geomorphology and disturbance patches in stream networks. *Conservation Biology* 14: 76-85.

Kodandapani, N., Cochrane, M. A., and Sukumar, R. (2004) Conservation threat of Increasing fire frequencies in the Western Ghats, India. *Conservation Biology* 18: 1553-1561.

Kumara, H. N., Sharma, A. K., Kumar, M. A., and Singh, M. (2000) Roadkills of wild fauna in Indira Gandhi wildlife sanctuary, Western Ghats, India: implications for management. *Biosphere Conservation* 3: 41-47.

Laurance, W. F., Delamonica, P., Laurance, S. G., Vasconcelos, H. L. and Lovejoy, T. E. (2000) Rainforest fragmentation kills big trees. *Nature* 404: 836.

Laurance, S. G., Stouffer, P. C. and Laurance, W. F. (2004) Effects of road clearings on movement patterns of understory rainforest birds in Central Amazonia. *Conservation Biology* 18: 1099–1109.

Laurance, W. F., Croes, B. M. , Tchignoumba, L., Lahm, S. A., Alonso, A., Lee, M. E., Campbell, P., and Ondzeano, C.(2006). Impacts of roads and hunting on Central African Rainforest mammals. *Conservation Biology* 20: 1251–1261.

Laurance, W. F., Croes, B. M., Guissouegou, N., Buij, R., Dethier, M., and Alonso, A. (2008) Impacts of roads, hunting, and habitat alteration on nocturnal mammals in African rainforests. *Conservation Biology* 22: 721-732.

Laurance, W.F., Goosem, M. and Laurance, S.G. (2009) Impacts of roads and linear clearings on tropical forests. *Trends in Ecology and Evolution* 24: 659-669.

Leopold, A. 1949. A sand county almanac: and sketches here and there. Oxford University Press, USA.

Luce, C.H. (2002) Hydrological processes and pathways affected by forest roads: What do we still need to learn? *Journal of Hydrological Processes* 16: 2901-2904.

Menon, V., Easa, P. S. and Johnsingh, A. J. T. (Eds) (2003) *Securing Chilla – Motichur Corridor - A Status Report*. Wildlife Trust of India, New Delhi.

Milberg, P. and Lamont, B.B. (1995) Fire enhances weed invasion of roadside vegetation in Southwestern Australia. *Biological Conservation* 73: 45-49.

Moosvi, A. H. and Mutch, R. W. (2000) Global voices, village choices: fire management strategies for people and wildlife in Wyanad, Kerala, India. In: Watson, Alan E.; Aplet, Greg H.; Hendee, John C. (Comps.) *Personal, societal, and ecological values of wilderness: Sixth World Wilderness Congress Proceedings on research, management, and allocation. Volume II.* October 24–29 1998, Bangalore, India. Proc. RMRS-P-14. U. S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Ogden, UT.

Negishi, J. N., Sidle, R. C., Noguchi, S., Nik, A. R., and Stanforth, R. (2006) Ecological roles of roadside fern (*Dicranopteris curranii*) on logging road recovery in Peninsular Malaysia: preliminary

results. *Forest Ecology and Management* 224: 176-186.
Newell, G.R. (1999a) Responses of Lumholtz's tree-kangaroo (*Dendrolagus lumholtzi*) to loss of habitat within a tropical rainforest fragment. *Biological Conservation* 91: 181-189.
Parasharya, B. M. and Tere, A. (2007). An observation of common Indian monitor lizard (*Varanus bengalensis* Schreiber) mortality on Anand-Ahmedabad highway, Gujarat, India. *Zoos' Print Journal* 22(10):2872.
Pohlman, C.l. (2006) *Internal fragmentation in the rainforest: Edge effects of highways, powerlines and watercourses on tropical rainforest understorey microclimate, vegetation structure and composition, physical disturbance and seedling regeneration.* PhD thesis, James Cook University, Cairns.
Postel, S. L. (1998) Water for food production: Will there be enough in 2015? *BioScience* 48: 629–637
Prasad, A. E. (2009) Tree community change in a tropical dry forest: the role of roads and exotic plant invasion. *Environmental Conservation* 36: 201-207.
Radhakrishna, S. and Singh, M. (2002) Conserving the Slender Loris (*Loris lydekkerianus lydekkerianus*). Pages 227-231, National Seminar on Conservation of Eastern Ghats, March 24-26, 2002, held at Tirupati, Andhra Pradesh.
Rajvanshi, A., Mathur, V. B., Teleki, G. C., Mukherjee, S. K. (2001) *Roads, sensitive habitats and wildlife: environmental guidelines for India and South Asia.* Wildlife Institute of India, Dehradun.
Raman, T. R. S. (2009) Death on the highway. *The Hindu Survey of the Environment* 2009: 113 – 118
Rangarajan, M., Desai, A., Sukumar, R., Easa, P. S., Menon, V., Vincent, S., Ganguly, S., Talukdar, B. K., Singh, B., Mudappa, D., Chowdhury, S. Prasad, A. N. 2010. *Gajah: Securing the future for elephants in India.* The Report of the Elephant Task Force, Ministry of Environment and Forests, Government of India, New Delhi.
Rao, R. S. P. and Girish, M. K. S. (2007) Road kills: Assessing insect casualties using indicator taxon. *Current Science* 92: 832-837.
Rodriguez, A., G. Crema, and M. Delibes. (1996) Use of non-wildlife passages across a high speed railway by terrestrial vertebrates. *Journal of Applied Ecology* 33:1527-1540.
Rodriguez, S., Subramanian, D., Sridhar, A., Menon, M. and Shanker, K. (2008) *Policy Brief: Seawalls.* UNDP/UNTRS, Chennai and ATREE, Bangalore, India.
Rytwinski, T., & Fahrig, L. (*in press*). Reproductive rate and body size predict road impacts on mammal abundance *Ecological Applications* http://dx.doi.org/10.1890/10-0968.1
Sarma, U. K., Easa, P. S., and Menon, V. 2006. Deadly tracks: a scientific approach to understanding and mitigating elephant mortality due to train hits in Assam. Wildlife Trust of India, New Delhi.
Seiler, A. (2003) *The toll of the automobile: wildlife and roads in Sweden*. PhD thesis. Swedish University of Agricultural Sciences, Uppsala. Link accessed 11 Feb 2009.
Sekhsaria, P. and Pandya, V. (Eds) (2010) *The Jarawa Tribal Reserve Dossier: Cultural and biological diversities in the Andaman Islands.* UNESCO, Paris.
Society for Ecological Restoration International Science and Policy Working Group (2004) *The SER International Primer on Ecological Restoration.* Society for Ecological Restoration International, Tucson.
Seshadri K. S., Amit, Y. and Gururaja K. V. (2009). Roadkills of amphibians in different land use areas from Sharavathi river basin, central Western Ghats, India. *Journal of Threatened Taxa* 1(11): 549-552.
Shareef, N.M. (2007) Disappearing beaches of Kerala. *Current Science* 92: 157-158.
Sharma, N. (2009). Wildlife under wheels. http://conservation.in/blog/wildlife-under-wheels/
Sidle, R. C., Ziegler, A. D., Negishi, J. N., Nik, A. R., Siew, R., and Turkelboom, F. (2006) Erosion processes in steep terrain—Truths, myths, and uncertainties related to forest management in Southeast Asia. *Forest Ecology and Management* 224: 199-225.

Singh, A. K., Kumar, A., Menon, V., and Mookerjee, A. 2001. *Elephant mortality in train accidents—A scientific approach to understanding and mitigating this problem in Rajaji National Park*. Wildlife Trust of India, New Delhi.

Singh A. P., Singh A. K., Mishra D. K., Bora P., Sharma A., 2010. *Ensuring safe access to wildlife in Lumding Reserve Forest, Assam, India: Mitigating the impacts of up-gradation of Doboka-Silchar National Highway (NH54E).* WWF-India, New Delhi.

Somashekar, R. K., Ravikumar, P., Mohan Kumar, C. N., Prakash, K. L. and Nagaraja, B. C. (2009) Burnt area mapping of Bandipur National Park, India using IRC 1C/1D LISS III Data. *Journal of the Indian Society for Remote Sensing* 37: 37-50.

Spellerberg, I. F. 2002. *Ecological effects of roads.* Science Publishers, Enfield, New Hampshire.

Srivastava, S. K. (2006) *A Geo-Information System approach for strengthening conservation measures in protected area with reference to forest fire.* MSc thesis, International Institute for Geoinformation Science and Earth Observation, Enschede, The Netherlands.

Sundar, K. S. G. (2004). Mortality of herpetofauna, birds and mammals due to vehicular traffic in Etawah district, Uttar Pradesh, India. *Journal of the Bombay Natural History Society* 101: 392-398.

Switalski, T. A., Bissonette, J. A., DeLuca, T. H., Luce, C. H. and Madej, M. A. 2004. Benefits and impacts of road removal. *Frontiers in Ecology and the Environment* 2: 21-28.

Trombulak, S.C. and Frissell, C.A. (2000) Review of ecological effects of roads on terrestial and aquatic communities. *Conservation Biology* 14: 18-30.

Yanes, M., Velasco, J.M. and Suarez, F. (1995) Permeability of roads and railways to vertebrates: the importance of culverts. *Biological Conservation* 71:217-222.

Vijayakumar, S. P., Vasudevan, K. and Ishwar, N. M. (2001) Herpetofaunal mortality on roads in the Anamalai Hills, southern Western Ghats. *Hamadryad* 26: 265–272.

Ziegler, A. D., Negishi, J., Sidle, R. C., Preechapanya, P., Sutherland, R. A., Giambelluca, T. W., Jaiaree, S. (2006) Reduction of stream sediment concentration by a riparian buffer: filtering of road runoff in disturbed headwater basins of Montane Mainland Southeast Asia. *Journal of Environmental Quality* 35: 151-162.

10 ANNEXURES

Annexure 1. Some recent studies on roadkill mortality of fauna from India.

Annexure 2. Roads construction in montane forests (observations of R. Athreya in Eastern Himalaya)

Annexure 3. Guidelines for ecologically safer roads provided in the report *Governance for Sustaining Himalayan Ecosystem (G-SHE): Guidelines and Best Practices* by the Ministry of Environment and Forests and the G. B. Pant Institute of Himalayan Environment and Development.

Annexure 4. Example of conditions prescribed at time of approval of a road project (for repair of black-topped road and construction of bridge in Orcha Wildlife Sanctuary, Madhya Pradesh, which was to involve felling of 115 trees). From the Minutes of the 20th Meeting of the Standing Committee of the National Board for Wildlife held on 13 October 2010.

Annexure 1. Some recent studies on roadkill mortality of fauna from India.

Source	Study period	Location	Target taxa	Important findings and	Recommendations
Baskaran & Boominathan (2010)	Dec 1998 - Mar 1999	Mudumalai WLS	Vertebrates	Amphibians most affected, followed by reptiles and mammals	Flyovers at animal crossing points, speed limiters, diversion of proposed state highway
Chhangani (2004a)	Dec 1995 - Dec 2000	Kumbalgarh WLS	Hanuman Langur	Male langurs die more often, might lead to female-biased troops	Speed breakers, limiters, signboards, prohibit feeding
Chhangani (2004b)	Dec 1995 - Aug 1999	Kumbalgarh WLS	Birds	Frequently killed were abundant species such as Eurasian collared and Laughing Dove. Critically endangered scavengers like White-rumped and Indian Vultures were often found killed near mammal carcasses	
Das *et al.* (2007)	May 2004 - Sep 2004	Kaziranga National Park	Reptiles	Almost 90% of road kills were snakes, followed by lizards (10%). Higher percentage of snakes in road kills maybe because snakes used roads for thermoregulation. The particular road (NH 37) is also the only high ground available during floods. Arboreal reptiles most affected, followed by terrestrial reptiles.	
Rao and Girish (2007)	Aug 2005 - Nov 2005	Bandipur and Nagarhole National Park	Insects	Mortality highest in dragonflies (61%) and butterflies (35%), all diurnal species. Nocturnal insect casualties mabe much higher. Higher diversity among road kills in roads through protected areas than those outside.	Speed limit of vehicles passing through national parks, construction of overbridges and underpasses, awareness programmes for drivers and general public on road ecology.
Parasharya & Tere (2007)	2007	Anand-Ahmedabad	Monitor lizard	9 individuals observed killed on a 65 km stretch	Tunnels /culverts across highways

Source	Study period	Location	Target taxa	Important findings and	Recommendations
Vijayakumar *et al.* (2001)	May 1998 - Jun 1998	Anamalai hills	Herpetofauna	Higher number of roadkilled reptiles associated with forests. Greater mortality of amphibians in coffee plantations compared with other vegetation. Lowest mortality of amphibians and reptiles with tea plantations. More roadkills on rainy days compared to dry days.	Closing heavy vehicle traffic at night hours on certain sections
Seshadri *et al.* (2009)	2008	Sharavathi river basin	Amphibians	32 % of roadkills in agriculture section, 22% in waterbody section and 46% in forest section. Roadkill encounter rate highest in forest followed by agriculture and waterbody. High road kill encounters, upto 40/km.	
Kumara *et al.* (2000)	Apr 1995-Dec 1998	Anamalai hills	Reptiles & mammals	Most reptilian roadkills during rainy season in the wet, forest region and most roadkills caused at night. Bonnet macaques followed by porcupines the most frequently killed mammals.	Tourist traffic to be minimised during rainy season and at night. Steps should be taken to maintain canopy contiguity beside the road. When constructing any further roads within the sanctuary, the sensitive rainforest areas must be avoided.
Sundar (2004)	2-year period	Etawah, Uttar Pradesh	Herpetofauna, birds, mammals	133 kills of 33 animal species, amphibians killed more during monsoon, medium-sized birds and omnivores more prone	While some bird species may not perceive road as barrier, their flying across puts them at risk of collision with vehicles
Behera and Borah (2010)		Nagarjuna-Srisailam Tiger Reserve	Mammals	Not available	Not available

Annexure 2

Road Construction in Montane Forests

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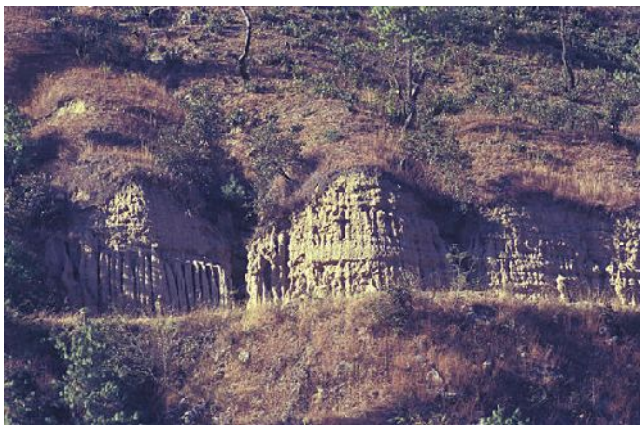
These suggestions are from my experience with roads in montane regions in Arunachal Pradesh. The issues are in red and suggestions are in black.

1. The debris from dynamiting the slopes is cleared by shovelling it down-slope. Since the debris consists of large boulders and huge amounts of soil, this destroys the vegetation on the entire slope below the road ... often in a strip up to 500m wide.
    a. The debris must be disposed of in specific locations to minimise the damage to the slopes below
    b. Boulders excavated by blasts should be "processed" for stone chips required to layer the road. Often, large amounts of rocks are disposed as waste at one location while stone quarries are opened up on roadside cliffs elsewhere to extract stone chips.
2. The fuel and timber requirements of road construction are usually met from forest trees.
    a. Timber for road construction should either be transported in from outside or should use the least important trees in the area, if such exist. For example, in Arunachal Pradesh the preferred fuelwood trees are oak, rhododendron and fir. All these are very slow growing trees which constitute the primary forest species at different elevations.
    b. Pine grows in extensive mono-specific stands and host a considerably diminished diversity of species. Pine is a coloniser which often prevents the regeneration of other native species. If at all local timber has to be used it should be based on a proper plan and should comprise species like pine ... even if it is less efficient.
    c. The proposed strategy of resource utilisation and the actual execution as per plan must be filed with and certified by the local Forest Department and available for public scrutiny.
3. The road construction work force cause havoc in the wilderness. They cut trees for fuel and building temporary shelters and hunt animals for the pot. It is understandable that the poorly paid workers in those remote areas indulge in these activities.
    a. Workers must be billeted outside the wilderness areas even if it involves an expensive daily commute.
    b. Workers must be supplied with adequate fuel for cooking and warmth, and construction materials from outside ... all these should be included in the price of the road – that is what it takes to build roads in wilderness areas, and on no account should the forest itself be made to bear the cost.
    c. Modern technology and proper logistical planning must be used in wilderness areas to greatly increase the pace of road construction to minimise the time spent by the work force in the area.
4. The greatest damage happens because of the poor standard of construction which requires continuous repairs – i.e. the above ills plague the road all through the year, for decades on end. For instance, the Tezpur-Tawang road is under maintenance with a work force billeted on the surrounding forest throughout the year, for the last 30 years.
    a. Can there be limits on how often roads can be repaired in wilderness areas? Quality HAS to be improved. This may translate into higher initial costs for better quality construction ... anyway, even now this extra cost is being borne in the form of repeated repairs over the years and by the forest itself as workers are billeted for longer periods.
    b. Good drainage to keep water away from the road, proper stability of the slopes along the road, and low level maintenance will minimise road damage and the consequent frequent repairs with a large work force.



The exposed retaining walls have been heavily eroded by rainwater run-off (aggravated by deforestation). During the monsoon large sections of the water-logged walls regularly collapse across the road. There is no effort at stabilising the road walls or the slope. Bad drainage and bad slope maintenance are a general feature of roads causing widespread road surface damage and landslides ... which necessitate perpetual maintenance and pressure on the forest.

Road construction is very slow and labour intensive, and so imposes a heavy burden on the natural resources of the area. While employment generation is a laudable aim, the focus while constructing roads in wilderness areas should be on rapid completion of work.

Also visible in the photo is the lack of any effort at slope stabilisation.

Above-left: forest timber being used to melt tar for the black-top road. Above-right: Stones being quarried on the roadside which causes damage to an existing road. On the one hand, rocks exposed while dynamiting for the road alignment are simply rolled down-slope which destroys the vegetation below. On the other, good sections of the road are destroyed to extract rocks for layering the road.

One of the major problems is the poor quality of construction and poor planning which necessitates perpetual repair work by a large work force. The asphalt surface in some places barely lasts a few months and almost never the rainy season.

If necessary, the extensive secondary pine forests should be utilised for road construction fuel and timber and then the exposed land should be used for mixed species plantations







Devastation around road construction camps (at Debrabu, Mandala and O-naga camps; all in Dirang area in West Kameng district). These are not traditional Arunachali settlements but colonies of road construction workers in otherwise uninhabited areas. All these camps are surrounded by extensive tree felling for construction and fuel, and hunting (takin skin on left, and wire snare above-right).

Above-left: Secondary forest on the road slope. Above-right: Untouched primary forest on the slope away from the road.
Left: Deforestation along the road near Bomdila.
For one reason or another deforestation tracks road construction. Some of it is because of Arunachali communities opening up new areas for agriculture along the road. More often it is because of deforestation associated with the construction work force. Most of the deforested areas in the Bomdila image have no cultivation.

Huge landslides extending many hundreds of metres, in both forested and deforested slopes. Roads are cut with little thought to slope stabilisation. Given the very loose soil even the presence of trees does not always guarantee soil stability. Above: slides along a small track in Eaglenest sanctuary. Below: slides along the highway in Dirang and Jang.

Annexure 3. Guidelines for ecologically safer roads provided in the report *Governance for Sustaining Himalayan Ecosystem (G-SHE): Guidelines and Best Practices* by the Ministry of Environment and Forests and the G. B. Pant Institute of Himalayan Environment & Development.

Ecologically Safer Roads

- For construction of any road in the Himalayan region of more than 5 km (including extension/widening of existing roads) length where the same may not be tarred roads and environmental impact assessment is otherwise not required, environmental impact assessment should be carried out in accordance with the instructions to be issued for this purpose by the State Governments.
- Provision should be made in the design of the road for treatment of hill slope instabilities resulting from road cutting, cross drainage works and culverts using bio-engineering and other appropriate techniques by including the cost of such measures in the cost estimate of the proposed road.
- Provisions should also be made for disposal of debris from construction sites in appropriate manner at suitable and identified locations so as not to aff ect the ecology of the area adversely; further, the dumped material should be treated using bio-engineering and other appropriate techniques and the cost of such measures should be included in the cost estimate of the proposed road.
- Wherever hot mix plants are used, they should be set up at least 2 km away from settlements and a minimum area of 200 sq. m. surrounding the site should be devoid of vegetation.
- No stone quarrying should be carried out without proper management and treatment plan including rehabilitation plan and fi nancial provision for rehabilitation of the site should be included in the cost of the management plan.
- All hill roads should be provided with adequate number of road side drains and these drains shall be kept free from blockage for runoff disposal; in the event that this is not done and this fact leads to damages that could otherwise have been prevented, the persons responsible should be liable for prosecution/damages; further, the cross drains shall be treated suitably using bio-engineering and other appropriate technologies so as to minimise slope instability.
- The runoff from the road side drains should be connected with the natural drainage system in the area.
- Fault zones and historically land slide prone zones should be avoided during alignment of a road, where for any reason it is not possible to do so, notice should be given providing full justifi cation and the construction should be carried out only after suffi cient measures have been taken to minimize the associated risks.
- Notice should be given about all fault zones and land slide zones along the roads indicating the beginning and the end of such areas.
- Ridge alignment should be preferred to valley alignment.
- Alignment should be selected so as to minimise loss of vegetal cover.
- South or South-west alignment should be preferred to avoid moist areas.
- Appropriate design standards should be followed while designing the roads including mass balancing of cut and fill and avoidance of unnecessary cutting.
- Encouragement should be provided for use of debris material for local development.

Annexure 4. Example of conditions prescribed at time of approval of a road project (for repair of black-topped road and construction of bridge in Orcha Wildlife Sanctuary, Madhya Pradesh, which was to involved felling of 115 trees). From the Minutes of the 20th Meeting of the Standing Committee of the National Board for Wildlife held on 13 October 2010.

Conditions imposed:

1. 5% of the project area falling with the Sanctuary would be paid by the user agency for the development of Orcha Wildlife Sanctuary
2. No new road would be constructed. Only the existing road would be repaired.
3. There shall be no widening of the existing road. The overall width of the road should not be more than existing width including shoulders on either side of the road.
4. The tree felling would be to the barest minimum.
5. No material including earth should be used from the sanctuary area. It will affect flora as well as fauna, particularly the micro fauna.
6. There should be provision of speed breakers at every 400 m of the road inside the sanctuary so that the speed is regulated within the sanctuary so as to avoid accidental death of wild animals.
7. Speed limit within the stretch of road passing through the Sanctuary should be restricted to 20 Kms/hr.
8. Apart from mandatory sign boards along the road, boards depicting wildlife safety instructions and cautions relating to it should also be placed at every 500 m using good material and having proper font size and pictures.
9. The agency should ensure that no damage to any flora or fauna is caused during the course of the execution of the work.
10. All construction materials should be brought from outside the sanctuary area including earth.
11. There should not be any labour camps permanent or temporary, in the sanctuary area during the course of construction of the road. Collection of firewood shall be prohibited.
12. All the trees along the road shall be protected by the user agency.
13. All quarry for metal/sand/moorum shall be informed by user agency and previous sanction to Revenue Department (mining) collector is mandatory. If any Private party found to violate rules or involved in illegal mining during contruction, than [sic!] user agency will be made responsible for it.
14. Heavy vehicular traffic should be avoided as it may cause permanent disturbance inside the sanctuary.
15. All vehicles shall pay prescribed entry fees.
16. All vehicles will enter sanctuary area after sunrise and shall exit the sanctuary before sunset.
17. No camping of vehicles shall be allowed inside the sanctuary..
18. NPV and Compensatory afforestation Funds will be paid by the user agency to the Chief Wildlife Warden as per norms.
19. The user agency should also abide by any other conditions that may be prescribed by the Chief Wildlife Warden.
20. The Chief Wildlife Warden would submit a compliance report on implementation of the conditions specified, before the Standing Committee of NBWL after completion of the project.

Breif note
on
Jeypore Rainforest

Jeypore Forest was notified as Reserve Forests vide Govt. Notification No.37 Dt.19.10.1888 with an area of 10,666.08 Hectares, and with two consecutive additions till 1969, total area of the Reserved Forests thus comes to 10,876.68 Hectares. Proposal for a third addition to the Reserved Forest with an area of 184.00 Hectares

Contiguous to its Northern Boundary is yet to see the light of preliminary Notification. Vide Govt. Of Assam notification dated FRW/34/2003/pt/6 dated 19th June 2004, Dheing-Patkai Wildlife Sanctruary was carved out of Jeypore RF. An area of 1119.42 ha was accordingly declared as Dheing Patkai Wildlife Santuary.

Jeypore Reserve Forests falls in the civil District of Dibrugarh and under the Dibrugarh Forest Division. It is situated within the geographical limit of Longitude 95 Degree 22 minutes to 95 Degree 30 minutes East and Latitude 27 Degree 0 minutes to 27 Degree 16 minutes north. It is bounded by Arunachal Pradesh in East and South, Sivasagar District in its West.

Forest Type:

As per classification made by Champion and Seth in their survey of Forest Types of India, this Reserve Forest is classified as Type 1 B.C. 1 Assam Valley Wet Evergreen Forest (Depterocarpus) or more commonly known as Upper Assam Depterocarpus Mesua formation. It forms a part of the world heritage site of sub-tropical wet evergreen forests, multi-storeyed in structure and rich in biodiversity, more popularly known to a part of the media now a days as Rain Forests.

This forest is characterized by being multi-storeyed with predominant species of Hollong (Dipterocarpus macrocarpus) reaching a height of 50 meters and above, and girth up to 7 meters. Another Species viz Makai (Shorea assamica) also occur in the top canopy along with Hollong over a limited locality specially and slightly at higher elevation with good drainage. Other species which are found to occur in the top canopy sporadically are Soppa, Dhuna, Sam, Hollock, Jatuli, Borpat etc. The middle storey is dominated by Nahar and Morhal. Other species found in this canopy are Hilikha, Jamuk Selleng, Bandor-dima, Bhomora etc. Sometimes there occurs a third storey occupied by Dendrocalamus hemiltonii (Kako) Bamboosa pallida (Dolo) Livingstonia jenkinsolana (Jengopa) etc.

The undergrowth is composed of woody shrubs like Goch bhedeli, Kachidoria, Osbeckia spps. Sorat etc Scitamineous shrubs like Kowpat, Bogitora etc. palms such as Gerugatamul, Takopat etc. and canes such as Jengu, Raidang, Haukabet, occurs in this storey.

Climbers are numerous and occur profusely common among them are Thuabergia grandiflora, Tapirts hirsutea, Entada scondens, Mazonewrum cucullatum, Derris oblonga Bauhinia vahlii etc. wherever there is an opening Mikenia Scendens, an exotic which invaded the Forests in World War – II is found to occupy space, rapidly spreading to form a mat suppressing all shrubs and seedling of tree species and intercepting seeds from reaching the ground. Ground cover includes various species of grass, fems, herbs, ground orchids, medicinal herbs. Etc.

Picture of Hoolock gibbon in Jeypore

The tract forms the transitional zone between India and Myanmar with the Patkai Hills as the water parting and is so rich in biodiversity that not to talk of the fauna most of the flora even awaits classification / identification.

The varieties of wild life commonly noticed, include terrestrial as well as arboreal, such as, Tiger, leopard, clouded Leopard, golden cat, Marble Cat, Elephant, Sun bear, Biringtorang barking deer, Sambar, wild cats, Wild Dog, civet cats, Hoolock gibbon, slow lorries, Capped Langur, Assamese Macaque, pig tailed macaque, flying squirrel, Otter etc. various birds including white winged wood duck, hornbills, hill myna, doves, green pigeon, red jungle fowl and many other local and migratory avifauna.

Picture of Clouded Leopard in Jeypore

The Forest is one of its kinds and quite rich in biodiversity.

Jeypore Reserve Forest is part of the Jeypore-Dehing Landscape of Assam Valley lowland evergreen rainforest – part of the northernmost rainforests in the world, and among the last stretches of this unique forest type remaining in the country. Jeypore Reserve Forest (RF) holds the largest population (at least 143 individuals) of the highly endangered western Hoolock hoolock in Assam (Kakati 2004). In addition, Jeypore RF also holds the 6 other species of primates. In a recent camera-trapping survey (Kakati 2008), 26 mammal species have been photographed, among them some very rare, endangered and elusive carnivores. With five large carnivores (tiger, leopard, clouded leopard, wild dog and Malayan sun bear) and three species of lesser cats (golden cat, marbled cat and leopard cat), the Jeypore Reserve Forest now holds the distinction of being the only location in Northeast India where the sympatric presence all of these eight charismatic carnivores have been confirmed with photographs. These are the first camera-trap photograph records in Assam for clouded leopard, marbled cat, golden cat, Malayan sun bear, yellow-throated marten and the endangered brush-tailed porcupine; and only the fourth location in northeast India to confirm presence of wild dogs (after Namdapha Tiger Reserve, Manas National Park and Mizoram). At least 146 species of birds have been recorded to date, a figure which is definitely only a fraction of the total. The importance of Jeypore RF can be gauged from the fact that recent camera-trapping efforts in the nearby world-renowned Namdapha National Park in Arunachal Pradesh have failed to reveal the presence of tiger, leopard, wild dog and elephant.

These magnificent dipterocarp forests harbour endangered species such as elephant, tiger, wild dog and hold critical populations of globally critically endangered species such as Assam's state bird, the white-winged wood duck and the dipterocarp tree Vatica lanceaefolia. Recently, this landscape has been shown to contain the largest diversity of carnivores photo-recorded in South Asia and the greatest diversity of wild cat species in the world. Over 281 bird species, 276 butterfly species, , 102 species of orchids, 70 species of fish and 45 species of mammals have been recorded so far. Many of the species are of high conservation value, globally threatened and/or endemics i.e. found only in this region.

Present Scenario:

The major challenges faced by the Forest Department in management and conserving Jeypore Forest, its flora and fauna are

- *Increasing dependence of the local population on the resources of the Forest mainly small timber and Minor Forest Produce.*
- *Illegal Fishing, Collection of Cane and other MFPs and illegal hunting by Arunachal people.*
- *Lack of proper data on the extent of resources of the Forest mainly floral diversity, including orchids. Other data regarding Butterflies, Avi Fauna etc are not collected scientifically.*
- *Lack of Infrastructural facilities and logistics required in managing and protection of the forest.*
- *Shortage of staff and small organisational set up.*
- *Problems related to Inter- State border such as fringe area agricultural encroachment etc on the Arunachal Side.*
- *Encroachment problems from nearby villagers*

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CONSERVATION OF DIBRU SAIKHOWA NATIONAL PARK, ASSAM

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Another neglected protected area is Dibru-Saikhowa National Park in Dibrugarh and Tinsukia districts of Upper Assam. I have visited Dibru-Saikhowa many times and finds it as good as Kaziranga. Recently, an excellent book on Dibru-Saikhowa has been brought out by Mr K.K, Dwevidi, District Magistrate of Dibrugarh. I will be happy to present you a copy of this remarkable book about this biodiversity hotspot. Dibru-Saikhowa has great potential to reintroduce Rhinoceros and Swamp Deer. Unfortunatley, not much attention is given to Dibru-Saikhowa - for example, there are only 20 forest guards in this 460 sq km National Park, and the budget is also meagre. I am sure that if this Park is protected properly, it will rival Kaziranga in its biodiversity and scenic beauty.

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Agenda items proposed by Prerna Singh Bindra, member, Standing Committee, NBWL on Jan 24, 2011

1) **No proposal within ten km of sanctuaries and National Parks to be entertained before the Standing Committee till Chief Wildlife Wardens submit proposal to state for Eco-sensitive zones:** About six years have gone by since the Supreme Court has directed states to propose and declare eco-sensitive zones around Protected Areas to regulate development and other activities that will endanger the ecology/wildlife/wildlife corridors. States have dragged their feet in declaring eco-sensitive zones. But have the Chief Wildlife Wardens and the state forest department demarcated proposed eco-sensitive zones around PAs and put these before the state government? Meanwhile, there is a slew of proposals bordering national parks and sanctuaries and we are losing vital buffer areas and corridors. It is proposed that unless the proposed Eco-sensitive zones around PAs are demarcated and put before the respective state government in the next three/four months, no development projects, etc in ten km around PAs will be entertained by the Standing Committee.

The Committee may consider not to entertain proposals for development and other projects etc within a ten km radius around PA buffers, and crucial corridors till such time as Chief Wildlife Wardens submit a proposal to the respective state government for Eco-sensitive zones around PAs that will protect the ecological integrity of the concerned PA.

b) It is understood that the **National Advisory Council has set a working group to propose amendments to the Forest Rights Act rules and also the provisions of the Act, other than the Saxena Committee**. This working group has come up with a draft amendment of the FRA rules which will have far reaching consequences on forests and wildlife. It appears that these are under the consideration of the MoEF. It is crucial that they be put before the National Board of Wildlife for comments given that this will have a major impact on critical tiger and wildlife habitats, and the very spectrum of forest governance in these areas. It is proposed that a specific working group looks at the issues pertaining to Protected Areas vis-à-vis FRA. It is seen that the response of the PA management—across various types of PAs i.e. nationals parks, tiger reserves etc is marred with utter confusion and chaos in absence of clear guidelines and policies and even clarity of thought. This is translating

to immense damage on the ground. There needs to be a policy on the new emerging forest governance specific to PAs given the bitter reality of FRA and how damage to conservation and wildlife be minimised.

The draft amendments to the Forest Rights Act Rules and the provisions of the Act by the working group of the National Advisory Council maybe placed before the National Board of Wildlife for consideration and comment considering the far reaching impacts on forest, ecology and wildlife. It is proposed that a specific working group looks at the issues pertaining to Protected Areas vis-à-vis FRA.

c) **Focus on Protected Areas beyond tiger reserves**: It is seen that while tiger reserves, rightly so, have some focus on protection and management and that there is considerable intervention from the centre (National Tiger Conservation Authority) on management, protection and technical issues, other PAs are very neglected. Especially those which have critically endangered species like hangul, bustards, wild buffaloes, wolves etc are of serious and immediate concern. Most lack focus, there is no effective management, protection and are generally in a pathetic shape. There is an urgent need to have a strategy/plan –to raise their profile and to bring focus in their management and protection. There is also an urgent need to look at the whole funding system. It has been seen in the field that the fund situation of sanctuaries, even the most critical wildlife areas, is pathetic**.** Funds are not sufficient and hugely delayed. One would like to see before the board when funds are released by the centre, and then later by the state to understand the time lags and delays. It is thought to be advisable to have a similar kind of structure as followed to NTCA to try streamline both provision of funds on time, and accountability of the states**.** Can there be a committee drawn from the NBWL, other experts, officers to look into the same?

The Committee would like to see before the board when funds from the centre are released to the states for Protected Area other than tiger reserves, and also discuss—a sub-committee can be formed for the same-to discuss and assess similar kind of structure as followed to NTCA to try streamline both provision of funds in a timely manner, and have more accountability of the states. The aim is to have more management intervention from the centre and more focus in PAs other than tiger reserves, which are badly neglected and are fast declining. The objective of the sub-committee should be to suggest strategies to deal with this concern.

c) **Mission Leopard:** The plight of the *Panthera pardus* is of increasing concern. Experts say that the leopard may beat the tiger in the race to extinction. For every tiger skin recovered, there are at least seven leopard skins seized. India lost at least 328 leopards 2010 – that's about a leopard a day, and these are the recorded cases. While it may appear that there are 'enough' leopards, scientists stress that the population cannot take this large off-take. We are all well-aware of the acute man-leopard conflict situation across the country—leopards are stoned, beaten, burnt to death. In just the first two weeks of the new year, a leopard in Faridabad, Haryana was lynched to death by an angry mob and another near Chandaka sanctuary close to Bhubneswar, Orissa, was beaten to death, hung on 'display' and paraded by a mob. Such examples are endless. It is time to address this situation which is way beyond out of hand. There is a need to have an idea of the status of the leopard-an estimated population, assess the loss of leopards. We need to address the issue of forest habitat loss and consequent human-animal conflict There must be an awareness campaign and some strategy to address/deal with the conflict situation.

It is proposed that the Committee must take on board the gravity of the leopard crisis and which may be best addressed through a focused programme on the leopard to understand the cause of conflict, strategies to mitigate it, a comprehensive awareness programme, and also to address the increasing leopard poaching cases .

e) **A visit to Valmiki Tiger Reserve** in December 2010 revealed a violation of the Wildlife Protection Act and Forest Conservation Act. **The Valmiki Nagar-Bagha State Highway which passes through the tiger reserve was being repaired, and widened almost to double its breadth-- without the required permission from the Standing Committee of the National Board of Wildlife as mandated**. Hundreds of vehicles pass through this road everyday, particularly tractors and trucks of sugarcane, causing huge disturbance. The state highway cuts through the Madanpur range on the western part of the reserve and the connectivity of this part is almost lost to western Valmiki, which is of grave concern. It must be restored.

As I was informed, that 'permission' has been sought and granted from the state for repairing the existing road breadth. This too, of course, requires permission from the NBWL.

The MOEF should seek a clarification from the Bihar state government as to why it was permitted to allow road repair and widening through a tiger reserve and that action must be taken against this violation of the law and not seeking mandatory clearances from the NBWL

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1	**Name of the Proposal**	Diversion of 7.605 ha forest land for Six laning of Vadakkancherry-Trissur Section of NH-47 in Kerala- Construction of 2 tunnels in Kuthiran hill in Peechi- Vazhani Wildlife Sanctuary.
2	**Name of the protected Area involved**	Peechi-Vazhani Wildlife Sanctuary
3	**File No**	6-8/2011 WL –I
4	**Name of the state**	Kerala
5	**Whether proposal is sub-judice**	No
6	**Area of the protected area**	125.00 Sq. Kms
7	**Area proposal for diversion/Denotification**	7.605 Ha
8	**Name of the applicant agency**	National Highways Authority of India, Palakkad
9	**Total number of tree to be felled**	104 trees
10	**Maps depicting the Sanctuary and the diversion proposal included or not**	Yes
11	**Recommendation of State Board for Wildlife** Yes. The State Board for Wildlife has approved the proposal in its meeting held on 30.11.2010.	
12	**Brief justification on the proposal as given by the applicant agency.** The proposal under consideration is for diversion of 7.605 ha of forest land in Peechi Vazhani Sanctuary for construction of two tunnels in Kuthiran Hill that pass beneath the surface of the Wildlife Sanctuary. The tunnel option requires 104 trees to be felled in the open cut excavation area. Out of this, 85 trees are planted Rubber trees. The proposed project is the best alternate option for traffic movement considering the impact of disturbance to wildlife habitat. Completion of the project is expected to facilitate free wildlife movement once the vehicular traffic is diverted. The Standing Committee of NBWL in its meeting held on 4th October 2005 had recommended for the survey proposal for this project.	
13	**Rare and endangered species found in the area** Not mentioned in the proposal. However, the Sanctuary is the habitat for Leopards, Elephants and Bison etc.	
14	**Opinion of the Chief Wildlife Warden** The Chief Wildlife Warden while recommending the proposal has indicated that at present the National Highway runs through the Sanctuary preventing animal movement. Once the tunnel is in place, around 600 meters will be free from traffic movement enabling free animal movement.	

15	**Comment of Ministry** The Standing Committee of NBWL may like to consider.