2011



# Report of the
# Western Ghats Ecology Expert Panel

*Submitted to*
**The Ministry of Environment and Forests**
**Government of India**

सत्यमेव जयते

जहाँ है हरियाली।
वहाँ है खुशहाली।।

Ministry of Environment and Forests
Government of India

westernghatindia.org

# Report of the Western Ghats Ecology Expert Panel
# Part I

**Submitted to**
The Ministry of Environment and Forests,
Government of India

31 August 2011

**Cover Design:**

Courtesy - Kerala State Biodiversity Board

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# Preface

India is remarkable for the deep and abiding concern demonstrated by its people and its successive Central, State and local Governments towards halting the rapid pace of degradation of the environment. Our country has been a pioneer in the area of integrating the needs of development with the desire to protect the environment, as reflected in the emphasis on sustainable development as a key feature of the development strategy of the nation since the Fourth Five Year Plan of the country in the early 1970s. The constitution of the Western Ghats Ecology Expert Panel by the Ministry of Environment and Forests of the Government of India is yet another reflection of the seriousness with which our country views these significant challenges.

The Western Ghats are naturally an important focus of sustainable development efforts. The protector of the Indian peninsula, the mother of the Godavari, Krishna, Netravathi, Kaveri, Kunthi, Vaigai and a myriad other rivers, Kalidasa likens the Western Ghats to a charming maiden; Agastyamalai is her head, Annamalai and Nilgiri the breasts, her hips the broad ranges of Kanara and Goa, her legs the northern Sahyadris. Once the lady was adorned by a sari of rich green hues; today her mantle lies in shreds and tatters. It has been torn asunder by the greed of the elite and gnawed at by the poor, striving to eke out a subsistence. This is a great tragedy, for this hill range is the backbone of the ecology and economy of south India.

Yet, on the positive side, the Western Ghats region has some of the highest levels of literacy in the country, and a high level of environmental awareness. Democratic institutions are well entrenched, and Kerala leads the country in capacity building and empowering of Panchayat Raj Institutions. Goa has recently concluded a very interesting exercise, Regional Plan 2021, of taking inputs from Gram Sabhas in deciding on land use policies. Evidently, the Western Ghats constitutes an appropriate region of the country to attempt to make the transition towards an inclusive, caring and environment-friendly mode of development.

It is therefore with tremendous enthusiasm that the Western Ghats Ecology Expert Panel has approached its appointed task. The Panel embarked upon the assignment through a multi-pronged strategy which included (i) compilation of all readily available and accessible information on the Western Ghats, (ii) development of a geospatial database on ecological sensitivity for the entire Western Ghats region which would provide a multi-criteria decision support system for demarcation of ecologically sensitive areas, and (iii) comprehensive consultations with principal stakeholders which included civil society groups, government officials, and peoples' representatives, ranging from members of Gram Panchayats and Zilla Parishads to MLAs and MPs.

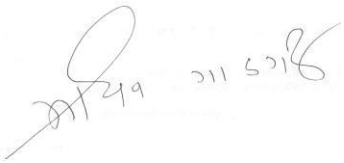
It is noteworthy that in all these endeavors special effort was made to have wide-ranging discussions with complete transparency. All the information generated by the Panel including the geospatial database is publicity available through a dedicated website created for the Panel.

During the course of the last one and half years, Western Ghats Ecology Expert Panel has had fourteen Panel meetings wherein the Panel deliberated at length on various issues related to the Western Ghats region. The detailed minutes of all these meetings are available on the Ministry's website. These meeting were interspersed with brainstorming sessions, public consultations and field visits. The central stream of thought was to develop a sound

scientific methodology/basis for arriving at decisions, with these decisions deliberated upon by adopting a participatory approach.

The report embodies among other things (i) categorization of the Western Ghats into three zones of varied ecological sensitivity, based upon careful analysis done by WGEEP, (ii) broad sectoral guidelines for each of these zones, and (iii) a broad framework for establishment of the Western Ghats Ecology Authority.

In this endeavor, the Panel has utilized the expertise of a number of people and organizations to whom the panel expresses its gratitude. The Panel thanks the Ministry of Environment and Forests, Government of India, for giving it this unique opportunity to be part of a very significant initiative directed at conserving the natural heritage of the Western Ghats – a global biodiversity hotspot.



**Prof. Madhav Gadgil**

**Chairman**

**Western Ghats Ecology Expert Panel**

# Acknowledgements

The Western Ghats Ecology Expert Panel (WGEEP) acknowledges the valuable inputs provided by the Hon. Ministers for Environment and Forests, GoI, several Ministers of State Governments, and the Members of Parliament of the Western Ghats region.

The WGEEP acknowledges the help and cooperation provided by the State Environment and Forest Departments, as well as other departments including Rural Development and Panchayat Raj, and institutions such as KILA and KFRI of various Western Ghats States viz. Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu.

The WGEEP acknowledges the members of all the civil society groups who have interacted and shared their invaluable experience and information with the Panel. Many of them have played an important role in evolving policy and management formulations for the ecologically sensitive zones. Individual names of the members and the civil society groups appear at relevant places in the Annexures.

The WGEEP acknowledges with great pleasure the warmth with which people at the grass-roots welcomed it and shared their understanding, perceptions and concerns.

The WGEEP acknowledges the significant and critical inputs provided by Shri Sanjay Upadhyay, Advocate, Supreme Court and Managing Partner, ELDF, regarding the modalities for setting up the proposed Western Ghats Ecology Authority.

Most importantly, the Western Ghats Ecology Expert panel puts on record its gratitude to Dr. S.N. Prasad and its deep appreciation of his effort in preparing the geospatial database for arriving at ecological sensitivity levels for the whole Western Ghats region. This database is the basis for defining the proposed ecologically sensitive zones across the Western Ghats.

The Panel would also like to acknowledge the following persons for their invaluable help and assistance in accessing the data and information required for the geospatial database used by WGEEP:

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5. Prof R Sukumar (elephant corridors)
6. Dr K N Ganeshiah (Western Ghats boundary)
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# List of Abbreviations

| | |
|---|---|
| ATREE | Ashoka Trust for Research in Ecology and the Environment |
| BMC | Biodiversity Management Committee |
| BVIEER | Bharati Vidyapeeth Institute of Environmental Education and Research |
| CCF | Chief Conservator of Forests |
| CEA | Central Electricity Authority |
| CEC | Central Empowered Committee |
| CEIA | Comprehensive Environment Impact Assessment |
| CES | Centre for Ecological Sciences |
| CETP | Common effluent treatment plant |
| CFR | Community Forest Resources |
| CPSS | Chalakudy Puzha Samrakshana Samithi |
| CRDS | Chalakudy River Diversion Scheme |
| CPCB | Central Pollution Control Board |
| CZMA | Coastal Zone Management Authority |
| DCR | Development Control Regulations |
| DEC | District Ecology Committees |
| DEVRAAI | Development Research, Awareness & Action Institute |
| DP | Development Plan |
| DEC | District Ecological Committee |
| DPC(s) | District Planning Committee (s) |
| DPDC | District Planning and Development Council |
| DPR | Detailed Project Report |
| DRP | District Regional Plans |
| DTEPA | Dahanu Taluka Environment Protection Authority |
| DTP | Director of Town Planning |
| EAC | Environment Appraisal Committee |
| EPA | Environment Protection Act |

| | |
|---|---|
| EPR | Environment (Protection) Rules |
| ESA | Ecologically Sensitive Area |
| ESL | Ecologically Sensitive Locality |
| ESZ | Ecologically Sensitive Zone |
| EVI | Enhanced Vegetation Index |
| FGD | Flue gas desulfurizer |
| FRA | Forest Rights Act |
| FSI | Floor Space Index |
| GAP | Good Agricultural Practice |
| GGGJDC | Goa Government's Golden Jubilee Development Council |
| GHEP | Gundia Hydro-Electric Project |
| GMO | Genetically modified organisms |
| GMOEA | Goa Mineral Exporters Association |
| GOK | Government of Karnataka |
| GoM | Government of Maharashtra |
| GRIHA | Green Rating for Integrated Habitat Assessment |
| GRP | Goa Regional Plan |
| HEP | Hydro Electric Project |
| HLMC | High Level Monitoring Committee |
| HT | high tension |
| IBWL | Indian Board of Wild Life |
| JNNURM | Jawaharlal Nehru National Urban Renewal Mission |
| KFRI | Kerala Forest Research institute |
| KMDA | Kolkata Metropolitan Development Authority |
| KPCL | Karnataka Power Corporation Limited |
| KSBB | Kerala State Biodiversity Board |
| KSEB | Kerala State Electricity Board |
| KSSP | Kerala Sastra Sahithya Parishath |

| | |
|---|---|
| LSG | Local Self Governments |
| MAHASESA | Maharashtra Sahyadri Ecologically Sensitive Area |
| MMDR | Mines & Minerals (Development & Regulation) Act. |
| MCD | Municipal Corporation Districts |
| MCM | Million cubic metres |
| MCR | Mineral Concession Rules. |
| MFD | Maharashtra Forest Department |
| MGNREGA | The Mahatma Gandhi National Rural Employment Guarantee Act |
| MIDC | Maharashtra Industrial Development Corporation |
| MMDR | Minerals and Metals (Development and Regulation) |
| MODIS | Moderate Resolution Imaging Spectroradiometer |
| MoEF | Ministry of Environment and Forests |
| MoTA | Ministry of Tribal Affairs |
| MPC | Metropolitan Planning Committee |
| MPESZ | Mahabaleshwar Panchgani Ecological Sensitive Zone |
| MPT | Mormugao Port Trust |
| MTDC | Maharashtra Tourism Development Corporation |
| NCAER | National Council of Applied Economic Research |
| NCF | Nature Conservation Foundation |
| NDVI | Normalized Differential Vegetation Index |
| NEERI | National Environmental Engineering Research Institute |
| NIO | National Institute of Oceanography |
| OGC | Open Geospatial Standards |
| PA(s) | Protected Area(s) |
| PCCF | Principal Chief Conservator of Forests (India) |
| PESA | Panchayat Extension to the Scheduled Areas Act |
| PIL | Public Interest Litigation |
| PPP | Public Private Partnership |

| | |
|---|---|
| PRI | Panchayat Raj Institution |
| PWD | Public Works Department |
| RRC | River Research Centre |
| RTI | Right To Information |
| SAM | Spatial analyses in Macro Ecology |
| SEZ | Special Economic Zones |
| SPCB | State Pollution Control Board |
| SRTM | Shuttle Radar Topographic Mission |
| SRUDPA | State Regional and Urban Development Planning Acts |
| STPs | Sewage Treatment Plants |
| TBGRI | Tropical Botanical Garden and Research Institute |
| TERI | The Energy and Resources Institute |
| TIFF | Tagged Image File Format |
| ULB | Urban Local Body |
| UNESCO | United Nations Educational Scientific and Cultural Organization |
| VP(s) | Village Panchayat(s) |
| WAPCOS | Water and Power Consultancy Services |
| WG | Western Ghats |
| WGEA | Western Ghats Ecology Authority |
| WGEEP | Western Ghats Ecology Expert Panel |
| WGMCMP | Western Ghats Master Conservation and Management Plan |
| WLS | Wild Life Sanctuary |
| ZASI | Zoning Atlas for Siting of Industries |
| ZMP | Zonal Master Plan |
| ZP | Zilla Parishad |

# Report of the Panel – Part I

## 1. Summary

On the basis of careful and extensive compilation of information, and wide-ranging field visits, consultations and analysis, the Western Ghats Ecology Expert Panel (WGEEP) has designated the entire Western Ghats as an Ecologically Sensitive Area (ESA) and, assigned three levels of Ecological Sensitivity to different regions of it. These are termed as Ecologically Sensitive Zone 1 (ESZ1), Ecologically Sensitive Zone 2 (ESZ2) and Ecologically Sensitive Zone 3 (ESZ3). A number of specific proposals received by the Panel from individual Gram Panchayats as well as NGOs from different parts of the Western Ghats are referred to as Ecologically Sensitive Localities (ESL).

The database employs square grids of ~ 9 km x 9 km that do not correspond either to natural features such as watersheds, or administrative units such as village or taluka boundaries. It will clearly be desirable to put in place a system of zonation that jointly considers micro-watersheds and village boundaries to decide on specific limits of ESZ1, ESZ2 and ESZ3, as well as to arrive at a locality specific management plan. This would be a task that will have to be initiated by the Western Ghats Ecology Authority through a broad-based participatory process when it is put in place. However, as a first step, we suggest the Ministry of Environment and Forests provisionally notify the initial limits of ESZ1, ESZ2 and ESZ3 based on WGEEP analysis. This may be most appropriately done at Taluka/Block level. With this in view, we have gone ahead and assigned ESZ1, ESZ2 and ESZ3 levels to all the 142 talukas within the Western Ghats boundary. The assigned ESZ level to the taluka is that ESZ that covers the largest fraction of the taluka. In the case of Goa, 1 minute x 1 minute grids were used and the zones across talukas were defined based on ecological significance of grids.

WGEEP advocates a graded or layered approach, with regulatory as well as promotional measures appropriately fine-tuned to local ecological and social contexts within the broad framework of ESZ1, ESZ2 and ESZ3. While we advocate this fine-tuning through a participatory process going down to gram sabhas, it is appropriate to provide a broad set of guidelines as a starting point. WGEEP has attempted to arrive at such a set of broad guide-lines for the various sectors on the basis of extensive consultations with officials, experts, civil society groups and citizens at large.

WGEEP recommends that no new dams based on large scale storage be permitted in Ecologically Sensitive Zone 1 as defined by the Panel. Since both the Athirappilly and Gundia hydel project sites fall in Ecologically Sensitive Zone 1, these projects should not be accorded environmental clearance.

For the state of Goa, WGEEP recommends an indefinite moratorium on new environmental clearances for mining in Ecologically Sensitive Zones 1 and 2, a phasing out of mining in Ecologically Sensitive Zone 1 by 2016 and continuation of existing mining in Ecologically Sensitive Zone 2 under strict regulation with an effective system of social audit. The moratorium on new clearances in ESZ2 can be revisited as and when the situation improves and when a comprehensive study on the impact of mining on the ecology, environment, human health, and biodiversity by a competent multidisciplinary team, working along with people's institutions, has been concluded.

The Panel has been asked to suggest an appropriate course of further development of mining, power production and polluting industries in Ratnagiri and Sindhudurg districts of

Maharashtra. Only portions of these districts are covered by the Western Ghats, and for which WGEEP has completed assignment of Ecologically Sensitive Zones and provided guidelines for sectors. For these Western Ghats regions of the district, the Panel recommends an indefinite moratorium on new environmental clearances for mining in Ecologically Sensitive Zones 1 and 2, a phasing out of mining in Ecologically Sensitive Zone 1 by 2016 and continuation of existing mining in Ecologically Sensitive Zone 2 under strict regulation with an effective system of social audit. It also recommends that in Ecologically Sensitive Zones 1 and 2, no new polluting (red and orange category) industries, which would include coal-based power plants, should be permitted to be established; the existing red and orange category industries should be asked to switch to zero pollution by 2016, again with an effective system of social audit.

WGEEP has not undertaken any extensive compilation of pertinent information and assignment of levels of ecological sensitivity to the plains and coastal portions of Ratnagiri and Sindhudurg districts falling outside the Western Ghats. Nevertheless, the limited investigations of the Panel in these plains and coastal tracts suggest that these are under severe environmental and social stress, and it is essential that a careful Cumulative Impact Analysis of various development activities in these tracts, ideally in conjunction with Raigad district of Maharashtra and the state of Goa, must be immediately undertaken, preferably under the leadership of the National Institute of Oceanography, Goa. The Panel recommends that the current moratorium on new environmental clearances for mining, and red and orange category polluting industries and power plants in the plains and coastal tracts of Ratnagiri and Sindhudurg districts should be extended till satisfactory completion of a Carrying Capacity analysis for these districts. The moratorium may then be reviewed in light of the findings of the study.

The Panel believes that immediate steps must be taken to address the issue of a serious deficit in environmental governance all over the Western Ghats tract. The Panel is impressed both by levels of environmental awareness and commitment of citizens towards the cause of the environment, and their helplessness in the face of their marginalization in the current system of governance. The Panel urges the Ministry of Environment and Forests to take a number of critical steps to involve citizens. These would include: pro-active and sympathetic implementation of the provisions of the Community Forest Resources of the Forest Rights Act, establishment of fully empowered Biodiversity Management Committees in all local bodies, promotion of programmes on the pattern of 'Conservation of biodiversity rich areas of Udumbanchola taluka' formulated by the Kerala State Biodiversity Board, a radical reform of Environmental Impact Analysis and Clearance processes, pro-active disclosure of all information of public interest interpreted in the broadest possible sense, a revival of the Paryavaran Vahini programme, and institution of a social audit process for all environmental issues on the model of that for the Mahatma Gandhi National Rural Employment Guarantee Act in Andhra Pradesh.

# 2. Introduction

*"When ascending, and on gaining the summit of any of these passes (in the Western Ghats), the scenery which everywhere presents itself is of the grandest kind. Some idea of it may be formed by imagining mountains succeeding mountains, three or four thousand feet high, covered with trees, except in places where the huge, black, barren rocks are so solid as to prevent the hardiest shrub from finding root in their clefts. The verdure about the Ghats to the southward of Poona is perpetual, but during the rainy season, especially towards the latter part of it, when the torrents are pouring from the sides of the mountains, the effect is greatly heightened by the extreme luxuriance of vegetation".*

- Grant Duff (1826) History of Marathas, Vol. 1

Describing King Raghu's conquest of the four corners of India, Kalidasa likens the mountain range of Western Ghats to a comely young maiden, her head near Kanyakumari, Anaimalais and Nilgiris her breasts, Goa her hips, and her feet near river Tapi. All over the world, such mountains, endowed as they are with high levels of environmental heterogeneity, are treasure troves of natural diversity. Thus, in the Western Ghats the annual rainfall ranges from as much as 8000 mm in the southwestern corner of the upper Nilgiris to a mere 500 mm in the Moyar gorge just 30 km to its east. In contrast, the annual rainfall spans a range of no more than 1000 mm over hundreds of kilometers across the Deccan plateau. Mountains also create isolated habitats far away from other similar habitats, promoting local speciation. Hence distinct species of the flowering plant *Rhododendron* and the mountain tahr goat *Hemitragus* occur on the higher reaches of the Western Ghats and Himalayas, with a large gap in the distribution of these genera in between. Moreover, mountains, being less hospitable to human occupation, retain much larger areas under natural or semi-natural biological communities. This is why the Western Ghats and the Eastern Himalayas are today the most significant repositories of India's biodiversity. Amongst them, the Western Ghats scores over the Eastern Himalayas in harbouring a larger number of species restricted to India alone. Not only are the Western Ghats and Eastern Himalayas biological treasure troves, they are also two of the world's biodiversity hot spots, a hot spot being a biodiversity-rich area that is also under a high degree of threat.

## 3. Mandate of the Panel

In view of the environmental sensitivity and ecological significance of the Western Ghats region and the complex interstate nature of its geography, as well as possible impacts of climate change on this region, the Ministry of Environment and Forests, Government of India, constituted, by an order dated 4 March 2010, a Western Ghats Ecology Expert Panel (WGEEP) (Appendix A ).

The Panel was asked to perform the following functions:

(i) To assess the current status of ecology of the Western Ghats region.

(ii) To demarcate areas within the Western Ghats Region which need to be notified as ecologically sensitive and to recommend for notification of such areas as ecologically sensitive zones under the Environment (Protection) Act, 1986. In doing so, the Panel shall review the existing reports such as the Mohan Ram Committee Report, Hon'ble Supreme Court's decisions, recommendations of the National Board for Wildlife and consult all concerned State Governments.

(iii) To make recommendations for the conservation, protection and rejuvenation of the Western Ghats Region following a comprehensive consultation process involving people and Governments of all the concerned States.

(iv) To suggest measures for effective implementation of the notifications issued by the Government of India in the Ministry of Environment and Forests declaring specific areas in the Western Ghats Region as eco-sensitive zones under the Environment (Protection) Act, 1986.

(v) To recommend the modalities for the establishment of Western Ghats Ecology Authority under the Environment (Protection) Act, 1986 which will be a professional body to manage the ecology of the region and to ensure its sustainable development with the support of all concerned states.

(vi) To deal with any other relevant environment and ecological issues pertaining to Western Ghats Region, including those which may be referred to it by the Central Government in the Ministry of Environment and Forests.

(vii) The Ministry has subsequently asked the Panel to include in its mandate (a) the entire stretch of Ratnagiri and Sindhudurg districts, including the coastal region, and to specifically examine the (b) Gundia and (c) Athirappilly Hydroelectric projects. (d) recommendations with regard to the moratorium on new mining licenses in Goa.

# 4. Organization of the report

This report is divided in two Parts, Part I and Part II. Part I is the main report of the WGEEP which deals with all the terms of reference while Part II contains elaborate discussion on current status of ecology of Western Ghats and specific detailed write ups on various sectors such as Land Use and Human Settlements, Water resources, Agriculture (including Horticulture and Plantations), Forestry and Biodiversity, Industry – organized, Mining, Power and Energy, Tourism, Transport and Communication, Education, Science and Technology and Information Management on which the recommendations of the Panel made in the main report were based.

Section 1 of this Part I summarizes the issues dealt with in Part I. Section 2 provides an introduction; Section 3 deals with the mandate; Section 4 explains the organization of the report; Section 5 deals with the activities undertaken, Section 6 deals with the boundaries of the Western Ghats region, Section 7 deals with the overall setting of the Western Ghats and Section 8 outlines an inclusive approach to conservation / development issues that WGEEP believes should guide further development when the Western Ghats Ecology Authority (WGEA) has been put in place. Sections 9 and 10 discuss the concept of ecologically sensitive areas / zones, outline the development of a Western Ghats Database employed to demarcate ecologically sensitive zones and lay out the specific proposals of WGEEP for areas within the Western Ghats Region which need to be notified as ecologically sensitive zones 1, 2 and 3 under the Environment (Protection) Act, 1986. Section 11 reviews the current pattern of management of ecologically sensitive areas / zones and reviews our experiences with the establishment and management of existing ecologically sensitive areas / zones. Section 12 goes on to review the experience of as yet nascent proposals of establishing ecologically sensitive areas / zones around Protected Areas of Western Ghats. Section 13 outlines an inclusive approach to conservation / development issues that WGEEP believes should guide further development of ecologically sensitive areas / zones in the Western Ghats and proposes a series of guidelines for regulation of activities that may potentially have environmentally adverse impacts as well as promotion of activities that may potentially have environmentally positive impacts in ecologically sensitive areas / zones 1, 2, and 3 in the Western Ghats. Section 14 puts forward our proposals for the establishment, composition and functioning of the Western Ghats Ecology Authority in the Centre and associated state level Western Ghats Ecology Authorities as well as District Ecology Committees. Section 15 provides reviews and recommendations of WGEEP with respect to Athirappilly and Gundia Hydroelectric projects. Section 16 provides a review of the prevalent situation in, and recommendations of WGEEP with respect to Ratnagiri and Sindhudurg districts. Finally, Section 17 provides a review of the prevalent situation in and recommendations of WGEEP with respect to mining leases in Goa. The appendices, annexures and references conclude Part I of this Report.

# 5. Activities undertaken

WGEEP initiated its activities on March 30, 2010 with a meeting in Bengaluru. It has subsequently held a total of 14 Panel meetings, concluding with a meeting on 16-17 August 2011 at Bengaluru. It obtained extensive inputs from the civil society as also Government agencies and technical experts with the help of a series of 42 Commissioned papers, 7 brainstorming sessions, 1 Expert Consultative Meeting, 8 consultations with Government agencies and 40 consultations with civil society groups, and 14 field visits. In addition, extensive inputs were obtained from both Government agencies and civil society groups in Goa through the involvement of two members of WGEEP, Madhav Gadgil and Ligia Noronha as members of Goa Government's Golden Jubilee Development Council. WGEEP also set up a public website to obtain civil society inputs. Further details of these activities are provided in Appendices B- F.

The mandate of WGEEP poses a number of scientific challenges. It calls for a comprehensive understanding of the current status and ongoing changes in the ecology of this extensive region covering approximately 129037 sq km, with a special focus on the implications of manifold human interventions. A great deal of information on these issues is available; however, the information is of variable quality and reliability, is often not properly referenced spatially, and is poorly organized. Thus, for example, the on-going exercise of the Goa Regional Plan 2021 undertook the tasks of compilation of manifold data scattered with different State Governmental agencies that had never been brought together in one place, and organizing it spatially on a Google Earth image platform. This is something that is readily possible today for the entire Western Ghats tract, and WGEEP decided to initiate such an exercise. Indeed the Pronab Sen Committee had strongly recommended that such an exercise be immediately undertaken for the whole country, as early as 2000. WGEEP has made an appropriate beginning, albeit fully a decade later.

A key mandate of WGEEP is to demarcate areas within the Western Ghats Region which need to be notified as ecologically sensitive zones under the Environment (Protection) Act, 1986. WGEEP hopes to anchor this on empirical facts with the help of the database that is together for this purpose. An appropriate scientific methodology has been developed for this purpose, and published in the January 25, 2011 issue of the journal *Current Science* soliciting feedback from the public (Appendix 4).

# 6. Boundaries of the Western Ghats

Given its mandate, WGEEP has attempted to define the Western Ghats from an environmental view-point. The term Western Ghats refers to the practically unbroken hill chain (with the exception of the Palakkad Gap) or escarpment running roughly in a north-south direction, for about 1500 km parallel to the Arabian sea coast, from the river Tapi (about $21^0$ 16′ N) down to just short of Kanyakumari (about $8^0$19′ N) at the tip of the Indian peninsula. In some accounts the term Western Ghats or Sahyadris is restricted only to the western escarpment of the Peninsular Plateau from the Tapi southwards to the region of Kodagu, (about 12 degrees N) while the higher mountain ranges further south, including the Nilgiris, the Anamalais, the Cardamom hills and the Agasthyamalai range, being referred to as a distinct geological entity named as the Southern Block (Mani 1974). For our purposes we use the term Western Ghats in the broader sense to include the entire tract of hills from the Tapi to Kanyakumari.

One issue that has to be resolved while defining the boundaries of the Western Ghats is its eastern limits in relation to what has been geographically termed as the Eastern Ghats. There have, however, been few attempts to accurately define the borders of these Ghats and hence the boundaries still remain elusive. The Western Ghats also have a number of eastern and western spurs, particularly in Maharashtra and Tamilnadu, making it difficult to define a precise boundary. Several institutions both at national (e.g. National Remote Sensing Agency) and international (e.g. Birdlife International, Conservation International) levels, have tried to define the boundaries, usually in the context of their biodiversity survey and conservation programmes, but these do not tally . Clearly the lack of consensus among these attempts could be because the drivers used for defining the boundaries are either not always defined or are not agreed upon.

For the purpose of defining the boundary of the Western Ghats, we used altitude and forest area or vegetation as drivers defining the boundaries. Our operational definition for the `Ghats' therefore is forest area above a certain altitude. Accordingly we demarcated the eastern edge by identifying the forested areas that are above 500 m; the rationale for this cut off followed from the digital data which showed that, in general, 500m constitutes the elevation at which the Western Ghats rise discretely from the Deccan plateau. For the western edge, we used a cut off of forested areas at 150 m and above as the Ghats fall more steeply down to the coastline as compared to the eastern side of the Ghats[1]. We also found that whenever the forested areas at elevations of more than 150m drop directly into the ocean or within a distance of 1km of the coastline, it was difficult to define the coast. Hence, in such situations (as in parts of Maharashtra), the coastline itself was considered as the western edge of the Ghats. We used the land-use map developed by Forest Survey of India to demarcate forested areas, and GTOPO30 (Global 30 Arc-Second Elevation Data Set) for altitude details at 1 x 1 km resolution. The boundaries were defined by overlaying these two datasets and following the criteria defined above. We also used the annual cumulative NDVI (normalized differential vegetation index) values as a surrogate for vegetation or forest cover[2] but eventually found that the Forest Survey of India's map per se was sufficient for the purpose.

It is generally agreed upon in the scientific literature that the southern-most and western-most extent of the Eastern Ghats is the hill range in Karnataka and Tamil Nadu known as the Biligirirangans (Mani 1974). The meeting place of the Western Ghats (the Nilgiris) and the Eastern Ghats (Biligirirangans) is the Moyar river valley between the Sigur plateau and the Talamalai plateau at a much lower elevation (250 m) between the two hill ranges. There is however both topographic and forest contiguity between the two ranges of the Nilgiris and the Biligirirangans making it difficult to mark a clear geographic boundary. The region between the Nilgiris and the Biligirirangans thus constitutes important habitat contiguity for several floral and faunal elements and, hence, it would be prudent to include the latter hill range within the ambit of the proposed Western Ghats Authority that aims to conserve the ecology of the Ghats.

We thus propose that the Biligirirangan range of Karnataka and Tamil Nadu, running in a north-south direction for about 150 km, be included within the boundaries of the Western Ghats for the purposes of the Western Ghats Authority. A clear boundary has to be identified for the eastern boundary of the Biligirirangans and we propose the following

[1] This cutoff to decide on the boundary needs to be revisited as it is an approximation.
[2] NDVI is a Normalized Differential Vegetation Index computed as a ratio of (NIR-RED) to (NIR + RED), where NIR and RED are near infrared and red bands respectively. It characterizes the vegetation cover in an area.

unambiguous administrative boundary that also corresponds to a topographic boundary. For the northern part of the Biligirirangans in Karnataka the boundary would be the boundary of the Chamrajnagar Forest Division that precisely abuts the highway from Kollegal to Satyamangalam in the east. For the southern part of the Biligirirangans in Tamil Nadu, we propose the eastern boundary of the Nilgiri Biosphere Reserve that incorporates a part of the Satyamangalam Forest Division and also abuts to its east the Kollegal-Satyamangalam highway.

As per these boundaries, the Western Ghats stretches to a length of 1490 km from Tapi Valley in the north to Kanyakumari in south. (Figure 1) With an area of approximately 129037 sq km, it stretches to a width of 210 km in Tamilnadu and narrows to as small as 48 km in Maharashtra (leaving the Palghat gap). We must however admit that the Western Ghats Ecology Authority, when put in place, will have to take another look at the boundaries we suggest, since we have not been able to find the time to examine and refine these with enough care. For example, we noticed too late for correction that important areas such as Dapoli and Guhagar in Ratnagiri District, and secondary ranges of the Western Ghats in Thane and Raigad districts such as Tungareshwar, Manor, Tansa, Vaitarna, Prabal etc have been excluded. Table 1 provides the geographical attributes of the Western Ghats.

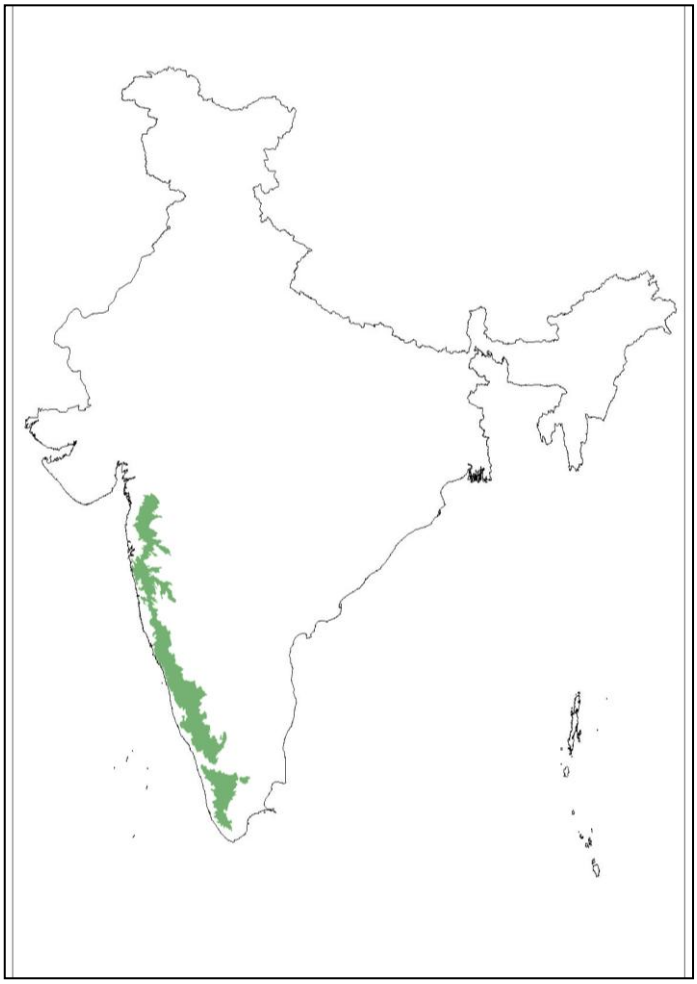


**Figure 1** Western Ghats Boundary

**Table 1** Geographical attributes of the Western Ghats

| Attributes of the Western Ghats | |
|---|---|
| Northern limit | $8^0$19′ 8″ - $21^0$ 16′ 24″ (N) |
| Eastern limit | $72^0$ 56′ 24″ - $78^0$ 19′ 40″ (E) |
| Total area | 129037 sq km |
| End-to-end length | 1490 km |
| Min width | 48 km |
| Max width | 210 km |

Thus defined, Western Ghats do not correspond exactly to particular administrative units such as districts and talukas. The district boundaries do not, by and large, coincide with limits of Western Ghats, except in a few cases such as Kodagu, Nilgiris, Wynaad and Idukki. The majority of districts also include either West Coast or Western Peninsular tract regions along with Western Ghats areas.

Western Ghats as an administrative entity was therefore first visualized only in the context of Regional Planning exercises, beginning with a report prepared by the Town and Country Planning Organization, Delhi in the 1960s. This report delineated the Western Ghats at Taluka level, and became the basis of the Planning Commission's Western Ghats Development Programme(WGDP) initiated in 1974-75 across 132 talukas.[3] This serves as the basis of disbursement of Central Government assistance. However, it must be noted that this administrative definition has no implications in terms of environmental regulation. Since talukas do constitute a reasonable administrative unit for defining the Western Ghats, WGEEP proposes that talukas be the focus for our further discussion.

# 7. The Setting

The hill chain of the Western Ghats, a treasure trove of biodiversity and the water tower of Peninsular India, runs parallel to the West coast of India from the river Tapi in the north to Kanyakumari in the south. The Ghats descend steeply to the coastal plains on the west, but merge rather gently through a series of hills with the Deccan plateau. Geologically the Ghats fall into two sections. North of the river Kali is the Deccan trap country of relatively fragile rocks and flat hill tops. The hills do not rise much beyond 1500 m in this tract. South of Kali is the region of Precambrian archean crystalline rocks which are much harder. The hills tend to be rounded and rise to 2000 m or more.

The Western Ghats force the moisture laden winds coming off the Arabian Sea to rise and receive in consequence heavy precipitation of 2000 mm or more a year. To the lee of the Ghats is a region of rain shadow; and the eastern slopes of the Ghats are much drier than

[3] The WGDP is currently being implemented in 171 talukas of Western Ghats viz. Maharashtra (63 taluka), Karnataka (40 talukas), Kerala (32 talukas), Tamil Nadu (33 talukas) and Goa (3 ) talukas) as some of the original talukas have been sub-divided. Source: http://planningcommission.nic.in/aboutus/committee/wrkgrp11/tg11_hillarea.pdf accessed in August 2011

the Western face. The rainfall is heavier to the south and extends over 8–9 months a year; it is lower and restricted to 4 months of the south-west monsoon in the northern parts of the Western Ghats.

Given this rainfall regime, the western slopes of the Ghats have a natural cover of evergreen forest, which changes to moist and then dry deciduous types as one comes to the eastern slopes. The vegetation reaches its highest diversity towards the southern tip in Kerala with its high statured, rich tropical rain forests. The commercially most important species, teak, however, grows best in tracts of more moderate rainfall where the natural vegetation is of the moist deciduous type.

The Western Ghats are second only to the Eastern Himalaya as a treasure trove of biological diversity in India. Originally recognized as among the several global "hotspots of biodiversity", the Western Ghats along with its geographical extension in the wet zone of Sri Lanka are now also considered one of the eight "hottest hot spots" of biodiversity (Myers et al. 2000). At the same time, the high human population density and major transformation of the landscape since the mid-18$^{th}$ century also emphasize the urgency of conservation of the Ghats and sustainable use of its resources. A study in the southern region, comprising the states of Karnataka, Kerala and Tamil Nadu, showed that between 1920–1990 about 40% of the original vegetation cover was lost or converted to another form of land use (Menon and Bawa 1997). It is estimated that not more than about 7% of the area of the Western Ghats is presently under primary vegetation cover, though a much larger area is under secondary forest or some form of tree cover. Nearly 15% of the Ghats is also under the Protected Area system.

The great topographic heterogeneity (from sea level to 2695 m at its highest point, the Anaimudi peak) and a strong rainfall gradient (annual precipitation of <50 cm in sheltered valleys in the east to >700 cm along west-facing slopes) combine to give rise to a tremendous diversity of life forms and vegetation types, including tropical wet evergreen forest, montane stunted evergreen forest (shola) and grassland, lateritic plateaus, moist deciduous and dry deciduous forest, dry thorn forests, and grassland. Many of these are critical habitats for plants and animals: for instance, the lateritic plateaus of Maharashtra harbour unique floral elements as well as provide seasonal foraging grounds for large mammals such as gaur; the shola forests and grasslands of the southern Western Ghats are unique as well as highly vulnerable to future climate change; the riparian vegetation along the numerous east and west-flowing rivers and streams of the Ghats shelter high levels of plant and animal diversity in addition to acting as corridors, while the relict lowland dipterocarp forests and *Mysristica* swamps to the west are highly threatened.

The importance of the Western Ghats in terms of its biodiversity can be seen from the known inventory of its plant and animal groups, and the levels of endemism in these taxa (Gunawardene et al. 2007). Nearly 4000 species of flowering plants or about 27% of the country's total species are known from the Ghats. Of 645 species of evergreen trees (>10 cm dbh), about 56% is endemic to the Ghats. Among the lower plant groups, the diversity of bryophytes is impressive with 850-1000 species; of these 682 species are mosses with 28% endemics and 280 species are liverworts with 43% endemics.

Among the invertebrate groups, about 350 (20% endemic) species of ants, 330 (11% endemic) species of butterflies, 174 (40% endemic) species of odonates (dragonflies and damselflies), and 269 (76% endemic) species of mollusks (land snails) have been described from this region. The known fish fauna of the Ghats is 288 species with 41% of these being endemic to the region. The Western Ghats are particularly notable for its amphibian fauna with about

220 species of which 78% are endemic; the recent discovery of a new genus of frog, *Nasikabactrachus sahyadrensis*, with Indo-Madagscan affinity, in the southern Western Ghats affirms the importance of the region in harbouring these ancient Gondwanan lineages. Similarly, the Ghats are unique in its caecilian diversity harbouring 16 of the country's 20 known species, with all 16 species being endemic. Of the 225 described species of reptiles, 62% are endemic; special mention must be made of the primitively burrowing snakes of the family Uropeltidae that are mostly restricted to the southern hills of the Western Ghats. Over 500 species of birds and 120 species of mammals are also known from this region. The Western Ghats region harbours the largest global populations of the Asian elephant, and possibly of other mammals such as tiger, dhole, and gaur. The Western Ghats also harbour a number of wild relatives of cultivated plants, including pepper, cardamom, mango, jackfruit and plantain. This biological wealth has paid rich dividends over the years. In fact, the tract was famous for its wild produce of pepper, cardamom, sandal and ivory.

This diversity has been in continual decline over the last century and more especially in recent decades, with many biological communities and types being almost totally eliminated. It is, however, notable that some of the age-old conservation practices, such as maintenance of sacred groves, sacred ponds and river stretches, as well as protection of sacred species such as many primates and peafowl, continue to effectively protect many elements of biodiversity to this day. In addition, recent decades have seen other significant measures being initiated to conserve some of this fast vanishing biological diversity with the constitution of Wildlife Sanctuaries, National Parks and Tiger Reserves. These measures have led to a welcome increase in populations of many wild animals. Regrettably this has also exacerbated man–wildlife conflict.

The traditional land use in the Ghats has been paddy cultivation in the valleys, supplemented by cultivation of millets and legumes on the hill slopes. Hill slope agriculture used to be largely of the shifting slash-and-burn type, but this has gradually been changed to cultivation of terraces. The traditional horticultural crops were arecanut on the hills and coconut on the coast, along with mango and jackfruit. Cattle and buffalo were maintained in great numbers wherever the natural vegetation was deciduous forest, but these were largely absent in tracts of evergreen vegetation.

A number of horticultural and tuber crops were introduced to this region through European influence. Prominent amongst these are tea, coffee, rubber, cashew, tapioca and potato. Pepper and cardamom, which are native to the evergreen forests of the Western Ghats were also taken up as plantation crops on a more extensive scale in modern times. Many of the newer plantations were taken up by clear felling natural evergreen forests tracts which till then had predominantly tribal populations.

The most important forest produce of the Ghats in earlier times were cardamom, pepper and ivory although teak wood had been exported from the west coast ports even in medieval times. The earliest forest plantations recorded were the teakwood plantations raised by the Angres, Maratha naval chiefs of Shivaji in the 17th Century. Exploitation of timber on a large scale, however, started only with the British. The evergreen forests were extracted for railway sleepers and deciduous forests were progressively replaced by teak plantations. As this demand picked up, forests which were till then largely managed by Village Communities were bifurcated into forests on village common lands and state-owned Reserved Forests. The community held grazing lands and forests cover extensive areas in many parts of the Western Ghats, as do privately held forest lands to a lesser extent. These lands have been considerably overexploited and degraded in recent decades.

The demands on reserved forests peaked between 1950–1980 with an explosion of forest-based industries such as paper, plywood, polyfibres and matchwood. Although these demands were expected to be met through sustainable harvests, this did not materialize and the forests were overexploited. The response was a switch to "aggressive" from "conservation" forestry with large-scale clear felling of natural forests and plantation of exotic species such as eucalyptus and *Acacia auriculiformis*. Many of the eucalyptus plantations failed because of various diseases. Consequently, harvests from Reserved Forests have slowly tapered off after the 1980's with the industry turning to import of pulp, pulpwood and timber from abroad. There have been other competing demands on reserved forest lands as well, especially for cultivation and river valley projects.

Collection of forest produce such as pepper, cardamom, ivory, honey, wax, myrobalan has gone on for a long time in the Western Ghats. The bamboos and reeds of the Ghat forests have also supported extensive basket weaving. There have been shipyards on the west coast using the timber of the hills for a very long time, as also artisans making wooden toys. There has been substantial decline in many of these activities with depletion of resources like honey and bamboo, and complete ban on use of ivory.

Several industries were started in the early decades before independence, primarily to utilize the forest resources of the Western Ghats. These have included saw mills, brick and tile, paper, polyfibre, matchwood, plywood, and tanning. A few other industries have sprung up based on the mineral resources of the hills such as the steel works at Bhadravati. By and large, these industries have grown beyond the capacity of the Western Ghats forest resource base to sustain them, and are now depending on imports or wood resources produced on farmland.

The bulk of the rains of Peninsular India fall on the Western Ghats from which originate Krishna, Godavari and Kaveri, the three major rivers of the Southern Peninsula, as well as many shorter west flowing rivers of the west coast. Traditionally these water resources were used to irrigate the valleys under paddy and arecanut on the hills with construction of small ponds and channels. Beginning with the British times, however, many major river valley projects have been executed, either to irrigate the drier tracts to the east or to generate power by taking advantage of the steep slopes to the west. These have rapidly proliferated since independence and today cover almost every river valley in certain regions such as that stretching from Mumbai to Kolhapur in Maharashtra. In recent years these reservoirs have also become the locus of development of resorts and hill stations like Amby Valley and Lavasa. In another more recent development, wind mills are being set up in large numbers on the crestline of the Ghats with steep roads up the hill slopes leading to substantial negative impacts on ecology and water resources.

The Western Ghats are rich in iron, manganese and bauxite ores in parts of their ranges. These are being extracted on a large scale and exported in ore form, especially from Goa. With a steep increase in iron ore prices and demand for lower grade ores, mining activities have grown rapidly and often in violation of all laws, resulting in serious environmental damage and social disruption.

Several centres of pilgrimage have traditionally attracted many visitors to the Western Ghats, prominent amongst these being Sabarimalai in Kerala, Madeveshwaramalai in Karnataka and Mahabaleshwar in Maharashtra. A number of other tourist centres have sprung up in modern times. The best known are Ooty in the Nilgiris and the Thekkady Wildlife Sanctuary in Kerala. Recent decades have seen a boom in building of second holiday homes, tourist resorts housed in plantations and new hill stations.

Transport and communication has been difficult in the Western Ghats because of the hilly terrain, heavy rains, washing off of roads and thick forests. In fact, the strength of the Maratha empire founded by Shivaji rested on the strategic advantages of an inaccessible terrain. Transport and communications really began to reach deeper into the Western Ghats only in British times. A spurt was given to the development of these facilities after independence when major river valley and mining projects brought development of extensive transport and communication facilities in their wake. Recent decades have seen a rapid spurt in growth of roads as well as railway lines across the Ghats with resultant disruption of connectivity between natural habitats.

The Western Ghats have always been sparsely populated compared to the adjoining plains, because of the difficult terrain and widely prevalent incidence of malaria. The coastal plains under paddy and coconut have supported far denser populations while the Deccan plateau to the east had intermediate levels of population density. The settlements on the Ghats have been of small sizes and scattered; the bigger towns all falling on the eastern side on the banks of major rivers, or on the west coast at river mouths, where they served as ports. With rapid increase in means of communication and transport, emergence of a large wealthy middle class and availability of powerful earth-moving machinery, the Western Ghats are beginning to be urbanized with a proliferation of holiday homes and resorts. These tend to be accompanied by a total decimation of natural biological communities and displacement of local people.

The people of the Western Ghats traditionally depended heavily on natural vegetation for meeting their requirement of shelter, fodder and fuel. They also derived much nutrition from hunted meat; consequently their quality of life has rapidly eroded in recent decades with the depletion of natural vegetation and extermination of wild animals. The major gain for the people from the view point of a better life has been the eradication of diseases, especially malaria, and the development of better means of transport and communication. Modern health and educational facilities have percolated little to the hills except in the State of Kerala where there has been remarkable progress, accompanied by a substantial fall in the rate of population growth.

The Western Ghats has a large tribal population only in a few pockets such as the Dangs and Thane districts north of Mumbai and Wynaad and Nilgiris tracts. The Nilgiris harbour the only truly stone age hunting gathering tribe of Peninsular India, the Cholanaikas. The tribals have borne the brunt of the degradation of the Western Ghats environment and have received little of the benefits of development. Vested interests have also blocked the implementation of acts such as PESA and FRA that were meant to give them a better deal.

By and large the Western Ghats have been subjected to a rapid erosion of natural capital with the building up of man-made capital, regrettably imposing excessive, unnecessary environmental damage in the process, accompanied by a degradation of social capital as well. Yet, on the positive side, the Western Ghats region has some of the highest levels of literacy in the country, and a high level of environmental awareness. The democratic institutions are well entrenched, and Kerala leads the country in capacity building and empowering of Panchayat Raj Institutions. Goa has recently concluded a very interesting exercise, Regional Plan 2021, of taking inputs from Gram Sabhas in deciding on land use policies. Evidently, the Western Ghats is an appropriate region of the country to attempt to make the transition towards an inclusive, caring and environment-friendly mode of development.

# 8. Develop sustainably – conserve thoughtfully

Many stakeholders have suggested that, apart from the context of provision of Central financial assistance for plan schemes, the Western Ghats Region should have a regulatory content of a go- no go nature; that certain activities would be banned within the limits of the Western Ghats, but fully permitted outside these limits. WGEEP would like to submit that we should move away from such formulae that impart inflexibility to development processes. To take a very simple example, the norm for the size of agricultural holding in which a farm house may be constructed is 2 acres throughout the state of Maharashtra. But in the hilly terrain of Mahabaleshwar, one of the existing ESAs of Western Ghats, 80% of farmers hold less than 2 acres of land. All of them have therefore been forced to stay in small, overcrowded houses in Gaothans, which have not been permitted to grow over the last 60 years, despite substantial increase in their populations. Farmers of Mahabaleshwar have therefore been requesting that the threshold for permission for a farm house be appropriately changed in their locality, to no avail. They feel particularly frustrated to see considerable construction activity of bungalows for the rich and hotels going on without much difficulty, while they see no signs of relief for themselves.

Indeed, what we see around the Western Ghats and the rest of the country may be termed "Development by Exclusion" hand in hand with "Conservation by Exclusion". Despite the 73rd and 74th Amendments to the Constitution that have devolved powers of making decisions relating to development to Panchayat Raj Institutions and Nagarpalikas, all development decisions are being thrust on the people. For instance, in Ratnagiri district several Gram Panchayats, and Panchayat Samitis, including the Ratnagiri Taluka Panchayat Samiti, have specifically passed resolutions relating to environmental issues that are also being completely ignored by the State Government. Box 1 presents a specific case of such "Development by Exclusion" in the context of development of a chemical industry in the same district.

**Box 1: Development by Exclusion: Lote MIDC and pollution of Dabhol creek**

The experience the world over is that people, and not government or industry, have led movements to protect the environment. It is therefore important that people be vigorously inducted into protecting, managing, and monitoring the environment. In this context, the Ministry of Environment and Forests had an excellent scheme of district-level Paryavaran Vahinis. Under this scheme concerned citizens were conferred authority to monitor environmental degradation such as pollution and deforestation, and report to the District Collector, who would then enquire into the matter. The programme was very effective in districts like Dakshin Kannada during the 1990's and the Steering Committee for Environment and Forests for the 11th Five Year Plan had strongly recommended that as part of the effort to promote partnerships, the 11th Plan should revive the programme of district-level Paryavaran Vahinis to promote a broadly participatory process of environmental monitoring and management. During the meeting with Government of Maharshtra officials in Mumbai on 30th September, 2010, Madhav Gadgil (MG) therefore enquired if there were any on-going programmes of involving the people in environmental monitoring in Ratnagiri-Sindhudurg districts. MG was informed that a similar function was being performed by a Ratnagiri District Environment Committee chaired by the Ratnagiri District Collector (which, it eventually turned out, did not exist at all), and additionally there was a very active 'Lote Abhyas Gat' attached to Lote MIDC, a chemical industries complex.

MG immediately contacted Ratnagiri District Collector, as well as the Lote Abhyas Gat with the help of Maharashtra State Pollution Control Board. On 5th October 2010 ,MG had a meeting with the Lote Abhyas Gat, and a field visit to the Common Effluent Treatment Plant and some surrounding areas, as well as visits to Dabhol creek and discussions with many community members. It is notable that contrary to information provided by authorities in the meeting in Mumbai, the Abhyas Gat has been totally inactive, with no meetings over more than two years. In spite of their demand, a representative of Kotavale village that has suffered maximally from pollution is not included in the Abhyas Gat. It was revealed that the CETP cannot handle the quantity of effluent it is receiving, and its functioning is highly defective. MG saw large overflows of untreated effluent from the plant going into streams serving Kotavale village. Since the situation is not being brought under control, the Sarpanch of Kotavale attempted to commit suicide by drinking the polluted stream water. He was rushed to Mumbai and saved, but there has been no abatement of pollution affecting Kotavale. People also reported that solid toxic sludge from industries was mixed with soil and dumped in the Ghat area. It is understood that many industries at Lote are pumping toxic waste into ground water through bore wells. Apparently, three such cases were brought to light, but there has been no action. Very recently, some unidentified party has dumped toxic wastes via a tanker in the Boraj Dam which is the water supply of Khed town. The town water supply had to be stopped for several weeks, but nobody has been brought to book. There has been significant decline in fish landings from Dabhol creek due to Lote chemical pollution, and severe loss of employment opportunities for members of fishing communities. With all these problems persisting all that the Pollution Control Board has done seems to be to transfer the Lote office to Chiplun, rendering any chances of effective action even more remote than before.

Not only are people not being active partners in the process of development, but their civil rights of protesting against excessive pollution levels, certainly well above legal limits, are being systematically suppressed. There had never been any violent agitation in Ratnagiri district till an activist protesting Jaitapur project was killed by a jeep, allegedly belonging to the Nuclear Power Corporation and driven by a police constable in early 2011. Yet the District Collector had promulgated Bombay Police Act 1951 Sec, 37(1)(3), prohibiting public gathering of more than five people for as many as 191 days between 28.08.07 to 21.10.09 to suppress protests against unacceptable levels of pollution, particularly from Lote MIDC.

It is reported that this industrial complex employs 11,000 people; while the local fishermen claim that the resultant pollution has rendered 20,000 people from their community jobless. With all these persistent and unrectified problems, we were informed by an MIDC officer that they are planning to set up a new Petrochemical MIDC area nearby on 550Ha.

The Indian society has rich traditions of nature conservation, and some of the best preserved remnants of indigenous vegetation of Western Ghats are in the form of Sacred Groves. Yet the official conservation efforts in the form of Protected Areas are being pursued on the assumption that it is the local people who are primarily responsible for loss of biodiversity and the highest priority should be given to excluding them. See Box 2 for such an example. It is also notable that the Forestry establishment is the only wing of the Government that

refuses to work with the Panchayat Raj Institutions, with the trivial exception of the Social Forestry wing.

**Box 2: Conservation by Exclusion: Soligas of BRT hills**

BRT hills are a forest covered range in Karnataka to the east of the Nilgiris. It is the traditional homeland of Soliga tribals, who earlier practised hunting-gathering and shifting cultivation. They have protected a large sacred grove, harbouring a magnificent *Michelia champaka* tree. When this area was declared a Wild Life Sanctuary, Soligas could no longer hunt or practice shifting cultivation. So gathering of honey, medicinal plants and amla (*Phyllanthus emblica)* became the mainstay of their subsistence. A voluntary organization, Vivekananda Girijana Kalyana Kendra, has organized them effectively and helped set up a system of regulated collection, processing and marketing of forest produce. A scientific institution, ATREE, has been engaged in a study of the Soliga forest produce collection practices and their impact on resource stocks. They have come to the conclusion that these practices are entirely sustainable. The Soliga earnings had also improved because of their own processing industry. Most regrettably, the Forest Department has banned all collection of forest produce for marketing, forcing Soligas into destitution.

It is now widely accepted that development plans should not be cast in a rigid framework, but ought to be tailored to prevalent locality and time-specific conditions with full participation of local communities, a process that has been termed *adaptive co-management*. What should be 'go' and what should be 'no go' development options ought then to be decided on a case-by-case basis, in tune with the specific environmental and socio-economic context, and aspirations of the local communities. Such a system of adaptive co-management would marry conservation to development, and not treat them as separate, incompatible objectives. See Box 3 for a discussion of this approach.

**Box 3: Adaptive Co-management**

Adaptive co-management is an emerging approach for governance of social-ecological systems. Novelty of adaptive co-management comes from combining the iterative learning dimension of adaptive management and the linkage dimension of collaborative management in which rights and responsibilities are jointly shared. Complementarities among concepts of collaboration and adaptive management encourage an approach to governance that encompasses complexity and cross-scale linkages, and the process of dynamic learning. Adaptive co-management thus offers considerable appeal in light of the complex systems view. In this regard, adaptive co-management has been described as an emergent and self-organizing process facilitated by rules and incentives of higher levels, with the potential to foster more robust social-ecological systems. Key features of adaptive co-management include:

- A focus on learning-by-doing
- Synthesis of different knowledge systems
- Collaboration and power-sharing among community, regional and national levels
- Management flexibility

These features can promote an evolving, place-specific governance approach in which strategies are sensitive to feedback (both social and ecological) and oriented towards system resilience and sustainability. Such strategies include dialogue among interested groups and actors (local–national), the development of complex, redundant and layered institutions, and a combination of institutional types, designs and strategies that facilitate experimentation and learning through change. Other important themes in adaptive co-management include improving evaluation of process and outcomes, additional emphasis on power, the role of social capital, and meaningful interactions and trust building as the basis for governance in social-ecological systems.

Yet we are today stuck in a system that forcibly divorces conservation from development. It ends up creating a dichotomy so that our policies at once promote reckless development in

certain areas, and thoughtless conservation in other areas. In the process we constitute islands of biodiversity (and social exclusion) – the so-called Protected Areas (PAs) – in an ocean of ecological devastation outside of these PAs. As we will explore below in some detail, our insistence on "not a blade of grass shall be removed from PAs" is as inappropriate as complete disregard for pollution control laws outside of PAs. WGEEP would like to propose that we should instead attempt to develop a model of conservation and development compatible with each other encompassing the whole of the Western Ghats region, to replace the prevailing "Develop recklessly – conserve thoughtlessly" pattern with one of "Develop sustainably – conserve thoughtfully". The fine-tuning of development–conservation practices to local context that this calls for would require full involvement of local communities. To sum up, WGEEP advocates a layered, nuanced, participatory approach, so that boundaries will not be discontinuities and therefore will not be of undue significance. Hence, while we will, of course, talk of the boundaries of the Western Ghats, we plead that the pattern of adaptive co-management that we propose may also be applied to regions beyond these boundaries.

# 9. Ecologically Sensitive Zones

Section 3 of the Environment (Protection) Act 1986 (EPA) gives power to the Union Ministry of Environment and Forests to take all measures that it feels is necessary for protecting and improving the quality of the environment and to prevent and control environmental pollution. To meet this objective the Central Government can restrict areas in which any industries, operations or processes, or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards. [Sec. 3(2) (v)]

Section 5(I) of the Environment (Protection) Rules 1986 (EPR) states that the Central Government can prohibit or restrict the location of industries and carrying out certain operations or processes on the basis of considerations like the biological diversity of an area (clause v), maximum allowable limits of concentration of pollutants for an area (clause ii), environmentally compatible land use (clause vi), or proximity to Protected Areas (clause viii).

These provisions were invoked in 1989 in the context of Murud-Janjira, a coastal village of Maharashtra. Subsequently, the term 'Ecologically Fragile Area' was used for the first time in 1991 in the context of Dahanu Taluka in coastal Maharashtra. This has been followed by declaration of a number of other areas such as the Mahabaleshwar- Panchgani and Matheran hills in the Maharashtra Western Ghats as Ecologically Sensitive Zones / Areas. So far, these Ecologically Sensitive Zones / Areas have been established either as a result of initiatives of some civil society organizations wishing to protect a particularly vulnerable and significant area, or as a consequence of a resolution of the Indian Board for Wildlife in 2002 to protect areas up to ten kilometres from the boundaries of Protected Areas, namely Wildlife Sanctuaries and National Parks.

Over the years, a variety of terms such as Ecologically Sensitive/ Ecologically Fragile/ Ecosensitive/ Ecofragile Zones/ Areas have been used in the context of programmes relating to Ecologically Sensitive Zones and Areas. It is obviously useful to introduce some standard terminology and definitions. WGEEP will therefore use the term 'Ecologically Sensitive Area' while referring to extensive tracts and 'Ecologically Sensitive Zone' while referring to specific zones within the extended 'Ecologically Sensitive Area' for which a particular set of regulatory/ promotional activities have been proposed.

The Pronab Sen Committee set up in 2000 by the Ministry of Environment and Forests proposed a series of species, ecosystem and geo-morphology based parameters to decide upon ecologically sensitive areas in India. The Sen Committee's foremost criterion for identification of an ESA is endemism, and the Committee proposed that the area of occurrence of every endemic species needs to be protected in its entirety. The Western Ghats harbours well over two thousand endemic species of flowering plants, fish, frogs, birds and mammals amongst the better known groups of organisms, and no doubt thousands more amongst less studied groups including insects. Amongst themselves these endemics would cover the entire geographical extent of the Western Ghats and all conceivable habitats, including many disturbed ones such as roadsides. The Western Ghats region thus qualifies as an ESA under several other, primary as also auxiliary, criteria proposed by the Pronab Sen committee. WGEEP fully endorses the conclusion that follows this set of criteria for the identification of an ESA, and recommends that the entire Western Ghats tract should be considered as an Ecologically Sensitive Area.

However, a uniform set of regulations cannot, obviously, be promulgated under the EPA for this entire region. Hence, WGEEP recommends the adoption of a graded or layered approach, and suggests that the entire Western Ghats be characterized as comprising (1) Regions of highest sensitivity or Ecologically Sensitive Zone 1 (ESZ1), (2) Regions of high sensitivity or ESZ2, and the remaining (3) Regions of moderate sensitivity or ESZ3. These will be complementary to areas already declared as Protected Areas, which will continue to be managed under regulations prescribed by pertinent acts such as the Wildlife Protection Act. Thus, WGEEP has come up with four colour maps spanning the entire Western Ghats depicting PAs, and ESZ1, ESZ2 and ESZ3.

## 9.1 Western Ghats Database

Such an assignment of ESZ1, ESZ2 and ESZ3 can be done on two bases; namely (1) The existing Protected Area network and (2) systematic mapping and recording of base-line data as recommended by the Sen Committee. Indeed, as early as 2000, the Sen committee had called for systematically mapping and recording base-line data for the entire country, as also to design and operationalize a comprehensive monitoring programme and network, involving not only government agencies but also other institutions, universities, NGOs, and individuals, particularly those living in pertinent areas. This challenge was taken up by WGEEP, and considerable progress made in the exercise of development of a spatial database, for over 2200 grids of 5'x 5' or roughly 9 km x 9 km through compilation of all readily available information on topography, land cover and occurrence of biodiversity elements. The rationale and methodology followed has been widely exposed to scientific scrutiny through publication of a detailed exposition in *Current Science*, India's leading scientific journal, in January 2011(Gadgil, M. et al. 2011). Box 4 briefly summarises the methodology followed. The detailed methodology followed in the development of this database is explained in Section 20. The WGEEP database is complemented by development of similar, more detailed, information bases by BVIEER, Pune and DEVRAAI, Kolhapur.

**Box 4: Mapping Ecologically Significant and Sensitive Areas of the Western Ghats: Proposed Protocols and Methodology**

**(Abstract of Gadgil et al (2011): *Current Science*)**

One of the objectives assigned for the Western Ghats Ecology Expert Panel (WGEEP) of the Ministry of Environment and Forestry, GOI, was to identify the Ecologically Sensitive Areas (ESAs) along Western Ghats, and thence to suggest regulatory procedures to conserve them. However the panel came to realize that globally there is no consensus either on the criteria to define ESAs or, on an adaptable methodology to identify them. Therefore defining and developing a methodology became an important first step before the panel could map the ESAs. This paper reports the outcome of a series of discussions and consultations held by the panel for a consensus on defining and mapping ESAs. The purpose of this paper is two-fold: first, to invoke discussion and suggestions from a wider section of experts, on the conceptual and methodological details arrived at by the WGEEP; second to promote the methodology as a generic procedure for mapping ESAs in other significant bio-rich areas within and outside the country.

We propose below a set of these attributes with the criteria to be used for each of them and then provide a methodological process to combine and use these criteria in demarcating ESA especially for a large area such as the Western Ghats.

**1. Biological attributes**: We propose that demarcation of an ESA shall consider the following components of biological and cultural uniqueness and richness :

**a. Biodiversity richness**: Richness in diversity at all taxonomic groups and hierarchies.

**b. Species Rarity**: Rarity of population size, distribution and also rarity in taxonomic representation.

**c. Habitat Richness**: Spatial heterogeneity of landscape elements

**d. Productivity:** Total biomass productivity

**e. Estimate of biological/ecological resilience:** Representation of the plesio-vegetation

**f. Cultural and Historical Significance:** Evolutionary–historical value and cultural–historical value of the area

**2. Geo-climatic layers attributes:** These include the range of layers that assess the innate or natural vulnerability of the area. Obviously features such as slope, aspect, altitude, precipitation etc shall be used under the following two component attributes:

**a. Topographic Features**: Slope, altitude, aspect etc.,

**b. Climatic Features:** Precipitation, number of wet days etc.,.

**c. Hazard vulnerability:** Natural hazards such as landslides and fires.

**3. Stake Holders Valuation:** It is important to invite the opinion of the public and local bodies especially the Zilla Panchayats, village level political bodies and also other civil societies to enlist the areas that they feel ecologically and environmentally sensitive and use these as important attributes.

(As the Methodology described in Section 20 indicates, we could not compile the full set of data indicated above, nor have we been able to cover all the criteria proposed by the Pronab Sen committee, primarily due to lack of time.)

Admittedly there still are serious lacunae. In particular, the database is yet to incorporate considerations of habitat continuity, other than in the special case of elephant corridors. It is also weak in terms of information on streams, rivers and other wetlands, as well as ground water, and further careful work is needed to identify, protect and sustainably manage aquatic habitats and water resources. Since our focus is on hill areas, this database also leaves out of consideration of issues of significance for the west coast and coastal plains, such as mangrove forests and khajan lands. Nevertheless, we now have, for the first time in the country, a comprehensive, spatially-referenced database on a series of important ecological parameters, transparently available in the public domain that can serve as the

basis of a systematic delineation of different levels of ecological significance/ sensitivity for a sizeable region.

WGEEP, of course, realizes that ecological sensitivity is not merely a scientific, but very much a human concern. In particular, a great deal of locality-specific understanding of what has been happening and what is desirable, is simply not part of any scientific databases and resides with local communities. WGEEP therefore invited all concerned people and institutions to share their own perceptions as to what specific areas on the Western Ghats should be identified as being 'Ecologically Sensitive Areas', why they feel so, and what set of regulations tailored to the needs of the locality should be put in place if the area were to be formally declared as being ecologically sensitive.

In response, we have received a number of specific proposals from individual Gram Panchayats as well as NGOs from different parts of the Western Ghats. Two of these are particularly noteworthy, (a) Gramsabha resolutions from a single cluster of 25 villages from Savantwadi and Dodamarg talukas of Sindhudurg district that they wish their areas to be constituted as ESAs, and (b) careful proposal for a "Maharashtra Sahyadri Ecologically Sensitive Area" by DEVRAAI, an NGO from Kolhapur drawing on extensive research conducted at Shivaji University. The proponents of these proposals have used the term Ecologically Sensitive Area in the currently prevalent sense, before WGEEP had decided to treat the entire Western Ghats region as an Ecologically Sensitive Area with different levels of ecologically sensitive zones. The proposals received by the WGEEP are referred to by the Panel as "Ecologically Sensitive Localities" to differentiate from its proposal to constitute the entire Western Ghats region as an Ecologically Sensitive Area. Table 2 lists specific proposals received from civil society for designation of new Ecologically Sensitive Localities. (ESL)

While the Panel is specifying ESZ1, ESZ2 and ESZ3 grids and talukas for immediate action, it is not specifying any specific action for the localities listed in Table 2. This is for three reasons: Firstly, because it was not possible to demarcate the boundaries which essentially require intensive field work, secondly, it was not possible to arrive at well-designed administrative mechanism to deal with them, and thirdly, because there may be many other deserving sites in the Western Ghats to be so designated and the Panel was not able to undertake a process of properly identifying them given the time constraints.

**Table 2** Specific proposals for new Ecologically Sensitive Localities (ESL)

| **ESLs** |
|---|
| **Maharashtra** |
| ▪ Lonavla-Khandala |
| ▪ Maharashtra Sahyadri |
| ▪ Cluster of 25 villages from Savantwadi and Dodamarg talukas |
| ▪ ESAs surrounding Protected Areas |
| **Goa** |
| ▪ Sahyadri |
| ▪ ESAs surrounding Protected Areas |
| **Karnataka** |
| ▪ Sahyadri |
| ▪ Kodachadri |
| ▪ Kodagu |
| ▪ ESAs surrounding Protected Areas |

| ESLs |
| --- |
| **Tamil Nadu**<br>▪ Valparai<br>▪ ESAs surrounding Protected Areas<br>▪ Kodaikanal<br>▪ Nilgiri District |
| **Kerala**<br>▪ Mandakol<br>▪ Panathadi<br>▪ Paithal Mala<br>▪ Brahmagiri-Thirunelli<br>▪ Wayanad<br>▪ Banasura-Kuttiyadi<br>▪ Nilumbur-Mepadi<br>▪ Silent Valley- New Amarambalam<br>▪ Siruvani<br>▪ Nelliampathy<br>▪ Peechi-Vazhani<br>▪ Athirappilly-Vazhachal<br>▪ Pooyamkutty Munnar<br>▪ Cardamom Hills<br>▪ Periyar<br>▪ Kulathupuzha<br>▪ Agasthya Mala<br>▪ ESAs surrounding Protected Areas |

# 10. ESZ assignment

WGEEP proposes that the 2200 odd grids spanning the entire Western Ghats be assigned to (1) Protected Areas, namely, existing Wild Life Sanctuaries and National Parks, and (2) ESZ1 (3) ESZ2 and (4) ESZ3 on the basis of composite scores of ecological significance derived from the database generated by WGEEP. Since a long-standing effort has gone into identification of Protected Areas and they represent both social and ecological values, we propose that grids with scores at the level of Protected Areas and above within the same state be assigned to ESZ1 category, with the proviso that the total area under PAs and ESZ1 be limited to 60% to balance the development needs of states. We propose that ~25% of grids with scores at the lower end be assigned to ESZ3 category, and the balance to ESZ2. This implies a decision to treat ~75% of the grids as belonging to PAs, ESZ1 or ESZ2. Our national goal is to maintain 66% of area under forest cover in all hill tracts. Given that the Western Ghats is a hill region of special significance, we decided that it was appropriate to aim at 75% being treated as areas of high or highest significance. In view of the strong north–south ecological gradient over the Western Ghats, one cannot really treat the Gujarat Dangs and Kerala Ashambu hills on the same footing. Therefore, this exercise has been undertaken separately for each state. In states where the boundary of the Western Ghats coincides or is very close to coastal areas, the WGEEP has left out a width of 1.5 km from the coast from the delimitation exercise to acknowledge the fact that the scoring exercise did not reflect coastal ecological values and sensitivities.

To sum up:

1. Western Ghats regions of each state are treated separately.
2. Existing Protected Areas are treated as a fourth separate category.
3. ESZ1, ESZ2 and ESZ3 status is assigned only to grids outside existing Protected Areas.
4. ESZ1 status is assigned only to such grids as have a score at least equaling, or higher than the lowest scoring grids falling within existing Protected Areas.
5. Detailed information such as localities of origin of rivers, laterite plateaus, and localities where local communities have expressed a strong interest in conservation can be used to decide on demarcation of ecologically sensitive localities
6. The extent of existing Protected Areas plus ESZ1will not normally exceed 60% of the total area.
7. The extent of area covered by existing Protected Areas plus ESZ1 and ESZ2 together will be around 75%.
8. The extent of ESZ3 will normally be around 25% of the total area.

Figures 2–7 give the State-wise colour maps depicting PAs and ESZ1, ESZ2 and ESZ3 for all the grids covering the Western Ghats region. Please note that in Figure 2, Kanakapura taluka does not fall within the boundaries of the Western Ghats and in Figure 7, Denkanikota and Bhavani taluka do not fall within the boundaries of the Ghats.

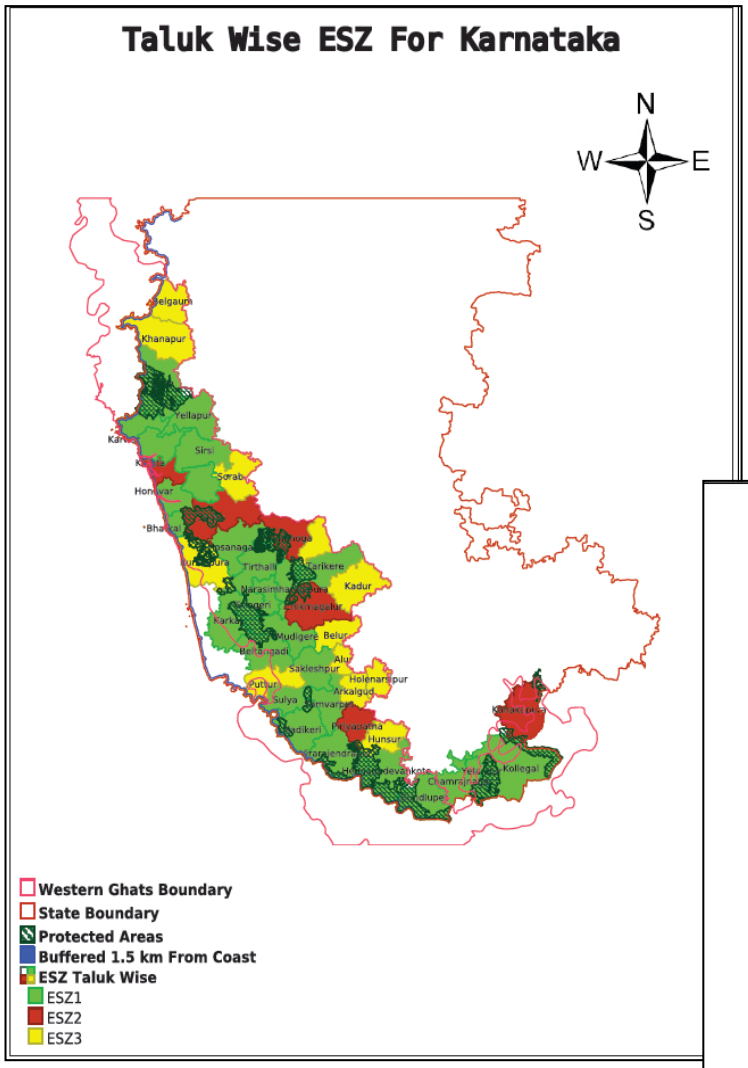



Figure 2

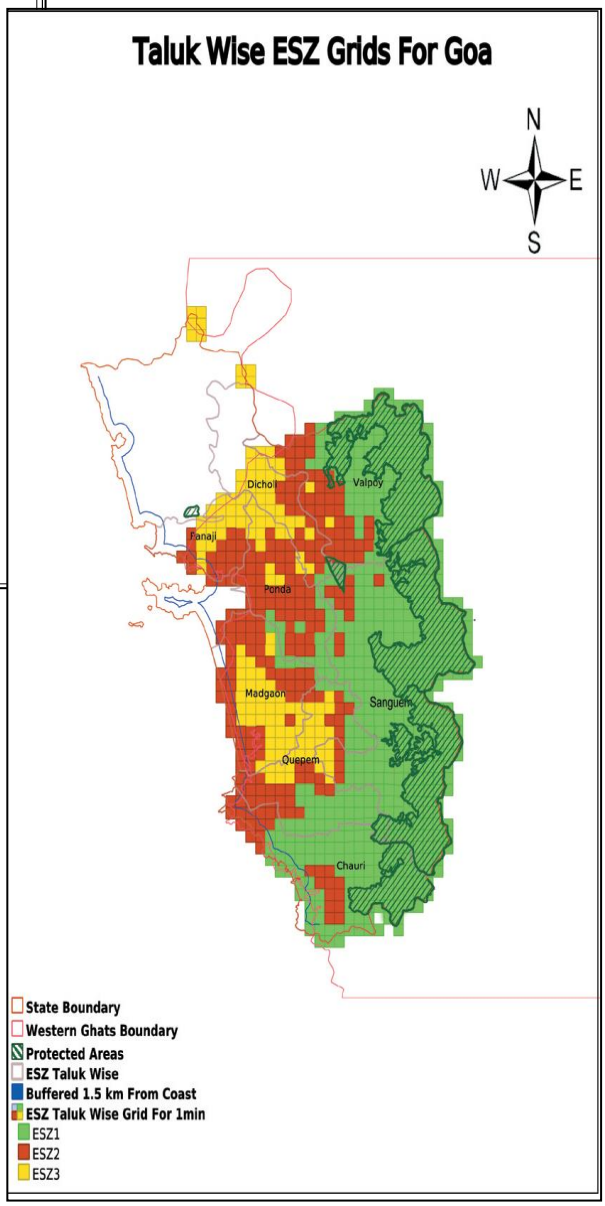



Figure 3

**Figures 2–7** Depicting PAs and ESZ1, ESZ2 and ESZ3

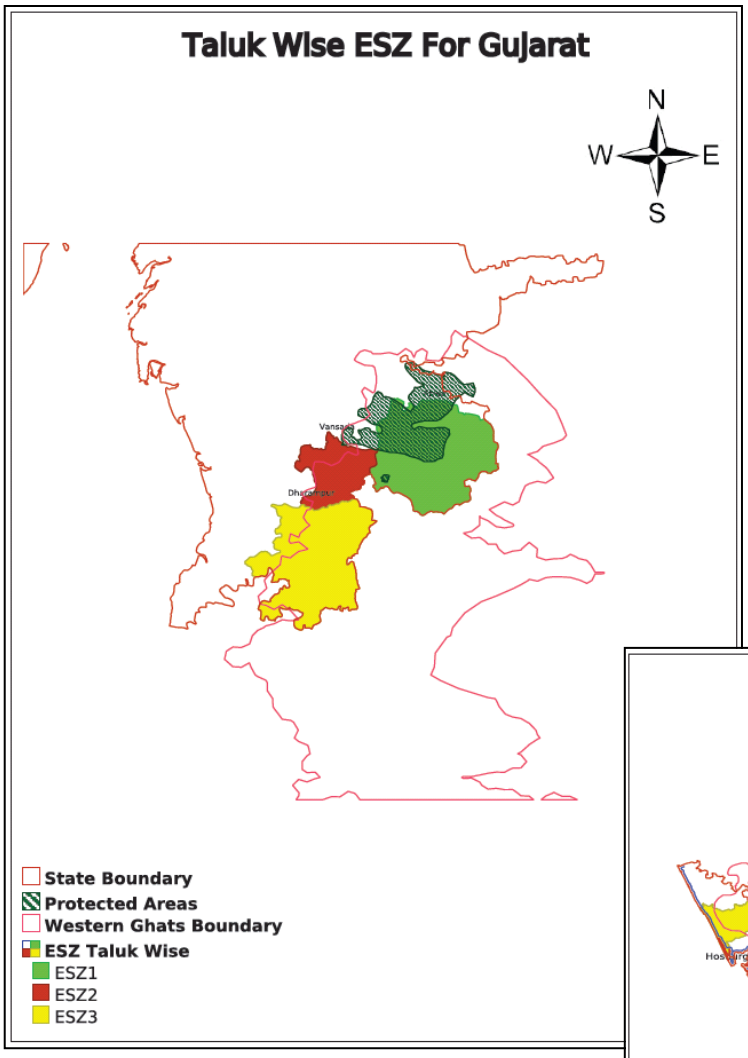



Figure 4

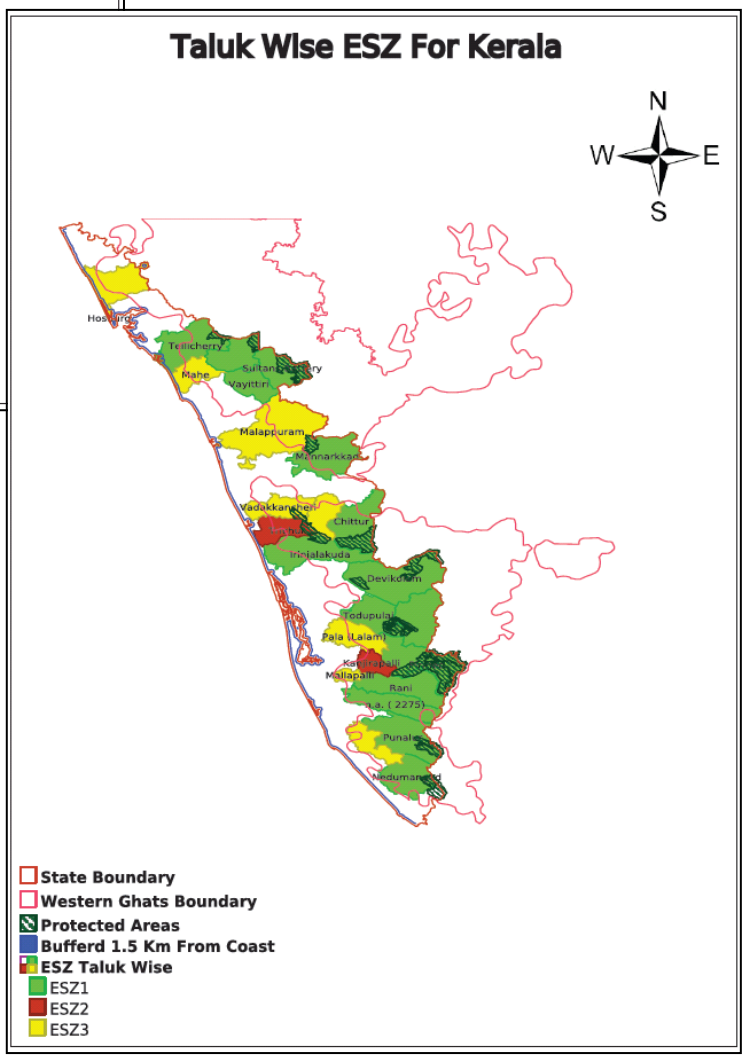



Figure 5

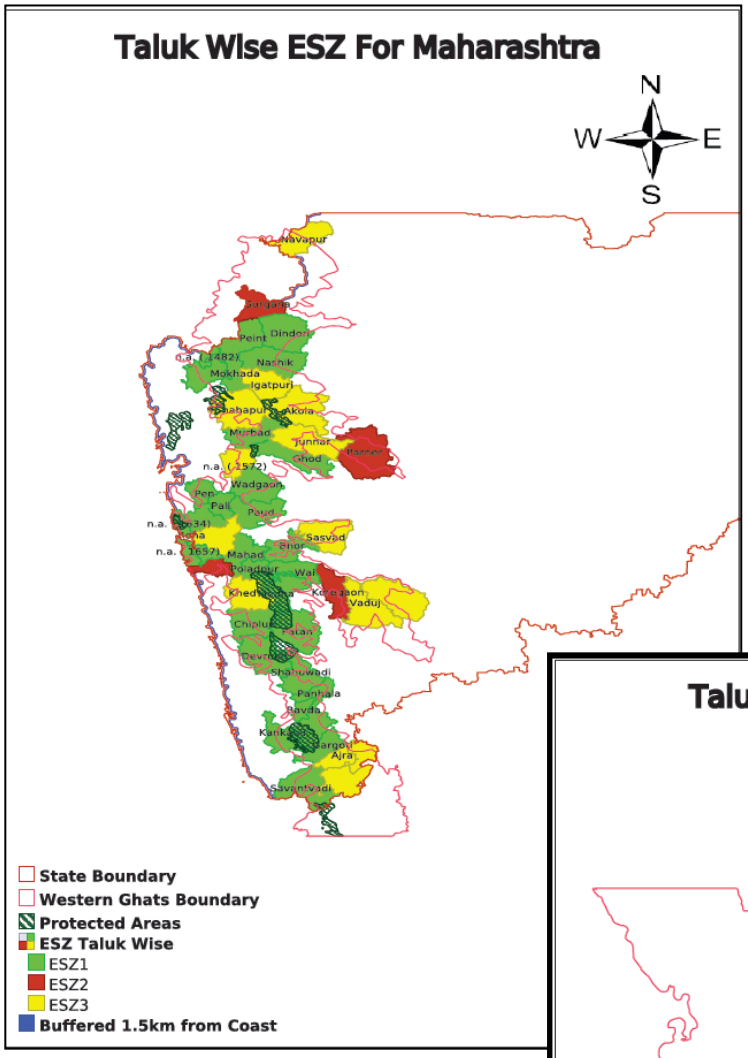



Figure 6

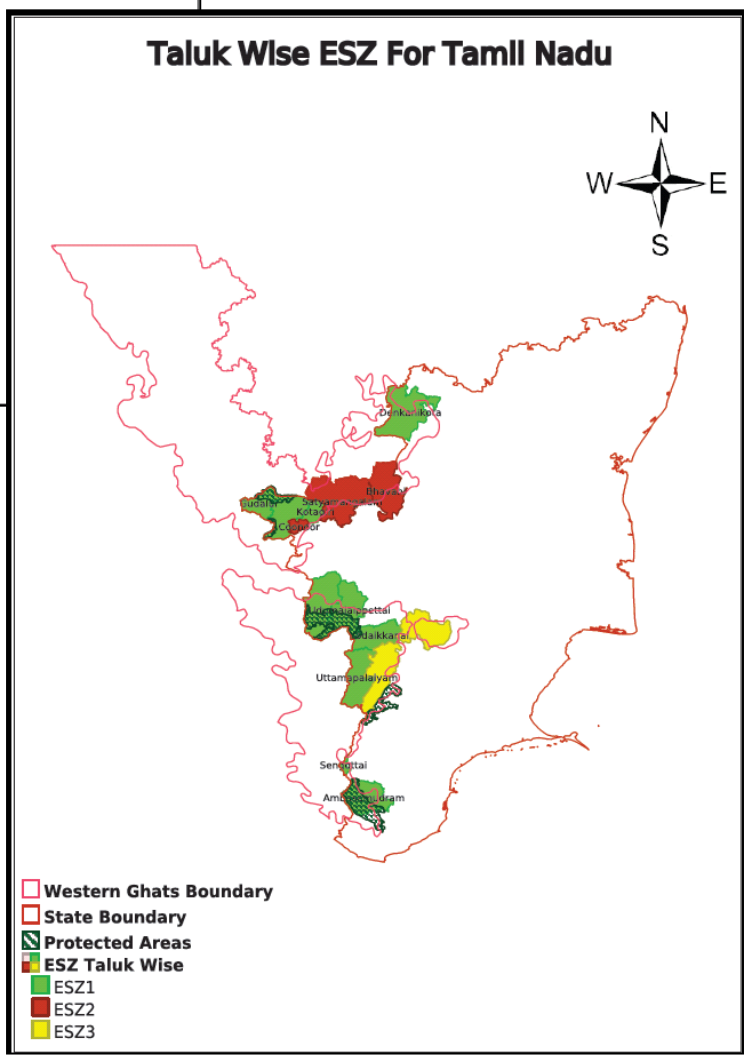



Figure 7

The database employs square grids of 5 minutes x 5 minute or grids ~9 km x 9 km that do not correspond either to natural features such as watersheds, or administrative units such as village or taluka boundaries. It will be clearly be desirable to put in place a system of zonation that jointly considers micro-watersheds and village boundaries to decide on specific limits of ESZ1, ESZ2 and ESZ3, as well as to arrive at a locality-specific management plan. This would be a task that will have to be initiated by the Western Ghats Ecology Authority through a broad-based participatory process when WGEA is put in place. However, as a first step, we suggest the Ministry of Environment and Forests provisionally notify the initial limits of ESZ1, ESZ2 and ESZ3 based on WGEEP analysis. This may be most appropriately done at Taluka/ Block level. With this in view, we have gone ahead and assigned ESZ1, ESZ2 and ESZ3 levels to all the 134[4] talukas of Western Ghats. The assigned level to the taluka is the ESZ that covers the largest fraction of the taluka.

Tables 3 and 4 provide a summary listing of taluka assignments for all states except Goa. Appendix 2 and 3 at the end of the document provide detailed district and taluka lists.

**Table 3** Proposed assignment of various Western Ghats districts to ESZ1, ESZ2 and ESZ3

| State | No of Districts in the WG | No of Talukas assigned to ESZ1 | No Talukas assigned to ESZ2 | No Talukas assigned to ESZ3 |
|---|---|---|---|---|
| Gujarat | 3 | 1 | 1 | 1 |
| Maharashtra | 10 | 32 | 4 | 14 |
| Goa | 2 | NA | NA | NA |
| Karnataka | 11 | 26 | 5 | 12 |
| Kerala | 12 | 15 | 2 | 8 |
| Tamil Nadu* | 6 | 9 | 2 | 2 |
| Totals | 44 | 83 | 14 | 37 |

* Based on the reorganization of districts and talukas, this will change

Table 3 above covers only talukas with 50% or more of their area included within the Western Ghats boundary. There are, however, grids that have been assigned either ESZ1 or ESZ2 status that fall in talukas not included in Table 3. Table 4 lists such talukas. In the case of Goa, 1 minute x 1 minute grids were used, and the zoning was done at the level of grids of ecological significance and not extended to talukas given Goa's size (see Appendix 1). These zones will have to be harmonized with Goa's ongoing process of ecological sensitive zoning under the Regional Plan 2021.

**Table 4** Proposed ESZ1, and ESZ2 assignment of various talukas for which less than 50% area is within Western Ghats boundary

| State | No of Districts in the WG | No of Talukas assigned to ESZ1 | No Talukas assigned to ESZ2 |
|---|---|---|---|
| Gujarat | 2 | - | 4 |
| Maharashtra | 11 | 6 | 23 |
| Goa | - | - | - |
| Karnataka | 15 | 1 | 22 |
| Kerala | 9 | 2 | 16 |
| Tamil Nadu* | - | - | - |

* See Appendix 2 and 3

[4] Eight talukas of Goa in the Western Ghat region have not been included in this table.

The Western Ghats Ecology Authority would also have to identify the Gram Panchayats that are covered in this fashion and initiate a broad-based participatory process to decide on specific limits of ESZ1 and ESZ2, as well as to arrive at a locality-specific management plan. Box 5 refers to one such grass-root initiative. Table 5 provides the names of 25 villages in Sindhudurg district whose Gram Sabhas have submitted resolutions requesting that their Panchayat areas should be constituted as Ecologically Sensitive Localities (ESL). Box 6 contains an extract of one such resolution.

**Box 5: A grass-roots level initiative**

A total of 25 Gram Sabhas from Sindhudurg district have passed resolutions requesting that their Panchayat areas be designated as ecologically sensitive areas. Of course, WGEEP is not in a position to verify exactly what transpired during these Gram Sabha meetings, and whether the meetings were conducted following proper procedures. Nevertheless field visits to several of these villages suggested that the resolutions have strong popular support. Notably several other Gram Panchayats in the region have passed resolutions to the contrary, namely, that they do not wish their Gram Panchayat areas to be constituted as ecologically sensitive areas. On further discussion, it turns out that people are trying to balance two evils. They feel that if their Gram Panchayat areas are constituted as ecologically sensitive areas, it would reduce the threat of completely unwelcome mining activities. At the same time they are afraid that if their Gram Panchayat areas are constituted as ecologically sensitive areas, they will come under the stranglehold of the Forest Department, which is also unwelcome. This is a classic example of the syndrome of development by exclusion, and conservation also by exclusion that plagues us today. Only when we put in its place inclusive development as well as inclusive conservation, will we be able to move in the direction of environmentally sustainable and people-friendly development. WGEEP would like to plead that we must take this route. In any event, it is notable that all the 25 Gram Panchayats that have sent in resolutions asking for their areas to be declared as ecologically sensitive areas constitute a single compact cluster that falls in the region designated as ESZ1 on the basis of DEVRAAI's carefully compiled database.

**Table 5** Proposals for Ecologically Sensitive Localities (ESL) in Sindhudurg District

| Taluka | Names of villages |
|---|---|
| Dodamarg | Fukeri, Kolzar, Kumbral, Sasoli, Kalne, Ugade, Zolambe, Talkat, Bhike-Konal, Dharpi |
| Savantwadi | Kesari, Dabhil, Asaniye, Padve-Majgaon, Udeli, Degve, Bhalawal, Sarmale, Otavane, Fansavade, Tamboli, Konshi, Nangar Tas, Nevali, Padve |

**Box 6: Extracts from resolution of Gram Sabha of village Talkat, Taluka Dodamarg, District Sindhudurg (translated from Marathi)**

It is necessary to consider the following things for conservation of forest, and development of the village:

Watershed development programme: Though we have perennial streams as a water source for village, it is important to plan methods for efficient use of these resources. In summer, orchards do not get enough water due to lack of planning. It is possible to build nala bunds and small dams for water storage. Government officials have made preliminary observations and conducted background investigations in the village. That's why it is very important to prioritise watershed development. Each wadi in the village is in need of this.

Perennial streams are present in the Western Ghats ridges in the village. It is possible to build mini hydel projects for power generation on these streams. There is need to study this possibility. It is needed to improve the present condition of cashewnut and arecanut orchards. In the areas where forest and enough water sources for horticulture are not present, we can develop agroforestry dependent on rainwater. We require training and funds from the government for this.

At present we don't have a plant nursery. We can develop one indigenous plant nursery for the above-mentioned agroforestry. Some self-help groups will get income from this.

Village tourism: Traditional houses, orchards and greenery in our village attract tourists. Our people from Mumbai (whose native place is Talkat) come here along with their city friends. There is scope to develop the village as a tourist place.

Human–Wildlife conflict: Location of Talkat village is near to the forest. Orchards are surrounded by forest. The forest area in the village is blessed with rich wildlife as it is a part of the forest between Amboli-Tillari. We are living with this wildlife for many years. But these days we are facing nuisance from monkeys, sambar, elephant and leopards. While preparing a development plan we have to consider this issue. We do like to live with wildlife.

This is what we think. Government and villagers should work on the development plan of our Ecologically Sensitive Area. We are ready to do it. Because projects like mining are hazardous for our life as well as will destroy our income source. Instead of such projects we would like to have our village located in an Ecologically Sensitive Area.

# 11. Existing ESZs: Lessons Learnt

The Pronab Sen Committee did not evolve a methodology for regulating the nature and extent of human activity in designated Ecologically Sensitive Zones/ Areas, a task that was addressed later by the Ministry of Environment and Forests itself. For this purpose, the MoEF has put in place a centralized system grounded in regulating land use employing the provisions of Section 5 of the Environment Protection Act, 1986. After receiving an ESA proposal, the MoEF prepares the ESA notification and calls for responses from the public and the concerned state government. Since land is a state subject, the state government is then asked to prepare a Regional Development Plan that will provide for appropriate use of land as visualized in the Ecologically Sensitive Zone/ Area notification. The state governments, in turn, finalize the Regional Development Plan after calling for public inputs. To oversee the implementation, MoEF constitutes a High Level Monitoring Committee (HLMC), in most cases without any local representation.

While the constitution of such ESZ /ESAs has had many positive consequences, there are also serious flaws in the system. The most serious problem is that the system depends heavily on bureaucratic regulation. With little or no meaningful participation by the local community, and given the absence of bureaucratic transparency and lack of accountability, this breeds corruption. The result is that the weaker sections suffer harassment and extortion, while the wealthy and the powerful successfully flout the regulations, leading to tremendous local resentment.

There are four ESZs constituted in the state of Maharashtra, namely, Murud-Janjira, Dahanu Taluka, Matheran and Mahabaleshwar-Panchgani. The experience has been that both the Central and State Government authorities tend to act slowly and hesitantly in the necessary follow-up. For instance, in the case of the Dahanu Taluka Environment Protection Authority (DTEPA), the Authority was constituted for an initial period of one year vide Notification dated 19-12-1996 and thereafter the Ministry started granting extensions piecemeal, first for a period of two months, next for a period of three months, thereafter for a period of six months. The Ministry was requested to make this Authority one of a permanent nature from the perspective of the efficiency of the monitoring function of the Authority. However, the Ministry granted extensions for the period of six months from November–December1999 onwards, until the Courts intervened once more. It is only such Court interventions that have ensured that DTEPA is armed by powers to issue directions under Section 5 and for taking measures with respect to the matters referred to in Clauses (v), (vi), (vii), (viii), (ix), (x) and (xii) of Sub Section (2) of Section 3 of the Environment (Protection) Act, 1986.

In contrast, the Mahabaleshwar-Panchagani High Level Monitoring Committee has continued to suffer seriously through lack of continuity, as also due to lack of adequate powers. WGEEP has had extensive dialogue with current Mahabaleshwar-Panchagani HLMC members and other activists, as also field visits and discussions with a cross-section of local community members, and a picture of very mixed reactions emerges. Unfortunately, there was no HLMC in place at all for a period of years from 2002–2005. While under the current Chairmanship of Shri Dev Mehta, the HLMC has tried to reach out to people and solve their problems, this did not happen earlier. So people have a strong impression that the ESZ is a regime imposed from outside and that it is a regime focused on rigid bureaucratic controls that are subverted by corrupt officials to harass and extort. WGEEP has received written petitions complaining that a farmer is obliged to pay a bribe of Rs 20,000 to get permission to dig a bore well on his farm. Mahabaleshwar-Panchagani region has large populations of Scheduled Tribes and traditional forest dwellers. Hence, it was imperative that the Forest Rights Act should have been implemented in these areas in its true spirit five years ago. Nothing has been done in this regard, and it appears that this is to facilitate extortion. People complain of very old paths to their villages being disrupted by trenches dug by the Forest Department, and Madhav Gadgil has personally inspected some of these. Allegedly, the trenches are then filled on payment of bribes, to be dug again some time later. The apparent lack of local support for the ESZ is also reflected in the report that at one time activists of the Bombay Environmental Action Group could visit Matheran, one of the ESZs promoted by them, only under police protection (Kapoor, M: K Kohli and M Menon, 2009 ).

Boxes 7, 8 and 9 summarize these experiences.

## Box 7: Dahanu Taluka Environment Protection Authority

The Hon. Supreme Court in disposing of the Writ Petition No. 231 of 1994, ordered as under:-

"that continuous monitoring at the level of the State Government and also by some independent Statutory Authority is necessary to protect the ecologically fragile Dahanu Taluka. The State Government is under an obligation to implement Town / Regional Plan as approved by Government of India subject to the conditions imposed in official memorandum dated 6th March, 1996, by Govt. of India, and directed the State of Maharashtra to execute the said Plan, subject to conditions and also two notifications issued by Government of India, Dated 19-2-1991 (CRZ Notification) and Notification Dated 20-6-1991 pertaining to Dahanu area. The State Government shall also take into consideration and implement all the Recommendations of NEERI, as reproduced in the said Judgment."

The said Writ Petition is transferred to the Bombay High Court to monitor is still pending. The Writ Petition No. is 981/1998.

Also the Hon. Supreme Court directed the Central Government to constitute an Authority under Section 3(3) of the Environment (Protection), Act, 1986 and also confer on the said Authority all the powers necessary to protect the ecologically fragile Dahanu Taluka and to control pollution in the said Area. The Authority shall be headed by a Retired High Court Judge and it may have other Members with expertise in the field of Hydrology, Oceanography, Terrestrial and Aquatic Ecology, Environment Engineering, Developmental and Environment Planning and Information Technology, to be appointed by Central Government. The Central Government shall confer on the said Authority all the powers to issue directions under Section 5 and for taking measures with respect to the matters referred to in Clauses (v), (vi), (vii), (viii), (ix), (x) and (xii) of Sub Section (2) of Section 3 of the Environment (Protection) Act, 1986.

The Central Government shall constitute the Authority before 20th December, 1996. The Authority so constituted by the Central Government shall consider and implement the "Precautionary Principle" and "Polluter Pays Principle". The Authority shall also consider and implement the Recommendations of NEERI and implement the two Notifications dated 19-2-1991 (CRZ Notification) and Dated 20-6-1991 (Dahanu Notification), Regional Plan for the Dahanu Taluka , Development Plan for Dahanu Town etc.

Accordingly, the Ministry of Environment and Forests, New Delhi, vide Notification bearing No,.S.O.884 (E), dated 19-12-1996 has constituted the Authority called as "Dahanu Taluka Environment Protection Authority".

Initially the DTEPA was constituted for the period of one year vide Notification dated 19-12-1996 up to 18th Dec. 1997 and thereafter the Ministry started granting extensions piecemeal, first for the period of two months, for the period of three months, thereafter for the period of six months. The Ministry was requested to make this Authority of permanent nature for discharging efficiently the monitoring function of the Authority. However, the Ministry granted extensions for the period of six months from Nov–Dec1999 onwards. Thereafter, an application was filed before the Supreme court bearing No. I.A.Nos. 2 & 3 in Writ Petition No. (Civil) No.231/1994, by the Ministry, and Supreme Court vide Order dated 09/09/2002 extended the period of this Authority "until further Orders" of the Supreme Court and the Ministry issued Notification No.S.O.1211(E), dated 18th Nov. 2002, granting extension "Until further orders".

It may be noted that the authority has one member representing civil society, an NGO representative. This position has been vacant for the last 16 months.

**Special features of the Authority**

- The Meetings of the Authority are open meetings and the discussions on the questions take place in the presence of the citizens of the area, activists, as well as the Officers of the concerned Government Departments and of the Project Agencies. All the complaints received by the DTEPA are considered and discussed in the meeting itself, after hearing all sides with the people from the area being present. This is a 'Public Consultation' in the true sense. The decisions are taken in the presence of all and their implementation is also followed regularly. So far all the decisions are unanimous. About 70 to 100 local people attend the Meetings of DTEPA and their problems/complaints are resolved regularly by the Authority.
- A unique criterion laid down by the Authority is the Social Cost of the Project. The Officers in-charge of the Projects are directed to compensate the people of the area, who are likely to be affected, by providing some social amenities, such as Samaj Mandir, Cement Bandharas, Bus Stand Sheds, Gymnasium, Cemetery, Bore wells, Mobile Van for Kasa Hospital, Trauma

Centres, Soil Erosion Bunds etc. The Authority is happy to report that the project owners, as well as the general public co-operates in the development of such social amenities.

- The Right to Good Environment is treated as part and parcel of Article 21 of the Constitution i.e. Right to Life. Therefore, care is being taken of the people living in the vicinity. In order to judge the effect of emission from the Thermal Power Plant and other industries on the environment or ecology, even physical health check up surveys are taken by the authorities concerned and in this the project owners as well as social clubs and the public of the area helped the DTEPA. In this process the Authority carried out health surveys and has conducted medical examinations /check ups of the women and the children of the area, as well as the persons employed in the Buffer and Balloon Industries etc. Therefore, the ecology and the environment, whose well being is the right of the people, guaranteed under section 51 of the Constitution of India, is protected by doing such surveys, so that remedies can be determined, which can then be implemented.
- This Authority adopted the new concepts of "Pre-afforestation" and "Pre-habilitation" keeping in view the said Right to Protection of Life. Government agencies always say that the lands for this purpose are already earmarked; then it is better to follow this principle, because compensatory afforestation and rehabilitation is absolutely necessary.
- The doctrine of Public Trust as laid down by the Father of the Nation, is now accepted by the Supreme Court of United States of America, as well as the Supreme Court of India. Meaning thereby, that the State or the Government is a Trustee and not the owner of the National Resources. Therefore, it is the duty of the State to use the same for the Public Good. The expression used is, "to reallocate the resources for public use, rather than self interest of private parties".
- The Supreme Court vide Order dated 31st October, 1996 did not dispose of the Writ Petition, but transferred it to the Bombay High Court and directed it "to monitor the whole matter", and to deal with the polluting and obnoxious industries, operating in Dahanu Taluka, in accordance with the Law, keeping in view the Town/Regional Plan, Government of India Notifications and the NEERI Report. Because of this, it was easy for this Authority to deal with the problems. Unfortunately, the power plant is practically in the sea and it uses coal. Therefore, installation of an FGD plant was absolutely necessary. Another problem is of fly ash, which requires serious consideration..The plant is under vigilance of the Authority and 70% fly ash is utilized, according to the RIL report. The mechanism of dealing with the balance fly ash is still under discussion.

**Box 8: Mahabaleshwar Panchgani Eco-Sensitive Zone**

*Presented by D. Mehta – Chairman HLMC, Mahabaleshwar-Panchgani ESZ*

**A Brief Background of Mahabaleshwar-Panchgani Region 'Eco Sensitive Zone'**

Mahabaleshwar-Panchgani region is a popular tourist hill station; the only one of its kind in the Northern Western Ghats. However, the region also has a rich natural heritage, and is the origin of the Krishna and Koyna rivers. The region faces a severe threat from booming tourism and its fallout, like illegal settlements, illegal hotels, illegal deforestation, solid waste pollution, traffic congestion, etc.

In order to contain these harmful consequences of uncontrolled development in the **Mahabaleshwar-Panchgani region, a notification was issued by the Ministry of Environment and Forests in January 2001** whereby the region was declared as an '**Eco-sensitive Zone' covering an area of 123.96 sq kms.** Controlled, sustainable development and protection to ecologically sensitive areas within the region was envisaged under this notification.

The importance of the Mahabaleshwar-Panchgani Eco Sensitive Zone (MPESZ) has increased, among other things, due to the recent judgment given by the Krishna Water Disputes tribunal. Since Krishna and Koyna are the major rivers which will affect the area upstream of the Almatti dam, practically every year during the monsoons, regulating and managing the head waters of these two rivers has acquired a special significance.

The Dhom and Balkawadi Dams on the Krishna and the reservoir on the Koyna will have to be managed and regulated carefully in order to avoid or at least minimize flooding of areas upstream of the Almatti dam. Therefore, the entire ecologically sensitive zone of Mahabaleshwar and Panchgani which receives the head waters of these rivers will have to be conserved as flood regulating catchments, among other things.

Mahabaleshwar receives up to 8000 mm of rain during the monsoon, which is absorbed by the forests on the nine plateaus and on the slopes and ledges of the MPESZ. Due to the impact of climate change, both weather and rainfall patterns have changed significantly.

The ecological and river basin significance notwithstanding, this region also has to cater for over 10 lakh tourists who converge on this hill resort every year and have to be provided with basic amenities and tourist facilities of high standards.

The resident population, which hosts these tourists also, have specific needs and requirements which need to be fulfilled.

**Experience of working in the HLMC of the Mahabaleshwar Panchgani eco-sensitive zone**

The High Level Monitoring Committee (HLMC) appointed by the Ministry of Environment and Forests has been trying to achieve these objectives since its initial appointment in 2002 to 2005 and then later from 2008 to 2012.

Important decisions taken during the recent period include;

**Proactive and Development oriented decisions:**

**1. Regional Plan**

The HLMC scrutinized the entire regional plan and submitted its detailed report containing a vision statement, aims and objective, and important additions and modifications, to the Ministry of Environment and Forests (MoEF), GoI. The HLMC report was fully accepted. The Regional Plan inclusive of HLMC report [Zonal Master Plan] has been approved by the MoEF and has been sent to the Government of Maharashtra (GoM) for final notification.

The HLMC appointed a sub-committee headed by Mr. David Cardoz to survey the waterfalls and sources of streams in the Zone in March 2010. Sources of streams and twelve waterfalls have been surveyed, identified and are now included in the Zonal Master Plan. Similarly, the rationalization of boundaries of a buffer zone around the ESZ is being studied by Prof. Jay Samant and Prof. Vijay Paranjpye. On completion of the study appropriate recommendations will be made to the Government.

2 **Tourism Master Plan**

The Terms of Reference for the Tourism Master Plan have been finalized by the HLMC and given to the Maharastra tourism development corporation, MTDC. However, the MTDC has not yet prepared the Tourism Master Plan, which will have to be a crucial part of the Zonal Master Plan.

3 **Development Plans**

Guidelines for the finalisation of the Development Plans for the Panchgani and Mahabaleshwar Townships have been given to the Director of Town Planning (DTP) (GoM). These Development Plans (DPs) when completed by the DTP and approved by MoEF will be treated as the Sub-zonal Master Plans.

4 **Institutes for Climate Change**

A decision has been taken to set up a Climate Change Institute in Mahabaleshwar which will be using advanced techniques and equipment for monitoring meteorological changes on a short term as well as long term basis. This institute will be located within the premises of the Meteorological Department located at Mahabaleshwar.

5 **New *Gaothans* – (Village settlements)**

Twelve villages within the ESZ were facing major administrative and developmental problems because of the pending final declaration as *Gaothans* by the GoM. The HLMC has during its last meeting advised the Collector Satara to start approving applications for housing in proposed *Gaothan* areas and the ADTP was requested to incorporate the changes in the Zonal Master Plan accordingly.

It is expected that this decision will greatly ease the provision of basic facilities like connecting roads to these villages.

6 **Environment Awareness**

An awareness program has been launched and printed material in Marathi and English, CDs, films etc. have been distributed/ are being distributed to schools, guides, hoteliers, gram panchayats, and govt. offices etc. who interface with public regularly. A website will be set up to exclusively deal with HLMC matters. Two interpretation centres in Mahabaleshwar and Panchgani have been set up. More interpretation centres within the Region are being set up. Seminars for school children, teachers, principals and guides were organised to explain SEZ and to understand their responses.

7 **Involvement of local residents**

To interact closely with local citizens, meetings are held prior to every HLMC meeting with the following existing groups:

Local administrative staff,

School teachers, voluntary groups, activists and stakeholders like:

Hoteliers Association,

Taxi and horse owners Associations,

Association of strawberry growers,

Association of guides, tour operators and adventure clubs,

Association of shop keepers and merchants.

All relevant information about the provisions of the ESZ, along with the historical, geographical, and biological and heritage-related information is made available to such groups and concerned citizens. These informal meetings helped the HLMC in understanding local difficulties and suggestions, many of which are reflected in its decisions.

We are actively encouraging formation of NGOs of local people for better interaction.

8 **Encouraging Eco-tourism**

The HLMC has indicated to all agencies and stakeholders that there will have to be a major shift from leisure and conventional tourism to ecological, cultural and agro-tourism, etc. Meetings with guides have been held in this connection and for whom a training workshop is being organized. In order to divert tourist flow towards nature trails, horse rides, and hiking trails, maps have been prepared with the help of the Hoteliers Association.

**Regulatory and Restrictive Decisions**

The HLMC had been approached with a proposal for a Ropeway Project across the Venna Lake. After several meetings and deliberations the HLMC has decided not to approve it, since it would not be permissible under the Ropeways Act, GoM, and since it is harmful to the MPESZ.

An Amusement Park was set up at Panchgani without following the correct procedures, and

without obtaining permissions from the HLMC or the MoEF and not consistent with the ESZ criteria. The HLMC is trying to minimize the damage due to the Amusement Park and has directed the agency to carry out certain corrective measures. The proposed Zonal Master Plan (RP) has ensured that no such undesirable development takes place in future.

In order to curb unauthorized constructions, and the misuse of FSI, a decision has been taken to provide electric connections and other civic amenities only for approved development plans/ projects. The Bed and Breakfast concept which was being widely misused has been frozen temporarily till new guidelines contained in the ZMP are notified.

It was observed that a large number of mega-sized hoardings were being illegally put up, thereby blocking the natural and man-made heritage sites. A decision was taken to remove all unauthorized hoardings. The PWD has recently removed 58 such hoardings. Similar actions will be continued by other departments as well.

Collector Satara, Member Secretary of the HLMC, has initiated a drive to disallow plastic bags below 50 microns thickness and the local Municipal authorities and agencies have also been asked to do the same. The local authorities were advised to increase the quantum of fines for this infraction to act as a more effective deterrent. The larger establishments like hotels and residential schools have agreed to the procurement of bulk supply of milk and drinking water in order to reduce the use and disposal of plastic bags. Small entrepreneurs have been encouraged to produce paper, cloth and jute bags.

**Work in Progress**

The GoM has approved funds for Sewage Treatment Plants (STPs) at both Mahabaleshwar and Panchgani, however the work being done is very slow and unsatisfactory and in the case of Panchgani, the implementation has been unsatisfactory and incorrect. The Municipal Councils are being monitored and have been asked to report to the HLMC on a monthly basis.

The HLMC has proposed the preparation of a roads and traffic management plan. Vehicles using alternative energy and a reliable public transportation system within the MPESZ will be the principal elements of this plan.

The HLMC has been working on plans and procedure for converting the ESZ into an organic farming zone. The successful example set by the Himachal Pradesh Government will be taken as the basis for this purpose. Issues such as eliminating plastics in organic farming will be dealt with in consultation with the local farming community

**Suggestions for making the HLMC more effective:**

*A. Suggestions specific to Mahabaleshwar-Panchgani ESZ (MPESZ)*

**1** The 'forest alike areas' surveyed as per Supreme Court orders are to be treated as *deemed forests*. HLMC has requested MoEF to give specific instructions to the state government as to how permissions for development on such identified spots should be given, keeping in mind the fact that those who protected forests on their plot should not be penalized and they should at least get the FSI normally available on such a plot without getting into the long procedure of approaching MoEF with a management plan. HLMC should be given powers to consider all applications pertaining to such plots to avoid hardship to owners.

**2** The Zonal Master Plan (ZMP) would not be complete unless maps of forest surveys are integrated into the plan. In order not to delay final publication of ZMP, it is suggested that such maps could be put on to websites to begin with. Subsequently certified maps can be made available in the offices of the Tahsildar, chief officers, Forest Department, Collector and the interpretation centres.

**3** The State Tourism Department was mandated to prepare the tourism master plan which is to be treated as a subzonal plan, after approval by MoEF and Ministry of Tourism, GOI. Despite the lapse of 8 years, work has not begun and the matter needs to be taken up at the highest level of state government.

**4** For want of budgetary provisions, the HLMC is unable to appoint consultants for various measures like the transport and traffic plan, conservation and awareness drives etc. The MoEF should direct the state government to provide funds specifically to the HLMC for this purpose. In addition MoEF can consider giving matching grants. It would be a nice idea to start with at least 1% of the District Planning and Development Council (DPDC) budget. Moreover, the funds from the Krishna Valley Action Plan and Hill Area Development Plan, etc., should be utilised for projects which enhance the eco-sensitivity of the ESZ.

*B. General suggestions for all HLMCs.*

**1** **Composition and tenure:** The tenure of 2 years is too short for the HLMC to complete its task. It is suggested that the tenure should be at least 3–5 years.

The representation of non-official members should be increased to include experts in the fields of biodiversity, geophysics, hydrology, socio-economics, as well as local representatives preferably through an NGO. Since tourism is one of the engines of growth in hill areas, an expert on eco-tourism should also be included. It would be appropriate in the MPESZ to make the Managing Director (MD) of the Krishna Valley Development Corporation a member of the HLMC.

The HLMC need not be too large and some government offices could be excluded e.g. Director of Municipal administration who is not concerned with ecological issues. Similarly the Secretary of Environment is unable to attend and is always represented through the Pollution Control Board who are members in any case.

2 **Powers to take punitive actions:** Powers under section 5 of EPA (1986) should be given to the HLMC to take quick and effective action against offenders.

The recommendations of the Central Empowered Committee (CEC) in I.A No. 659 and 669 of 2001 in Writ Petition (Civil) No. 202 of 1995 at page 9, para ii) are as follows-

"*The Monitoring Committee set-up under the notification has been given powers only under section 19 of the Environment (Protection) Act, 1986, to file complaints. Power u/s 5 and 10 of the said Act should also be given, as has been given to similar other authorities such as the Coastal Zone Management Authorities, etc. These powers would permit a smother and better functioning of the Monitoring Committee.*"

3 **Finance:** The HLMC is provided with no funds at all, either by central or state governments. As a result, it is unable to take up special projects, consultancies, awareness drives or environmental research. In fact most of the non-official members spend their own money and other resources to carry on the work of the HLMC.

4 **Co-ordination:** For better coordination it is suggested that MoEF should regularly hold workshops for non-official members of all HLMCs, concerned state environment secretary, proposed WGEA authority, MoEF and other national and international experts.

5 **Execution:** It is found generally that except the Collector who is also the Member Secretary of HLMC, other government officials who are members do not regularly attend meetings. Our present experience shows that the local authorities do not take the directions of the HLMC seriously. The state governments show benign neglect, at best. There is a need to give directions to speedily comply with all HLMC decisions. The concerned state departments should regularly monitor the implementation and enforcement of HLMC decisions.

### *C. Proposed Western Ghats Ecology Authority*

We appreciate that the Chairman of WGEEP has made efforts to take cognizance of the difficulties faced by HLMCs in their functioning. Due to the brief tenure of the WGEEP, it was not possible for HLMCs to participate in the deliberations of the WGEEP.

As and when the Western Ghats Ecology Authority is constituted, it would be useful to set up a mechanism to involve concerned HLMCs for continuous interaction with the Authority. Besides HLMC's answerability to MoEF, their functioning should be under the overall supervision of the WGEA. Since the jurisdiction of WGEA is large, it would be difficult for the Authority to monitor development at the micro-level. As such it is recommended that administrative units like the HLMC be set up in identified ESZs. The WGEA should include NGOs, tourism and socio-economic experts in addition to technical experts.

**Box 9: A summary of feedback from citizens in Mahabaleshwar-Panchgani ESZ**

**Prepared by Madhav Gadgil as summarized by Suresh Pingale, a local strawberry and rose cultivator**

*The ESZ programme is designed and operates in a highly centralized fashion; there has been no involvement of citizens in making any pertinent decisions, on deciding on how the ecological objectives would be best served, and in day-to-day operation of the ESZ authority*

Many so-called illegal constructions targeted were temporary sheds or cowsheds. People who had refused to give bribes were victimized. At the same time, a hotel near the ST stand which had probably undertaken construction without permission, was spared. The whole proposal for the ESZ was developed and moved by Bombay-based people; there was essentially no involvement of local people, especially farmers and adivasis. Local people, including elected members on local bodies had no idea whatsoever of the intention behind the ESZ. There were rumors of the on-going process and people, e.g. Gavlis, Kolis, and Dhavad Muslims especially from remote hamlets, were afraid they were going to be ousted, and were exploited by the officials. Forest dwellers were alienated from their access to the forest, with negative consequences. At the same time, large scale constructions continued, especially by those with black money, such as smugglers, to set up hotels. Forest Officials neglected maintenance of access to tourist view points like Bombay Point.

*Citizens have little awareness about the purpose of the ESZ, what is expected to be achieved, and how the ESZ authority is supposed to function*

Barring some political leaders and a small educated class of year-long residents, the general public has no idea about the ESZ. They have a vague idea that an office in Bhopal, and another in Mumbai, is controlling affairs. Forest officials keep particularly aloof from local people. Even political leaders have no idea of possible projects of positive interest to local people from the ESZ programme.

*Broader considerations, e.g. stream conservation or restoration, promotion of organic farming, soil carbon sequestration, reducing use of agro-chemicals, promoting bridle paths are completely ignored*

The ESZ role seems to be restricted to regulation of construction and tree felling. As a nursery owner, Suresh Pingale wished to propagate and popularize indigenous species that do well locally. There was no response from officials to such a proposal.

*Citizens are not informed about the respective roles and authority of the HLMC and of bureaucracy; consequently they are misled, creating greater opportunities for corruption*

Even political leaders are unclear on their roles. The local leadership that is positively interested in maintaining ecology is encouraged in no way. They are treated as enemies. The revenue and forest officials are aligned to commercial interests and wealthier outsiders owning property in the locality.

*Citizens are not informed of and no attempt is made to implement Acts that would involve them actively in conservation efforts,e.g. Biological Diversity Act, Protection of Plant Varieties and Farmer's Rights Act and Community Forest Resources, Forest Rights Act*

Local leadership would be quite positively inclined to implement provisions of these acts, but are completely uninformed.

*Bureaucracy and political leadership continually try to push through projects favouring the construction and commercial tourism lobby*

Even today there is on-going conversion of Agricultural to Non-agricultural land involving corrupt practices.

*Citizens are harassed and substantial bribes collected, for simple building repairs, for minor construction, for digging wells*

Suresh Pingale's own small bamboo pole shed shaded by a net to protect nursery plants was classified as an illegal construction but his shed was demolished long before a notice to this effect

was served. This is routine occurrence. People complain that they have to pay a bribe of Rs 20,000 for permission to dig a bore well; for an open well even larger amounts are demanded. Farms on hilly lands may be split on two levels; levelling of land is then permitted only on payment of bribes.A bribe of at least Rs 1000–1500 from small farmers is demanded for a small extension of verandas.

*Citizens are harassed by closure of roads to old villages in areas surrounded by forests in existence for a long time*

Previously jeepable roads, or those traversable by bullock carts are now made unusable by trenches dug by the Forest Department; these are allowed to be repaired on payment of bribes.

*Villagers without sanctioned gaothans are particularly vulnerable to harassment*

While populations have grown, gaothan areas have remained static over the last 40 years. Due to natural growth in populations, new construction are needed but are not permissible. Under the land revenue code, a farmer is allowed to construct a farm house if he holds a minimum of one acre, whereas in the ESZ no such permission will be granted for landholdings of less than two acres. An estimated 80% of farmers own less than two acres of land and are denied permission to build causing great hardships. They are forced to dwell in very small huts in gaothans.

*Rampant violations do go on, such as illegal construction, illegal tree felling, operations behind high corrugated iron sheet fences*

Allegedly 3000 trees were felled by Ramba Hotels Pvt Ltd. Currently a new extension to Brightland Hotel seems to be indulging in similar tree cutting. Allegedly there has been a clear case of illegal construction in Bhose village. As of today, at least in 4 large plots in Mahableshwar, construction along with suspected tree felling is going on behind the shelter of high corrugated iron sheets.

*Other suggestions*

It is imperative that we involve local people, promote proper public awareness. The ESZ programme should also provide positive opportunities. Strong and authoritative handling by the bureaucracy, forest and revenue officials has strangely resulted in degradation of the socio-ecological balance of the area, as this attitude discourages voluntary participation of villagers, farmers and adivasis who live here. Fortunately these people, especially the educated youth and enlightened leadership, have realized that their lot will be much better if they preserve and enhance biodiversity. Instead of taking of confrontationist postures, if government officials encourage participation of people, their creative, positive energy and participatory work will certainly play an important role in achieving sound ecological objectives.

With these aims in mind, care should be taken towards creation of employment opportunities. Agriculture would provide great scope in this direction. Organic farming, specialty fruit cultivation, such as all berries, kiwi etc should be encouraged with technical inputs, marketing facilities and related assistance. Preservation, packaging and processing of agri-products would add substantially to the incomes of farmers. In this direction agri-, eco- and health- tourism, jungle trekking etc may generate further employment opportunities.

Education, promotion of local/ adivasi arts and crafts would provide honourable livelihoods to the poor. An institute for this purpose should be established. About 200 magicians/madaris from Ghorpadi, a village near Pune visit and perform for tourists in Mahabaleshwar/Panchgani making good earnings. On similar lines local youths be trained for performing arts such as songs, music etc.

Gram Sabhas in small forest hamlets should be especially made aware of provisions like Forest Rights Act.

# 12. Buffering Protected Areas

Another stream of ESZ related activities has stemmed from a resolution of the Indian Board for Wildlife in 2002 to constitute areas up to ten kilometres from the boundaries of Protected Areas such as Wildlife Sanctuaries and National Parks as ESZs /ESAs. In pursuance of this resolution, MoEF called for proposals from State Governments, with Forest Departments expected to take the initiative. By 2002, the Pronab Sen (2000) committee report on identifying parameters for designating ecologically sensitive areas was available. This report had called for systematically mapping and recording base-line data, as also to design and operationalize a comprehensive monitoring programme and network, involving not only government agencies but also other institutions, universities, NGOs, and individuals, particularly those living in the pertinent areas. No such information base has been created. An excellent voluntary attempt along these lines was made by Ashish Kurne, an MSc student at Bharati Vidyapeeth Institute of Environmental Research and Education, Pune who visited 16 PAs of Maharashtra, including several in the Western Ghats and submitted a thesis outlining the issues that will need to be addressed in this regard. The thesis was submitted in 2004 and his guide, Dr Erach Bharucha, published a detailed paper incorporating the results. This material was presented to Maharashtra Forest Department. (Bharucha et al. 2011).

When the Forest Departments were goaded into some action after a Court judgment in 2005, the PCCF sent out letters in which he asked the various Forest Department functionaries to prepare appropriate proposals after consulting these publications. Yet only some hesitant, tardy action is being taken relating to PAs in Kolhapur Circle, namely Radhanagari WLS, Chandoli NP, and Koyna WLS, a follow up that is still incomplete six years after the wake-up call by the courts in 2005.

WGEEP made serious, concerted attempts to obtain information relating to any such follow up for all Western Ghats PAs, with some limited success only for the state of Maharashtra. Some information was obtained relating to PAs in Kolhapur Circle, and two Conservators of Forest who had been in charge, M K Rao (13 May,2011) and Sai Prakash (11 June,2011), were kind enough to explain the position in person. Both confirmed that no cognizance whatsoever was taken of the Kurne thesis, nor of the many studies undertaken by the faculty and research students of Shivaji University. They also confirmed that no systematic data has been recorded by the Maharashtra Forest Department. Minutes of the meeting note that two Forest Officials advised that the steep escarpments of the Western Ghats that fall within the 10 km zone from PAs, and also have some Reserve Forest areas should not be considered as being ecologically sensitive. This is incredible in view of the fact that these escarpments fulfil two of the primary criteria of the Pronab Sen committee including [i] Steep Slopes and [ii] Origins of Rivers, and the areas so sought to be dismissed include very steep slopes and locations of origins of some important west-flowing rivers. In any case, even as of August 2011, the Forest Department has advised WGEEP that no proper maps for proposed ESAs around these PAs have been prepared.

The Forest Department has also gone about the business of formulating the management regime around these PAs in a most unsatisfactory fashion. A notification asking the public to express their views on these issues was issued around August–September 2010. This

notification specified the management regime throughout the 10 km zone.. [5] Box 10 provides the proposed management rules for the buffer areas around PAs in Kolhapur.

**Box 10: Kolhapur Wild Life Division's proposed management rules for Ecologically Sensitive Zones around Protected Areas**

- Within the 10 km extent of ESZ an area of 1 km will be declared as a buffer zone. There will be no construction within the buffer zone. Buffer zone will be maintained free and green.
- There shall be no noise pollution in the ESZ.
- No artificial lighting will be used in ESZ.
- There shall be no industrial establishments in ESZ.
- There will be no stone quarries and mining in ESZ. No new proposal will be entertained
- No tree cutting will be permitted in private /revenue land without permission of District Collector.
- It will be essential to guard natural heritage.
- There shall be no modifications to waterfalls, caves etc.
- Special efforts will be made to save endangered plant species.
- Human heritage such as forts etc will be protected.
- Excessive use of natural water sources for industrial establishments /residential buildings will be prohibited. Similarly care will be taken to prevent water pollution.
- Use of plastic will be banned.
- Construction on hill slopes will be prohibited.
- It will be necessary to properly manage sewage.
- Pollution resulting from burning of solid wastes will be banned.
- Pollution from vehicular emissions will be controlled.

While there are many eco-friendly and positive suggestions in these management rules, there has been little or no dialogue of officials with local communities, and consequently there is much confusion as to the management regime that will be followed in these ESZ /ESAs. For instance, "No artificial lighting will be used in ESZ" can be interpreted as no electric lights, nor even kerosene lanterns or oil lanterns with wicks will be permitted even inside residences in the 10 km zone. This zone includes large numbers of villages, and many other establishments. People interpret such regulations in only one way; that these will create opportunities for officials to harass and extort bribes.

As a result, WGEEP has received many representations that the only fallout of such a programme will be for the poor to suffer harassment and extortion, and the wealthy and the powerful to successfully flout the regulations. Indeed, Kolhapur Zilla Parishad has passed a formal resolution on 6th October 2010 rejecting the ESZ /ESAs around PAs in the Kolhapur district. When WGEEP visited Kolhapur and neighbouring areas between 11–12 October, 2010, it received a large number of written and oral representations submitting that while they are very much in favour of nature conservation, the Forest Department is an agency

[5] Ref: Power point presentation made by Mr.Chavan, DFO at the meeting held on 12/10/2010 at Kolhapur Zilla Parishad Assembly Hall)

that will only harass and in no way act positively to conserve nature. Indeed, a written submission from a prominent member of Wai Taluka panchayat has gone so far as to state that the rule of the Forest Department is more tyrannical than that of the East India Company.

Several political leaders belonging to many different parties from Sindhudurg also met WGEEP between 6–10 October, 2010, and submitted memoranda to the same effect. Notably enough, in the same Sindhudurg district, some 25 village Gramsabhas have passed resolutions requesting their areas to be constituted as 'Ecologically Sensitive Areas'. WGEEP had the opportunity of visiting many of these villages on 9th October and discussing the WGEEP concept of 'Ecologically Sensitive Areas'. It was made clear to them that there need be no rigid regulations associated with ESAs in their villages; instead they should themselves suggest an environment- and people-friendly management system that they believe to be appropriate. Many of these Gramsabhas have submitted their proposals to WGEEP along these lines.

## 12.1 Bhimashankar Wild Life Sanctuary

Mahabaleshwar-Panchgani ESA, constituted prior to the IBWL resolution of 2002 calling for the 10 km ESAs around PAs, serves to protect a significant belt of evergreen forest of the Western Ghats, near the origin of Krishna river and its major tributary, Koyna. The northward extension of this evergreen forest belt constitutes the Bhimashankar Wildlife Sanctuary, an ancient, extensive Sacred Grove on the hill from which the Bhima river, another major tributary of the Krishna, originates. No action whatsoever has been taken since 2002 to establish an ESA around this PA, despite the following communication from PPCF(WL), Maharashtra dated 19/8/04 to CCF(WL), Nagpur, Nashik, Mumbai and CF(project Tiger), Amaravati: "Central Government had asked for proposals regarding the constitution of ESZs over an area of 10 km surrounding all PAs in connection with a resolution of the IBWL in 2002. The follow up should have been concluded by 2004. However, no action has been taken so far. Hence, in response to the direction of Nagpur High Court, all Wildlife Wardens in charge of Protected Areas are asked to constitute a committee involving forest officials as well as NGOs and Hon. Wildlife Wardens to decide on the necessity of declaration of ESZs around PAs. Even if it is considered unnecessary to constitute any ESZ, full rationale for why this is considered appropriate should be provided." The report was to be submitted by 30.10.04. Subsequently a Wind Mill project by the company ENERCON has come up in this area. This project has proved to be controversial, with pending Court cases. As a result WGEEP was asked to specially look into the matter by the Hon Minister for Environment and Forests at the WGEEP meeting in his chambers on 24 March 2011.

WGEEP therefore attempted to obtain information in this connection from the following officials of Maharashtra Forest Department: PCCF(General), PCCF(WL), CF(T),Pune, CF(WL), Pune. Beginning 7th April 2011, they were all requested in writing to provide all pertinent background documents and maps relating to ENERCON project, and the proposal to constitute an ESZ around Bhimashankar Wildlife Sanctuary. The Forest Department subsequently facilitated WGEEP field visits to this area by Madhav Gadgil on 14 April, 2011 and by Renee Borges on 19 May, 2011. Pertinent documents were requested during these field visits also. No documents relating to Bhimashankar Wildlife Sanctuary have been provided to Madhav Gadgil at any stage till date despite repeated reminders, and on 2nd June 2011 Shri Sinha CF(T), Pune personally told Madhav Gadgil that no papers relating to this matter are traceable in any office of the Maharashtra Forest Department. However,

Renee Borges was handed a file with correspondence that has been exchanged on the ENERCON project and also the legal proceedings vis-a-vis the case filed by Shri Kale. In addition, substantial material was accessed under RTI by an activist, Shri D K Kale, a resident of Chas village close to project area, and this was made available to WGEEP. Evidently, this project should not have been cleared at all without completing the constitution of the Ecologically Sensitive Zone, as also implementation of Forests Rights Act (FRA).

It is clear from field inspection, as well as from Google Earth images, that the hills where wind mills have come up are tracts of high rainfall and biodiversity-rich evergreen forest, contiguous with that in the Bhimashankar WLS, and home to Maharashtra's state animal, the Malabar Giant Squirrel *Ratufa indica*. In fact, RB noticed nests of the Giant Squirrel in the project area. The local Range Forest Officer had also clearly recorded these facts and recommended that the wind mill project should not be sanctioned. He was overruled by his superior officers who have cleared the project by patently misrepresenting the facts on ground.

Apart from substantial forest destruction (including Forest Department estimates of about 28,000 trees being cut) via wide roads cutting huge swathes through Reserve Forest, the wind mill project has triggered large scale erosion and landslides through poor construction of roads with steep gradients, and all this rubble is ending up on fertile farmland and in reservoirs of tributaries of the Krishna.

The Forest Department is colluding with wind mill project operators in also illegally denying citizens access to these hills. Boards and check-posts have been put up by the company, falsely claiming to be authorized by the Forest Department. There are many traditional forest dwellers on these hills. Not only are their rights under the Forest Rights Act not being recognized, they are being illegally restrained in their movements on hills they have inhabited for centuries.

## 12.2 A people-oriented process to ESZ delimitation

WGEEP therefore believes that it is inappropriate to depend exclusively on Government agencies for constitution and management of ESZs. Instead, WGEEP suggests that the final demarcation of the Zones (including those surrounding PAs, as also in context of the UNESCO Heritage Site proposal) taking micro-watersheds and village boundaries into account, and fine tuning of the regulatory as well as promotional regimes, must be based on extensive inputs from local communities and local bodies, namely, Gram Panchayats, Taluka Panchayats, Zilla Parishads, and Nagarpalikas, under the overall supervision of the Western Ghats Ecology Authority (WGEA), State level Ecology Authorities and District Ecology Committees (see details of these proposed committees later). An interesting precedent for this process has been established during the preparation of the Goa Regional Plan 2021. The first step in this GRP21 planning was a compilation of a comprehensive, spatially referenced, database on land, water and other natural resources of Goa state; however, regrettably, unlike our Western Ghats database, this has not been, as yet, made available in the public domain. Yet, this information was selectively shared with all Gram Sabhas and their suggestions as to the desired pattern of land use obtained, consolidated and used as an important basis for the preparation of the final plan. Again, regrettably, the Government of Goa has not continued with the dialogue, failing to go back to the Gram Sabhas when it felt it appropriate to diverge from the Gram Sabha suggestions. Nevertheless, this is an excellent model that should be implemented in its true spirit, and WGEEP proposes that WGEA should follow it.

Another admirable model for WGEA is the formulation of 'Conservation of biodiversity rich areas of Udumbanchola taluka' project by Kerala State Biodiversity Board (2010) The procedure followed has been grounded in the powers and functioning of Biodiversity Management Committees (BMC) in local bodies at all levels, namely Gram Panchayats, Taluka Panchayats and Zilla Panchayats, as also Nagarpalikas and Mahanagarpalikas, linked to state level Biodiversity Boards and the National Biodiversity Authority. This institutional structure of BMCs, mandated by India's Biological Diversity Act 2002 for the country as a whole, is potentially readily available throughout the Western Ghats region and provides a sound basis for designing a transparent, participatory system for arriving at final decisions regarding (1) delineation of ESZ1, ESZ2 and ESZ3, and (2) the management regime to be followed in ESZ1, ESZ2 and ESZ3, fine-tuned to local ecological and social context wherever necessary. This highly desirable participatory process will obviously take some time. Nevertheless, WGEEP strongly commends its adoption. In the meantime, the Ministry of Environment and Forests, GoI, must take immediate steps to safeguard the precious natural heritage of the Western Ghats. With this in view WGEEP strongly recommends that the Ministry of Environment and Forests immediately notifies under EPA the limits of ESZ1, ESZ2 and ESZ3 as proposed by WGEEP at taluka level, along with an appropriate regulatory regime as suggested in Table 6.

## 13. Proposed guidelines/summary recommendations for sector-wise activities

WGEEP advocates a graded or layered approach, with regulatory as well as promotional measures appropriately fine-tuned to local ecological and social contexts within the broad framework of (1) Regions of highest sensitivity or Ecologically Sensitive Zone 1 (ESZ1), (2) Regions of high sensitivity or ESZ2, and the (3) Regions of moderate sensitivity or ESZ3. While we advocate this fine-tuning through a participatory process going down to gram sabhas, it is appropriate to provide a broad set of guidelines as a starting point. WGEEP has attempted to arrive at such a set of broad guide-lines for the various sectors on the basis of extensive consultations with officials, experts, civil society groups and citizens at large. These are summarized in Table 6.

**Table 6** Proposed guidelines and summary recommendations for sector-wise activities[6]

| Sector | ESZ1 | ESZ2 | ESZ3 |
|---|---|---|---|
| Across the Western Ghats | Genetically modified crops should not be allowed<br>Phase out the use of plastic bags in shops, commercial establishments, tourist spots, on a priority basis (not more than 3 years) | | |
| Land use | For all settlements and built areas/ to be developed areas, certain types of areas would be no-go areas, including water courses, water bodies, special habitats, geological formations, biodiversity rich areas, and sacred groves<br>Special Economic Zones should not be permitted<br>New hill stations should not be allowed<br>Public lands should not be converted to private lands; | | |
| | Change in land use not permitted from forest to non-forest uses or agricultural to non-agricultural, except | Change in land use not permitted from forest to non-forest uses or agricultural | Changes from agricultural to non-agricultural land permitted, considering |

[6] Detailed sectoral recommendations are in Part II of the Report

| Sector | ESZ1 | ESZ2 | ESZ3 |
|---|---|---|---|
| | agriculture to forest (or tree crops) except when extension of existing village settlement areas to accommodate increase in population of local residents.<br><br>For existing built structures such as hotels, resorts, the tourism policy of the MOEF appropriately refined by WGEA, to be followed<br><br>Road and other infrastructural expansion plans to be submitted for EIA scrutiny by the ULB / Local Planning Authority before execution of projects, especially assessing the cost-benefits considering ecological costs and public benefits. | to non-agricultural, except agriculture to forest (or tree crops) except when extension of existing village settlement areas to accommodate increase in population of local residents.<br><br>For existing built structures such as hotels, resorts, the tourism policy of the MOEF appropriately refined by WGEA, to be followed<br><br>Road and other infrastructural expansion plans to be submitted for EIA scrutiny by the ULB / Local Planning Authority before execution of projects, especially assessing the cost-benefits considering ecological costs and public benefits. | the following (and mitigating the impacts) in addition to the other socioeconomic and environmental parameters: |
| Building codes<br><br>consisting of green technology<br><br>and green building materials | A building code should be evolved by the WGEA which include inter-alia eco-friendly building material and construction methods, minimising the use of steel, cement and sand, providing water harvesting methods, non-conventional energy and waste treatment The application or detailing of the framework would be done by local authorities to suit local conditions.. | | |
| Area treatment/ plot development/ landscaping in the open areas of plots | Certain recognized best practices of construction/development such as topsoil conservation, trees conservation etc. should be followed as per the guidelines of Green Building certifications of Eco Housing, GRIHA or any other appropriate codes to be encouraged.<br><br>Certain activities for example filling of marshes/ wetlands, introduction of alien invasive species are not permitted<br><br>The area that may be paved is to be restricted; paving of ground areas may be done in such a manner that there is no change in the run-off / permeability of the plot overall before and after paving (if some area is paved, the recharge from other areas will have to be enhanced) | | |
| Waste treatment | Local authorities should be made responsible to for developing regional systems for handling hazardous, toxic, biomedical wastes as well as recyclable materials | | |
| | No hazardous or toxic waste processing units | No hazardous or toxic waste processing units | Recycling and waste processing and units compliant with PCB regulations should be sited in ESZ3 areas (or outside the WG region) and should cater to nearby ESZ1 |

| Sector | ESZ1 | ESZ2 | ESZ3 |
|---|---|---|---|
| | | | and 2 areas |
| Wastewater management | Mandatory for all layouts/ building developments though the choice of technology would vary with size of settlement;<br>Should be such as to permit, reuse, recharge, recycling as locally appropriate and permit recovery of energy where possible | | |
| Water | Decentralized water resources management plans at Local Self Government level<br>Protect high altitude valley swamps and water bodies.<br>Catchment area treatment plans of hydroelectric and major irrigation projects should be taken up to improve their life span.<br>Improve river flows and water quality by scientific riparian management programmes involving community participation<br>Water conservation measures should be adopted through suitable technology up gradation and public awareness programmes<br>Inter-basin diversions of rivers in the Western Ghats should not be allowed | | |
| Agriculture | Promote organic agricultural practices; discourage cultivation of annual crops on slopes exceeding 30%, where perennial crops should be promoted; introduce incentive payments for sequestration of carbon in soils, introduce incentive payments for maintenance of select traditional cultivars, encourage participatory breeding programmes to improve productivity of traditional cultivars; encourage precision agricultural practices, No GMOs | | |
| | Phase out all use of chemical pesticides/ weedicides within five years<br>Phase out, through a system of positive incentives, use of chemical fertilizers within five years | Phase out all use of chemical pesticides/ weedicides within eight years<br>Phase out, through a system of positive incentives, use of chemical fertilizers within eight years | Phase out all use of chemical pesticides/ weedicides within ten years<br>Phase out, through a system of positive incentives, use of chemical fertilizers within ten years |
| Animal Husbandry | Introduce incentive payments as "conservation service charges" for maintenance of land races of livestock;<br>Redeploy subsidies for chemical fertilizers towards maintenance of livestock and production of biogas and generation of organic manure;<br>Restore community grasslands and forest grazing lands outside the Protected Areas.<br>Breeds which can withstand adverse agro climatic conditions should be encouraged<br>Application of weedicides in cash crop areas alongside the roads must be prohibited, since almost all plants coming under the weed category are rich cattle fodder.<br>The unused land in tea estates should be used for cattle rearing and the organic manure thus produced used for tea plantation. | | |
| Fishery | Strictly control use of dynamite and other explosives to kill fish; provide fish ladders at all reservoirs<br>Introduce incentive payments as "conservation service charges" for maintenance of indigenous fish species in tanks under control of Biodiversity Management Committees or Fishermen's co-operatives; monitor and control trade in aquarium fishes with the help of Biodiversity Management Committees | | |
| Forestry: Government lands | Forest Rights Act to be implemented in its true spirit by reaching out to people to facilitate their claims, Community Forest Resource provisions under FRA to replace all current Joint Forest Management programmes, | | |

| Sector | ESZ1 | ESZ2 | ESZ3 |
|---|---|---|---|
| | No monoculture plantation of exotics like eucalyptus;<br>No pesticide/ weedicide application;<br>Extraction of medicinal plants with strict regulations | No monoculture plantation of exotics like eucalyptus;<br>Encourage planting of endemic species;<br>Phase out pesticide/ weedicide application;<br>Extraction of medicinal plants with strict regulations | No monoculture plantation of exotics like eucalyptus;<br>Encourage planting of endemic species;<br>Phase out pesticide/ weedicide application;<br>Extraction of medicinal plants with strict regulations |
| Forestry: private lands | Recognize rights of all small-scale, traditional private land holders under FRA, Introduce incentive payments as "conservation service charges" for maintenance of natural vegetation for small land holders, as also for switch-over from annual crops to perennial crops on steep slopes for small landholders. Introduce incentives such as tax breaks or renewal of leases as "conservation service charges" for maintenance of natural vegetation for small land holders; | | |
| Forestry: private lands | No monoculture plantation of exotics like eucalyptus; existing plantations of such exotics should be replaced by planting endemic species or allowing area to revert to grassland where it was originally grassland.<br>No pesticide/ weedicide application;<br>Extraction of medicinal plants with strict regulations ;<br>Encourage planting of endemic species | No monoculture plantation of exotics like eucalyptus; existing plantations of such exotics should be replaced by planting endemic species or allowing area to revert to grassland where it was originally grassland<br>Encourage planting of endemic species;<br>Quarrying with strict regulations;<br>Phase out pesticide/ weedicide application | No monoculture plantation of exotics like eucalyptus; existing plantations of such exotics should be replaced by planting endemic species or allowing area to revert to grassland where it was originally grassland<br>Encourage planting of endemic species in private forests;<br>Quarrying with strict regulations;<br>Phase out pesticide/ weedicide application |
| Biodiversity | Introduce incentive payments as "conservation service charges" for maintenance of sacred groves; for maintenance of biodiversity elements on private lands, lands under control of Biodiversity Management Committees, JFM lands, and lands assigned as Community Forest Resources<br>Make special funds available to Biodiversity Management Committees for disbursal in relation to wildlife related damage | | |
| Mining | No new licenses to be given for mining<br>Where mining exists, it should be phased out in 5 years, by 2016<br>Detailed plans for environmental and social rehabilitation of mines to be closed. | No new licenses to be given for mining.<br>This moratorium can be reviewed on a case by case basis<br>Existing mining to adopt good practice mining and be under strict regulation and | New mining may be taken up only for scarce minerals not available on the plains and should be under strict regulation and social audit, subject to free prior informed consent of tribal and other communities and in recognition of tribal rights. |

| Sector | ESZ1 | ESZ2 | ESZ3 |
|---|---|---|---|
| | Illegal mining to be stopped immediately | social audit<br><br>Detailed plans for environmental and social rehabilitation of mines to be closed.<br><br>Illegal mining to be stopped immediately | Existing mining to adopt good practice mining and be under strict regulation and social audit<br><br>Illegal mining to be stopped immediately |
| Quarry and sand mining | Where exists should be controlled effectively for environmental and social impacts immediately<br>No new licenses to be given for quarry and sand mining | Upgradation possible/permitted subject to strict regulation and social audit | Existing and new quarry and sand mining should be under strict regulations and social audit and without affecting tribal rights |
| Polluting Industry (Red /Orange) | No new polluting (red and orange category) industries; for existing industries switch to zero pollution by 2016 and be subject to strict regulation and social audit | No new polluting (red and orange category) industries; for existing industries switch to zero pollution by 2016 and be subject to strict regulation and social audit | New industries may be set up under strict regulation and social audit. |
| Non polluting (Green/ Blue) Industry | With strict regulation and social audit.<br>Local bioresource based industry should be promoted. All should be strictly regulated and be subject to social audit. | Promote Green/ Blue industries. Local bioresource based industry should be promoted. All should be strictly regulated and be subject to social audit. | Promote Green/ Blue industries. Local bioresource based industry should be promoted. All should be strictly regulated and be subject to social audit. |
| Power/Energy | Educate the energy consumer about the environmental and social impacts of energy production and the need for reducing "luxury" demand<br><br>Encourage demand side management; enhanced energy efficiency across sectors<br><br>Launch "smart" campaigns as key components of demand side management, focusing on smart grids, smart buildings, smart power, smart logistics and smart motors<br><br>Promote decentralized electricity, use of solar power | | |
| | Allow run of the river schemes with maximum height of 3 m permissible which would serve local energy needs of tribal/ local communities / plantation colonies subject to consent of gram sabha and all clearances | Small *bandharas* permissible for local and tribal community use / local self government use | Large Power plants are allowed subject to strict environmental regulations including<br>1. cumulative impact assessment studies |

| Sector | ESZ1 | ESZ2 | ESZ3 |
|---|---|---|---|
| | from WGEA, SEA and DECs<br><br>No forest clearance or stream diversion for new projects<br><br>Run of the river schemes not allowed in first order or second order streams<br>Promote small scale, micro and pico hydropower systems, that are people owned & managed and are off grid<br>New small hydropower projects (10 MW and below) are permissible<br>No new thermal power plants<br>Strict environmental regulation of existing thermal power plants<br>Existing thermal plants to actively promote alternate uses of fly ash - such as in road making in addition to the existing practices of manufacture of fly ash bricks<br>No large scale wind power projects<br><br>Promote biomass based /solar sources for decentralized energy needs. | No new dams above 15 m or new thermal plants permissible<br><br>New hydro projects between 10- 25 MW (up to 10 m ht) permissible<br><br>All project categories subject to very strict clearance and compliance conditions through SEA and DECs of WGEA<br><br>Have run off the river hydropower projects but after cumulative impact study of the river basin is done<br>Regulated wind power projects but after cumulative environmental impact assessment (CEIA)<br>Zero pollution to be required of existing Thermal Power Plants | 2. carrying capacity studies<br>3. minimum forest clearance ( norms to be set by WGEA)<br>4. based on assessment of flows required for downstream needs including the ecological needs of the river<br><br>Existing Power plants subject to strict regulation and social audit.<br><br>Zero pollution to be required for new thermal power plants.<br><br>Wind projects only after CEIA<br><br>For already existing dams reservoir operations to be rescheduled for allowing more water downstream |
| | No diversion of streams/ rivers allowed for any power projects and if already existing, to be stopped immediately<br><br>Catchment area treatment in a phased manner following watershed principles;<br>continuous non-compliance of clearance conditions for three years would entail decommissioning of existing projects<br><br>Dams and thermal projects that have crossed their viable life span (for dams the threshold is 30–50 years) to be decommissioned in phased manner<br><br>All project categories to be jointly operated by LSGs and Power Boards with strict monitoring for compliance under DECs | | |
| Transport | No new railway lines and major roads, except where it is highly essential( as perhaps, in case of Goa), and subject to EIA, strict regulation and social audit.<br><br>Avoidance of new highways, expressways | No new railway lines and major roads, except when highly essential and subject to EIA, strict regulation and social audit.<br><br>Upgradation of | Essential new roads/ railways may be allowed subject to strict regulation and social audit. |

| Sector | ESZ1 | ESZ2 | ESZ3 |
|---|---|---|---|
| | | roads possible/ permitted subject to EIAs, strict regulation and social audit | |
| Tourism | Ecotourism policy of MoEF refined by the WGEA to promote minimal impact tourism in the region<br><br>Strict regulation for waste management, traffic and water use | Strict regulation on basis of a Tourism master plan and social audit. Tourism Master Plan should be based on carrying capacity of area and after taking into account social and environmental costs. | Strict regulation and social audit<br><br>Tourism Master Plan should be based on carrying capacity of area and after taking into account social and environmental costs |
| Education | Reconnect children and youth to local environment through education programmes focusing on local environmental issues, especially degradation of natural resources of land and water and air and water pollution.<br>Tailor Environmental Education projects to serve as an instrument of participatory environmental monitoring involving local community members; connect such exercises to preparation of "People's Biodiversity Registers" by the local Biodiversity Management Committees<br>Students' "River Clubs" should be encouraged in schools situated along the course of the respective river<br>Teach agriculture in schools | | |
| Science and Technology | Cumulative impact assessment for all new projects such as dams, mines, tourism, and housing, that impact upon water resources should be conducted and permission given only if they fall within the carrying capacity<br>Focus research on perfecting green technology and make it affordable for common people.<br>Environment flow assessments indicators should be worked out by Research institutions, NGOs along with local communities | | |
| Information management | Build on the Western Ghats database of WGEEP to create an open, transparent, participatory system of environmental monitoring involving all citizens, in particular the student community<br>Update and upgrade a hydrological data base of rivers and consolidate the ecological data base and information at river basin level | | |

## 13.1 Regional Plans and ESZs

The overall planning and development of the extensive Western Ghats region would have to be placed within the framework of the proposed Ecologically Sensitive Zones. Box 11 suggests an approach as developed by Professor Edgar Ribeiro, Retd Chief Town Planner, GOI, New Delhi.

**Box 11: Regional Plans and the WGEA**

Note prepared by Professor Edgar Ribeiro

**A. DPCs and MPCs under the Constitution**

1. THE 73/74th Constitutional Amendment Acts, 92, introduced the concept of District Planning Committees (DPCs) and Metropolitan Planning Committees (DPCs). Thus within the Administrative Districts of India and which with the ushering in of 5 year plans in 1950 saw the emergence of Development Blocks in empathy with the administrative sub-districts of Talukas / Tehsils, a new dimension to districts has constitutionally been introduced. Uniquely DPC's /MPC's focus on down-top participatory growth based on electoral wards that define the Municipalities and Village Panchayats within Development Blocks /Tehsils that constitute the Districts of the State /UT's of India. There are no governance overlaps in this three-tier hierarchy of Municipalities (Corporations, Councils, Nagar Panchayats) and of Village Panchayats and which settlements in turn constitute the regions of Districts with DPCs or MPCs.
2. The constitutional amendments have ensured that at least 2/3rds of MPC and 3/4th of DPC members would be from the electoral Constituencies with a minimum of one-third elected representatives being women apart from catering to other statutory reservations. The Constitution has also attempted to address the vexing question of inter-se sectoral development conflicts on the use of scarce land by mandating that DPCs /MPCs would prepare draft development plans for their jurisdiction by amalgamating sectoral projects in a programmed development format for the consideration of the State Government. However confusion persists on the sanctity of a draft plan.
3. Currently most states have DPCs in place but with limited functions. This is through 3-tier Panchayat Raj Institution (PRIs ) of village Panchayats (VPs) Development Blocks and Districts (Kerala, Karnataka, Maharashtra, Gujarat) or 2-item PRIs of VPs and Districts as in Goa.
4. However only Kolkata Urban .Area has a working MPC in place with the KMDA doubling up as its technical secretariat. The Constitution requires that these MPCs be established for all Metropolitan Areas (population exceeding one million) i.e., 35 in number in 2001. In fact in the 12th 5 year plan, promotional funds through JNNURM is likely to be withheld to states that do not constitute MPCs. A bottleneck in this regard is stated to be the jurisdictional overlaps in peri-metropolitan areas between DPCs with their Zilla Parishads (ZP) or equivalent institutions and MPCs outside full Municipal Corporation Districts.
5. An option that is under debate is, if all continuous districts with peri-metropolitan areas, could be placed in their entirety under the MPC. Thereby each state would have distinct Districts with DPCs serviced by ZPs and distinct MPCs serviced by Metropolitan Development Authorities with ZPs of such districts reporting to MPCs for draft development plan purposes apart from their other statutory functions.

**B. The emerging role of spatial plans (regional and urban plans).**

1. The Constitutional amendments that have established MPCs and DPCs attempt to address the issues of sectoral investment development planning but not necessarily the implications of such sectoral investment planning on the use of land and which increasingly are inter-se in conflict due to escalating land shortages and the need to cater to spatial development (the use of land and the emerging built environment) after ensuring the conservation of environmentally eco-sensitive land and areas /plots of identified heritage value.
2. This issue is currently being addressed by the Ministry of Urban Development through a model "spatial" Development Planning Law for the States of the Union to adopt. This draft law aims to ensure an integrative spatial canvas covering the entire state with Regional level broad brush plans for Districts, for settlement level plans for Municipalities /Panchayats, and for local area level electoral ward plans, each with 20-year perspectives and 5-yearly development programmes, complete with distinct land use zones, a chart of uses allowed in each land use zone and Development Control Regulations (DCRs) for each land use zone. More importantly, the draft law aims to ensure that this instrument is to be the only law in the state that determines the use of land. Thereby, under this law no project or scheme would be prepared and processed as such projects/schemes are prepared under several Acts, notably Municipality/PRI Acts, Development Authority Acts, Industrial Development Acts, Infrastructure Development Authority Acts, etc. The definition of project or scheme in the draft Regional and Urban Planning Law is as below.

3. "A project or scheme" is a plan to scale for a plot of an area for implementation under local Authorities Acts or any other Act – Central or State. These are to follow the stipulations of this Act and inter alia comprise of plans for transport and other infrastructure, layouts with or without designs for the development of townships or areas for housing, industries, commerce, institutions, recreation, conservation and for redevelopment including those of obsolete or bad layouts.
4. Thus a distinction is made between a Spatial Planning Frame work" (regional/settlement /Local area ) and a "Project/Scheme" (regional /settlement /local Area.)

**C. The Western Ghats Ecology Authority (WGEA)**

1. The moment is opportune for the WGEA to be set up along with other such Authorities for India's eco-sensitive areas. In fact over one third of India's 650 or so districts are largely eco –sensitive and where development has to play a supporting role. On the other hand around a third of India's Districts are development friendly and where eco-sensitivity has to be judiciously introduced. The remaining districts need a balance between development and eco-sensitivity.
2. The epoch-making (and overdue) WGEA is for an Authority for a spine covering (in full or part) several districts in six states (Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu). All these districts need spatial regional plans (as in Kerala and Goa). These district level statutory surface utilization plans if prepared and processed would earmark eco-sensitive land use zones along with other use zones. The boundaries of the WGEA area would accordingly have to be shown on each spatial regional plan of the relevant district of all the participating states. Thereby clearance would be required from the WGEA before any development is to take place (regional /settlement /local area level) within the identified boundaries.
3. The fact has to be underlined that the WGEA is a "Project body" and not a land use framework body as the framework is provided under the Regional Urban Development Planning Act of the State. As the WGEA project matures, any land use they consider fragile (for conservation) has mandatorily to be shown on the Regional Development plan. Over a period of time the WGEA would determine areas to be conserved, those to be preserved and those that can be developed with special DCRs. These would have to be incorporated in each the District Regional Plans. It would therefore help if "Project" terminologies are distinct from framework terminologies. Typically, a 'Zone' is a land use zone as a crucial component of spatial development plans.
4. In retrospect, if the WGEA had been set up a decade ago Lavasa/Amby Valley as regional projects would have taken another shape in empathy with the WGEA ecological mandate and not as globally advertised real estate entities. Therefore, for the WGEA project to succeed it should be developed within the context of State Regional and Urban Development Planning Acts and with the term 'development' being redefined to incorporate conservation and preservation.
5. In fact, the WGEA project could pioneer the new paradigm of spatial development planning of "development in the context of conservation" through a subtle exercise of "Constraints and Opportunities" where the positive constraints of forest covers, multi-cropped agriculture lands wetlands / water bodies, natural / man-made environments and the like are mapped with zero or subdued DCRs, round which the development opportunities of transport, basic infrastructure are super imposed for built form land uses with appropriate and even promotional DCRs.

# 14. Western Ghats Ecology Authority

The Western Ghats Ecology Authority (WGEA) should be a statutory authority appointed by the Ministry of Environment and Forests, Government of India, enjoying powers under Section 3 of the Environment (Protection) Act 1986. Of course, the Western Ghats is an extensive region spanning over six states, 44 districts, and 142 talukas, so the WGEA would need to function in a networked fashion with six constituent State Western Ghats Ecology Authorities, appointed jointly by the State Governments and the Central Ministry of Environment and Forests. The State Western Ghats Ecology Authorities should interact closely with the State Biodiversity Boards and Pollution Control Boards, as well as State Planning Departments administering the Western Ghats Development Programmes funded through Five Year Plans by the Planning Commission. It would be appropriate that all the Western Ghats Development Plan schemes are worked out by the State Governments with

the help of the State Western Ghats Ecology Authorities and used to support sustainable development oriented schemes developed under the guidance of the Western Ghats Ecology Authority.

Currently, the Ecologically Sensitive Areas are administered with the help of High Level Monitoring Committees appointed by the Central Ministry of Environment and Forests. These are hampered by lack of regulatory powers, except in the case of the Dahanu Taluka Ecology Authority established through a judgment of the Supreme Court. They are also hampered by lack of financial and human resources. In some cases, no HLMC has been in place for several years at a stretch. WGEEP proposes that they should be replaced by District Ecology Committees in all Western Ghats districts. These District Ecology Committees should work in collaboration with the district level Zilla Parishad/ Zilla Panchayat Biodiversity Management Committees, as well as District Planning Committees. Indeed, it may be appropriate that the district level Biodiversity Management Committees, which are statutory bodies established under the Biological Diversity Act and not ad-hoc committees which may cease to function for years at a stretch as has happened with HLMCs, may be asked to discharge the functions of WGEA District Ecology Committees by augmenting their membership by some experts appointed by the Central Ministry of Environment and Forests and State Western Ghats Ecology Authorities.

WGEA should focus on promoting transparency, openness and participation in every way. An excellent tool for this could be the revival of the scheme of Paryavaran Vahinis, or committees of concerned citizens to serve as environmental watchdogs and undertake first hand monitoring of the environmental situation in the district as required. These Paryavaran Vahini volunteers could play a significant role in building capacity of people at the grass-root level for conservation, sustainable development and ecorestoration. WGEA could also undertake to appoint Environmental Ombudsmen in all districts. It should vigorously promote the institution of a social audit process for all environmental issues on the model of that for the Mahatma Gandhi National Rural Employment Guarantee Act in Andhra Pradesh.

WGEEP has made excellent progress in the development of a spatial database, for over 2200 grids of 5'x5' or roughly 9 km x 9 km through compilation of all readily available information on topography, land cover and occurrence of biodiversity elements for the Western Ghats. WGEA should vigorously pursue further development of this database by bringing on board many available databases such as that prepared in connection with Zonal Atlases for Siting of Industries (ZASI), by sponsoring further scientific inputs, as also by linking Environmental Education activities at school and college levels and the People's Biodiversity Register exercises to augment the database. WGEA should encourage citizen involvement in continual development of the Western Ghats database on the pattern of the Australian River Watch schemes. In this context, WGEA should help overcome the entirely unjustifiable difficulties that researchers encounter today in working in forest areas. WGEA should pursue concerned Government agencies to make available all pertinent information pro-actively as provided in the Right to Information Act, and not wait for applications by citizens. For example, the Ministry of Environment and Forests should immediately make public all district level Zonal Atlases for Siting of Industries in a searchable form on the Ministry's website, which may then be linked to the Western Ghats database.

WGEA should lead a radical reform of the Environmental Impact Analysis and Clearance process. It should revisit the list of projects that require Environmental Impact Analysis and Clearance and include certain items such as Wind Mills and small scale hydroelectric projects that are excluded today, and seek ways to carry out the EIAs in a transparent

fashion. Furthermore, it should link Environmental Education activities at school and college levels and the People's Biodiversity Register exercises to the EIA process. Equally urgent is the need to promote a more holistic perspective and organize a process of Cumulative Impact Analysis in place of the current project-by-project clearances.

WGEA should strive to promote a participatory, bottom-up approach to conservation, sustainable development and ecorestoration of the Western Ghats. With this in view, it should encourage devolution of democratic processes as visualized in the 73rd and 74th Amendments to the Indian Constitution. Kerala, one of the Western Ghats states has made substantial progress in this direction, and WGEA should promote the emulation of Kerala example in all the Western Ghats districts. Kerala has also taken the lead in meaningful implementation of the Biological Diversity Act through Biodiversity Management Committees, and WGEA should take immediate steps to ensure establishment of Biodiversity Management Committees at all levels, namely, Gram Panchayats, Taluka Panchayats, Zilla Panchayats, as also Nagarpalikas and Mahanagarpalikas in all the Western Ghats districts. Furthermore, WGEA should ensure that BMCs are motivated through empowerment to levy 'collection charges' as provided in the Biological Diversity Act. These institutions may be involved in developing programmes on the model of 'Conservation of biodiversity rich areas of Udumbanchola taluka' in Kerala. These Biodiversity Management Committees are expected to take care of agro-biodiversity as well, and in this context the provisions of the Protection of Plant Varieties and Farmers' Rights Act 2001 are highly relevant. A National Gene Fund has been established under PPVFRA and has substantial amounts available. These funds can be utilized to build capacity at the Panchayat level for *in situ* conservation of genetic diversity of indigenous crop varieties.

The Mahatma Gandhi National Rural Employment Guarantee Act has much potential for the task of ecorestoration. It also has the advantage that Gram Sabhas are expected to be involved in planning of the works to be undertaken. Other opportunities exist for capacity building and empowerment of Gram Sabhas through Extension of Panchayat Raj to the Scheduled Areas Act (PESA) and the Forest Rights Act, and WGEA should promote pro-active and sympathetic implementation of PESA and of the provision of Community Forest Resources under the Forest Rights Act.

Finally, WGEA should strive to make a transition from regulations and negative incentives to promote nature conservation-oriented activities to a system of use of positive incentives to encourage continued conservation-oriented action in the context of traditional practices such as sacred groves and to initiate other action in modern contexts. An example of the latter is the payment of conservation service charges by the Kerala Biodiversity Board to a farmer who has maintained mangrove growth on his private land. WGEA should undertake a critical assessment of the efficacy of funds being deployed towards conservation efforts today in the form of salaries and perks of bureaucrats and technocrats, including their jeeps and buildings to house them. It would undoubtedly be found to be exceedingly low. These funds should then be redeployed over a period of time to provide positive incentives to local communities to maintain biodiversity elements of high value to conservation.

Technical inputs would be required to decide on a common system of assigning conservation value to specific elements of biodiversity and to organize a reliable, transparent system of monitoring biodiversity levels within the territories assigned to various local communities, in the form of either Community Forest Resources assigned under FRA, or Panchayat areas assigned to Biodiversity Management Committees. Educational institutions at all levels, from village primary schools to universities, could play an important role in this

effort. Indeed, these exercises could become very valuable components of environmental education curricula. In the long run, only a very lean bureaucratic apparatus should be retained to play a coordinating, facilitative role and to ensure that local communities can effectively enforce a desired system of protection and management of the natural resource base. Such a system would create a very efficient market for conservation performance so that funds earmarked to promote biodiversity would flow to localities and local communities endowed with capabilities of conserving high levels of biodiversity. This system would also channel rewards for conservation action to relatively poorer communities living close to the earth, thereby serving the ends of social justice, and creating in the long range a situation far more favourable to the maintenance of biodiversity on the earth.

## 14.1 The Legal Framework

### Mandate of the WGEA

1. In order to address the myriad environmental implications in the Western Ghats, which is proposed as an Ecologically Sensitive Area along with varying degree of ecological sensitivity as ESZ1, 2 and 3, it is proposed that an apex authority for the entire Western Ghats along with state Western Ghats authorities for each state and within them District Ecology Committees (DEC) be created to address the various environmental challenges of the Western Ghats. The Western Ghats Ecological Authority (WGEA) (hereinafter the Authority) shall be the Apex multi-statal authority for regulation, management and planning of all activities impacting all categories of ecologically sensitive zones within the states of the Western Ghats namely Gujarat, Goa, Maharashtra, Karnataka, Tamil Nadu and Kerala, and shall be constituted under the relevant provisions of the Environment Protection Act, 1986.

### Constitution

1. The Authority shall be constituted by the Central Government through the Ministry of Environment and Forests in consultation with the state governments of the Western Ghats.

### Role of the Authority: Conformity with other Environmental Laws

1. The Authority shall function in conformity with all other environmental laws such as Wildlife Protection Act, 1972, Forest Conservation Act, 1980, Rules, Orders and Notifications issued under the Environment Protection Act, 1986, the Biodiversity Act, 2002, the Air Act, 1981, Water Act, 1974, and the Rules made thereunder and also the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, and Rules and the Provisions of Panchayats (Extension to Scheduled Areas) Act, 1996, and its state adaptations as the case may be. In other words this notification under the EPA will not be in derogation of but in addition to other environmental laws to deal with offenders in the Ecologically Sensitive Area of the Western Ghats.

### Constitution of the Western Ghat Ecology Authority

1. The WGEA shall comprise discipline or domain experts, resource experts and include representation from the nodal ministries. Discipline or domain experts include experts from the discipline of science, economics, law, sociology and the like. Resource experts include experts in forestry, hydrology, soil science, agriculture, land use, ecology and the like.

The **Western Ghats Ecology Authority** shall comprise 24 members as given hereunder

**Non-Official Members**

1. **Chairman** – A retired judge of the Supreme Court, preferably from the Western Ghats region, with proven integrity and sympathetic to the cause of conservation and pro-poor sustainable development

Or

An eminent ecologist/conservation biologist of the Western Ghats region who has made substantial contribution to the Conservation of the region in the last 25 years (preferably from one of the Western Ghats States).

2. An eminent conservation biologist of Western Ghats region who had contributed to the cause of conservation of Western Ghats (preferably from the Western Ghats States).
3. An eminent environmental lawyer or environmental law academician/Professor familiar with the laws of the Western Ghats States (preferably from the Western Ghats States).
4. An eminent social Scientist/economist/sociologist (preferably from the Western Ghats States).
5. An eminent agricultural scientist/Professor (preferably from the Western Ghats States).
6. An eminent landscape ecologist
7. A representative of a prominent tribal group ( on rotation from each State)

8–13. Civil Society Representatives- one from each State of the Western Ghats who had contributed to the conservation of the Ghats in the respective State.

**Official Members**

8. One Representative of MoEF – An Additional Secretary, MoEF- GOI-Ex-Officio
9. Chairman Pollution Control Board – Central –Ex Officio
10. One Member of Central Planning Commission who is dealing with Western Ghats/Environment –Ex Officio.
11. Chairman National Biodiversity Authority –Ex-Officio
12. Member Secretary (Full time) – any officer in the cadre of Joint Secretary/Scientist-G to be deputed by MoEF-GOI with the consent of the Chairman of the WGEA.

19 – 24. Member Secretary of each of the State Western Ghats Ecology Board

## Powers and Authority of WGEA

1. The Authority shall be a statutory authority whose recommendations are ordinarily binding. (This could be patterned on the National Board of Wildlife where their decisions are rarely tampered with and by and large have been approved even by the Supreme Court of India.)
2. The Authority shall have jurisdiction over location of industry or other facilities or processes, land use planning and any other activity having adverse impact on the ESZ from environmental, social and ecological aspects.
3. The Authority shall also be the final authority for approving the Ecologically Sensitive Zones in a prescribed period as recommended by the WGEEP in consultation with the

states in various categories such as ESZ 1, 2 and 3. However, an inclusive and participatory consultation process shall precede such finalization of the various categories of ESZs in a prescribed time period (say six months).

4. The Authority shall also establish a transparent decision-making process where decisions shall be speaking orders for every approval or rejection and also the method of arriving at any adjudication process. It shall also publish its decision in the public domain as soon as the final decision is taken.
5. The Authority shall also be the appellate authority for any decision taken by the state authorities provided if there are disputes between two states within the Western Ghats, then such disputes may directly be brought before the Authority which shall be the final authority for adjudication of such disputes.
6. The Authority may also revalidate accredited EIA Consultants for working in the Western Ghats if they deem fit and shall also have the power to blacklist such consultants if proved guilty of any malafide action, provided that such accredited EIA consultants shall have the opportunity of being heard.
7. The WGEA shall have the power to issue directions to the state government or agencies or authorities to prohibit, regulate or allow any activity that may have adverse impact on the Western Ghats and to comply with its orders.
8. The WGEA shall also have the power to issue clarifications on any provisions in the notification.
9. The Authority shall have the power to levy fines and other punitive measures as laid down in the Environment Protection Act and other environmental laws.
10. The WGEA shall have the power to call for any records, documents, or notes by any authority, agency within concerned state government as well as the central government in order to arrive at any decision. It shall be empowered under the relevant provision of the Civil Procedure Code.

## Functions of WGEA

1. The WGA shall function in accordance with the mandate of the Environment Protection Act, 1986 and other environmental laws such as Wildlife Protection Act, 1972, Forest Conservation Act,1980 and Rules and Guidelines issued thereunder, the various Rules and notifications issued under the EPA, the Biodiversity Act, 2002, the Air Act,1981 Water Act, 1974 and also the Forest Rights Act, 2006 and the Provisions of Panchayats Extension to Scheduled Areas Act.
2. The WGEA shall also approve the master land use plan of the ESZ which shall be prepared by the state governments in consultation with the DEC.
3. The WGEA shall develop a Western Ghats-specific master plan for the conservation of biological diversity/ecosystem and promotion of sustainable development. Such a master plan shall be developed with a bottom up approach through specific village, taluka and district (by whatever name called) plans, schemes and programmes.
4. The WGEA shall lay down normative standards for regulating, managing and controlling activities that have adverse impact on the ecology and social fabric of the communities with respect to environmental decisions in the Western Ghats.

5. The WGEA shall promote, coordinate research and monitoring of activities that have impacts on the ecology of the Western Ghats.
6. The WGEA shall be vested with delegated powers under Section 3(2) and other relevant provisions of the EPA in order to discharge its functions effectively for the conservation and development of the Western Ghats.
7. The Authority shall be guided by the conditions and restrictions enumerated in the Schedule where different guidelines have been enumerated and sectors have been listed along with the permissivity or prohibitions as the case may be. Such conditions may be adhered to in the strictest sense unless a project is of strategic defence requirement in such ESZs.
8. The Authority shall follow a cumulative impact approach to projects that are permissible and shall ensure that the regional planning process sets an upper limit for number, size and nature of projects or activities in the given region.
9. The WGEA shall perform such other functions as may be necessary to carry out the purposes of this Notification with regard to conservation and sustainable management and regulation of the Western Ghats Ecological Sensitive Area.

## Constitution of State Western Ghat Ecology Authorities

1. There shall be State authorities created by the Central Government in consultation with the respective state governments (patterned on the State Environment Impact Assessment Authority) and in consultation with the apex Western Ghats Ecology Authority.

2. The State Ecology Authorities shall comprise of discipline or domain experts, resource experts and representation from nodal departments. Discipline or domain experts include experts from the discipline of science, economics, law, sociology and the like. Resource experts include experts in forestry, hydrology, soil science, agriculture, land use, ecology and the like.

**Composition of State Western Ghats Authority (SWGA): It shall comprise 11 members**

**Non-Official Members**

1. Chairman – retired High Court Judge

   or

   eminent ecologist of the area preferably from the Western Ghats region
2. Eminent enviro-legal expert of the area preferably from the Western Ghats region
3. An eminent ecologist of the region

4–6 Eminent Civil Society representatives of the concerned State

**Official Members:**

7. Chairman, State Pollution Control Board- -Ex-Officio
8. Principal Secretary, Dept of Environment and Forest of the concerned State- Ex-Officio
9. One representative of the State Planning Board of the State.
10. Chairman- State Biodiversity Board-Ex-Officio

11. Member Secretary (Full time) – One officer of the rank of Joint Secretary/Advisor-G (of the State Government) to be deputed by the concerned State.

Special Invitee: Chairman may invite subject experts or Government Officials as and when the services of such invitees are required.

## Power of State Authority

1. The State Authorities shall be the deciding authority for every dispute on the Western Ghats relating to environment within its jurisdiction and that is brought before it through a prescribed process.
2. The State Authority may also appoint an Environmental Ombudsman, on the pattern of Ombudsmen for MGNREGA, in each district who may be the focal point between the Authority and the District and who shall head the District Ecology Committee.
3. The State WGEA shall have the power to issue directions to any agency at the state level or authorities to prohibit, regulate or allow any activity that may have adverse impact on the Western Ghats within the state jurisdiction and ensure compliance with its orders.
4. The State WGEA shall be vested with delegated powers under Section 3(2) and other relevant provisions of the EPA in order to discharge its functions effectively for the conservation and development of the Western Ghats in their specific jurisdiction.
5. The State WGEA shall have the power to levy fines and other punitive measures as laid down in the Environment Protection Act and other environmental laws.
6. The State WGEA shall have the power to call for any records, documents, or notes by any authority, agency within concerned state government as well as the central government in order to arrive at any decision. It shall be empowered under relevant provision of the Civil Procedure Code.

## Constitution of the District Ecology Committee

1. The State Authorities shall also constitute a District Ecology Committee (DEC) at every Western Ghats District in consultation with the state Government and the WGEA which will be the scrutinizing and verifying body for any dispute regarding ecologically sensitive zones within its jurisdiction.
2. The District Ecology Committees shall comprise of discipline or domain experts, resource experts and representation from nodal departments. Discipline or domain experts include experts from the discipline of science, economics, law, sociology and the like. Resource experts include experts in forestry, hydrology, soil science, agriculture, land use, ecology and the like.
3. The DEC may also appoint Environment Awareness Volunteers ( patterned on Paryavaran Vahinis or Hony Wildlife Wardens) whose primary task would be to raise awareness about the ecological importance of the Western Ghats and carry out participatory monitoring among other things.

## Function of the District Ecology Committee

1. The DEC shall be the initiating planning agency at the district level for the Western Ghats Master Plan through a bottom up process and also be the scrutiny agency to assess the integration of other plans by other departments into the master plan at the district level.

2. The DEC shall also be the first statutory body for scrutinizing and verifying any dispute, before it is brought to the state authority. However, if a dispute involves more than one district, such disputes may directly be brought before the state authority.

### Term of Authority

1. The term of the members of all Authorities and Committees shall be 5 years.

### Cognisance of Offence including Citizens Suit Provision

1. No court will take cognizance of any offence unless a complaint is filed in a prescribed manner and through an authorized officer of the authority at the district, state or Authority level.
2. There shall also be a citizen suit provision wherein any citizen shall have the power to send a notice in a prescribed form to any district ecology committee, state authority or the apex WGEA to take action on any violation of the said notification or against any act having adverse impact on the environment and ecology of the Western Ghats.

### Financial Autonomy of the Western Ghats Ecology Authority and other State Authorities and District Ecology Committee

1. The Central Government shall ensure that there is a complete financial autonomy of the Authority, the State WGEA and DEC wherein the central government along with the concerned state governments shall pool in resources for the functioning of such authorities and Committees. Further, a portion of any pecuniary fine may be utilized for the functioning of the authority itself.

### Dispute Resolution

1. When any person is aggrieved by any activity or act of any other person(s) , or agency or authority in contravention of the provisions of the notification or which has an adverse impact on the ecology, environmental or social consequences on the ESZs of the Western Ghats as prescribed in the Sectoral guidelines as enumerated in the Schedule, then s/he may approach the concerned authority through the District Ecology Committee, State Authority or the apex WGEA as the case may be in a prescribed form.
2. The concerned Authority or Committee shall respond within a period of thirty days and adjudicate the dispute within a prescribed period which may ordinarily be six months or earlier and in exceptional circumstances may be extended by giving reasons thereof. The concerned Authority or Committee shall give a reasonable opportunity to all parties for being heard either in person or through representative(s).

### Establishment of Western Ghats Conservation and Management Foundation

1. The Central Government through the WGEA shall establish a Western Ghats Conservation and Management Foundation which shall be financially independent to support the various extension activities of the WGEA.
2. Such funds may be used to carry out further research on specific issues, field visits and assessments, obtaining experts' views and other materials necessary for arriving at sound environmental decisions.

### Proposed Framework of the Western Ghat Ecology Authority

1. Statement of Object and Rationale of the Authority
2. Preamble
3. Definitions
4. Constitution of WGE Authority
5. Term of office and conditions of service of members
6. Officers and employees of WGE Authority
7. Powers
8. Functions
9. Procedure to be regulated by the Authority
10. Grants and loans to the Authority and Constitution of Fund
11. Accounts and audit of the Authority
12. Annual report of the Authority
13. Annual report and audit report to be laid before parliament
14. Constitution of State Authority
15. Constitution of District Ecology Committee
16. Western Ghats Master Conservation and Management Plan
17. Alteration and modification of the ESZ categories
18. Establishment of Western Ghats Conservation and Management Foundation
19. Offences by Company
20. Immunity to Officers discharging duties in official capacity

# 15. Athirappilly and Gundia Hydel projects

WGEEP proposes that Environmental Clearance should not be given to any large scale storage dams in ESZ1 and ESZ2. Reportedly, Karnataka Power Corporation now proposes to reduce the submergence area for Gundia project by 80% from original proposal by dropping of Hongadahalla dam. Nevertheless, the other proposed Bettad kumari dam also comes under ESZ1. Likewise, the location of Athirappilly dam falls in ESZ1. Hence we recommend that the Ministry of Environment and Forests refuse Environmental Clearance to these two projects. WGEEP further notes that the process of proper assignment of rights under the Scheduled Tribes and other Traditional Forest Dwellers (Rights over the Forest) Act has not been completed in either of these areas, it is therefore quite improper to accord Environmental or Forest Clearances to these two projects.

## 15.1 The Athirappilly Project

1. The KSEB (Kerala State Electricity Board) proposes a hydro-electric dam across the Chalakudy River in Trichur district, Kerala, to generate 163 MW of power (233 Mu firm energy) to meet the deficit during the peak hours from 6 pm to 10 pm.

2. The concrete gravity dam is envisaged to be 23 m in height and 311 m in length. The water spread area would be 104 ha, whereas the total forest area required would be 138 ha. Water from the dam will be brought through a 4.69 km tunnel of 6.4 m diameter to the main power house situated north-west of the dam site and above Kannankuzhithodu into which the tail race water will be emptied. These discharges through the Kannankuzhithodu will join the Chalakudy River at a distance of 1.5 km. Two penstocks each of 3.4 diameter and 50 m length will be provided to the power house with an installed capacity of 2 x 80 MW. Apart from these, two dam-toe generators with 1.5 MW capacity each are planned 50 m down the dam, thus making the total installed capacity to163 MW.

## Background

1. The Ministry of Environment and Forests, Government of India, gave environmental clearance on 20.1.1998 and forest clearances on 22.12.1997 (Stage I - Forest Clearance) and on 16.12.1999 (Stage II Forest Clearance).
2. The honourable High Court of Kerala suspended the above sanction on three Public Interest Litigations, based on the irregularities in the procedure followed for tendering and against the clearance of the MoEF which was in violation of the Environmental Protection Act. The High Court further asked the KSEB to re-examine the procedure and, directed the Central Government to withdraw the sanction given earlier and conduct a public hearing in accordance with the EIA notification of the MoEF (1994) and the amendment to it dated 10.4.1997 (Kerala High Court judgment dated 17.10.2001) and then reconsider the grant of Environmental Clearance
3. Accordingly, a public hearing was conducted by the Kerala State Pollution Control Board on 6.2.2002 at Trichur. The arguments against the reliability of the EIA conducted by the TBGRI (Tropical Botanical Gardens and Research Institute) in 1996, the impact on environment and biodiversity and, the technical feasibility of the project based on the actual availability of water were raised by the gathering. Considering all these, the Public Hearing Panel asked for a second EIA which should be comprehensive and should include *inter alia* consultations with local bodies, various departments of the government and the local communities of the river basin.
4. The KSEB engaged WAPCOS (Water and Power Consultancy Services, India Ltd) in January 2002 to conduct a Comprehensive Environment Impact Assessment (CEIA). Their report was questioned by the Chalakudy Puzha Samrakhna Samithi (Chalakudy River Protection Council) on various grounds: its period of study, consultations with various agencies (local bodies, various departments of the government and the local communities) suggested by the High Court, methodology, and scientific reliability.
5. The KSBB (Kerala State Biodiversity Board) in an affidavit filed in the High Court of Kerala categorically stated that the EIA report of WAPCOS was not comprehensive, and that the methods followed for the biodiversity studies were wrong and unacceptable. There was no indication that WAPCOS had any consultation with the agencies suggested by the Public Hearing Panel.
6. However, the KSEB went ahead and obtained the clearance from the MoEF on 10.2.2005. Another PIL was filed by the Athirappilly Gram Panchayat and the Kadar tribals, the actual potential sufferers of the proposed dam, challenging the sanction accorded by the

MoEF, mainly on the ground that the report of the second EIA was not circulated and kept away from the public and that there was no public hearing on the second EIA.

7. The honourable Division Bench of the High Court of Kerala by its order dated 23 March 2006 quashed the Environmental Clearance given by the MoEF on 10.2.2005 and asked the Kerala State Pollution Control Board to conduct a Public Hearing after "publishing the environmental assessment report stated to have been prepared by the KSEB".

8. Thus, the second Public Hearing on the proposed Athirapilly hydro-electric dam was conducted on 15 June 2006 at Chalakudy, Trichur. According to the written submission made by CPSS (Chalakudy Puzha Samrakshana Samithi) to the WGEEP, more than 1200 people attended the Public Hearing where none spoke in favour of the project and, in the 252 written representations submitted to the Public Hearing Panel, the ratio for and against the project was 1:9 respectively. CPSS further states that the minutes of the Public Hearing Panel was not unanimous; of the five members, three were against the project and among them two happened to be the Presidents of the Athirapilly Gram Panchayat and the Chalakudy Block Panchayat; representatives of the people of the two Panchayats who would be affected directly by the construction of dam.

9. Pressure from civil society mounted up again, against the project. A five member EAC (Environment Appraisal Committee) of the MoEF visited the dam site and related areas, and had discussions with those opposing the project as well as officers of the KSEB at Athirappilly on April 2007. It also conducted a "public hearing" at the Town Hall, Trichur, the following day. The then Chairman of the KSBB was also present at the meeting. The members of the Committee did not seek any clarification on the points raised by those objecting to the project. Instead it was just another "Public hearing"

10. Based on the report of this Committee, the Expert Committee for River Valley projects of the MoEF gave clearance for the project on 18 July 2007.

11. PILs were filed again by Ms. Geetha, representative of the Primitive Kadar Tribe, and Mr. C. G. Madhusoodhanan, a hydrology engineer, the former challenging the project on the ground of ecology and biodiversity and the impact on their life-support system, while the latter challenged the WAPCOS EIA *per se* and the hydrological data base used in the WAPCOS study.

12. The Kerala State Biodiversity Board discussed the issue in detail and took a decision against the project considering the rich biodiversity of the area and filed an affidavit at the Kerala High Court as KSBB has been made a Respondent.

13. The Kerala High Court heard the case twice, in 2008 and in 2009, by two Division Benches. The judgment is awaited.

14. On mounting pressure from the Government of Kerala for the clearance from the MOEF, it has asked the WGEEP to examine the issue, along with a few other projects proposed in the Western Ghats, and give recommendations.

## Visits and consultations

1. The WGEEP visited the proposed dam site, the reservoir area, the primitive tribal settlements at Pokalappara and Vazhzchal, its surroundings and, the downstream Thumburmuzhi Major Irrigation project (Chalakudy River Diversion Scheme) on 29 January 2011. It had consultations at various levels; with the representatives of the primitive Kadar tribe at the site, the local Panchayat (Athirappilly Panchayat), and the

general public who responded to the WGEEP's press note inviting those interested to come and give their views.

2. In addition to these, the WGEEP organized a technical consultation which was attended by experts from the KSEB, Chalakudy Puzha Samrakshana Samithi, River Research Centre, KSSP (Kerala Sastra Sahithya Parishath), KFRI (Kerala Forest Research institute), KSBB (Kerala State Biodiversity Board), TBGRI (Tropical botanical Garden and Research Institute), NCF (Nature Conservation Foundation). Officers from Kerala State's departments of Irrigation, Tribal Department, and Forest & Wildlife, Tourism section, retired forest officers, Vana Samrakhana Samithi, and KSEB's Officers' Association were also present. It goes to the credit of the WGEEP that this was the first time that such a discussion was held between the proponents and opponents of the project.
3. The WGEEP heard the views of all sections and individuals and, the Chairman, WGEEP requested the KSEB and all other participants that if they had any additional information or more detailed answers to questions raised by both the parties, they may send them to the Chairman by e-mail/post.
4. Considering the views expressed by and the written representations received from the local primitive tribal community, Athirappilly Panchayat, the general public, technical experts including the officers of the Kerala State Electricity Board, the detailed minutes of the 14th meeting of the Kerala State Biodiversity Board held on 26 September 2007, the EIAs conducted by the TBGRI (1996) and WAPCOS (2002), the results of the three public hearings as given in the minutes of the KSBB, technical details of the project explained by the KSEB, questions raised on the technical feasibility of the project, alternatives for power and the alternatives suggested by the Kerala High Court in its judgment of 17 October 2001, the WGEEP comes to the following conclusions:

## Biodiversity

1. **Unique riverine forest ecosystem:** The riparian vegetation in the Chalakudy river system is unique in that there is no such riparian vegetation at such low elevations anywhere else in the Western Ghats, especially in Kerala.
2. **High endemism in the riparian vegetation:** The riparian vegetation in the proposed dam site contains 155 species of endemic plants and more than 33 species of plants belonging to the Rare, Endangered and Threatened categories of IUCN
3. **Richness in endemic, endangered species**: The project area has a high degree of endemic species of several taxa: 21% of plants (out of 508 spp.), 16% of butterflies (out of 54 spp.), 53% of amphibians (out of 17 spp.), 21% of reptiles (out of 19 spp.), 13% of birds (out of 98 spp.) and, 14% of mammals (out of 22 spp.) recorded in the area are endemic species (WAPCOS EIA 2002).
4. Critically endangered plants: Critically endangered riparian trees such as *Syzygium occidentalis* and *Atuna travancorica* occur in the area.
5. **Rare species of plants in Kerala**: *Gymnema khandalense was reported* in Kerala only from Athirappilly. A new species of plant, namely *Lagenandra nairii* is reported only from Athirappilly
6. **Habitat connectivity**: The riparian vegetation of the Vazhachal-Athirappilly area serves as a link between the varied habitats at lower and higher elevations.
7. **The very high conservation value**: According to the Biodiversity Conservation Strategy and Action Plan for Kerala prepared by the French Institute, Pondicherry, the conservation value of the Vazhachal (project area) is as high as 75%. The KFRI, in a

recent study, has also classified Vazhachal area as a High Value Biodiversity Area and has brought out a detailed Biodiversity Management Plan for it.

8. **Unique area for bird conservation**: i) Of the 486 species of birds recorded from Kerala, 234 are sighted in the Vazhachal-Athirappilly area, ii) all the four species of hornbills found in Kerala, namely Malabar Grey Hornbill, Grey Hornbill, Malabar Pied Hornbill, and Great Indian Hornbill occur in the Athirappilly-Vazhachal area; a very rare phenomenon, iii) riparian forests of the area constitute one of the only two breeding sites of the Malabar Pied Hornbill in Kerala, the other being Aralam Wildlife Sanctuary, iv) 12 of the 16 species (75%) of the endemic species of birds seen in the Western Ghats are present in the Athirappilly-Vazhachal area.
9. **Important Bird Area (IBA):** The Vazhachal-Sholayar area has been identified as a globally Important Bird Area in 1995 by Birdlife International, Cambridge.
10. **Extremely high fish diversity**: Out of the 210 species recorded in Kerala, the Chalakudy River has 104 species including 22 Endangered and 9 Critically Endangered species.
11. **Fishes found only in Chalakudy River**: In an exhaustive analysis of the fish fauna of Kerala, it is reported that out of the 210 freshwater species of fishes in Kerala, 23 are found only in the Chalakudy River.
12. **New species of fish**: The fish fauna of the Chalakudy River is unique in that there are as many as five new species, namely *Osteochilichthys longidorsalis*, *Travancoria elongata*, *Horabagrus nigrocollaris*, *Puntius chalakudiensis*, and *Salarias reticulatus* were discovered for the first time from the Chalakudy River
13. **An extremely rare species of fish**: The population of one fish species (*Osteochilichthys longidorsalis*) found only in the Chalakudy river has reduced 99% during the last two decades.
14. **Fish abundance in the project area**: In a single study, out of the 99 species of fish recorded in the Chalakudy River, 68 were from the project area.
15. **Breeding area of fish**: Athirappilly-Vazhachal area provides microhabitats for various species of fishes to breed.
16. **Fish migration*:*** Some of the species of fish migrate upstream while some do so downstream to complete their annual life cycle . Hence, construction of the dam will directly affect the survival of these species.
17. **Chalakudy River as a Fish Sanctuary:** Considering the rich fish diversity and its other various importance as given above, the National Bureau of Fish Genetic Resources has recommended the Chalakudy river to be declared as a Fish Sanctuary
18. **Loss of microhabitats of amphibians:** Some amphibians such as the torrent frog *Micrixalus saxicolus* recorded from the area are confined only to the boulders submerged in the water course would lose their habitat by commissioning this project,
19. **Elephant Reserve**: **The** entire project area falls within the Elephant Reserve No.9 identified by the MOEF under 'Project Elephant'.
20. **Migratory route of elephants**: The submergence area is within the migratory route of elephants from Parambikulam plateau to Pooyamkutty forests.
21. **Presence of the rare Lion-tailed Macaque**: One troop containing around 13 individuals of the Lion-tailed Macaque, an endemic, endangered species of the Western Ghats, lives in the riparian vegetation of the submergence area.
22. **Ideal habitat of the rare Cane Turtle**: The cane turtle, an endemic and endangered species, first reported here, is currently the only place where they could be seen in reasonable numbers
23. **Loss of riparian forest**: Construction of the dam and subsequent submergence will cause the loss of 28.4 ha of riparian forest rich in biodiversity and endemic species.

24. **Loss of animals of lower taxonomic groups**: No serious attempts have been made so far to document the lower forms of life in this biodiversity-rich ecosystem. The present EIA also did not work on the lower forms. The rich microhabitats in the riverine system holds promise for the discovery of a large number of hitherto unknown species, especially invertebrates

## Impact on ecology

1. **Complete alteration of the ecology of the river system**: Construction of the dam will completely alter the ecology of the river system, both upstream and downstream of the proposed dam site (from a dynamic and vital ecosystem to merely a physical water transporting system).
2. **Indispensability of the flow of water for ecosystem functioning**: One of the vital reasons for the high species richness and endemism of the area is the total volume of water flow and the fluctuation in it from a minimum of 7.26 cumec in May to 229 .97 cumec in August (average of 50 years; 1941–1942 to 1995–1996; table 4.10 of the EIA report).
3. **Alteration of the ecology of the system**: The proposal to regulate the water flow to 7.75 cumec, consequent to the construction of dam. This diversion of water for power generation would certainly affect the ecology of the system, especially the area between the dam site and the point where the tail race waters joins the Chalakudy river, a stretch of 7.89 km. The water flow in this sector would be only 7.75 cumec throughout the year.

## Impact on drinking water and agriculture downstream

1. **Impact on the availability of water in downstream Panchayats:** Construction of the dam and retention of water for 20 hrs while releasing only a portion of it and subsequently releasing 5–8 times more water during an interval of four hours at night would certainly affect the flow pattern, which would affect the irrigation dynamics as well as the ecology of the area.
2. The downstream irrigation needs of the ayacut (14000 ha spread across 20 Local Self Governments in the districts of Thrissur and Ernakulam) depend on the Chalakudy River Diversion Scheme (CRDS). According to KSEB the present water discharge from Poringalkuthu Hydro-electric Project, the main source of water for the Athirappilly Project, during lean months is 6.2–7.6 cumec for 20 hours and 36–38 cumecs for four hours (peak hours – 6 pm to 10 pm). The KSEB ensures 7.65 cumec for 20 hours and 36–38 cumecs for four hours even after the Athirappilly project is implemented. Therefore, according to KSEB, the water available to the CRDS will not be affected.
3. While this variation (7.65–38 cumec) itself would affect irrigation, the Chalakudy Puzha Samrakshana Samithi (CPSS) challenges these figures and points out that the impact will be more severe. According to them, quoting the figures of the 2003 DPR (flow series from 1970–71 to 2001–02), the present discharge through the river from December to April is 14.92 cumec. Based on the maintenance schedule of generators at Poringalkuthu, the average flow for 20 hours between December and April is 13.25 cumec and that for four hours is 25–31 cumec. If the project comes through, the 20 hours flow will reduce from the average of 13.25 cumec to 7.65 cumecs, and that for four hours will increase to about 50 cumecs. This will badly affect irrigation from the CRDS. The irrigation needs from CRDS cannot be met with a flow of 7.65 cumec for 20 hrs. The change in the flow pattern would also affect the ground water in the catchments of the ayacut which in turn would affect the availability of drinking water in the area. The KSEB did not counter

these arguments at the Technical Consultation held by the WGEEP at Chalakudy in January 2011.

4. It may also be noted that water scarcity is already experienced in the downstream Panchayats, and salinity intrusion is reported up to 20 km from the coast. Construction of one more dam and changes in the flow pattern would aggravate the situation.

## Impact on the tribal population

1. Although most of the tribal dwellings in the area will not be affected by the project, their habitats will certainly be seriously affected. A few dwellings may also fall within the submergence area when the dam is full.
2. There are eight Kadar settlements in the Vazhachal Forest Division extending to 413 sq km. Two of them, namely Vazhachal and Pokalapara settlements, with 56 and 23 families respectively, are within the reach of the high impact area of the proposed Athirappilly project.
3. The Kadar tribe is considered to be the most primitive of the South Indian forest tribes that show more evidence of a Negrito ancestry with a predominant proto-Australoid element. They are a primitive hunter and food gatherer tribe originally restricted to the forests and hill tracts of Chalakudy river basin and their population is fewer than 1500. They had been subjected to various resettlements on account of construction of various dams above the proposed dam in Athirappilly.
4. Although the tribal settlements would not fall within the submergence area, except probably a few at the Pokalapara settlement, their habitats in both the settlements will be seriously affected. The Vazhachal settlement with 56 families, the Tribal Cooperative Society, and Tribal Residential LP school are all within just 400 m downstream of the dam site. The Pokalappara settlement with 23 families is on the border of the proposed reservoir and a few houses may fall within the reservoir area when it is full.
5. No action has been taken as per the statutory provisions of the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006**,** under which there are special provisions to recognize "rights over community tenures of habitat and habitation for primitive tribal groups and pre-agricultural communities".

## Technical feasibility of the project

1. The technical feasibility of the project was questioned by the RRC (River Research Centre, Chalakudy) and CPSS (Chalakudy Puzha Samrakshana Samithi) on the following main grounds which were not countered or answered by the KSEB at the technical consultation held by the WGEEP at Chalakudy.
2. Availability of water and power generation

Varied figures are shown on the availability of water:

a. Water availability as per 1999 DPR : 1269 MCM

b. Water availability as per 2003 DPR : 1169 MCM

c. Water availability as per CWC : 1056 MCM

3. In all these calculations, the water diverted to Idamalayar Diversion Scheme appeared not to have been considered. Data obtained by the RRC (River Research Centre, Chalakudy) from KSEB under RTI show that after deducting the water made available to the Idamalayar diversion Scheme, only 750 MCM will be available to the Athirappilly dam.

4. The Central Electricity Authority had calculated the electricity generation from the project at 233 MU per annum on the basis of the figures given in 2003 DPR; i.e. 1169 MCM. Since water availability will be only 750 MCM, the power generation will be reduced accordingly. An analysis of daily generation and discharge data from Poringalkuthu from 1987 to 2006 (received under RTI) suggests that even at 70% dependability the generation at Athirappilly hydroelectric project will be about 170 MU and 210 MU respectively with and without the Idamalayar diversion.
5. During the lean periods (December–May) and considering the Idamalayar Diversion Scheme, the power that could be generated will only be less than 25 MU. In case the Idamalayar Diversion Scheme is stopped as KSEB claims, the major portion of the electricity that is being generated from that scheme, about 60 MU (as per WAPCOS EIA), will cease to be available. That means there will be a substantial loss to the total power grid during lean periods, if the Athirappilly Project comes through.

### Conclusions

Considering (1) the biodiversity richness, the high conservation value, highly significant fish fauna with type locality of five new species and as many as 22 endemic and 9 critically endangered species, the bird fauna with 75% of the endemics of the Western Ghats, and the unique riverine ecosystem not seen in other areas in the State, (2) the impact of the project on the biodiversity and the ecosystem, some of which may be irreparable, (3) the impact on downstream irrigation and drinking water, (4) the questionable technical feasibility of the project, (5) the meagre amount of power that could be generated from the project, (6) impact on the habitats of the primitive Kadar tribes of the area, (7) the high cost of construction even without considering the ecosystem services and environmental cost, and (8) the judgment of the honourable High Court of Kerala made on 17 October 2001 directing the KSEB to ***"take all necessary steps to repair and restore to full capacity , all the existing Hydro Electric Projects to ensure that the generation of power as envisaged is obtained and also to take steps to ensure that transmission losses are minimized and that theft of energy is prevented and to the extent possible eliminated altogether",*** the WGEEP recommends to the MoEF that the Athirapilly -Vazhachal area should be protected as such and the permission for the proposed hydro-electric project at Athirappilly should not be given. The WGEEP further recommends that the Chalakudy River should be declared as a fish diversity rich area, to be managed on the pattern of 'Conservation of biodiversity rich areas of Udumbanchola taluka' in Kerala.

## 15.2 Gundia hydroelectric project

### The Project

Karnataka Power Corporation Limited (KPCL) has proposed a hydro-electric project in the Gundia River Basin in the Hassan and Dakshina Kannada districts of Karnataka state to generate 200 MW of power (613 MU). Three stages have been proposed for development of this project – the first stage would include utilization of water from Yettinahole, Kerihole, Hongadahalla and Bettakumari streams covering a catchment area of 178.5 km$^2$, the second stage would include Kumaradhara and Lingathhole covering 78 km$^2$ of catchment area and the third stage would involve six streams including Kumarahole and Abilbiruhole covering a catchment area of 70 km$^2$.

The total catchment area of all the streams contemplated for power development is 323.5 sq. km with an average annual yield of 975 Mcum. The area is proposed to be developed in two

phases. **Phase I** is proposed to be developed initially which will include pooling of waters by linking Yettinahole, Kerihole, Hongadahalla and Bettakumari. Small weirs/dams across these would be built to intercept the flows in the streams and this water will be drawn through a tunnel running from Yettinahole leading to Bettakumari reservoir. From the foreshores of this reservoir, water will be led to an underground powerhouse through a 7.8 km long head race tunnel opening into a surge tank. From this tank, water will be lead through a 850 m long pressure shaft bifurcating into two penstocks and an underground powerhouse. The proposed installed capacity of the powerhouse is two units of 200 MW each (400 MW). **Phase II** contemplates two tunnels – one taking the waters of Kadumanehalla and surrounding areas through a 13 km long unlined tunnel to the tunnel starting from Yettinahole weir, while the other will bring the waters of Lingathhole and Kumaradhara to Bettakumari reservoir through a 15 km long unlined tunnel. In the second phase, only small weirs of about 5 m height are proposed for diversion of waters. With the completion of Phase I of the project, the annual energy generation in a 90% dependable year will be 653 MU whereas the estimated annual energy generation for the ultimate implementation in a 90% dependable year from this project will be 1136 MU. The basic cost of the project for Phase-I only including obligatory works of Phase-II works out to be Rs. 926.50 crores at high tension (HT) bus. Table 7 provides the salient features of the project.

**Table 7** Salient features of the proposed Gundia Hydroelectric project

| | **Yettinahole Weir** | **Kerihole Weir** | **Hongadhalla Weir** | **Bettakumari Dam** |
|---|---|---|---|---|
| Latitude | 12°51′40″ | 12°50′03″ | 12°49′29″ | 12°47′09″ |
| Longitude | 75°43′20″ | 75°42′44″ | 75°42′23″ | 75°40′10″ |
| Catchment area | 60.50 $km^2$ | 27.00 $km^2$ | 8.50 $km^2$ | 35.00 $km^2$ |
| Full Reservoir Level (FRL) | EL 750 m | EL 763 m | EL 745 m | EL 740 m |
| Riverbed Level | EL 738 m | EL 758 m | EL 730 m | EL 720 m |
| Intake Weir Level | EL 743.50 m | EL 759.40 m | - | EL 681 m |
| Type of Dam | Concrete | Concrete | Composite | Composite |
| Height of Dam | 15 m | 8 m | 32 m | 62 m |
| Length of Dam at top | 80 m | 68 m | 152.40 m | 575 m |
| Spillway and Number of Gates | 36 m length, 3 gates of 10 x 8 m size | 53 m length, over flow type | 60 m length, 4 gates of 12 x 10 m size | 45m length, 3 gates of 12 x 10 m size |
| Design inflow | 525 cumecs | 360 cumecs | 1544 cumecs | 954 cumecs |

| | Yettinahole Weir | Kerihole Weir | Hongadhalla Weir | Bettakumari Dam |
|---|---|---|---|---|
| flood | | | | |
| Average yield | 163 Mcum | 86 Mcum | 28 Mcum | 120 Mcum |
| Area under submersion | 11.54 Ha | 0.09 Ha | 40 Ha | 133 Ha |
| Access and deviation roads (length 100 km, width 10m): | | | **100 Ha** | |
| Dams, power house and other structures: | | | **170 Ha** | |
| Other uses (including quarry, field office, material stack, yard, etc.): | | | **15 Ha** | |
| Excavated tunnel muck dump, stock yard: | | | **275 Ha** | |
| *Please note that these submersion areas do not include the HONGADAHALLA dam (**523.80 ha**) which has reportedly been cancelled.* | | | | |
| UNDERGROUND POWER HOUSE | | | | |
| Type of turbines | | Francis turbine | | |
| Installed capacity | | 200 MW | | |
| Approach tunnel to UGPH | | 965 m 'D'- shaped 7 m dia | | |
| ENERGY | | | | |
| Average annual energy | | 1136 MU (90% dependable) | | |
| COST | | | | |
| Total basic cost of the project | | Rs 926.50 crores | | |

## Background

Government of Karnataka (GOK) allotted the Gundia Hydro-Electric Project (GHEP) to Karnataka Power Corporation Limited (KPCL) on 06-10-1998. Since then, KPCL obtained clearances from a number of state and central government departments including the Fisheries Department, GOK (letter dated 28-09-2006), Department of Culture, Archaeological Survey of India, GOI (letter dated 10-03-2008), and Directorate of Health & Family Welfare Services, GOK (letter dated 16-04-2008). The Central Electricity Authority (CEA) accorded concurrence to the project vide their letter dated 25-04-2008. KPCL also obtained the approval from the Water Resources Department, GOK (letter dated 02-05-2008) and approval for land availability from Government of Karnataka (letter dated 06-06-2008). No objection to the proposed project was received from the Ministry of Defence, GOI, through a letter dated 07-07-2009.

A public hearing was conducted at Hongadahalla in Sakleshpura taluk of Hassan district on 06-06-2008 where representatives of the District Administrations of Hassan District and Dakshina Kannada District along with people affected by the proposed project were present and expressed their views on the proposed project. The Karnataka State Pollution Control Board (KSPCB) submitted a copy of the proceedings of the public hearing along with a letter dated 27-09-2008 to Ministry of Environment and Forests, GoI. KPCL also submitted a Comprehensive Environment Impact Assessment (CEIA) report to MoEF on 05/06-11-2008. The 20th meeting of the Expert Appraisal Committee (EAC) of MoEF was held on 21-11-2008 which considered the project for clearance. The MoEF conveyed the observation of the 20th meeting of the EAC vide letter dated 03-12-2008 and insisted on conducting a public hearing in Dakshina Kannada district also. The KPCL submitted the clarification to MoEF on16-02-2009.

A public hearing was conducted in Siribagilu village of Putturtaluk of Dakshina Kannada District on 25-03-2009. A copy of the proceedings of the hearing was furnished to MoEF by KSPCB on 18-04-2009. The 27th meeting of the EAC of MoEF was held on 15-06-2009 which considered the project for clearance. The MoEF sought information on certain points vide letter dated 29-06-2009 to which KPCL furnished compliance through a letter dated 29-09-2009. The Malenadu Janapara Horata Samiti made a presentation before the subcommittee of the Expert Appraisal Committee for River Valleys and Hydro Electric Projects, MoEF, New Delhi on their visit to the GHEP site on 05-12-2009. The noted environmentalist and Chipko movement leader Shri Sunder Lal Bahuguna protested at Bettakumari (Gundia Project Balancing Site) and conducted a protest meeting at Hongadhalla village on 21-12-2009. The next day a big protest rally and public meeting was organized by the Malenadu Janapara Horata Samiti in Hassan town. It would be pertinent to mention that several such local protests had also been organized between 2004–2006.

## WGEEP Visits and Consultations

At the invitation of Prof. Madhav Gadgil, Chairman, Western Ghats Ecology Expert Panel, Ministry of Environment and Forests, a team constituting Dr. T.V. Ramachandra (Member, Western Ghats Task Force, and Scientific Officer, Centre for Ecological Sciences, Indian Institute of Science), Prof. M. D. Subhash Chandran (Member, Karnataka Biodiversity Board), Mr. Harish Bhat (Hon. Wildlife Warden, Bangalore) and other researchers visited the proposed Gundia Hydroelectric Project site from 29th August 2010 to 31st August 2010. They were accompanied by some local villagers and representatives. The team also conducted a public hearing meeting on 31st August 2010 in Hongadhalla village, where local people came out in significant number to express their views and opinions about the proposed hydroelectric project. This was presented to the WGEEP on 15th September 2010. Subsequently, Prof. Madhav Gadgil, with WGEEP member Ms Vidya Nayak, visited the project site on 16th September and had a consultation meeting with locals on 17th Sept 2010.

## Biodiversity of the Gundia project area

The Gundia River is an important tributary of the Kumaradhara originating at an elevation of about 1400 m in Sakleshpura taluk in Hassan District. The Netravathi and Kumaradhara rivers are two west-flowing rivers of the Central Western Ghats in Karnataka. Gundia River is formed by the Yettinahole and Kemphole streams to which Kadumanehole and Hongadahalla streams join along the course of the river. The Gundia catchment comes under influence of the south-west monsoon in the months of June to September. This river basin is situated along a narrow belt of tropical wet evergreen and semi-evergreen climax

and secondary forests that are generally classified under two major forest types 1) *Dipterocarpus indicus–Kingiodendron pinnatum–Humboldtia brunonis* type of lower elevation (0–850 m elevation) and 2) *Mesua ferrea–Palaquium ellipticum* type of mid-elevation (650–1400 m). However, these tree species are not characteristic of the areas that would be directly affected by the project (submergence and construction). *Vateria indica* and *Elaeocarpus tuberculatus* are the two most common and dominant trees in terms of abundance and basal area (Sukumar and Shanker 2010). Much of the forest in the basin is secondary growth with some patches of primary evergreen forest remaining. Large extent of grassland, characteristic of degraded vegetation, is also seen in this basin.

This region is representative of the biodiversity of the moist western tract of the Western Ghats. Of the plant species found in the basin nearly 36% are endemic to the Western Ghats, while 87% of amphibians and 41% of fishes of this basin are similarly endemic to Western Ghats. Several species of animals included in Schedule I of the Wildlife Protection Act (1972) also seen in this basin though their abundance may be low.

The salient features of the biodiversity of the Gundia basin can be summarised as follows (Sukumar and Shanker 2011):

a) Plants: The tree species (woody plants >1 cm dbh) mean richness of 43 species (in 0.1 hectare) and associated measures of heterogeneity are comparable to that of the richness of other Western Ghats moist tropical forests such as at Kudremukh (Karnataka) and Silent Valley (Kerala), though lower than at Sengaltheri in the Kalakkad-Mundanthurai Tiger Reserve (Tamil Nadu). Being situated in valleys, the tree richness of the Bettakumari and the Hongadahalla submerge sites are higher than the average richness of the Gundia basin. Out of 18 species of Western Ghats endemic plants recorded in one study, 16 species are widespread in the ghats, one (*Atlantia wightii*) is restricted to Karnataka and Kerala and the other (*Pinganga dicksonii*) is restricted to Karnataka. However, the biomass of the vegetation in the Gundia basin is much lower than other comparable forests in the Western Ghats such as Kudremukh and Silent Valley, presumably because of removal of large trees in Gundia.

b) Insects: A bee new to science was discovered by Renee M. Borges and team within an ant-plant *Humboldtia brunonis* that is found in these forests and is endemic to the Western Ghats. This cuckoo bee *Braunsapis bislensis* Michener & Borges (named after the Bisle forests in which it was found) is a unique species that is parasitic on *Braunsapis puangensis*.

c) Fishes: Three locally-protected sites for mahseers in the downstream region of the Kumaradhara and Nethravathi indicate the fish richness of the region as well as the conservation priority given to these rivers by local people.

d) Amphibians: Out of a total of 21 species of amphibians recorded in this study, 18 species were endemic to the Western Ghats while two species (*Nyctibatrachus sanctipalustris* and *Indirana gundia*) are presently known only from the Gundia basin.

e) Birds: Of 69 species of birds sampled in this study, 6 species were endemic to the Western Ghats.

f) Mammals: Several species of mammals that are listed under Schedule I of the Wildlife Protection Act (1972) are present in the Gundia basin though at low abundances. Lion-tailed macaque – *Macaca silenus*), Travancore flying squirrel (*Petinomys fuscocapillus*), and Nilgiri marten (*Martes gwatkinsii*) have been reported from the broader region though they were not recorded in the biodiversity study within the project areas. Similarly, the

presence of tiger (Panthera tigris) has been reported from the region. The Asian elephant (*Elephas maximus*) is also present in the region, and has been recorded in the project area, though at very low densities compared to its presence in the major elephant habitat (Mysore Elephant Reserve) of Karnataka. The Gundia basin lies outside the Pushpagiri Wildlife Sanctuary that is a part of the Project Elephant: Mysore Elephant Reserve. The significance of the Gundia basin for movement of elephants between the Mysore Elephant Reserve and other areas to the north of the Hassan-Sakleshpur-Mangalore highway has not been investigated so far. Presently, it has not been listed among the priority elephant corridors recognized by the Government of India as given in the publication *Right of Passage*: *Elephant Corridors of India* (Menon et al. 2005).

## Land-use pattern of the Gundia Basin

Land-use in the river basin includes cardamom and coffee plantations. In these plantations some of the original trees are preserved to favour the shade- and humidity-loving cardamom plants beneath. This cash crop fetches high returns of Rs 1500 per kg of dried fruit. Both small and large farmers of Gundia basin are engaged in cardamom cultivation. The coffee estates, both small and large, like in the rest of the Central Western Ghats, constitute a major economic activity in the region. In many large private holdings a portion is under wild vegetation, though unauthorized logging has already removed many of the large trees such as *Elaeocarpus tuberculatus*, *Calophyllum polyanthum*, *Vateria indica*, *Holigarna grahami* and *Garcenia indica* (Sukumar and Shanker 2010). In fact, illegal logging is rampant in this region and most of the valuable *Calophyllum polyanthum* has already disappeared. Likewise, encroachment on forest land by settlers is also common and has contributed to reduction and degradation of forests.

### *Recommendations*

1. The execution of the Gundia project in three stages and two phases will cause large scale land cover changes in this basin. The impacts on the habitat and biodiversity would come not only from submergence but also associated activity including building constructions as well as roads to access the various project sites.

2. The project would alter the hydrological regime of the river basin. Kumaradhara River, a perennial source of water to the important temple-township at Subramanya, will lose water due to its diversion to the Bettakumari dam. This may have implications for the piligrims visiting the temple. The implications of land cover changes on the catchment yield as well as diversion of waters as envisaged in the project are not clear. Current perennial streams could become seasonal (as has happened in the Sharavathi river basin), while the altered hydrology downstream could affect livelihoods of local people.

3. The tunnel access to the main underground powerhouse is located in an area of primary forest cover. This location is not desirable as it would cause disturbance to one of the few remaining patches of primary evergreen forests of the Gundia basin.

4. The proposed Gundia hydro-electric project falls in an area that has been classified as Ecologically Sensitive Zone 1 by the WGEEP (Figure 2). WGEEP recommends that no large storage dams be permitted in ESZ1.

5. The recommendation of the WGEEP is therefore not to permit the execution of the Gundia hydroelectric project (in three stages and two phases) as the loss of biodiversity and environmental impacts would be significant.

# 16. Ratnagiri and Sindhudurg districts

The Panel has been asked to suggest an appropriate course of further development of mining, power production and polluting industries in Ratnagiri and Sindhudurg districts of Maharashtra. This entire region has been seriously impacted, both environmentally and socially by a number of mining, power projects, and polluting industries. The impacts are manifold; depletion and pollution of ground water, siltation of water bodies, increased flood frequencies, loss of fertile agricultural land, depletion of fisheries, deforestation, loss of unique biodiversity elements such as herbaceous plants of lateritic plateaus, air pollution, noise pollution, traffic congestion and accidents, increase in respiratory ailments, and so on. The situation clearly warrants a careful assessment and mid-course correction.

The problem is not just legal, but substantial levels of illegal activities. For instance, many farmers complain of miners muscling their way onto private land and digging pits. Pollution from many industries is also well above legally permissible limits. Consequently, there is much social discord, especially because people firmly believe that the law and order machinery is being misused to protect illegal activities.

## 16.1 Assignment of levels of ecological sensitivity

Only a portion of Ratnagiri and Sindhudurg districts comes under Western Ghats and has been assigned to ESZ1, ESZ2 and ESZ3 categories on the basis of WGEEP database. A group of scientists and activists associated with the Development Research, Awareness & Action Institute (DEVRAAI), Kolhapur has been working in close collaboration with WGEEP, and has submitted a proposal for the constitution of "Maharashtra Sahyadri Ecologically Sensitive Area (MAHASESA)". This group has at its disposal extensive data culled from a number of research projects and student dissertations undertaken at Shivaji University, and using this material, as well as fresh field work, this group has assigned ESZ1, ESZ2 and ESZ3 categories for some areas falling in Satara, Sangli, Kolhpur, Ratnagiri and Sindhudurg districts following WGEEP methodology. Hence for the areas thus covered by DEVRAAI for Ratnagiri and Sindhudurg districts, WGEEP has decided to accept their assignments of levels of Ecological Sensitivity. Indeed, the proposed Western Ghats Ecology Authority should promote such exercises throughout the Western Ghats region.

## 16.2 Deficit in environmental governance

WGEEP's extensive field visits and consultations with Government officials, industry representatives, elected officials of Panchayat Raj institutions, state legislature and members of parliament, scientific and technical experts, as well as citizen groups representing farmers, herders, fisherfolk, artisans, industrial and farm labourers all point to a grave deficit in environmental governance.

Consider, as an example, ZASI. The Ministry of Environment and Forests has sponsored the preparation of these Zoning Atlases for Siting of Industries (ZASI) by Central and State Pollution Control Boards with substantial financial and technical help from German Donors. It has generated a spatial database for all the districts of the country, mapping existing pollution levels and environmentally and socially sensitive areas, delineating zones where it would be undesirable to add further pollution loads, and suggesting locations where industries with different levels of potential air and water pollution impacts may be set up without undue environmental risks. Clearly, this is a valuable exercise, although it has some limitations, and has potential of promoting environmentally and socially sustainable development. Apparently under unfair pressure, the Ministry of Environment and Forests

has suppressed making this exercise fully public. As a result, the Ratnagiri ZASI has not been released at all, and a copy was obtained by WGEEP only after much effort. Despite repeated requests, ZASI reports for other Western Ghats districts have not been made available to WGEEP. The Ministry of Environment and Forests must obviously expeditiously put all these documents in the public domain. A perusal of the Ratnagiri ZASI reveals that today industries are being located without due regard to clear cut prescriptions of ZASI. Such decisions clearly require to be reviewed.

Maharashtra Government has prepared a Regional Plan for Ratnagiri and Sindhudrg districts emphasizing the natural endowments and strengths of these districts, and prescribing land use priorities. However, these prescriptions are being comprehensively violated in current practice. Such decisions ought to be reviewed.

Current environmental clearance processes are seriously defective. The EIAs are particularly weak in the sections on biodiversity and socio-economic issues. For instance, they commonly dismiss as barren land, the 'sadas' or the wind swept lateritic plateaus of the Western Ghats with stunted tree growth. These plateaus are very rich in biodiversity. In fact, Dr Sanjappa, former Director, Botanical Survey of India states that these plateaus are, for their size, the country's richest repository of endemic plant species. There are other important environmental resources that are ignored, such as bivalve production on tidal mudflats. A recent study in Aghanashini estuary of Uttara Kannada district just to the south of Goa has revealed that the annual value of this production was Rs. 5.6 crores.

The EIA process leaves out of consideration many pertinent issues. For example, transmission lines emanating from power projects have significant impacts on mango and cashew orchards, as well as forests on Western Ghats; such impacts are ignored. Similarly transport of ore by trucks on roads and by barges on rivers and ships on sea all have significant environmental and social impacts that have never been considered.

The inputs made available during the Public Hearings process are often simply ignored, leading to high levels of social frustration and discord. For instance, in Kalane village in Sindhudurg, the first Public hearing relating to the mine was held on 20-9-2008. At this time, the Marathi EIA was not available and therefore the hearing was postponed. The public hearing was once again held on 11-10-2008, after the Marathi EIA was made available. At this hearing, the unanimous resolution of the Gram Panchayat dated 6-8-2008 opposing mining was submitted and several objections were raised: 1) Pollution of Kalane river and adverse impact on water supply scheme on this river at Chandel in Goa. 2) Adverse impact on horticulture dependent on natural water sources in Kalane. The villagers were not provided summary minutes during the public hearing. These summary minutes were made available only after 57 days. Despite the unanimous rejection of the mining proposal, the Government of Maharashtra has gone ahead and accorded Environmental Clearance to the mine on 17th March 2009. In the absence of any transparent, participatory monitoring process, the conditions imposed while according Environmental Clearance are routinely violated. Indeed, the absence of any transparent, participatory process of environmental monitoring is a burning issue. Ratnagiri district has been an epicentre of environment related agitations in recent years.

India's Biological Diversity Act, 2002, provides for establishment of Biological Diversity Management Committees (BMC) involving local community members at Gram, Taluka, Zilla Panchayat, as well as at Municipal levels. These BMCs have the responsibility of documenting local biodiversity resources, and the authority to regulate their harvests, and levy collection charges for permitted uses. Such BMCs could provide a meaningful public

forum and play a significant role in local level environmental management and monitoring. Unfortunately, no step has been taken to implement the Biological Diversity Act in the state of Maharashtra, and the implementation has been unsatisfactory and restricted to the state level committee in Goa. The BMCs must be immediately activated at all levels, before taking any further decisions.

The on-going and proposed mining, industrial and power project activities are in serious conflict with the traditional economic sectors of agriculture, horticulture and fisheries, and the newer tourism sector on which the lives of a large majority of the people of Ratnagiri and Sindhudurg depend. For instance, mangoes are exported in substantial quantities from this region. Recently, the doors of the global export market for the Alphonso Mango have opened through Global GAP certification. These global standards demand that there be no seriously air polluting industries, including coal based power plants in their vicinity. If these come up, and even if it turns out that pollution, such as from thermal power plants, does not harm the orchards, the inevitable loss of export market is bound to hit horticulture hard. Given this very significant social conflict, it is vital that people be fully taken on board in deciding on the course of future economic development.

Huge conflicts have emerged in the context of acquisition of land for various industrial, power and mining projects. Land was acquired from farmers of Jaitapur area by invoking emergency provisions, leading to grave social discord. There are examples of people being misled and being forced to accept activities against their wishes. In Ratnagiri district PTIANA now plans to set up a coal-based power plant on land people sold on the understanding that it was being purchased to set up an ecotourism resort. Finolex is forcibly closing fishermen's traditional access to fishing areas. Residents of Tamboli village in Sindhudurg district narrate that they suddenly discovered in 2006 that mining had been entered as 'other rights' on their land records without so much as informing them, although this can only be done with their full concurrence. They had to resort to prolonged agitation, including fast unto death in 2007 to have these illegal entries removed. We must clearly evolve systems of meaningful participation by people in deciding on the course of future economic development.

Social discontent is also fuelled by failure to enforce laws such as pollution control. The Common Effluent Treatment Plant at the chemical industry estate at Lote in Ratnagiri district cannot handle the quantity of effluent it is receiving, and its functioning is highly defective. During a visit in October 2010, WGEEP saw large overflows of untreated effluent from the plant going into streams serving Kotavale village. Since the situation is not being brought under control, the Sarpanch of Kotavale attempted to commit suicide by drinking the polluted stream water. He was rushed to Mumbai and saved, but there has been no abatement of pollution affecting Kotavale. Also, in 2000, around 30 school children near Lote MIDC became unconscious due to inhalation of poisonous gases. The company involved took no notice, and did not come forward to take children to the hospital. People also reported that solid toxic sludge from industries was mixed with soil and dumped in the ghat (a steep hill road) area. Very recently, some party has dumped toxic wastes via a tanker in the Boraj Dam which is the source of water supply to Khed town. The town water supply had to be stopped for several weeks, but nobody has been brought to book. There has been significant decline in fish landings from Dabhol creek due to chemical pollution from Lote, and severe loss of employment opportunities for members of fishing communities.

With all these problems persisting all that the Maharashtra Pollution Control Board has done seems to be to transfer the Lote office to far off Chiplun, rendering any chances of effective action even more remote than before. While promises to stop pollution go unfulfilled, protests and demonstrations are routinely suppressed by invoking the Bombay Police Act 1951 Sec, 37(1)(3) prohibiting gatherings of people. Between 2008–2009, such orders were promulgated in Ratnagiri district for no less than 191 days. With all these persistent and unrectified problems, we were informed by an MIDC officer that they are planning to set up a new Petro-Chemical complex near the existing MIDC area on 550Ha. Obviously, we must evolve systems of meaningful participation by people in deciding on the course of future economic development to ensure that development genuinely benefits society at large, and is not hijacked merely to serve particular vested interests.

While the 73rd and 74th amendments to the Indian constitution have attempted to empower people at the grass-root level, this is not being translated into practice. For instance, several Gram Panchayats and Panchayat Samitis, including the Ratnagiri Taluka Panchayat Samiti, have specifically passed resolutions relating to environmental issues that are being completely ignored by the state government. We must clearly move towards making grass-roots empowerment of people a reality.

An important act empowering people in hilly, forested tracts like Ratnagiri-Sindhudurg-Goa is the Scheduled Tribes and Other Traditional Forest Dwellers (Rights over Forests) Act (FRA), 2006. Regrettably, the current state of implementation of FRA everywhere, including in Maharashtra, is characterized by a series of serious problems, as set out in great detail in the just completed report of the Saxena Committee set up jointly by MoEF and MoTA.

All the exercises of Environmental Impact Assessment undertaken so far have the serious limitation that they look at various interventions one at a time, ignoring the cumulative impacts. For example, air pollutant emissions from a coal based power plant may be acceptable when looked at individually. But, in certain seasons, emissions from several such power plants may accumulate in some particular basin in a hilly region and considerably exceed the threshold for tolerance. Similarly, ore transport trucks from a single mine may be accommodated on the road without excessive traffic congestion, but those from five mines may exceed the carrying capacity of the roads and lead to intolerable levels of congestion and road accidents. Another key factor that is generally ignored is the continuity of habitats so essential for maintenance of several elements of biodiversity. Again the cumulative effects may be totally unacceptable, although individual impacts may be acceptable. For many such reasons it is essential to look at the cumulative impacts of various industrial, mining, power generation and other activities in Ratnagiri and Sindhudurg districts, and the adjoining state of Goa.

## 16.3 Recommendations

### Mining, power production and polluting industries

The Panel has been asked to suggest an appropriate course of further development of mining, power production and polluting industries in Ratnagiri and Sindhudurg districts of Maharashtra. Given the many problems facing these ecologically rich yet fragile districts, it is clear that we must proceed with great care. Only the eastern portions of these districts are covered by the Western Ghats for which WGEEP has completed assignment of Ecologically Sensitive Zones and guidelines for further development projects. For these Western Ghats regions of the district, the Panel recommends:

(a) An indefinite moratorium on new environmental clearances for mining in Ecologically Sensitive Zones 1 and 2

(b) A phasing out of mining from ESZ1 by 2016

(c) Continuation of existing mining in Ecologically Sensitive Zone 2 under strict regulation with an effective system of social audit

(d) No new red and orange category industries, which would include coal based power plants, should be permitted to be established in Ecologically Sensitive Zones 1 and 2

(e) The existing red and orange category industries should be asked to switch to zero pollution in Ecologically Sensitive Zones 1 and 2 by 2016, and operated only under an effective system of social audit

## Cumulative impact analysis

WGEEP has not undertaken any extensive compilation of pertinent information and assignment of levels of ecological sensitivity to the plains and coastal portions of Ratnagiri and Sindhudurg districts falling outside the Western Ghats. Nevertheless, the limited investigations of the Panel in these plains and coastal tracts suggest that these are under severe environmental and social stress, and it is essential that a careful Cumulative Impact Analysis of various development activities in these tracts, ideally in conjunction with Raigad district of Maharashtra and the state of Goa, must be immediately undertaken, preferably under the leadership of the National Institute of Oceanography, Goa.

This should not be a techno-centric study alone, but should ensure that people's deep locality-specific knowledge of environmental issues and their development aspirations are taken on board. To this end, the Ministry of Environment and Forests should ask the state Forest Departments to proactively assist the Tribal Welfare Departments in implementation of the Scheduled Tribes and Other Traditional Forest Dwellers (Rights over Forests) Act. The implementation of the Community Forest Resources provisions of this act would greatly help create broad-based stakes for people in safeguarding the environment of the region. Furthermore, the Ministry of Environment and Forests should ensure the establishment of Biological Diversity Management Committees in all local bodies in this region, motivate them through empowerment to levy 'collection charges' as provided in the Biological Diversity Act and fund the BMCs to document the local ecological setting and biodiversity resources in collaboration with local educational institutions. This would not only further encourage local community members to engage in taking good care of their own environment, but generate much detailed information of key relevance for the proposed cumulative environmental impact analysis.

Of course a strong scientific institution needs to take overall responsibility of such an exercise and ensure sound scientific and technical inputs. Therefore, as mentioned above, WGEEP recommends that NIO, Goa, be asked to play such a role. The Panel recommends that the current moratorium on new environmental clearances for mining, and red and orange category polluting industries and power plants in the plains and coastal tracts of Ratnagiri and Sindhudurg districts should be extended till satisfactory completion of such an analysis of the Carrying Capacity of these districts. The moratorium may then be reviewed in light of the findings of the study.

# 17. Mining in Goa

The Ministry of Environment and Forests has requested WGEEP to provide inputs to review the current moratorium on fresh clearances for mining in Goa. The Panel's observations and analysis are based on:

- Papers commissioned for the Western Ghats Ecology Expert Panel (WGEEP) (R Kerkar, 2010; N Alvares, 2010; G Kalampavara, 2010)
- A multistakeholder workshop organized by the Panel in September 2010. http://moef.nic.in/downloads/public-information/mom-6-western-ghats.pdf
- Materials prepared for the Panel by Goa Foundation and the Goa Team http://moef.nic.in/downloads/public-information/Annexure3-6th.pdf
- Our field visits to Goa's mining areas in September 2010 and January 2011 and interactions with mine owners and managers, villagers, NGOs
- A number of studies on mining in Goa (TERI, 1997; Goa Foundation, 2002; TERI, 2006; CSE, 2008; NCAER 2010; GMOEA reports; Basu, 2011; Mukhopadhyay and Kadekodi, 2011, TERI, DISHA study ongoing)

Based on observations and analysis, the Panel recommends an indefinite moratorium on new environmental clearances for mining in Ecologically Sensitive Zones 1 and 2 in Goa and a phasing out of mining to 2016 in Ecologically Sensitive Zone 1 as defined by the Western Ghats Panel. The Panel also makes a number of recommendations to reduce the environmental and social impacts of mining in Goa and in other regions which are included in Part II of the WGEEP Report. The moratorium for ESZ2 can be revisited as and when the situation improves.

## 17.1 Status and Trends

The mining and quarrying industry in Goa is the second most important industry next to the tourism industry. The wholly exported iron ore industry contributes to exports, employment and foreign exchange earnings of India. For the year 2009–2010, the contribution to government revenues of state and centre was Rs. 500 crores and Rs. 2000 crores respectively. (GMOEA and NCAER (2010). The share from this sector to state income is estimated to be around 4.7% (1999/00 prices); 10.1% at 2007/08 prices (indirect 17%) (Economic Survey of Goa 2009–2010) Contribution from mining and quarrying is mainly from iron ore mining.

Figure 8 shows the increase in production of iron ore in Goa for the period 1992–2009. There has been an increase from 12.1 million metric tonnes in 1992 to 41.1 million metric tonnes in 2009 with a 20 million metric tonnes increase in the last 5 years alone. GMOEA estimate that there has been considerable illegal mining of around 10 million metric tonnes. 100% of Goa's ore is exported of which about 89% is exported to China and about 8% to Japan (GMOEA and NCAER, 2010).

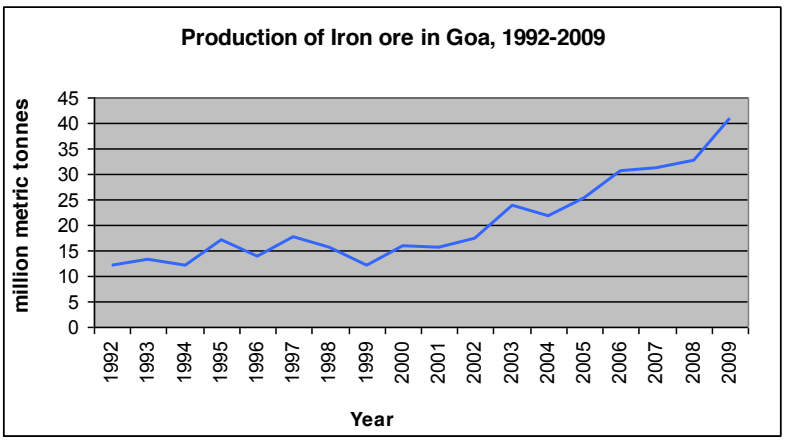



**Figure 8** Production of Iron ore in Goa (1992-2009)

Source: GMOEA (2010)

## 17.2 Footprints of mining

Most of the mining in Goa is in the Western Ghats (Figure 9). The mining belt extends 65 km from southeast to northwest spanning some 700 sq. km. Goa is the only state in India, as a result of a historical regulatory legacy, where iron ore mines are concentrated in lease areas of less than 100 hectares. There are a number of leases that have been dormant but are being reactivated given the rising demand for iron ore from China. Following are the key sustainability footprints that are a result of mining activities in Goa; these have also been recognized in the draft Regional Plan of Goa 2021 (RPG-21)[7].

[7] The subsequent paragraphs draw from earlier studies but also RPG-2021; Kerkar, 2010; presentation made by Goa team to the WGEEP on 27 September 2010.

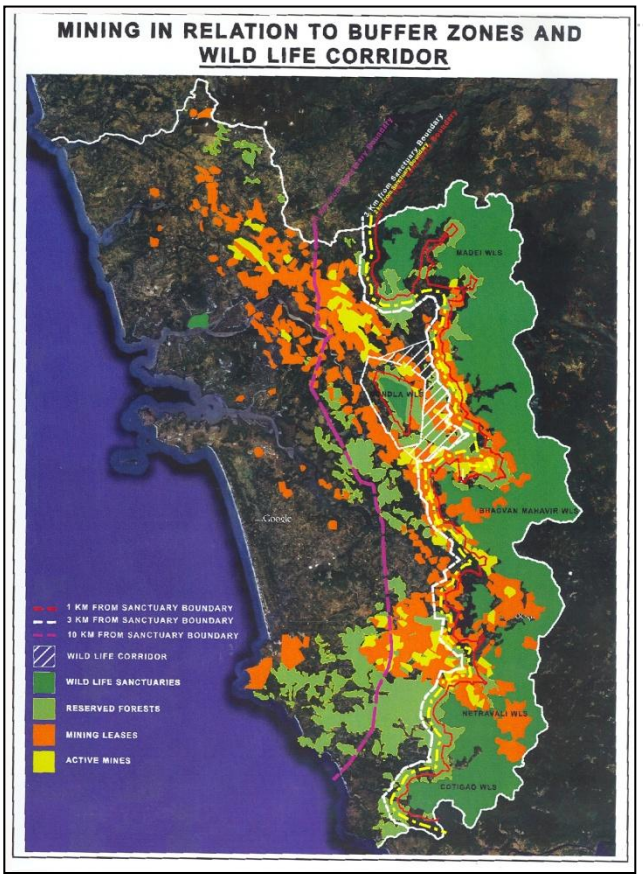



**Figure 9** Mining leases in Goa

Source: Goa Foundation, 2010, presentation to the WGEEP, 27.9.11

Most mining leases are located in and around Wildlife Sanctuaries (WLS) and forest areas. For example, 31 leases are within 2 km of WLS, of which 7 are working mines; 13 leases are within 1 km of WLS. Evidence of some mines operating illegally within WLS also exists. 2500 ha of forest area were lost to mining in the period between 1988–1997. (TERI, 1997) No studies to assess the loss in forest area in the Western Ghats have been done since then. Forests are practically non existent in some parts of the Bicholim taluka where mining has been in operation since the late 1940s. In parts of Sattari and Sanguem talukas, forests are affected in mining villages. Biodiversity loss associated with the land use and cover change resulting from mining operation in the region is very serious .

## Surface water

The loading jetties of the barges are right on the river bank and these result in surface water pollution during loading and unloading operations. Sedimentation of river beds and estuaries (Figure 10) (particularly the Mandovi-Zuari estuarine complex) and the resultant flooding of the rivers like Bicholim and Sanquelim have been attributed to this activity. Dumps are located close to water bodies which contributes to the silt runoff into the water especially during Goa's heavy monsoons (Figure 11).



**Figure 10** Sedimentation of river beds and estuaries



**Figure 11** Overburden dumps close to waterbodies

Source: R Gawas

Opencast mining has induced significant changes in water quality and quantity besides causing topographical, morphological, and land use changes. The following two problems in the mining areas have been identified:

- Suspended particulate matter in the mine and tailings discharge water used for paddy cultivation can be major threats to sustainability of fertility of these agricultural lands.
- Direct surface runoff from the adjoining mine dumps into the agricultural lands adds to the problem of siltation.

## Groundwater

Mining activities involve the conjunctive production of groundwater as they require considerable pumping out of water. Many studies have highlighted the negative impact of Goa's mining activities on local hydrology (MS Swaminathan 1982; TERI 1997; G.T. Marathe, IIT; B.S. Chowdhri and A.G. Chachadi; NEERI Report; Regional Plan of Goa, 2021.) As water tables drop due to the drainage of water into mining pits in zones of unconfined aquifers, local wells go dry and affect availability of water for domestic needs and agriculture and this impacts local lives. Water shortages as a result of mining activities have been well documented (TERI, 1997; TERI, 2002). Evidence from studies (TERI, 2006) also

reveals that the impact of changes in groundwater is disproportionately borne by women who are more vulnerable to insecurity, poverty, and ill health.

### Waste Dumps

Enormous amount of mining waste is piled up in steep and high dumps. Some of this overburden waste is being mined currently as it contains material of an iron content that has a market in China. Another important concern is how the mines will be backfilled once the ore is exhausted, if we export most of this excavated material out of the country.

### Local air quality

There is massive movement of minerals by road as well as rail from Karnataka to Goa for the purpose of blending with local ore for its upgradation as well as export by miners through Mormugao Port Trust (MPT) and for 5 sponge iron plants located in Goa. An ongoing TERI study estimates that 39% of emission loads for PM10 in Goa are from the mining region and 25% from industry. It is observed that trucks have been using NH4A and transporting ore upto Usgao to access further shipment through barges to MPT. This has been creating enormous traffic problems as well as environmental hazards along its route due to ore spilling over the wayside by overloaded, and often uncovered, trucks. Many accidents are observed in the ore transport route. Studies have also estimated that exposure to air pollution (especially respirable suspended particulate matter) is high in the mining clusters and transport corridors in Goa, affecting the health of local communities.

### Agriculture

Agriculture has also been severely affected in the area due to extraction of ground water, vast areas being covered by siltation and mining dust, thus destroying farms and livelihood (TERI, 1997; Kerkar, 2010; Goa Team Presentation to the WGEEP, 2010). Agricultural fields at the foothills of the dumps and mining areas have been severely impacted due to siltation from mining. This has led, at times, to serious conflicts between those involved in agriculture and mining in the area. A current case in point is Colomba village in Sanguem taluka, where 23 mining concessions granted during the Portuguese regime are located and which cover 75% of the village. A few of these mines have already commenced activities. In other words this agricultural village is under the shadow of being completely consumed by mines, leading to local agitation. Another village is that of Caurem. Kerkar (2010) in his paper to the WGEEP notes "Very few villages in Goa are blessed with the ecological heritage of sacred groves, perennial springs and rich forests like that of Cavare of Quepem in south Goa. But today, (the) very existence of Cavare is threatened on account of increasing mining activities." Agriculture and mining, people and mining companies, are pitted against each other. Current laws offer inadequate compensation for those whose land and livelihood is taken away by mining.

Many of these environmental and social impacts do not get reflected when one hears of the value that mining contributes to the gross state domestic product (GSDP). An exploratory study to value some of the impacts of mining in Goa using 1996/97 data, for example, suggested that even if this partial accounting of the environmental and social impacts is netted out of the value created by mining activity in terms of value added to GSDP, the "true income" would be only 15% of reported income (Noronha, 2001; TERI, 2002, ). More recent papers in response to the NCAER Report (2010) suggest that the benefit-cost ratios no longer favour mining in Goa (Basu, 2011; Mukhopadhyay and Kadekodi, 2011).

## 17.3 Governance Issues

The total failure to implement the community forest resources provisions of FRA in Goa has absolutely no justification. To take a specific case, the Devapon Dongar mine of Caurem village in Quepem taluka of Goa is located on a hill sacred to the Velips, a Scheduled Tribe group, and to sanction a mine on this hill against serious local opposition, and without completing the implementation of FRA is thoroughly inexcusable.

Illegal mining is observed in Goa, both in terms of no clearances obtained, fraudulent EIAs and/or flouting of conditions of environmental clearances. The Panel has obtained a list of mines that are flouting environmental conditionalities in terms of extracting ore beyond output limits.

### The EIA, Environmental Clearance Process, and EC violations

The EIA process which is so central to protect the ecosystems in the Western Ghats was found to be defective at several points[8].

- These relate to the poor quality of EIA reports and the process of public hearings. Not only were EIAs seen at times to be fraudulent, but it is found that the minutes of public hearings are also manipulated. We have seen and heard of cases where the EIA consultant did not visit the village or did not conduct appropriate surveys and impact studies. EIAs are prepared by agencies employed by project proponents and are therefore under tremendous pressure to tweak the information so as to facilitate clearance. They are consequently riddled with incomplete and often patently false information. For example, the EIA report for Devapon Dongar mine of Caurem village in Quepem taluka of Goa states that there are no water courses in the mine lease area. Field inspection by WGEEP revealed the presence of two perennial springs.
- The EIAs are particularly weak in the sections on biodiversity and socio-economic issues. For instance, they commonly dismiss as barren land, the 'sada's' or the wind swept plateaus of the Western Ghats with stunted tree growth. These plateaus are very rich in biodiversity, being habitats of many endemic herbaceous plants, are a major source of fodder for livestock, and sources of streams that are vital to the life in valleys surrounding them.
- Given that EIA reports are not to be trusted, the role of the Environmental Appraisal Committee (EAC) for the sector becomes that much more important. The Composition of the Environmental Appraisal Committee (EAC) is considered inadequate since it does not always have representation from the region in which the project is to be located. Many problems emerge because the EAC does not have a sense of the place and also knowledge of what other activities may be stressing the region when the new project is being proposed. Since EAC deliberations take place in Delhi, without, most often, a visit to the project site, local level pressures and concerns are not always understood, since the EIA report is defective and the public hearing minutes are manipulated Given this, reliance on faulty EIA reports makes a mockery of the whole regulatory process.
- States, such as Goa, felt that the EC 2006 notification reduced the SPCB to post offices; little state/local input permeated into the EC process.[9] However, at other places it was

[8] WGEEP observations are based on field work, consultations with GOG, SPCB etc., and more generally on R Dutta and R Sreedhar, 2010; Asaniye PH April 2010: N Alvares, 2010; Goa team presentation to the WGEP, 27 September 2010;

felt that the SPCB acted against the interests of the local people by misleading the EAC of the MoEF.

- The perception of the State government is that its views or the State Pollution Control Board's views do not find place in the whole procedure and process post 2006 except in the Consent to Establish which in any case happens only after the MoEF has given its clearance. States do have a veto-under the "consent to establish" requirement but that needs to be exercised better. It was felt that pressure to give consent is high post the clearance from the MOEF.
- Environmental Clearances are given to individual projects so the cumulative Impacts of Projects are ignored[10]
- Despite poor history of compliance, the Project Promoter is granted clearance for new projects. For example, most of those mines found extracting more than the norms laid down in their ECs and consents have been granted renewal by the Pollution Board.)

In the absence of any transparent, participatory monitoring process, the conditions imposed while according Environmental Clearance are often violated. The Environmental Clearance granted stipulates that if there are any water courses, they should not be disturbed and that dense natural vegetation be maintained for a distance of 50 meters on either side of the water courses. Field inspection revealed that these conditions were totally violated; that the streams are dammed, their flow diverted and stream bank vegetation destroyed. There is on-going serious social strife in this area due to this and other such violations of conditions. This state of affairs has led to enormous disaffection in the state regarding mining activity. The PILs against mining in this state also support the increased public opposition to what mining is doing to the local environment here (Box 12).

[9] It is held by the former Secy, MoEF, P Ghosh, that SPCB in forwarding the minutes can (and should) give the views of the State and the MoEF would be bound to consider them. However, he stated, that the procedure can be re-visited to provide a separate forum for inputs (not veto!) by the State Personal communication, 2011.
[10] Since the year 2003, for example, about 141 Environmental Clearances have been granted for mining in a small state like Goa, and predominantly in the Western Ghat talukas of the State.

**Box 12: PILs in mining in Goa**

**Water**

- "Advalpal village in north Goa has filed PILs against two mining companies citing diversion of streams by the mining companies as the main reason for the repeated flooding of the village every monsoon and for the blockage of their water source for irrigating their fields"

**Agriculture**

- "…at least half a dozen PILs from villagers in south Goa alone praying for stoppage of mining activities as the mining silt from the dumps has entered into the streams or simply flows down the hillside and ends up as unwanted deposits in their fields resulting in huge tracts of fields left fallow, year after year"

**Air/noise/accidents**

- Truck transportation (2010)
  - The court approved the government's decision to restrict movement of mining trucks to fixed hours during daytime only
  - to fix speed limits when traversing through populated areas.
  - imposed restrictions on the quantum of ore that may be loaded in the trucks.

**Forests (Apex Court)**

- Challenging de-notification of large areas of two notified Wildlife Sanctuaries (Madei and Netravali):
- Challenging exclusion of 55 mining leases from Netravali Wildlife Sanctuary:
- Grant of post-facto clearances issued to industrial projects and mining leases (2004)
- Supreme Court in 2006 ordered all mining projects within 10 km of wildlife sanctuaries and national parks to get an NOC from the Standing Committee of the National Board of Wildlife

Source: Norma Alvares, 2010. Paper for the WGEEP

It seems to us that mining in Goa has crossed the social and environmental carrying capacity of this small state. Table 8 below reports household responses to mining in four mining village clusters in Goa in 1996 when mining in Goa was about 17 mn tonnes.11 Out of the households surveyed, 50% had responded that mining had not benefited villages. Another survey based study shows that the populace in mining regions reported lower satisfaction levels in all facets as compared to that in non-mining regions12. Were this survey carried out today, with higher levels of mining activity estimated to be at 50 million tonnes of exported ore, we believe the nays would be much higher.

[11] Cluster I is the Bicholim cluster; Cluster II is the Surla Pale cluster of mines; cluster III is the Codli cluster of mines and Cluster IV refers to the Tudou –Bati cluster of mines which are now part of the Netarvalli sanctuary.
[12] TERI (2002). Also see Noronha and Nairy (2005)

**Table 8** Survey Responses to mining activity

| Clusters | Villagers' views | | | | | | |
|---|---|---|---|---|---|---|---|
| | About new mining activity | | | About fate of existing mines | | | |
| | Yes | No | Don't know | Expand | Freeze Capacity | Close | Don't know |
| Cluster I | 33 | 41 | 26 | 40 | 42 | 13 | 8 |
| Cluster II | 33 | 34 | 33 | 45 | 24 | 11 | 16 |
| Cluster III | 36 | 28 | 36 | 47 | 40 | 3 | 10 |
| Cluster IV | 5 | 35 | 60 | 7 | 88 | 5 | 0 |

Source: Household survey (TERI 1997) (Mineral production at 17 million tonnes)

## 17.4 Recommendations

### Recommendation 1: Exclusion of mining from ecologically sensitive areas/zones

- No mining should be allowed in the Western Ghats in Goa in:
  - Current protected areas, i.e., national parks and wild life sanctuaries as per current Supreme Court orders and wildlife Act 1972 provisions
  - In regions of high sensitivity, ESZ1, as being demarcated by the WGEEP.
  - All Environmental Clearances for mines in these areas should have an additional conditionality requiring (i) 25% reduction in mining every year till 2016, when mining has to be stopped in ESZ1 (ii) environmental rehabilitation of the mined area post closure.
- In EZ2, current mining may be allowed but no new mining licenses should be granted until the conditions in the mining region improve.

### Recommendation 2: Mineral Extraction Control

- Close all mines that have been extracting ore beyond limits allowed by environmental clearance given as evident from data available with WGEEP
- Introduce an iron ore content cut off for iron ore extraction that reflects environmental and social concerns.
- Cancel all working leases by 2016 and non-working leases immediately in ESZ1s.
- Mining leases in WL Sanctuaries to be permanently cancelled. While mines may be closed, the leases in Goa are still showing them as existing mines. Hence they must be terminated under section 4 of the MMDR Act. Any orders passed by the Collector and Revenue Officer excluding any of these mines from the Netravali Wildlife Sanctuary to be cancelled. This is also the recommendation of the Central Empowered Committee.
- Mining leases in the catchment area of dams used for drinking water to be terminated.

- Rules for Sand mining (Padmalal, 2011)
  - Sand mining to be audited; introduce sand mining holidays on stretches of rivers
  - Aggregate management should be considered separately from river management.
  - Separate legislations are required for the purpose
  - Examine and encourage alternatives to river sand for construction purposes
  - Necessary steps are to be taken to promote regeneration of natural riparian vegetation in areas hit by anthropogenic interferences along the river and tributary banks.
  - The developmental and infrastructural activities in the riparian areas should be carried out only after proper Environmental Impact Assessments by a competent authority.
- For mining in Goa, cumulative EIAs must be made mandatory rather than entertaining EIAs for individual leases in the same areas.

Other recommendations regarding regulation of conjunctive productions of minerals and ground water, regeneration of agriculture, better practices in mining, etc are discussed in Part II of the WGEEP Report.

# Appendices

## Appendix 1: Methodology employed in generating and interpreting the Western Ghats Database and assigning ESZs

The following datasets were used for geospatial analyses.

1. *Data Sets:*

    1. Western Ghats boundary (shape file) obtained from Dr. Ganeshaiah, Member, WGEEP
    2. India states, districts, talukas (shape file ) source : DIVA-GIS (http://www.diva-gis.org/)
    3. Shuttle Radar Topographic Mission (SRTM) data for India (TIFF) at 90 m resolution.
    4. Data on endemic plants, IUCN Red list Mammals, percent forest, unique evergreen elements, forest with low edge: (from Das et al., 2006) 25k grid (shape file)
    5. Forest types of India (TIFF)
    6. Protected Areas of Western Ghats Cover (shape file) Source: FERAL
    7. Elephant Corridors of Western Ghats Cover (shape file) Source: Prof R Sukumar, CES, and WTI.
    8. Endemic vertebrate data of Western Ghats Cover (Spread sheet) Source: Ranjit Daniels
    9. Endemic Odonata data of Western Ghats Cover (shape file) Source: ZSI
    10. Enhanced vegetation index of MODIS for North Maharashtra and Gujarat
    11. Riparian Forests derived through drainage and forest cover
    12. Important Bird Areas (IBAs) as point coverages

Of these, data sets 1–5 and 8–12 were used for the geospatial analyses. For North Maharashtra and Gujarat, Enhanced Vegetation Index (EVI) of MODIS was used as the forest vegetation data were not readily available.

*Use of Free and Open Source Software:*

Free and Open source geospatial tools (www.osgeo.org) were extensively used as given below

**Desktop GIS**: Open jump, QGIS, SAGA, DIVA-GIS

**Database**: PostgreSQL/ PostGIS

**Web GIS**: OpenGeo Suite which is a complete web platform based upon Open Geospatial Standards (OGC) which includes GeoServer (GIS Server), PostgreSQL/PostGIS(Database), Geo Web Cache (Cache Engine), Geoexplorer (for Visualization of WMS layers), GeoEditor (Online editing geospatial data), and Styler (Online styling of the data).

A web enabled searchable database has been a major contribution of this short-term project. In addition, through UNICODE, local language adoption has been showcased using Marathi as an example.

In addition, using methods of spatial analyses on large landscape level data, an attempt was made to arrive at the relative importance of these seven attributes. This has been done using a programme called Spatial analyses in Macro Ecology (SAM) . However, this has been done only on a preliminary exploratory basis to showcase one possible way of reducing the dimensionality of the factors involved. Not much headway was made with this approach due to several operational constraints.

2. *Data Cleaning Process:*

   a. 5 minute x 5 minute grid file generation for Western Ghats Cover (shape file) using Vector Grid plugin of QGIS

   b. 1 minute x 1 minute grid file generation for Western Ghats Cover of Goa state (shape file) using **Vector Grid plugin** of QGIS

   c. Rasterization of each attribute of ATREE data by applying Surface method using **Rasterize (Vector to Raster) plugin** of QGIS

   d. Generated slope map in TIFF format using GDAL library

   e. Generated shape files for following classes in Endemic Vertebrate data (Ranjit Daniels, 2011)

      - Amphibians
      - Birds
      - Reptiles
      - Fish
      - Endemic Odonata (ZSI, 2011)

3. *Uploading datasets into database:*

All the available and generated datasets were uploaded to the PostgreSQL/PostGIS database using QGIS as below. The vector datasets were uploaded to the database using the **SPIT plugin** of QGIS while raster datasets were uploaded using **Load Raster to PostGIS plugin** of QGIS. In case of Raster dataset, the data was stored into 64 x 64 blocks.

4. *Vector/Raster analysis using PG Raster of PostGIS*

   a. Vector/Raster analysis was done for elevation values from SRTM data using WKT Raster Queries. Following is the sample query for it.

Sample Query:

Create table <table name> as SELECT e.id,test.val, ST_Intersection(test.geom, e.geometry) AS gv FROM (SELECT (ST_DumpAsPolygons(ST_SetBandNodataValue(rast, 0))).geom, (ST_DumpAsPolygons(ST_SetBandNodataValue(rast, 0))).val FROM <Raster_table_name>) as test, <Grid_table_name> as e WHERE ST_Intersects(test.geom, e.geometry);

5. *Grouping and averaging of pixel values based upon grids*

Thereafter, average elevation values were calculated for each 5' x 5' grid for each state in the Western Ghats and considered as a parameter.

The steps 4–5 were performed for parameters such as maximum slope values, endemic plants, iucn max, unique percent, comp3 percent, forest percent values, area of riparian

forest (see explanation of parameter below) for each 5' x 5' grid for each state in the Western Ghats Cover.

*6. Ranking the parameters generated*

Assigned ranks for the following 8 parameters

a. **Endemic plants** : Number of endemic plant species
b. **IUCN_max**: Number of IUCN Red listed mammal species
c. **Unique percent**: Percentage of area covered by unique evergreen ecosystems
d. **Comp3 percent** : Percentage of area covered by relatively undisturbed forest with low edge
e. **Forest percent**: Percentage of forest area
f. Elevation
g. Slope
h. Riparian Forests/Vegetation

As there is an ecological gradient from north to south in the Western Ghats with changes in diversity and species richness as well as physical features, a normalization for every state was done for these parameters. Thus, scores were normalized for each state. For instance, the highest recorded altitude in a given grid in a state was given the maximal score and all other grids in that state were ranked in relative fashion. After normalization ranks were assigned on a scale from 1 to 10 based on the maximum value of each parameter for each state.

*7. Average of the ranks for all parameters*

Subsequent to the rank generation, the average of the ranks for all parameters were calculated. If, for a grid, there is data for only for 5 parameters out of 8 parameters, then dividing the sum by the number of parameters assessed took care of the problem of data available for variable numbers of parameters per grid.

8. *ESZ assignment algorithm*

1. We treat Western Ghats regions of each state separately
    a. Existing Protected Areas are treated as a fourth separate category
    b. ESZ1, ESZ2 and ESZ3 status are assigned only to grids outside existing Protected Areas
    c. ESZ1 status are assigned only to such grids as have a score at least equalling, or higher than the lowest scoring grids falling within existing Protected Areas
    d. The extent of existing Protected Areas plus ESZ1will not normally exceed 60% of the total area
    e. The extent of ESZ3 will normally be around 25% of the total area

With these stipulations, we adopt the following procedure:

Let *p* be the percentage of area falling under existing Protected Areas

Let $x$ be the percentage of area assigned to ESZ1

Let $y$ be the percentage of area assigned to ESZ2

Let $z$ be the percentage of area assigned to ESZ3

Obviously, $p+x+y+z = 100$

Now, we can visualize three scenarios in terms of value of $p$; [1] $p>75$, [2] $60<p<75$, and [3] $p<60$. Normally $p<60$ will hold, but logically we must allow for the first two as well.

[1] $p>75$: In this case, all areas outside existing Protected Areas will be assigned to ESZ3. No grids will be assigned to ESZ1 or ESZ2, as existing Protected Areas themselves exceed 75% of the region. x=0, y=0, z= (100–p);

so that $x+y+z+p$= 0+0+(100–p)+p=100

[2] $60<p<75$: In this case, we will assign the lowest scoring 25% of grids to ESZ3 and the balance grids to ESZ2. No grids will be assigned to ESZ1, as existing Protected Areas themselves exceed 60% of the region. Then, x=0, y=(75–p), z=25 leading to

$x+y+z+p$= 0+(75–$p$)+25+$p$=100

[3a] $p<60$: This will be the normal case. In this case, we will assign the lowest scoring 25% of grids to ESZ3. The balance of (75–$p$) has to be assigned to ESZ1 and ESZ2 such that $p$+ESZ1=60. Since we accept that existing Protected Areas and ESZ1 should not exceed 60%, we have to assign all of the top scoring 60% grids that are outside existing Protected Areas to ESZ1, provided that the lowest score amongst these at least equals or is higher than the lowest score of the grids falling within existing Protected Areas.

So, in this scenario of $60<p<75$; x=(60–$p$), y=15, z=25, and

$x+y+z+p$= (60–$p$)+15+25+$p$=100.

[3b] One more special case, has to be considered for this scenario of $p<60$, namely that equating the lowest score of the grids falling within existing Protected Areas to the lowest score of the grids assigned to ESZ1 does not assign enough grids to ESZ1, so that ($p$+x)<60. In that case, the balance of the top scoring 75% grids that are outside existing Protected Areas, and grids assigned to ESZ1, will be assigned to ESZ2. So, y=75–($p$+x), and will be more than 15%.

Again, $x+y+z+p$= $x$+75–($p$+$x$)+25+$p$=100

[4] An additional, score assignment device has been introduced. When we want to select some specific percentage of grids, say, lowest 25%, setting the threshold to a specific integral score may not yield the desired result. Then, we rank the parameters used to generate the scores in the order of their importance, and rework the scores by ignoring the least important parameters till roughly the desired percentage, say between 22 to 28, is reached.

To make administration easy, the ESZ are extrapolated and reported for talukas. The assigned ESZ level to the taluka is the ESZ that covers the largest fraction of the taluka.

In the case of Goa, because of its size and the use of 1 minute x 1 minute grids, ESZs are not reported for whole talukas, but by grids within talukas.

The method is illustrated for Goa:

a. A WG database for Goa is prepared as discussed above

b. The parameters are ranked on a 1-10 scale, with lowest at 1 and highest ecological significance at 10

c. Composite scores – average for each grid- are calculated

d. For arriving at ESZs, the grid scores were treated thus:

- All grids having PAs are excluded for arriving at the ESZ1. Since these grids also have scores, a guiding strategy for demarcation of ESZ1 is the range of scores for PAs of a given state. Thus the average minimum threshold for Goa PAs is 4.92. Hence all grids having a score of above 4.92 get assigned to ESZ1.Thus 11 grids out of a total of 55 grids make the cut (20%). The grids with PAs are 21 in number and account for 38% of the total grids. ESZ1 and PAs together constitute 58%.
- the lowest quartile (approx. 25%) of these scores for grids was computed. For Goa , this score is 3.14 which means all grids below this core are assigned to ESZ 3. For Goa there are 12 grids under ESZ3 , which constitute about 22% of the area.
- The balance of grids are assigned to ESZ2. These are 11 in number (20%, a deviation of 5% from the suggested 15% of area).

*9. Outputs*

The results obtained are presented as

a. A spatial depiction of ESZs grid-wise as well as taluka-wise and displayed on a colour palette , with Green showing ESZ1, Red showing ESZ2 and yellow showing ESZ3.

b. Percent grids for a given score for each state both in a tabular and graphical notation

c. Riparian forest scores for each state and in different elevation zones

d. 1' x 1' grid analysis for Goa to incorporate the results of the Goa Regional plan

e. A Web GIS application

*10. Information and Data Sources*

a. Habitat related information in the form of shape files for parts of Mahrashtra, Karnataka, Kerala and Tamil Nadu: Mr Kiran , Arundhati Das, V Srinivasan and Dr Jagdish Krishnaswamy of ATREE Additional data from Ravindra Bhalla of FERAL and Bhaskar Acharya of CEPF

b. Dr RJR Daniels of Care Earth: point locations of mammals, reptiles, birds, amphibians and fishes

c. Dr K A Subramanian , ZSI: point locations of Odonata

d. Prof R Sukumar: information on elephant corridors

e. Dr K N Ganeshiah: Western Ghats boundary

f. Dr P S Roy, Director, Indian Institute of Remote sensing, Dehra Dun: habitat information and shape files for Gujarat and Maharashtra

g. Dr Bharucha and Shamita from BVIEER, Pune: data on parts of Maharashtra

h. Dr K S Rajan , Open Source Geospatial Foundation – India chapter and IIIT, Hyderabad : geospatial statistical analyses

i. Dr P V K Nair, KFRI: assistance in analyses for Kerala

j. Santosh Gaikwad, Siva Krishna, Ravi Kumar, Ch.Appalachari, Sai Prasad of SACON: GIS work.

# Appendix 2: Proposed assignment of various Western Ghats Talukas to ESZ1, ESZ2 and ESZ3

| State | District | Talukas assigned to ESZ1 | Talukas assigned to ESZ2 | Talukas assigned to ESZ3 |
|---|---|---|---|---|
| Gujarat | The Dangs | Ahwa | | |
| | Navsari | | Vansada | |
| | Valsad | | | Dharampur |
| Karnataka | Belgaum | | | Belgaum, Khanapur |
| | Chamrajnagar | Kollegal,Gundlupet, Yelandur | | |
| | Chikmagalur | Narasimharajapura, Tarikere, Mudigere, Koppa, Sringeri | Chikmagalur | Kadur |
| | Dakshin Kannad | Beltangadi, Sulya | | Puttur |
| | Davanagere | | | Bhadravati |
| | Hassan | Sakleshpur | | Holenarsipur, Belur, Alur, Arkalgud |
| | Kodagu | Somvarpet, Virarajendrapet, Madikeri | | |
| | Mysore | Heggadadevankote | Piriyapatna | Hunsur |
| | Shimoga | Tirthalli, Hosanagara | Sagar, Shimoga | Sorab |
| | Udupi | Karkal | | Kundapura |
| | Uttar Kannada | Honavar, Bhatkal, Sirsi, Siddapur, Ankola, Karwar, Yellapur, Supa | Kumta | |
| Kerala | Idukki | Todupulai, Udumbanchola, Devikolam, Pirmed | | |
| | Kannur | Tellicherry | | |
| | Kasaragod | | | Hosdurg |
| | Kollam | Punalur | | Kottarakara |
| | Kottayam | | Kanjirapalli | Pala (Lalam) |
| | Kozhikode | | | Mahe |

| State | District | Talukas assigned to ESZ1 | Talukas assigned to ESZ2 | Talukas assigned to ESZ3 |
|---|---|---|---|---|
| | Malappuram | | | Malappuram |
| | Palakkad | Mannarkkad, Chittur | | Alattur |
| | Pattanamtitta | Rani, n.a. ( 2275) | | Mallapalli |
| | Thiruvananthapuram | Nedumangad | | |
| | Thrissur | Irinjalakuda | Trichur | Vadakkancheri |
| | Wayanad | Vayittiri, Manantavadi, Sultans Battery | | |
| Maharashtra | Ahmednagar | | Parner | Akola |
| | Kolhapur | Radhanagari, Gargoti, Shahuwadi, Panhala, Bavda | | Ajra, Chandgad, Gadhinglaj |
| | Nandurbar | | | Navapur |
| | Nashik | Nashik, Peint, Dindori | Surgana | Igatpuri |
| | Pune | Ghod, Paud, Bhor, Wadgaon | | Junnar, Sasvad |
| | Raigarh | Mhasla, Pali, Poladpur, Roha, n.a. ( 1657), Pen, Mahad, n.a. ( 1634) | | Mangaon, n.a. ( 1572) |
| | Ratnagiri | Devrukh, Chiplun | Mandangarh | Khed |
| | Satara | Medha, Patan, Mahabaleshwar, Wai | Koregaon | Vaduj, Dahivadi |
| | Sindhudurg | Kankauli, Savantvadi | | |
| | Thane | Murbad, Mokhada, n.a. ( 1482), Jawhar | | Shahapur |
| Tamil Nadu* | Coimbatore | Pollachi, Udumalaippettai | | |
| | Dindigul | Kodaikkanal | | Dindigul |
| | Erode | | Satyamangalam | |
| | Nilgiris | Udagamandalam, Gudalur, Kotagiri | Coonoor | |
| | Theni | Uttamapalaiyam | | Periyakulam |

| State | District | Talukas assigned to ESZ1 | Talukas assigned to ESZ2 | Talukas assigned to ESZ3 |
|---|---|---|---|---|
| | Tirunelveli Kattabo | Sengottai, Ambasamudram | | |

*The list of talukas within the Western Ghats in Tamil Nadu according to more recent information of reorganized administrative units is as follows (the assignment of these new talukas to ESZs has yet to be done) :

Coimbatore district (Coimbatore North, Coimbatore South, Mettupalayam, Pollachi, and Valparai talukas)

Dindugal district (Kodaikanal, Nilakotai, and Palani talukas)

Erode district (Satyamangalam taluka)

Kanyakumari district (Kalkulam, and Vilvankode talukas)

The Nilgiris district (Coonoor, Gudalur, Kotagiri, Kundah, Panthalur, and Udhagamandalam talukas)

Tirunelveli district (Ambasamudram, Nanguneri, Radhapuram, Shenkottai, Sivagiri, Thenkasi, and Veerakeralamputhur talukas)

Tiruppur district (Udumalpet taluka)

Theni district (Andipatti, Bodinayakanur, Periyakulam, and Uthampalayam talukas)

Virudunagar district (Rajapalayam and Srivilliputhur talukas)

# Appendix 3: Proposed ESZ1, and ESZ2 assignment of various Western Ghats talukas for which less than 50% area is within the Western Ghats boundary

| State | District | Talukas with areas assigned to ESZ1 | Talukas with areas assigned to ESZ2 |
|---|---|---|---|
| Dadra and Nagar Haveli | Dadra and Nagar Haveli | | Silvassa |
| Gujarat | Navsari | | Chikhli |
| | Surat | | Uchchhal, Vyara, Songadh |
| | Belgaum | | Gokak, Hukeri |
| | Mysore | | Mysore, Krishnarajanagara |
| | Hassan | | Hassan, Arsikere, Channarayapatna |
| | Shimoga | | Shikarpur |
| | Haveri | | Hangal |
| | Chitradurga | | Hosdurga, Holalkere |
| | Dharwad | | Kalghatgi |
| | Uttara Kannanda | Haliyal | Haliyal, Mundgod |
| | Belgaum | | Bail Hongal |
| | Davanagere | | Honnali, Channagiri |
| | Udupi | | Udupi |
| | Chamrajnagar | | Chamrajnagar |
| Kerala | Kottayam | | Changanacheri |
| | Ernakulam | | Perumbavur, Alwaye, Kotamangalam, Muvattupula |
| | Palakkad | Palghat | Palghat, Ottappalam |
| | Malappuram | | Perintalmanna, Tirur |
| | Kozhikode | Kozhikode | Quilandi, Kozhikode |
| | Kannur | | Talipparamba |
| | Kasaragod | | Kasaragod |
| | Thiruvananthapuram | | Trivandrum, Chirayinkil |

| State | District | Talukas with areas assigned to ESZ1 | Talukas with areas assigned to ESZ2 |
|---|---|---|---|
| | Kollam | | Quilon |
| Maharashtra | Nashik | Kalvan, Chandvad, Sinnar | Chandvad, Sinnar, Satana |
| | Sindhudurg | Kudal, Vaibhavwadi | |
| | Sangli | Shirala | Atpadi, Kavathe Mahankal, Tasgaon, Vite |
| | Thane | | Bhiwandi |
| | Dhule | | Sakri |
| | Ratnagiri | | Dapoli, Guhagar |
| | Solapur | | Malsiras, Sangole |
| | Pune | Rajgurunagar, n.a. ( 1612) | Rajgurunagar, n.a. ( 1612), Shirur |
| | Kolhapur | | Kagal |
| | Ahmednagar | Sangamner | Sangamner, Ahmadnagar |
| | Satara | | Karad, Shirwal, Phaltan, Satara |
| Tamil Nadu | See Appendix 2 footnote for list of talukas under the recent reorganization. These have not been assigned ESZ at this stage. | | |

# Appendix 4 : *Current Science* Paper

## Mapping Ecologically Significant and Sensitive Areas of Western Ghats: Proposed Protocols and Methodology

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**Abstract:**

One of the objectives assigned for the Western Ghats Ecology Expert Panel (WGEEP) of the Ministry of Environment and Forestry, GOI, was to identify the Ecologically Sensitive Areas (ESAs) along Western Ghats, and thence to suggest regulatory procedures to conserve them. However the panel came to realize that globally there is no consensus either on the criteria to define ESAs or, on an adaptable methodology to identify them. Therefore defining and developing a methodology became an important first step before the panel could map the ESAs. This paper reports the outcome of a series of discussions and consultations held by the panel for a consensus on defining and mapping ESAs. The purpose of this paper is two folded: first, to invoke discussion and suggestions from a wider section of experts, on the conceptual and methodological details arrived at by the WGEEP; second to promote the methodology as a generic procedure for mapping ESAs in other significant bio-rich areas within and outside the country.

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Ecologically Sensitive Area (ESA) is a concept more easily perceived than perhaps defined. Just as the term `biodiversity', ESA is among the most widely used terms with no unequivocally accepted definition. In fact ESA is often referred synonymous to, Environmentally Sensitive Areas[1-5], Environmentally Sensitive Zones[6], Ecologically Sensitive Ecosystem[7], Ecologically Sensitive Sites[8] etc., depending upon the context and the area or location that is being referred to, for conservation. In most of these situations the terms used are without any specific definition or with variable meanings (see table 1 ). And for the same reason it is possible only to enlist a set of criteria that characterise the ESAs, all of which, though, may not be applicable to all the situations. One such criterion is that ESAs are expected to have least resilience to disturbance and hence are difficult to be recovered or restored if perturbed by external influences.

Western Ghats Ecology Expert Panel (WGEEP), set up by the Ministry of Environment of Forestry, GOI was assigned the task identifying such sensitive areas. However, the panel found that world over a number of features are being used for identifying the ESAs in different contexts. In fact some of these refer more to the significance of the area- either ecological, or economical, than merely to its resilience (table 1). Given the fact that the eventual purpose of identifying ESAs is to ensure conservation of sites that are important, it is perhaps imperative to consider features that define the ecological and economic values as well along with the resilience of an area while identifying the ESAs. Therefore, following a country-wide consultancy among the experts and the interested stake holders, WGEEP attempted to re-evaluate the concept of ESAs, redefine the concept if possible and develop a consensus protocol for mapping the ESAs along Western Ghats. In this paper we outline the conceptual basis and details of protocols arrived at, through a series of discussions by the WGEEP for mapping the ESAs for Western Ghats. We hope that a generalized form of these protocols could be used for other biorich areas as well within and outside the country.

**A working definition of ESA:**

While there does not exist an unequivocally accepted definition, McMillan Dictionary[9] defines environmentally sensitive area as *an area where the natural environment can easily be harmed*. Accordingly, for the present purpose though, it may be convenient to define Ecologically Sensitive Areas as those *ecological units that may be easily affected or harmed*, we wish to refrain from offering a specific definition. Nevertheless, for operational purposes, we wish to refer to ESAs as those areas *that are ecologically and economically very important, but, vulnerable to even mild disturbances and hence demand conservation*. We refer to *`ecologically and economically important'* areas as those that are biologically and ecologically `rich' `valuable' and, or `unique' and are hence irreplaceable if destroyed. Further, by the virtue of them being biologically rich, they could be potentially of high value to the human societies, help in maintaining the ecological stability of the area, and important in conserving biological diversity. Similarly, their `uniqueness' may be recognised either by the rarity of the living systems they harbour that are difficult to replace if lost, or by the uniqueness of the services they offer to human society. Their `vulnerability' could be determined by their physiographic features that are prone to erosion or degradation under human and other influences such as erratic climate. Several earlier attempts to define ESAs have also suggested these components as important (see table 1) directly or indirectly.

**Do we need a different Terminology?**

Clearly, as being practiced or being suggested world over for demarcating them, ESAs are not merely sensitive areas but are also Ecologically Significant Areas. They are significant for their biological value, ecological value, economic value, cultural and historical (both biological and anthropological) values and also significant because they are sensitive to external and natural pressures. Therefore they need to be conserved though with graded levels of protection depending upon their intrinsic value and extent of resilience. In other words there appears to be a consensus, at least in practice and by suggestions, that the ESAs shall not be merely ecologically sensitive areas but are also biologically and ecologically significant areas. Given the fact that Ecological Significance is a much wider and more inclusive term than the specific Ecological Sensitivity, we propose to use the term Ecologically Significant Areas in lieu of Ecologically Sensitive Areas (but retain the abbreviation as ESA). Thus in the ensuing pages we use ESAs in this sense and not to refer merely to ecologically sensitive areas.

**Why ESAs?**

In India, there are a good set of conservation sites such as biosphere reserves, national parks and wild-life sanctuaries that constitute an effective network of protected areas for conserving biological diversity and natural habitats[10,11] . All these are large forested areas identified for conservation because they harbour high levels of biological diversity or, flagship species or, unique landscape elements. However excepting in certain cases such as the handful of bio-sphere reserves, the demarcation of the areas for these conservation programs was not based on any scientific data or on a large scale consultation involving diverse stake holders. Rather, more often they have been identified either on the basis of the wisdom of the forest managers and, or, on the basis of a historical contingents (eg., the royal hunting grounds, historically known places for certain species such as lions, buffers of reservoirs etc.,). Nevertheless the demarcated areas have been remarkably effective in attaining the goals of the conservation programs in the post independent period[10,11] notwithstanding the repeated conflicts emerging between the native residents and the managers in several areas, and, distinct lacunae identified in some areas for effective conservation of the focal species (such as the lack of most essential corridors between certain PAs for large animals such as elephants[12] etc.,

Against the background of such effectiveness of the existing network of conservations sites, an obvious question would be why do we need ESAs? While the existing network of conservation sites have been wonderfully effective, there are several unforeseen consequences as given below, that have biased our emphasis, and our attitude in the conservation efforts. We opine that these biases could be corrected by extending the existing conservation networks and we argue that the approach taken through ESAs could address such problems and complement the existing programs.

**Asymmetry in conservation efforts:** While national parks, wildlife sanctuaries, and biosphere reserves are important and effective in conservation, their establishment has led to a complacency in our attitude towards other un-recognised but equally important areas. A host of unique habitats[13] (such a Myristica swamps, floral plateaus of north Western Ghats, sholas of high altitude), lesser charismatic species (such as the endangered plants, lesser visible but threatened insects etc.,) and newly emerging hotter -spots (eg., `hot-specks' such as certain water bodies with unusually high concentration of diversity, water seepages that teem with insect, plant and other animal life but are vulnerable to desiccation etc., as suggested by Dr P T Cherian; personal comunication ) are lacking the required attention

from the existing conservation programs. Identification of such unique habitats and micro-niches of species require special efforts and the approach of ESA would at least partly address this problem.

**The neglect of small and beautiful:** There are a number of smaller units of the wilderness, that are significant for their historical, cultural and social relevance and hence deserve to be conserved (example limestone outcrops at Yana in Karnataka). Unfortunately, they can not be conserved via the existing network of conservation sites because they are smaller in size, or biologically poor or lack of charismatic wildlife etc., There are of course new conservation approaches emerging such as the identification of biodiversity heritage sites, conservation reserves etc., For instance, as per the provision provided in Wildlife (Protection) Act 1972 even small areas such as tree groves, traditionally venerated by local human communities can be conserved; there are also instances of such efforts as for example of the kind established by the TN Forest Department along the banks of the Tambaraparani river close to KMTR in Tirunelveli. However The ESA-approach proposed here attempts to encompass all these along with a host of areas of conservation interest that are otherwise neglected.

**Non-valuation of invisible services:** There are several areas that do not fall under the existing network of conservation, but offer a range of tangible and often invisible services to the communities. These services that have generally gone unnoticed require immediate conservation. For instance, vast areas of grass lands, not so rich in biodiversity could be serving as catchment areas for important rivers that provide agricultural- and food- stability to people far off in the downstream. A small patch of land in the form of sacred grove could be offering the most important medicinal plants used regularly by the communities depending on it. Areas that provide such invisible services may be important for locals communities dependent on them and hence could be considered as important components of ecologically significant areas.

**Need for variable management strategies:** Protected Area networks are rigid with respect to their management and the local dependents have least role in utilizing, managing and conserving them. Considering the formidable costs involved in expanding the PA network and the general lack of wilderness outside the domain of human societies it would be more practical to think of alternate ways of a variable management system. Several of the areas of conservation significance may be managed by variable regulations with a consensus on its utilization and sustenance/management. In other words we need a network of conservation sites that have variable and perhaps even flexible management strategies. As would be shown below ESAs can be identified with such flexible system of management. In fact there could be ESAs with PAs embedded within them with an adaptive regime of regulation.

Thus there is a need to expand the scope of the existing process of identifying the areas for conservation. Ecologically Significant Areas (ESAs) as proposed here aim at attaining this much more comprehensively than focusing merely on the biodiversity richness, or on ecologically sensitive areas. It takes a more general complementary (than being competing) approach for identifying conservation sites.

**Demarcating the ESAs**

**A. Criteria for Demarcating ESAs**

As discussed above, there are three important attributes that need to be considered in defining the ecological significance or sensitivity of an area: the physico-climatic features (geo-climatic features), the biological features and the social relevance (including their

cultural, economic and historical importance) of the area. All these can be grouped under a) abiotic attributes, b) biotic attributes and c) anthropological or socio-cultural attributes. Such attributes are suggested and used by other workers also[4] . But as yet we do not find any structured protocol for using these attributes to arrive at ESAs. We propose below a set of these attributes with the criteria to be used for each of them and then provide a methodological process to combine and use these criteria in demarcating ESA especially for a large area such as Western Ghats.

**1. Biological attributes**: We propose that demarcation of an ESA shall consider the following components of biological and cultural uniqueness and richness :

**a. Biodiversity richness**: Richness in diversity at all taxonomic groups and hierarchies.

**b. Species Rarity**- Rarity of population size, distribution and also rarity in taxonomic representation.

**c. Habitat Richness**: Spatial heterogeneity of Landscape elements

**d. Productivity:** Total biomass productivity

**e. Estimate of biological/ecological resilience:** Representation of the plesio-vegetation

**f. Cultural and Historical Significance:** Evolutionary- historical value and cultural-historical value of the area

**2. Geo-climatic layers attributes:** These include the range of layers that assess the innate or natural vulnerability of the area. Obviously features such as slope, aspect, altitude, precipitation etc shall be used under the following two component attributes:

**a. Topographic Features**: Slope, altitude, aspect etc.,

**b. Climatic Features:** Precipitation, number of wet days etc.,.

**c. Hazard vulnerability:** Natural hazards such as landslides and fires.

**3. Stake Holders Valuation:** It is important to invite the opinion of the public and local bodies especially the Zilla Panchayats, village level political bodies and also other civil societies to enlist the areas that they feel ecologically and environmentally sensitive and use these as important attributes.

**B. Methodology to demarcate ESAs**

**i. Grid the study area:** Most often ESAs are discussed and debated with a focus on individual landscape elements, specific sites, localities, and habitats. This has obviously bought in a lot of ad-hocism in to the process of recognising the ESA. But we propose that an exercise to identify ESAs is preferably taken up for a vast area (landscapes) using a common set of criteria and by adopting a uniform, replicable methodology. Accordingly, we propose here one such protocol for mapping ESAs of the Western-Ghats (Figure 1). However the methodology proposed here can be generalized for other similar bio-rich areas as well.

ii. Since it is difficult to decide in advance the exact size of the ESAs, we propose that the area in question could be divided in to grids of suitable size, depending upon the datasets available and vastness of the area. In case of Western Ghats we propose a 5′ X 5′ grids because most of the data sets available complement well at this scale .

**iii. Valuing Grids for their ecological sensitivity:** Data and information could be obtained for the entire Western Ghats on each of the criterion listed and maps depicting the three attributes are developed as below:

**1. Biological and cultural Layer:**

a. Species Biological Richness: Areas that harbour high levels of biological diversity shall be considered as important ESAs than those that are less diverse and the diversity could be measured preferably using the Avalanche Index[14,15] that integrates diversity at all levels of taxonomic hierarchy. Further in this particular situation, these values could to be normalized from the lowest (1) to the highest (10) values of biological diversity and each grid shall then be attached with the normalized value corresponding to its level of biodiversity.

**b. Rarity of species :**

i. Distributional Rarity: Areas that contain the rarest of the species are to be considered more important because the loss of these species is irreversible. For this, the rarity of each species needs to be defined quantitatively as the proportion of the total grids occupied by it (Pi) and for each grid these rarity values are summed over all the species in that grid. Accordingly, the rarity of species can range from 1/ N for those that occur in only one of the total N grids to 1.00 for those that occur in all the grids. These rarity values of the species are then summed over all the species (S) for each grid to arrive at a Rarity Value for each grid. It is important to consider only the naturalized species to avoid the recently introduced invaders. The Rarity Value of a grid (RVg) is given by

$$RVg = \sum_{i=1}^{S} (Pi)$$

Further these RVg values shall be normalized again from 1 (lowest ) to 10 (highest) and assigned to the grids. Such quantification is fortunately possible now owing to the datasets accumulated on the distribution of species for several bio-rich areas.

**ii. Taxonomic rarity:** Using the taxonomic hierarchy from the datasets available[16] taxonomically (and hence probably evolutionarily) rare species shall be identified as the families that contain only one monotypic genus. Such families are counted for each grid and normalized between 1 to 10.

c. Habitat Richness: Habitat heterogeneity is well known to be correlated to the diversity of a range of organisms especially of animals including aquatic fishes[17,18]. Therefore, in the absence of data on a wide range of animals, we propose that grids that contain high levels of habitat heterogeneity or landscape heterogeneity shall be regarded as biologically rich and hence as ESAs. Habitat heterogeneity is possible to be quantified for large areas such as Western Ghats as fine resolution remote sense data sets are now available. The habitat richness of a grid (HRg)can be computed using Simpson Index where the species are replaced by the landscape types and the frequency of the species by the proportion of the area occupied by the landscape types as given below:

$$\mathbf{HRg = \sum_{i=1}^{L} (Pi)^2}$$

where Pi is the proportion of the area of the ith landscape element and L, the number of elements in the grid.

These values are then normalized from 1 to 10 and assigned to grids.

d. Productivity : It has been demonstrated that productivity of an area, as represented by the cumulative greenness or NDVI over the year is a good surrogate for the vegetation diversity[19,20]. Since this index captures the extent primary productivity that sustains life, it can also be used as a surrogate for diversity of a host of organisms for which data sets are not available. Here again the cumulative NDVI over the year is attached for each grid and normalized to range from 1 to 10. We understand that this parameter may underestimate the importance of certain habitats such as grass lands, and overestimate for others such as evergreen forests, we also realize that there are a number of possible ways of using NDVI to circumvent these biases. But given that we have other attributes that capture the importance of such habitats, we wish to restrict to the cumulative values of NDVI as it does represent the base productivity for the life to sustain.

**e. Estimate of biological /ecological resilience**: The extent of deviations in the biological composition (plant composition) of an area from its original plesio-climax composition would reflect the resilience of the system over large time scale; those that have deviated more from the original composition can be considered to be least resilient and hence are ecologically highly sensitive. For this we propose to estimate the proportion of the existing vegetation that reflects the plesio-climax as an index of resilience[21,22] . These proportions are assigned to all the grids and then normalized to range from 1 (highest deviations) to 10 (least deviations).

**f. Cultural Significance:** Areas that harbour historical relics and cultural diversity also shall be considered important as ESAs. While there is no easy way to value the cultural significance, we suggest that the oldest of the relics shall get the highest value (10) and the most recent the low value (1); if there are no relics the grid gets zero value.

**2. Geo-climatic layers**:

**a. Topographic Features:** Areas with steep slopes and high altitudes are likely to be eroded more easily, and hence vulnerable to natural erosion. Obviously such areas need to be considered as least resilient and hence environmentally sensitive zones areas. We suggest that the slopes, and altitudes can be normalized within each grid from 1 (least average slope or lowest average altitude) to 10 (high slope and high altitude) and assigned to the grids (see Figure 2 and 3 as examples).

**b. Climatic Features:** Areas with high rain fall, and with a narrow window of wet or rainy season (actual length of dry season or number of rainy days in conjunction with total annual precipitation; rainfall in excess of 3000mm and dry season that exceeds 6 months have made landscapes the most vulnerable/least resilient; Pascal, 1988) are most vulnerable of erosion and hence needs to be considered environmentally sensitive. Accordingly these are normalized within each from 1 (low rain fall or highest number of rainy days) to 10 (highest rain fall or least number of rainy days) and assigned to grids.

**c. Hazard vulnerability:** Available data on natural hazards such as avalanches and fires shall be obtained wherever possible and attached to the grids, and normalized from 1 to 10.

**3. Stake Holders Valuation:** WGEEP has been having local consultations, public hearing and is also getting responses from wide section of civil societies (through the website www.westernghstsindia.org) for their inputs on the ESAs. Similar opinions shall be invited

from public and local bodies. Too often these would not be having the exact boundaries and hence they would be assigned to grids. These area then normalized from 1 to 10.

**Grading the ESAs:**

There could be no immediate consensus on how to weigh each of these attributes but one simple way (but obviously un acceptable to all) would be to weigh the three criteria (Abiotic, Biotic and Socio-cultural) equally. We wish to continue such a process with the hope that once the results are out, there could be further discussions, re-valuation and revision of the ESAs. However for the time being we propose that all the three attributes viz., biological, geo-climatic and public perception are developed and graded as given in the table -1 below. Each of them is divided into three categories based on the importance of the biological component, environmental sensitivity and valuation by the public and are ranked accordingly. These attributes are later overlaid as shown in table 2. The biological and geo-climatic layers are first combined and the public perception layer is overlaid on this to arrive at the different grades of ESAs (see table 2).

Once the grids are assigned with these grades/ranks, areas for demarcating ESAs are identified as set of consecutive grids with similar grading/ranking. However the more fine scale borders of the ESAs can be developed with local inputs from the forest managers and the stake holders before they are legally declared as ESAs.

**Conclusions:**

We are aware that the protocol and methodology provided here for mapping ESAs can not be final and may not be directly adaptable without further discussions. However it is our hope that responses from a wider section of experts and the consequent discussions help significantly towards developing a more generic methodology on which there could be more consensus. In the meanwhile, however WGEEP has been compiling the datasets required for the purpose for mapping the ESAs along Western Ghats using these steps. Any constructive suggestions during the process would be highly appreciated.

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**Table 2. Suggested methodology to categorise and valuing the attribute layers**

| Sl No | Attributes | Category | Valuing |
|---|---|---|---|
| 1 | Biological | BHV (Biologically Highly Valued)<br>BMV (Biologically Modestly moderately Valued)<br>BLV (Biologically Less Valued) | 10<br>5<br>0 |
| 2 | Geo-climatic | EHS (Environmentally Geo-climatically Highly Sensitive)<br>EMS (Environmentally Geo-climatically Moderately Sensitive)<br>ELS (Environmentally Geo-climatically Less Sensitive ) | 10<br>5<br>0 |
| 3 | Public perception | VIPP (Very Important through Public Perception)<br>MIPP (Moderately Important through Public Perception)<br>LIPP (Less Important through Public Perception) | 10<br>5<br>0 |

**Table 3 Suggested methodology to combine the valued layers and grading the ESAs.**

| Combined Value from Layers 1 and 2 | Value from Public Perception | ESA Grade | Extent of protection |
|---|---|---|---|
| 10 -20 | 5-10 | Grade1 | Highly Protected with no activities inside |
| | 0-5 | Grade 2 | High protection with regulated activities |
| 0 -10 | 5-10 | Grade 3 | Regulated Protection |
| | 0-5 | Grade 4 | To be kept under watch |

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Table 1. Terminologies used and the attributes suggested to be used while identifying the ESAs.

| Term Used | Intrinsic Biological value | Intrinsic Ecological Service value | Intrinsic Economic Value | Intrinsic Socio-cultural Value | Intrinsic Sensitivity |
|---|---|---|---|---|---|
| Environmentally Sensitive Area[4] Or Ecologically Sensitive Ecosystems[7] Ecologically Sensitive Zone | Habitats, Plant Types Fishes reptiles birds, mammals<br><br>Biological Diversity Endangered species, Forests | Linkage Corridors Seismic areas,<br><br>Groundwater recharge, Public water supply areas, Habitats | Community needs, Economics,<br><br>Agricultural Land, Major settlements | Human history, land Use, Unique Farmlands, Prime farmlands Recreation areas Community organization Demographics. Torurist and religious places | Soils, Hydrology, Physography (slope elevation), Geology, Cliamate<br><br>Flood prone, Earthquake, |
| Desertification Sensitivity[24] | Vegetation quality (Vegetation cover) | | | | Soil quality (texture, depth, slope,) ,Climatic quality index (Erosion, Rainfall, Aridity) etc., |
| Ecologically Sensitive Areas[25] (Pronab Sen Committee report to MOEF, GOI) | Endemism Rarity Endangered species Centres of evolution of domesticated species, Special breeding site/area | Specialised ecosystems Wildlife Corridors Origins of Rivers Wetlands Grasslands | Areas or centres of less known food plants | Sacred groves | Areas with intrinsically low resilience Steep Slopes |

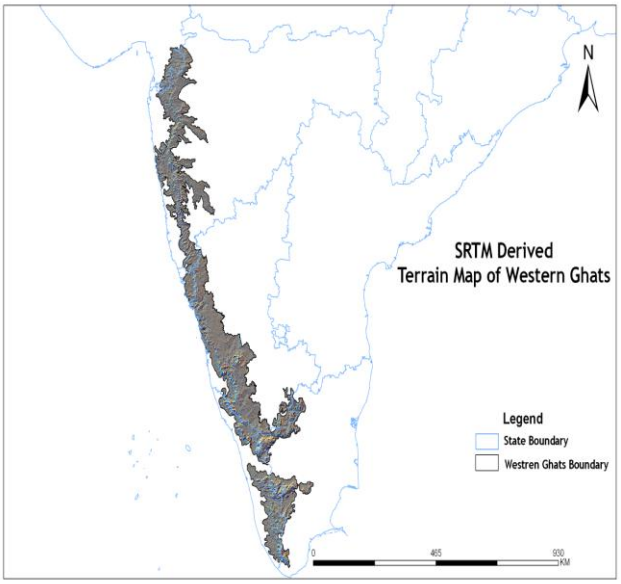



**Figure 1.** The terrain map if the Western Ghats. The boundary map has been prepared following a series of discussions26 by Narayani Barve, Ganeshaiah, K N and R Uma Shaanker. The terrain on the boundary has been overlaid by S N Prasad. For details see Western Ghats boundary section of www.westernghatsindia.org

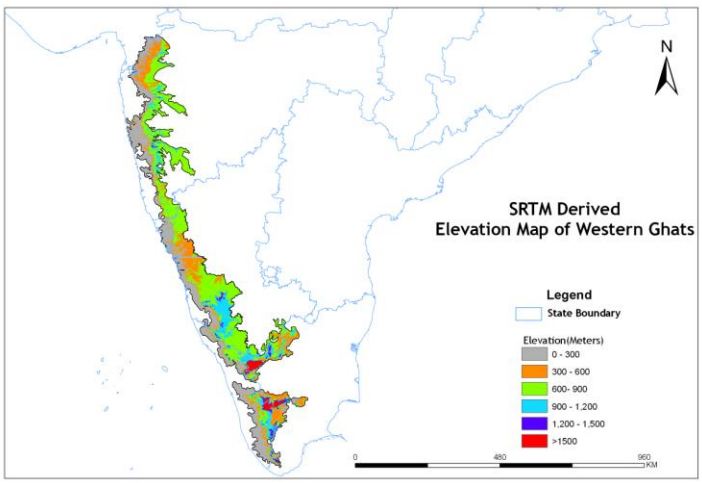



**Figure 2.** The elevation map of Western Ghats (prepared by SN Prasad)

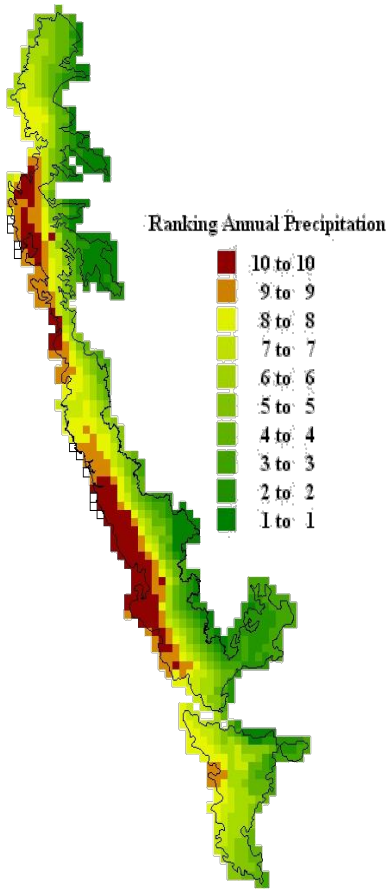



**Figure 3.** Grids (.1250 X 0.1250) of Western Ghats ranked based on annual precipitation. The data was obtained from the DIVA GIS program which offers average for 100 years and the map was prepared by Asha and K N Ganeshaiah

# Annexures

## Annexures A: Establishment of Expert Panel on Western Ghats

**No.1/1/2010- RE (ESZ)**

**Government of India**

**Ministry of Environment & Forests**

**(RE Division)**

****

Paryavaran Bhavan,

CGO Complex, Lodi Road,

New Delhi – 110 003

Dated: March 4, 2010

**OFFICE ORDER**

**Sub: Constitution of Western Ghats Ecology Expert Panel**

1. The Western Ghats region runs to a length of 1600 kilometers starting from the mouth of the river Tapti near the border of Gujarat and Maharashtra to Kanyakumari, the southern most tip of India in Tamil Nadu covering six states namely; Tamil Nadu, Karnataka, Kerala, Goa, Maharashtra and Gujarat (portions of Dang Forests). The region covers an area of about 1.60 lac square kilometers.

2. The Western Ghats Region generally receives 500 mm to 7000 mm of rainfall. Most of the rivers in peninsular India have their origin in Western Ghats of which Godavari, Krishna, Kaveri, Kali Nadi and Periyar are of inter – state importance. These water resources have been harnessed for irrigation and power. About 30% of the area of the Western Ghats Region is under forests. The region is also a treasure house of plant and animal life. The Western Ghats is one of the four Biodiversity hotspots of the country. The region harbors 1,741 species of flowering pants and 403 species of birds. Notable wildlife includes the tiger, elephant, the Indian bison, lion-tailed macaque, wynad laughing thrush, Travancore tortoise, uropeltid snakes, several species of legless amphibians and dipterocarp trees.

3. The traditional horticultural crops in the region are arecanut, pepper and cardamom in the hills and coconuts in the coast along with mango and jack fruit. Tea, coffee, rubber, cashew and tapioca are the other important plantation crops of the region. This region has one of the world's highest concentrations of wild relatives of cultivated plants. Some of the National parks situated in this region are the Borivali National Park, Nagarhole National Park, Bandipur National Park, Annamalai Wildlife Sanctuary, Periyar National Park, etc.

4. The ecological and environmental problems of the area include increasing pressure of population and industry including tourism on land and vegetation; submergence of forest areas under river valley projects, encroachment on forest lands; mining operations, clear felling of natural forests for raising tea, coffee, rubber, eucalyptus, wattle and other monoculture plantations; infrastructural projects such as railway lines and roads, soil erosion, land slides; habitat fragmentation and rapidly declining biodiversity.

5. Given the environmental sensitivity and ecological significance of the region and the complex interstate nature of its geography, as well as the possible impacts of climate change on this region, it is proposed to constitute a Western Ghats Ecology Expert Panel.

6. The Western Ghats Ecology Expert Panel is hereby constituted with the following members for a period of one year from the date of issue of this order, namely[13]:

1. Prof. Madhav Gadgil — Chairman
   Ex-Chairman, Centre for Ecological Sciences,
   Indian Institute of Science,
   A-18, Spring Flowers, Panchavati
   Pashan Road
   Pune – 411 008,
   Maharashtra.
2. Shri B.J. Krishnan — Member
   Senior Advocate,
   Nilgiris Centre, Hospital Road,
   Ootacamund - 643001
   Tamil Nadu.
3. Dr. Nandkumar Mukund Kamat, — Member
   Assistant Professor,
   Department of Botany,
   Goa University,
   Goa.
4. Dr. K.N. Ganeshaiah — Member
   Ashok Trust for Research in Ecology & Environment
   (ATREE),
   659 5th A Main, Hebbal
   Bengaluru - 560 024, Karnataka.

[13] - Dr. Nandkumar Kamat has since resigned from the Panel
- Dr. V.S. Vijayan has been included as a non-official expert member in his individual capacity while Dr. R.V.Varma has become an ex-officio member as Chairman, Kerala State biodiversity Board

| | | |
|---|---|---|
| 5. | Dr. V.S. Vijayan<br>Chairman,<br>Kerala Biodiversity Board,<br>Pallimukku, Pettah P. O.<br>Thiruvananthapuram - 695 024<br>Kerala. | Member<br>(ex-officio) |
| 6. | Prof. (Ms.) Renee Borges<br>Centre for Ecological Sciences,<br>Indian Institute of Science (IISC),<br>Bengaluru – 560 012, Karnataka. | Member |
| 7. | Prof. R. Sukumar,<br>Chairman, Centre for Ecological Sciences,<br>Indian Institute of Science (IISc),<br>Bengaluru – 560 012, Karnataka. | Member |
| 8. | Dr. Ligia Noronha<br>Director (Resources & Global Security Division),<br>The Energy and Resources Institute (TERI),<br>Darbari Block, India Habitat Centre,<br>Lodhi Road, New Delhi – 110 003. | Member |
| 9. | Ms Vidya S. Nayak<br>Nagarika Seva Trust,<br>Gurvayankere - 574 217,<br>Belthangadi Taluk,<br>Dakshina Kannada District, Karnataka. | Member |
| 10. | Dr. D. K. Subramaniam<br>Professor of Computer Science and Automation,<br>and Ecological Sciences, IISc, Bengaluru (Retd)<br>Foundation for Advancement of Education and Research<br>G5, Swiss Complex, 33, Race Course Road<br>Bengaluru – 560 001, Karnataka. | Member |
| 11. | Dr. P.L. Gautam<br>Chairman, National Biodiversity Authority (NBA)<br>5th Floor, TICEL Bio Park,<br>Taramani Road, Taramani, | Member<br>(ex-officio) |

Chennai - 600 113, Tamil Nadu.

| | | |
|---|---|---|
| 12. | Prof. S.P. Gautam<br>Chairman, Central Pollution Control Board (CPCB)<br>Parivesh Bhavan, CBD-Cum-Office Complex,<br>East Arjun Nagar, Delhi – 110 032. | Member<br>(ex-officio) |
| 13. | Dr. R.R. Navalgund<br>Director, Space Application Centre (SAC),<br>Ahmedabad – 380 015 Gujarat. | Member<br>(ex-officio) |
| 14. | Dr. G.V. Subrahmanyam<br>Advisor (RE), Ministry of Environment &<br>Forests, Government of India, New Delhi. | Member-Secretary<br>(ex-officio) |

7. The Panel shall perform, the following functions, namely:-

(i) to assess the current status of ecology of the Western Ghats region.

(ii) to demarcate areas within the Western Ghats Region which need to be notified as ecologically sensitive and to recommend for notification of such areas as ecologically sensitive zones under the Environment (Protection) Act, 1986. In doing so, the Panel shall review the existing reports such as the Pronab Sen Committee report and Dr. T. S. Vijayraghvan Committee Report, Hon'ble Supreme Court's directions, Recommendations of the National Board for Wildlife and consult all concerned State Governments.

(iii) to make recommendations for the conservation, protection and rejuvenation of the Western Ghats Region following a comprehensive consultation process involving people and Governments of all the concerned States.

(iv) to suggest measures for effective implementation of the notifications issued by the Government of India in the Ministry of Environment and Forests declaring specific areas in the Western Ghats Region as Eco-sensitive zones under the Environment (Protection) Act, 1986.

(v) to recommend the modalities for the establishment of Western Ghats Ecology Authority under the Environment (Protection) Act, 1986 which will be a professional body to manage the ecology of the region and to ensure its sustainable development with the support of all concerned states.

(vi) to deal with any other relevant environment and ecological issues pertaining to Western Ghats Region, including those which may be referred to it by the Central Government in the Ministry of Environment and Forests.

8.The Panel may co-opt any other expert(s) /official (s), if necessary, for taking requisite inputs, with the permission of the Chair.

9. The Panel shall furnish its report to the Central Government through the Ministry of Environment and Forests within six months from the date of its constitution. Additional submissions, if any, may be submitted after this period.

10. The Panel shall have its meetings at Delhi or at any other place within India as decided by the Chair.

11. The TA/DA of non-official members, including co-opted members, if any, for attending the meetings of the Panel and for undertaking site visits, if any, will be met by the Ministry of Environment & Forests as per rules.

12. The non-official members, including co-opted members, if any, are entitled for a sitting fee of Rs. 1000/- per day during the meetings of the Panel.

13. This issues with the approval of the Competent Authority and with the concurrence of the Integrated Finance Division of this Ministry, vide their U.O. Note Dy. No. 407/AS & FA / F/10 dated 04-03-2010.

(**Dr. G.V. Subrahmanyam**)

Adviser (RE)

To

All Members

Copy to:

1. Pay & Accounts Officer, Principal Pay & Accounts Office, Ministry of Environment & Forests, New Delhi.
2. IFD/B& A Section, Ministry of Environment & Forests.
3. PS to MOS (I/C), E&F. New Delhi
4. PPS to Secretary (E&F)
5. PPS to Addl. Secretary (MFF).
6. Guard File.
7. Spare Copies (10).

# Annexure B: Commissioned Papers

| Sl.No. | Name | Theme |
|---|---|---|
| 1 | V.B.Savarkar,<br>464 Rasta Peth, Flat 3, Nr. MSEDC Ltd. Power House, Opposite. Mahalaxmi Motors,<br>Pune-411011. Maharashtra.<br>E-mail : woodowl464@yahoo.co.in | Protected Areas in Support of Conservation of Biological Diversity and Other Values of Western Ghats |
| 2 | Mohana, G.S.<br>Assistant Professor (Genetics and Plant Breeding) , Ponnampet-571 216, Coorg district, Karnataka state, INDIA<br>Phone: 08274 249156<br>Mobile: + 91 99022 73468; 99862 23568<br>Email: mohangs2007@gmail.com<br>Also at<br>Department of Forest Biology and Tree Improvement, College of Forestry (UAS, Bangalore)<br>Phone: 08274 249370 extn. 215 | Wild Relatives of Cultivated Plants and Crop genetic Resources of the Western Ghats: |
| 3 | Padmalal, D<br>Centre for Earth Science Studies, Thiruvanathapuram- 695031, Kerala, India<br>E mail: drdpadmalal@gmail.com | Alluvial Sand Mining: The Kerala Experience |
| 4. | N. Baskaran (with technical assistance of R. Sukumar), Asian Nature Conservation Foundation, Innovation Centre, Indian Institute of Science, Bangalore 560012<br>E-mail: basakar@ces.iisc.ernet.in | The State of Asian Elephants in the Western Ghats, Southern India and Its Implications to Promote Conservation of the Ecology of Western Ghats |
| 5 | V. Bhaskar<br>Professor of Forestry & Former Director (Rtd.), National Afforestation & Eco-Development Board, Regional Centre, Ministry of Environment & Forest, Govt. of India, University of Agricultural Sciences, Bangalore – 560 065<br>Residence: No. 33, 'Udayaravi', 2nd Main Road, Cholanagar, R.T. Nagar P.O., Bangalore - 560 032<br>Email: vbhaskar49@yahoo.co.in or vbhaskar49@gmail.com | Balsams (Genus : *Impatiens* L.) Of Western Ghats |
| 6 | K.A.Subramanian, | Biodiversity and Status of Riverine Ecosystems of the Western Ghats |

| Sl.No. | Name | Theme |
|---|---|---|
| | Scientist C,<br>Zoological Survey of India<br>Prani Vigyan Bhavan,<br>M-Block<br>New Alipore<br>Kolkata-700 053<br>Ph: +91-33-24008595 (O)<br>Fax:+91-33-24008595 (O)<br>Mobile: +91-9088039540<br>E-mail: subbuka.zsi@gmail.com | |
| 7 | R J Ranjit Daniels<br>Managing Trustee, Care Earth Trust, No 5, 21st Street, Thillaiganganagar, Chennai 600 061<br>E-mail: ranjit.daniels@gmail.com; www.careearthtrust.org | Ecologically Sensitive Areas and Birds of the Western Ghats |
| 8 | S K Khanduri IFS<br>Director,Environment and Climate Change,<br>Social Forestry Complex, Vattiyurkavu PO<br>Thiruvananthapuram, Kerala 695013<br>E-mail: skhanduri@sify.com | Forest Management In Kerala in Context of Evolving Forestry and Conservation Concerns for Western Ghats |
| 9 | E Somanathan,<br>Indian Statistical Institute, Delhi<br>E-mail:som@isid.ac.in | Incentive-Based Approaches to Nature Conservation |
| 10 | M. D. Subash Chandran<br>CES Field Station, Viveknagar, Kumta – 581343, Uttara Kannada)<br>E-mail: mdschandra@yahoo.com | On Understanding and Saving the Sacred Groves of Western Ghats |
| 11 | Aparna Watve<br>BIOME, 34/6, Gulawani Maharaj Road, Pune 411004<br>E-mail: aparnawatve@gmail.com | Rocky Plateaus (Special focus on the Western Ghats and Konkan) |
| 12 | Mrunalini Vanarase<br>Ecological Society, Pune<br>E-mail: ioraespune@gmail.com, ecological.society@gmail.com | Regeneration of Streams of Western Ghats |
| 13 | Vinod Kumar Uniyal, IFS,<br>Head, PA Network, WL Management and Conservation<br>Education | Ecodevelopment Committees: Translating Theory into Practice |

| Sl.No. | Name | Theme |
|---|---|---|
| | Wildlife Institute of India<br>P.B.No. 18, Chandrabani<br>Dehradun (Uttarakhand) -248001<br>E-mail: vkuniyal50@rediffmail.com | |
| 14 | Dilip B. Boralkar<br>Former Member Secretary, Maharashtra Pollution Control Board<br># 602, Amar Residency, Sion-Trombay Road, Punjabwadi, Deonar, Mumbai 400 088<br>E-mail: dbboralkar@gmail.com | Industrial Pollution |
| 15 | N. Anil Kumar & M. K. Ratheesh Narayanan<br>M S Swaminathan Research Foundation, Community Agro-biodiversity Centre,<br>Puthurvayal P.O, Wayanad 673 121, Kerala<br>E-mail: anil@mssrf.res.in | Diversity, Use Pattern and Management of Wild Food Plants of Western Ghats: A Study from Wayanad District |
| 16 | Narayan G. Hegde<br>BAIF Development Research Foundation<br>Pune 411 058<br>E-mail: nghegde@baif.org.in | Tree Planting on Private Lands |
| 17 | Dr. Ritwick Dutta<br>Co Convener, EIA Resource and Response Centre, N-71 Lower Ground Floor, Greater Kailash -1 New Delhi<br>E-mail: ritwickdutta@gmail.com<br>www.ercindia.org | A Framework for EIA Reforms in the Western Ghats |
| 18 | Honnavalli N. Kumara[1] and Mewa Singh[2]<br>[1]Salimali Centre for Ornithology and Natural History, Anaikatti P.O., Coimbatore, 641108, India.<br>[2]Biopsychology Laboratory, University of Mysore, Mysore, 570006, India<br>E-mail: mewasingh@bsnl.in | Distribution, Status And Conservation of Primates of the Western Ghats |
| 19 | R.S. Bhalla[a], Jagdish Krishnaswamy[b], SrinivasVaidyanathan[a]<br>[a]Foundation for Ecological Research, Advocacy and Learning<br>[b]Ashoka Trust for Research in Ecology and the Environment<br>E-mail: jagdish@atree.org, jagdish.krishnaswamy@gmail.com | Vulnerabilities of Critical Ecosystems and Services in the Western Ghats to Overland Flows and Sedimentation During Extreme Rainfall Events |
| 20 | Snehlata Nath | Livelihood Security in the Western Ghats – |

| Sl.No. | Name | Theme |
|---|---|---|
| | Keystone Foundation, Groves Hill Road, Kotagiri, Nilgiris, Tamil Nadu<br>E-mail: sneh@keystone-foundation.org | Some Notes & Discussions |
| 21 | R J Ranjit Daniels<br>Managing Trustee, Care Earth Trust, No 5, 21st Street, Thillaiganganagar, Chennai 600 061;<br>E-mail: ranjit.daniels@gmail.com | Spatial Heterogeneity, Landscapes and Ecological Sensitivity in the Western Ghats |
| 22 | M.S. Viraraghavan<br>Hillview, Fernhill Road, Kodaikanal 624101, Tamil Nadu<br>E-mail: girija.vira@gmail.com | Hill Stations in the Western Ghats. Kodaikanal – A Case Study |
| 23 | Anita Varghese [1,2],Tamara Ticktin [2], Snehlata Nath[1], Senthil Prasad[1], Sumin George[1]<br>[1]Keystone Foundation, Kotagiri, Nilgiris, Tamil Nadu, India. kf@keystone-foundation.org<br>[2]Department of Botany, University of Hawaii, Manoa, HI.<br>E-mail: anita@keystone-foundation.org | Non Timber Forest Products: Experiences in Conservation, Enterprise, Livelihoods and Traditional Knowledge in the Nilgiri Biosphere Reserve, Western Ghats, India |
| 24 | N.A. Aravind* and K.V. Gururaja**<br>*SuriSehgal Centre for Biodiversity and ConservationAshoka Trust for Research in Ecology and the Environment (ATREE), Royal Enclave, Sriramapura, Jakkur PO., Bangalore 560064<br>E-mail: aravind@atree.org<br>**Centre for Infrastructure, Sustainable Transportation and Urban Planning (CiSTUP), Indian Institute of Science, Bangalore 560012<br>E-mail: gururaj@cistup.iisc.ernet.in | Amphibians of the Western Ghats |
| 25 | G. Ravikanth<br>Ashoka Trust for Research in Ecology and the Environment, Royal Enclave, Srirampura, Jakkur Post, Bangalore 560064, India<br>Phone: 091-080-23635555 (110)<br>Email: gravikanth@atree.org | Conservation of Forest Genetic Resources in Western Ghats, India |
| 26 | N A Madhyastha and Aravind N A*<br>Malacology Centre, Poornaprajna College Udupi 576101<br>*ATREE, Royal Enclave, Sriram Puram, P O Jekkur, Bangalore 64.<br>E Mail: na.madhyastha@gmail.com | Land Snails of Western Ghats |
| 27 | Shashidhar Viraktamath* and Bhaktibhavana Rajankar | Wild Bees of Western Ghats: Crop Pollination Deficits |

| Sl.No. | Name | Theme |
|---|---|---|
| | Department of Agricultural Entomology, University of Agricultural Sciences, Dharwad 580005<br>*E-mail: shashiv777@gmail.com | |
| 28 | Kalyan Kumar Chakravarty<br>B-15 (8th Floor),<br>Delhi Administration Officers' Flats,<br>Sector D-2,<br>Near DDA Sports Complex,<br>Vasant Kunj,<br>New Delhi - 110070<br>Mobile - 9818857536<br>Res.(phone) – 26891504<br>E-mail: msk4747@yahoo.co.in | A Prolegomena towards a Strategy for Bio Cultural Survival in the Western Ghats |
| 29 | K.S. Valdiya<br>Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore – 560 064<br>E-mail: ksvaldiya@gmail.com, valdiya@jncasr.ac.in | Geological Framework and Tectonics of Western Ghāt |
| 30 | D.J. Bhat<br>Department of Botany, Goa University, Goa-403 206, India<br>E-mail: bhatdj@rediffmail.com | Documentation of Micro-Fungal Diversity in the Forests of Western Ghats, India |
| 31 | K.R. Sridhar<br>Department of Biosciences, Mangalore University, Mangalagangotri,<br>Mangalore 574 199, Karnataka, India<br>E-mail: sirikr@yahoo.com | Aquatic Fungi in the Western Ghats – Current Status and Future Concerns |
| 32 | Sanjeeva Nayaka and Dalip Kumar Upreti<br>Lichenology Laboratory, National Botanical Research Institute (CSIR)<br>Rana Pratap Marg, Lucknow – 226 001, U.P.<br>E-mail: nayaka.sanjeeva_n@gmail.com | Lichen Diversity in Western Ghats: Need for Quantitative Assessment and Conservation |
| 33 | A.Sundara,<br>"Kartikeya" 1st floor, Sharada Nagara, SHRINGERI<br>577139 (Karnataka)<br>E-mail: nasundara@gmail.com | Glimpses of the Prehistoric and the Proto-Historic Cultures in the Region of Western Ghat and Ecology |
| 34 | Rajendra Kerkar<br>Keri – Sattari, Goa 403505 | Mining – Goa, Konkan (social and ecological aspects) |

| Sl.No. | Name | Theme |
|---|---|---|
| | E-mail: rpkerkar@yahoo.com | |
| 35 | Glenn Kalavampara<br>Goa Mineral Ore Exporters Association, P.O Box 113, Vaglo Building, Panaji - Goa 403001<br>E-mail: Gmoea1963@yahoo.com,<br>glenngoa@yahoo.com | Mining – Geological and Economic Perspective |
| 36 | Dr. Jayendra Lakhmaprukar<br>Gujarat Ecological Society, 3rd Floor, Synergy House, Subhanpura, Vadodara- 390023<br>E-mail: jlakhmapurkar@yahoo.com | Mining in Gujarat – Impacts on Biodiversity |
| 37 | EQUATIONS<br>#415, 2 C Cross, 4th Main, OMBR Layout, Banaswadi , Bengaluru – 560043, India<br>Telephone: +91-80-25457607 / 25457659<br>Fax: +91-80-25457665<br>Email: info@equitabletourism.org<br>Url: www.equitabletourism.org<br>Research Team : Rosemary Viswanath, Aditi Chanchani, Varun Santhosh, Sabitha Lorenz<br>Advisory Team : K T Suresh<br>E-mail: ktsuresh2006@gmail.com | Tourism in Forest Areas of Western Ghats |
| 38 | Manasi Karandikar and Ketaki Ghate<br>Oikos, 210, Siddharth Towers, Kothrud,<br>Pune – 29.<br>E-mail: oikos@oikos.in Website: www.oikos.in | Sahyadri -'Western Ghats' : An Overview of Private Ownership, Commercial Development and its Impact on Ecosystem |
| 39 | Devavrat Mehta<br>Chairman, Hlmc, Panchagani-Mahabaleshwar<br>No. 404, SHALAKA<br>M.K.Road, MUMBAI-400021<br>E-mail: devshalaka@rediffmail.com | Tourism Development Strategy in Western Ghats |
| 40 | Vishwambhar Choudhari<br>Oasis Environmental Foundation, Pune<br>E-mail: oasisenv@vsnl.com | Critical Analysis of Environmental Impact Assessment Process and Environmental Clearance Procedure in India |
| 41 | Vijay Paranjpe<br>Gomukh Environmental Trust For Sustainable Development, Pune<br>E-mail: gomukh@pn3.vsnl.net.in | Threats to the Western Ghats of Maharashtra: An Overview |

| Sl.No. | Name | Theme |
|---|---|---|
| 42 | Adv. Norma Alvares<br>Goa Foundation<br>G-8, St Britto's Apts, Feira Alta,Mapusa, Bardez, Goa – 403507<br>E-mail: goafoundation@gmail.com,<br>cnalvares@gmail.com | Political Struggle through Law<br>The Public Interest Litigation (PIL) route to environmental security in India with special reference to the environment movement in Goa. |

# Annexure C : Brainstorming Sessions

| Date | Place | Topic |
|---|---|---|
| 18 November 2010 | Centre for Ecological Sciences<br>Indian Institute of Science, Bengaluru | Power Sector |
| 19 November 2010 | Centre for Ecological Sciences<br>Indian Institute of Science, Bengaluru | Joint Forest Management |
| 27 January 2011 | Kerala Forest Research Institute, Peechi | Water resources planning |
| 28 January 2011 | Kerala Forest Research Institute, Peechi | Decentralized Planning |
| 3 March 2011 | Centre for Ecological Sciences<br>Indian Institute of Science, Bengaluru | Land Use Policy |
| **Expert Consultative Meetings** | | |
| 27 March 2011 | Centre for Ecological Sciences<br>Indian Institute of Science, Bengaluru | Ecologically sensitive areas in Western Ghats in Tamil Nadu state with particular reference to Nilgiris and Valparai.<br>Participants<br>Prof R. Sukumar Dr. S.N. Prasad,<br>Shri BJ Krishnan,<br>Dr. TR Shankar Raman,<br>Dr. N Bhaskaran |
| 3rd to 5th May 2011 | Kerala Institute of Local Administration, Thrissur | Development of management plans for ecologically sensitive zones |

## Lists of Participants

**Brainstorming Session on Role of Power Sector in Development of Western Ghats held at Indian Institute of Science, Bengaluru on 18 November 2010**

| No. | Name | Organization |
|---|---|---|
| 1 | S. Sumathy Malarvizhi | TN Power Finance Corporation |
| 2 | Anandi Sharan | Green party India |
| 3 | Shubhada Shintre | Synergy lee Resources |
| 4 | EAS Sarma | Individual |
| 5 | M.G. Waghmare | Executive Director, Mahagenco |

| No. | Name | Organization |
|---|---|---|
| 6 | C.V. Ramachandra | CES, IISc |
| 7 | Ranjan Rao Yerdoor | Nagarika Seva Trust |
| 8 | A. S. Reddy | CCF (RO, MoEF), Bangalore |
| 9 | A.B. Harrapanhali | Director (RO, MoEF) Bangalore |
| 11 | C. Kaliyapervmal | Director (RO, MoEF) Bangalore |
| 12 | Santosh Kumar Singh | Adani Power |
| 13 | Karuna Raina | Green Peace |
| 14 | Amruta Joglekar | RANWA |
| 15 | Shankar Sharma | Individual |
| 16 | K.N. Balasubramanya | KPCL |
| 17 | S.L.Rao | ISEC |
| 18 | Anadakumar A | KPCL |
| 19 | V.M. Shastri | Associate Vice President, JSW Energy |
| 20 | G. Krishnadas | IISc |
| 21 | Y.B. Ramakrishna | Chairman, Biofuel Taskforce Karnataka |
| 22 | Ashwin Gambhir | Prayas Pune |
| 23 | Belure Sudarshna | Individual |
| 24 | S. Ramesh | Chief Engineer, KPCL |
| 25 | C.K. Sar | Wild Orissa, Bhubhaneswar |
| 26 | Mukti Roy | CES, IISc |
| 27 | N. Baskaran | ANCF |
| 28 | P. Vethamony | NIO, Goa |
| 29 | J. Srinivasan | IISc |
| 30 | A. Uduya | Green Peace |
| 31 | MSKVN Rao | Energy Sector |
| 32 | M.D. Subhashchandran | IISc |
| 33 | A.K. Shyam | Individual |

**Brainstorming Session on Role of Joint Forest Management (JFM) in Western Ghats held at Indian Institute of Science, Bengaluru on 19 November 2010**

| No. | Name | Organization |
|---|---|---|
| 1 | Bhagwan Singh | APCCF, Tamil Nadu Forest Department |
| 2 | Anandi Sharan | Green party India |
| 3 | Mohan Hirabai Hiralal | Vrikshamitra, Chandrapur-Gadchiroli |
| 4 | A.K. Joshi | PCCF, Maharastra |
| 5 | M.H. Swaminath | APCCF, Karnataka Forest Department |
| 6 | Ranjan Rao Yerdoor | Nagarika Seva Trust, Karnataka |
| 7 | A. S. Reddy | CCF (RO, MoEF), Bangalore |
| 8 | Rajeeva | Nagarika Seva Trust, Karnataka |
| 9 | Madhu Sarin | CSD |
| 11 | Amruta Joglekar | RANWA, Project Assistant WGEEP |
| 12 | A.K. Shyam | Individual |

**Brainstorming Session on Water Resources Planning in Western Ghats held at Kerala Forest Research Institute, Peechi on 27 January 2011**

| No. | Name | Organization |
|---|---|---|
| 1 | Prof S. Janakrajan | Madras Institute of Development Studies, Chennai |
| 2 | Dr. K.J. Joy | Forum for Policy Dialogue on Water Conflicts in India C/o SOPPECOM, Pune |
| 3 | Dr. Sudhirendar Shrama | Ecological Foundation, New Delhi |
| 4 | Mr. Samir Mehta | International Rivers, Mumbai |
| 5 | Dr. A. Latha | River Research Centre, Kerala |
| 6 | Shri S.P. Ravi | Chalakudy Puzha Samrakshana Samithi, Kerala |
| 7 | Shri Shree Padre | Water Journalist, Post Vaninagar, Kerala |
| 8 | Dr. K.M. Madhavan Nambuthiri | Water Consultant, Kerala |
| 9 | Dr. K. A. Subramaniam | ZSI, Pune |
| 11 | Dr. S. N. Prasad | SACON, Hyderabad |
| 12 | Er. M. Syed Mohamed Abuthalib | SG&SWRDC, Chennai |
| 13 | Er. M. Manmathan | SG&SWRDC, Chennai |
| 14 | Shri Devrata Mehta | High Level Monitoring Committee, Panchgani-Mahabaleshwar ESA |

**Brainstorming Session on Decentralized Planning in Western Ghats held at Kerala Forest Research Institute, Peechi on 28 January 2011**

| No. | Name | Organization |
|---|---|---|
| 1 | Prof. M.K. Prasad | Information Kerala Mission |
| 2 | Shri S.M. Vidyanand | Special Chief Secretary, Govt of Kerala |
| 3 | Dr. K.A. Subramaniam | ZSI, Pune |
| 4 | Dr. S. Narendra Prasad | SACON, Hyderabad |
| 5 | Shri Devrata Mehta | High Level Monitoring Committee, Panchgani-Mahabaleshwar ESA |
| 6 | Ms. Prakriti Srivastava | DIG (WL), Ministry on Environment & Forests, Government of India, New Delhi |
| 7 | Col. C.P. Muthana | KMFT, Kodagu |
| 8 | Mr K.A. Ravi Chengappa | Cauvery Sene |
| 9 | Mr. K.N. Chengappa | KMFT, Kodagu |
| 11 | Mr. Babu Kottur | KMFT |
| 12 | Mr. Balakrishna Shetty | Janagrithi Samithi |
| 13 | Vidya Dinkar | Citizens Forum for Mangalore Development |
| 14 | Vinay P Kumar | Krishi Bhoomi Samakrshama Samiti |

**Brainstorming Session on land use policy in Western Ghats held at Indian Institute of Science, Bengaluru on 3rd March 2011.**

| No. | Name | Organization |
|---|---|---|
| 1. | Shri Edgar Ribeiro | former Chief Town Planner, Government of India |
| 2. | Shri Y.B. Ramakrishna | Executive Chairman, Karnataka State Biofuel Taskforce |
| 3. | Dr. A.K. Shyam | formerly at NTPC |
| 4. | Ms T.M. Sudha | Senior Town Planner, Department of Town and Country Planning, Kerala |
| 5. | Dr. Gopal Kadekodi | Centre for Multi-Disciplinary Development Research, Dharwad |
| 6. | Dr. Seema Purushothaman | ATREE, Bangalore |
| 7. | Dr. Jagdish Krisnaswamy | ATREE, Bangalore |
| 8. | Dr. Shrinivas Badiger | ATREE, Bangalore |
| 9. | Dr. T.R. Shankar Raman | Nature Conservation Foundation, Mysore |

**WGEEP meeting and Expert Consultative meeting at Kerala Institute of Local Administration, Thrissur held on 3rd May 2011**

| S.No. | Name | Institution |
|---|---|---|
| 1 | Prof K.P. Kannan | Centre for Development Studies, Thiruvanthapuram |
| 2 | Dr. CTS Nair | Executive Vice President<br>Kerala State Council for Science Technology and Environment |
| 3 | Shri C.P. Narayanan | Member, Kerala Planning Board |
| 4 | Dr. A Latha | River Research Centre |
| 5 | Prof MK Prasad | Executive Chairman, Information Kerala Mission |
| 6 | Shri SM Vijayanand | Additional Chief Secretary, Government of Kerala |
| 7 | Dr. R. Ajayakumar Varma | Member Secretary, Kerala State Council for Science Technology and Environment |
| 8 | Shri M.S. Vinod | Deptt of Rural Development, Government of Kerala |
| 9 | Shri Aby George | Programme Officer, Social Audit, NREGA |
| 10 | Prof T. Gangadharan | Consultant, Kerala Institute of Local Administration, Thrissur |
| 11 | Dr. S. N. Prasad | Senior Principal Scientist, SACON |
| 12 | Shri Nitin Rai | ATREE, Bengaluru |
| 13 | Shri Pratim Roy | Keystone Foundation, Kotagiri |
| 14 | Shri A.K. Shyam | Ex-NTPC, Bangalore |
| 15 | Shri Sanjay Upadhyay | Senior Advocate, Supreme Court |
| 16 | Shri Samir Mehta | International Rivers, Mumbai |
| 17 | Shri R.K. Garg | Vice Chairman, EAC (Industries) Mumbai |
| 18 | Smt Archana Godbole | AERF, Pune |
| 19 | Dr. N Ramakantan | Director, Kerala Institute of Local Administration, Thrissur |
| 19 | Dr. Vijaya Kumar Nair | KFRI |
| 20 | Dr. CP Shahji | Kerala State Biodiversity Board |

**WGEEP meeting and Expert Consultative meeting at Kerala Institute of Local Administration, Thrissur held on 4th May 2011**

| S.No. | Name | Institution |
|---|---|---|
| 1 | Prof K.P. Kannan | Centre for Development Studies, Thiruvanthapuram |
| 2 | Shri C.P. Narayanan | Member, Kerala Planning Board |
| 3 | Dr. A Latha | River Research Centre |
| 4 | Prof MK Prasad | Executive Chairman, Information Kerala Mission |
| 5 | Dr. R. Ajayakumar Varma | Member Secretary, Kerala State Council for Science Technology and Environment |

| S.No. | Name | Institution |
|---|---|---|
| 6 | Shri Aby George | Programme Officer, Social Audit, NREGA |
| 7 | Prof T. Gangadharan | Consultant, Kerala Institute of Local Administration, Thrissur |
| 8 | Dr. S. N. Prasad | Senior Principal Scientist, SACON |
| 9 | Shri Nitin Rai | ATREE, Bengaluru |
| 10 | Shri Pratim Roy | Keystone Foundation, Kotagiri |
| 11 | Shri A.K. Shyam | Ex-NTPC, Bangalore |
| 12 | Shri Sanjay Upadhyay | Senior Advocate, Supreme Court |
| 13 | Shri Samir Mehta | International Rivers, Mumbai |
| 14 | Shri R.K. Garg | Vice Chairman, EAC (Industries) Mumbai |
| 15 | Smt Archana Godbole | AERF, Pune |
| 16 | Ms Prakriti Srivastava | DIG (WL) MoEF |
| 17 | Dr HC SharatChandra | Bengaluru |

**WGEEP meeting and Expert Consultative meeting at Kerala Institute of Local Administration, Thrissur held on 5th May 2011**

| S.No. | Name | Institution |
|---|---|---|
| 1 | Dr. A Latha | River Research Centre |
| 2 | Dr. S. N. Prasad | Senior Principal Scientist, SACON |
| 3 | Shri Nitin Rai | ATREE, Bengaluru |
| 4 | Shri Pratim Roy | Keystone Foundation, Kotagiri |
| 5 | Shri A.K. Shyam | Ex-NTPC, Bangalore |
| 6 | Shri Samir Mehta | International Rivers, Mumbai |
| 7 | Shri R.K. Garg | Vice Chairman, EAC (Industries) Mumbai |
| 8 | Smt Archana Godbole | AERF, Pune |
| 9 | Shri Raghu Babu | GIZ Delhi |
| 10 | Dr HC SharatChandra | Bengaluru |
| 11 | Dr. CP Shahji | Kerala State Biodiversity Board |

# Annexure D: Consultations with Government Officials

## Maharastra

| Date | Place | Officer and Name of Government Department | Issues/Remarks |
|---|---|---|---|
| 30/09/2010 | Mantralaya,Mumbai | **Prof. Madhav Gadgil**<br>Chairman,WGEEP<br>**Amruta Joglekar**<br>Project Assistant ,WGEEP<br>**Dr. Amit Love**<br>Deputy Director, MoEF<br>**Mr. Niraj Khatri**<br>Deputy Director, MoEF<br>**Dr. A. Mehrotra**<br>Director, Bhopal<br>**Shri B.R. Naidu**<br>Zonal Officer, Central Pollution Control Board, West Zone, Varodadra<br>**Shri B. V. Rathod**<br>Addl. Director, Industries, Mumbai<br>**Dr. K. Shivaji**<br>CEO, MIDC<br>**Shri R.V. Sonje**<br>Addl. C.E., MIDC<br>**Shri Prakash Chavan**<br>Executive Engineer, MIDC<br>**Shri P.P. Nandusekar**<br>Advisor (Env), MIDC<br>**Shri S.D. Landge**<br>Director, Town Planning, M.S. Pune<br>**Shri C.S. Thotwe**<br>Director (Projects), Mahagenco, Mumbai<br>**Shri K.M. Chirutkar**<br>CGM Corporation Office, Mahagenco<br>**Capt. J.B. Rohilla**<br>Hydrographer, MMB<br>**Shri A.M. Khan** | Status of different projects in Ratnagiri and Sindhudurg district |

| Date | Place | Officer and Name of Government Department | Issues/Remarks |
|---|---|---|---|
| | | Principal Secy. (Industries)<br>**Smt. Valsa Singh**<br>Secretary, Environment Department<br>**Shri Nitin Kakodkar**<br>Joint Secretary (Forests), Revenue & Forests Department<br>**Shri G.N. Warade**<br>Director, Environment Department<br>**Dr. B.N. Patil**<br>Scientist-I, Environment Department<br>**Shri M.M. Ngullie**<br>Scientist, Grade I, Environment Department<br>**Shri V.M. Motghare**<br>MPCB, Head Quarter<br>**Shri P.D, Goud**<br>Jt. Secretary, Home Department<br>**Shri S.V. Zanzane**<br>Section Officer, (Energy), I.E.& L. Department<br>**Shri Vijay Chavan**<br>G.M., MTDC<br>**Shri Ajay Ambekar**<br>Dy. Secretary, Tourism<br>**Shri Suresh Surve**<br>Under Secretary (Tourism)<br>**Shri Radheshyam Mopalwar**<br>Member-Secretary, Maharashtra Pollution Control Board | |
| 30-11-2010 | Department of Biodiversity, Abasaheb Garware College | Dr.Amar Supate, Maharashtra Pollution Control Board,Maharashtra | Meeting regarding ZASI in Maharashtra Districts |
| 13/05/2011 | A 18 Spring Flowers Panchavati Pashan Pune | Shri.M.K.Rao,CF(Wl),<br>Forest Department,Government of Maharashtra | Status of 10 km Buffer zone around Protected Area |
| 30-05-2011 | CCF,Territorial office,Pune | Shri. Sinha, CCF(T)<br>Forest Department,Government of Maharashtra | Status of 10 km Buffer zone around Protected Area |

| Date | Place | Officer and Name of Government Department | Issues/Remarks |
|---|---|---|---|
| 02-06-2011 | Yashvantrao Chavan Sabhagruh,Pune | Shri. Sinha, CCF(T)<br>Forest Department,Government of Maharashtra | Status of 10 km Buffer zone around Protected Area |
| 11-06-2011 | A 18 Spring Flowers Panchavati Pashan Pune | Shri.Saiprakash, Forest Department,Government of Maharashtra | Status of 10 km Buffer zone around Protected Area |

## Tamil Nadu

| Date | Place | Officer and Name of Government Department | Issues/Remarks |
|---|---|---|---|
| Dec. 23, 2010 | Chennai, TN | Principal Seceretary, Environment and Forest, Principal Chief Conservator of Forest and Chief Wildlife Warden of Govt. of Tamil Nadu. | Issues of conservation, sustainable development and governance in the context of the proposed ecologically sensitive areas of Western Ghats in Tamil Nadu. |
| Jan. 18, 2011 | Ootacamund, Nilgiris, TN | Collector of Nilgiris, Field Director Mudumalai Tiger Reserve and District Forest Officers of Gudalur, Nilgiris South and Nilgiris North | Issues of conservation, sustainable development and governance in the context of the proposed ecologically sensitive areas of Western Ghats in Tamil Nadu. |

# Annexure E: Public Consultations/ Roundtable/ Consultations with Civil Society Groups

## Karnataka

| Date | Place | Issues/Remarks | Participants |
|---|---|---|---|
| 11.2.2011 | Shirsi Forestry College | Conservetion of Mangroves Forest, Myristica swamps.<br><br>Aganashini, Sharavathi, Bedthi river basin should be declared ESZ1. | Chaired by Ananta Ashisara, Chairman, Karnataka Western Ghats Task Force, Ms. Vidya Nayak, WGEEP, Shri Vasudev-Task Force, DFO, Canara Circle, Environmentalists, Scientists, Farmers, NGO's of U.K. & Belgaum. |
| 14.2.2011 | School of Social Work, Roshni Nilaya, Mangalore | ➢ Dankshin Kannada & Udupi District should be declared Ecologicaly sensitive area.<br>➢ Declaration of SEZ in Coastal Belt is devasting and Petro Chemical Industries and Thermal Plant in coastal region will effect W.Ghats. So it should be stopped.<br>➢ Permission should not be given to Gundia Hydel Project-ESA region.<br>➢ No River Diversion or River Linkages. Conservation of Sacred Grooves<br>➢ No G.M.Crops in W.Ghats region. | Chaired by Keshava Korse, member of Karnataka W.Ghats Task Force, Vidya Nayak-WGEEP, H.C.Sharathchandra,Ex.Chairman, KSPCB, Prof.K.P.Achar, Prof.N.A.Madhyasta, Prof. Ramachandra, B.K.Parameshwara Rao, Organic Farmer; Vasudeva Boluru, Fishermen Leader; NGO Heads; Environmentalists; Media & Press personel; Farmers; Consumer activists; Civil Society members of Udupi & D.K. |
| 28.2.2011 | Dr.T.M.A.Pai Hall, Sri J.C.B.M. College, Shringeri | ➢ Acording to Forest Right Act, Trible Rights should be protected. Trible should not be evicted from National Park harassment from Forest Department and Naxalites should be addressed. The Forest dwellers are ready to leave the forest if they are given agricultural land with land records.<br>➢ Conservation of Sacred Grooves and Heritage sights. | Chaired by Gajendra Gorasukudige, member, W.Ghats Task Force; Vidya Nayak, WGEEP; Prof.Kumaraswamy Udupa, Botanist; Veerappa Gowda, Principle; ACF Kambli; Members of Raitha Sangha; Environmentalists; NGO's; Farmers; Tribals of Chikamagalore and Shivamogga. |

| Date | Place | Issues/Remarks | Participants |
|---|---|---|---|
| | | ➢ No Dams in W. Ghats | |
| 10.6.2011 | Kodava Samaja Hall, Vijayanagar, Mysore | Ecologically the whole of Kodagu District should be declared as ecologically silent area and should be protected.<br><br>Seetavana, Bisle Forest, Seege Gudda, Biligiri Ranga, Jumma Male, Majrabadh Forest should be declared ESA. Tourism should be strictly regulated. Land Use Policy should be strictly regulated. Tribals Rights should be protected. No Railway project. No more cutting forest for Power Transmission Line. | Chaired by Dr.K.A.Kushalappa, Kodagu Model Foresters, Ponnampete; Dr.K.N.Ganeshaiah and Vidya Nayak-WGEEP; Dr.Vasudev, W.G.Task Force; DFO of Mandya and Mysore; Dr.C.G.Kushalappa, Forestry College, Ponnampete; Prof.Mohan, Forestry College; NGO's; Tribles Groups; Environmentalists; Rtd. Forest Officials; Agriculturists; Estate Owners of Kodagu, Hassan, Mysore Division. |
| 28 May 2011 | Centre for Ecological Sciences<br>Indian Institute of Sciences, Bengaluru | Consultation on Karnataka ESAs | Dr. S.N. Prasad<br><br>1. Mr. Rajeeva Salian<br>Nagarika Seva Trust<br>Guruvayanakere,<br>Belthangady<br>Dakshina Kannada district<br><br>2. Ms. Nyla Coelho<br>Paryavarni<br>Belgaum<br>nylasai@gmail.com<br><br>3. Mr. Balakrishna Shetty<br>Jana Jagrithi Samithi<br><br>4. Mr. S. Rajanna<br>APCCF (FRM)<br>Aranya Bhavan<br>Bangalore<br><br>5. Mr. C.S. Raju<br>APCCF (HQ&C)<br><br>6. Mr. S.V. Hosur |

| Date | Place | Issues/Remarks | Participants |
|---|---|---|---|
| | | | C.F. (F.C)<br><br>7. Mr. Siddarth Machado<br>siddarthmachado@hotmail.com<br><br>8. Ms. Vidya Nayak<br>Nagarika Seva Trust<br>Guruvayanakere,<br>Belthangady<br>Dakshina Kannada district<br><br>9. Mr. Vinay Kumat<br>Karaavali Karnataka Janaabhivrudhi Vedike (KKJV)<br>Mangalore<br><br>10.Mr. Sagar Dhara<br>sagardhara@gmail.com<br><br>11. Mr. Y.B. Ramakrishna<br>Chairman, Karnataka State Biofuel Development Board<br><br>12. Ms. Vidya Dinker<br>Citizens Forum for Mangalore<br>vidyadinker@gmail.com<br><br>13. Dr. H.C. Sharatchandra<br>sharatchandra@vsnl.net<br><br>14. Mr. G.S. Kariyappa<br>Forest Department<br>Karnataka<br><br>15. Prof. Renee M. Borges<br>Centre for Ecological Sciences<br>Indian Institute of Science<br>Bangalore 560012<br>renee@ces.iisc.ernet.in |

## Maharastra

| Date | Place | Issues/Remarks |
|---|---|---|
| 28/10-29/10/2010 | BVIEER, Pune | Open Consultation on how to demarcate Ecological Sensitive Area<br>**Number of Participants: 118**<br>**List of participants given at point 1 below** |
| 29/11-6/12/2010 | Bengaluru | Cumulative Impact Assessment in Konkan, Maharashtra |
| 13/12/2010 | Department of Biodiversity, Abasaheb Garware College | Flaws in EIA Process and Lavasa issue |
| 26/12/2010 | A 18 Spring Flowers Panchavati Pashan Pune | Environmental Problems in Konkan,Maharashtra |
| 04/01/2011 | Oikos office,Pune | Lavasa –Environmental Impact |
| 07/01/2011 | Oikos office, Pune | Lavasa-Field Work Planning |
| 07/01/2011 | Gomukh, Pune | Mahabaleshwar-Pachgani ESZ |
| 09/01/2011 | Gomukh, Pune | HLMC functions in MPESZ and suggestions for Western Ghats Ecology Authority |
| 06/02/2011 | A 18 Spring Flowers Panchavati Pashan Pune | Meeting with NPCIL officials on Jaitapur Project |
| 10/02/2011 | Department of Biodiversity, Abasaheb Garware College | Long Term Ecology Monitoring site and Cumulative Impact Assessment in Konkan |
| 18/02/2011 | Department of Biodiversity, Abasaheb Garware College | Northern Western Ghats data and Long term Ecology monitoring site in Konkan |
| 19/02/2011 | Department of Biodiversity, Abasaheb Garware College | Cumulative Impact Assessment and Long term Ecology monitoring site in Konkan |
| 27/02/2011 | Department of Biodiversity, Abasaheb Garware College | DEVRAAI ESZ proposal for southern part of Western Ghats of Maharashtra |
| | | |
| 09/03/2011 | Department of Biodiversity, Abasaheb Garware College | Local people facing Problems in Mahabaleshwar- Panchgani ESZ |
| 11/03/2011 | COEP,Pune | Cumulative Impact Assessment in Konkan |
| 17/03/2011 | Kokan Krushi Vidyapeeth,Dapoli | Cumulative Impact Assessment and long term ecology monitoring site in Konkan |
| 17/03/2011 | Datar, Behre, Joshi College,Chiplun | Cumulative Impact Assessment and long term ecology monitoring site in Konkan |
| 17/03/2011 | Gogate- Jogalekar College, Ratnagiri | Cumulative Impact Assessment and long term ecology monitoring site in Konkan |
| 18/03/2011 | Sangameshwar | Cumulative Impact Assessment and long term |

| Date | Place | Issues/Remarks |
|---|---|---|
| | | ecology monitoring site in Konkan |
| 22/03/2011 | BVIEER, Pune | Northern Western Ghats data and ESA in Maharashtra |
| 25/04/2011 | CDAC Pune | Biodiversity data from Nashik,Nandurbar and northern Western Ghats |
| 23/06/2011 | BVIEER, Pune | ESAs in Maharashtra Western Ghats |
| 21/07/2011 | Gomukh, Pune | Mahabaleshwar-Pachgani ESZ |
| 25/07/2011 | CDAC Pune | ESAs in Maharashtra Western Ghats |
| 11/08/2011 | BVIEER, Pune | ESZ levels to Taluks in Maharashtra Western Ghats |

## Tamil Nadu

| Date | Place | Issues/Remarks |
|---|---|---|
| Jan. 16, 2011 | Ootacamund, Nilgiris, TN | Conservation of natural resources, sustainable development and governance in the context of ecological sensitive areas in Western Ghats in the Nilgiris district. |

## Goa

| Date | Place | Issues/Remarks |
|---|---|---|
| 27.9.2010 | National Institute of Oceanography, Goa | Iron ore mining in Goa<br>Number of participants: 87<br>List given at point 2 below |

## Meeting of the WGEEP with the members of the Save Western Ghats Movement (SWGM) Bengaluru

| Date | Place | Issues/Remarks |
|---|---|---|
| 5.3.2011 | Indian Institute of Science, Bengaluru | Interaction with SWGM on different issues related with Western Ghats, demarcation and management of ecologically sensitive areas.<br>List of participants<br>1. Shri Somnath Sen<br>2. Shri Pratim Roy<br>3. Dr. Latha Anantha<br>4. Shri S. Unnikrishnan<br>4. Dr. Archana Godbole<br>5. Shri Samir Mehta<br>6. Ms Snehlata Nath<br>7. Shri Madhu Ramnath<br>8. Ms. Suprabha Seshan |

## Kerala

| Date | Place | Issues/Remarks |
|---|---|---|
| 26 & 27 July 2010 | Trivandrum | ESA, Decentralised Planning, water resources, plantation, agriculture with *Government officials and NGOs* |
| 9 November 2010 | Trivandrum | Discussion on ESA with active conservationists |
| 2 May 2011 | KFRI, Peechi, Trichur | Discussion on ESA with a core group of conservationists who is familiar with the areas |
| 31 May 2011 | KFRI, Peechi, Trichur | ESA discussion with a core group of conservationists who is familiar with the areas |
| 1 June 2011 | KFRI, Peechi, Trichur | ESA discussion with a core group of conservationists who is familiar with the areas |
| 2 June 2011 | KFRI, Peechi, Trichur | ESA discussion with a core group of conservationists who is familiar with the areas |
| 11 August 2011 | KFRI, Peechi, Trichur | Finalizing the ESA the core group of conservationists who is familiar with the areas |

## List of participants in public consultation on how to demarcate Ecological Sensitive Areas in Pune on 28th October 2010

| No. | Name | Organization |
|---|---|---|
| 1 | Hirji E Nagarwala | Individual |
| 2 | Rajbir Singh Bhadana | Videocon Industries |
| 3 | Loveleen Kumar Garg | UEGPL |
| 4 | Hasti Mal Kachhara | Urban Energy generation |
| 5 | Amruta Joglekar | Honarary researcher, RANWA, Abhaseb Garware College |
| 6 | Medhavi Tadwalkar | Honarary researcher, RANWA, |
| 7 | Anuj Khare | Nature Walk, Pune |
| 8 | Sunil Manahar kale | Abhaseb Garware College |
| 9 | Amrita Neelkantan | BNHS |
| 11 | Dr. Korad Vishakha | Ferguson College |
| 12 | Y. V. kanhare | Private |
| 13 | Dr K A Subramaniam | ZSI, WRC, Pune |
| 14 | Jayant Kulakarni | Wildlife Research and Conservation Society |

| No. | Name | Organization |
|---|---|---|
| 15 | Dr. Prachi Mehta | Wildlife Research and Conservation Society |
| 16 | Dr. M.S. Pradhan | Individual |
| 17 | Madhav Sahasvabudhe | Prayas Energy Group |
| 18 | Dr Ankur Patwardhan | Garware College |
| 19 | Mrs Poorva Joshi | Garware College |
| 20 | Rishikesh Patil | Honarary researcher, RANWA, Abhaseb Garware College |
| 21 | Mridul S Kashelkar | M.Sc. Student Garware College |
| 22 | Shubheda Shintre | Crossover Advisors Pvt ltd |
| 23 | Nandinidevi Pant Pratinidhi | Restoration of Nature |
| 24 | Pradeep Charan | Kalpvriksh Pune |
| 25 | Sunil G Ingle | Maharastra State Power Generation Company |
| 26 | M.R. Lad | MSPCL |
| 27 | Ketaki Ghate | Oikos |
| 28 | Manasi Karandikar | Oikos |
| 29 | Dr C.P. vibhute | Pune University |
| 30 | Vidya S Kudale | Biodiversity Department Garware College |
| 31 | Shweta S Majumdar | Biodiversity Department Garware College |
| 32 | Amit S Kalyankar | Biodiversity Department Garware College |
| 33 | Prerna Agarwal | IISER, Pune |
| 34 | Manali B Rane | Biodiversity Department Garware College |
| 35 | Ashok D'Costa | Turbosketch, Goa |
| 36 | Durga Thikale | Biodiversity Department Garware College |
| 37 | Mukta Mahajan | Biodiversity Department Garware College |
| 38 | Anand Dandekar | Maharastra Nav Nirman Sena |
| 39 | Kiran Purandare | Nisarga Vedh |
| 40 | P.K. Mirashe | MPCB Pune |
| 41 | M.M. Ngullie | Environment Department GoM |
| 42 | K.N. Hasabnis | MPCB Pune |
| 43 | Vivek M Tumsare | - |
| 44 | R.K. Adkar | C/o CF (WL) Pune |

| No. | Name | Organization |
|---|---|---|
| 45 | N. Hariharan | Adani Power |
| 46 | A. Barodia | Adani Power |
| 47 | Anupriya Karippadath | Abhasaheb College |
| 48 | D.K. Goyal | NDCIL Mumbai |
| 49 | Sajal Kulkarni | Abhasaheb College |
| 50 | Sanjay Patil | BAIF |
| 51 | S W H Naqvi | Director SFD Pune |
| 52 | S.P. Nande | OSD Energy Department Goa |
| 53 | Sachin A Punekar | Agarkar Research Institute |
| 54 | Dr. V. B. Sawarkar | - |
| 55 | M.G. Waghmode | MSPGCL |
| 56 | K.M. Chisutkar | MSPGCL |
| 57 | Dr Archana Godbole | AERF |
| 58 | Kadam Arunas | - |
| 59 | Prasad Joshi | Sakal Media Group |
| 60 | Santosh Kr Singh | Adani Power Ltd |
| 61 | Eva Pilot | Geomed Germany |
| 62 | Thomas Kraft | Geomed Germany |
| 63 | Rahul. D. Prabhu Khanolkar | BVIEER |
| 64 | Aparna Watve | BIOME |
| 65 | Pradeep Patankar | Hon. Wildlife warden Satara |
| 66 | Vijay P | - |
| 67 | Kalpana Kadap | Asstt. Prof. SCOA, landscape Architecture |
| 68 | Anand Chain | Sakal Times |
| 69 | Dr Mayuri Panse | - |
| 70 | Dipannita Das | TOI |
| 71 | Santosh R | Go Maharastra |
| 72 | Bhagyashree Kulthe | DNA |
| 73 | Amruta | MKCL |
| 74 | Shamita Deo | Kalpavrikhsa |
| 75 | Hema & Nudrak | BEAG |

| No. | Name | Organization |
|---|---|---|
| 76 | Lakshmikant | Survey of India |
| 77 | David | - |
| 78 | Dr. Dhavle | P.V. |
| 79 | S. Asthana | Forest |
| 80 | Meenakshi Gurrav | Pudhari Newspaper |
| 81 | Satish Awate | CEE |
| 82 | J.S. Duge | MAHAGENCO |
| 83 | Swati Shinde | Times of India |
| 84 | Amol Gole | Times of India |
| 85 | Jagdsing Girage | Collector Raigads Representative |
| 86 | Dr. Pramod Patil | Gahivar Foundation |
| 87 | Melissa Greenberg | The Alliance of global Education |
| 88 | Chelsea O Julliran | The Alliance of Global Education |
| 89 | Allegra Mount | The Alliance of Global Education |
| 90 | Liza Gordon | The Alliance of Global Education |
| 91 | Erik Rempen | The Alliance of Global Education |
| 92 | Harencha Whitchorft | The Alliance of Global Education |
| 93 | Jeannie Kinnett | The Alliance of Global Education |
| 94 | Preston Hollts | The Alliance of Global Education |
| 95 | Sarah Stodder | The Alliance of Global Education |
| 96 | Donas Piper | University of Applied Science, Berlin |
| 97 | Dr. J. Sohoeikart | University of Applied Science, Berlin |
| 98 | Kusum Karnik | Shashwat |
| 99 | Jayant Sarnaik | AERF |
| 100 | Niteen Pawar | - |
| 101 | M. S. Somni | Individual |
| 102 | U.V.Singh | - |
| 103 | Nilam V Kumbhar | BVIEER |
| 104 | Priti | BVIEER |
| 105 | Nayela Sultanpuri | BVIEER |

| No. | Name | Organization |
|---|---|---|
| 106 | R. Khalid | BVIEER |
| 107 | Alineza lakhamsey | BVIEER |
| 108 | Kand Mandke | Deptt. of Audiology, BVU |
| 109 | Yogeah Kakade | Deptt. of Audiology, BVU |
| 110 | Dayanand Hembade | Deptt. of Audiology, BVU |
| 111 | Govind Rajopadhye | Deptt. of Audiology, BVU |
| 112 | Janvi Desmukh | Deptt. of Audiology, BVU |
| 113 | Anisha Gejji | Deptt. of Audiology, BVU |
| 114 | Arun Lad | Deptt. of Audiology, BVU |
| 115 | Priyanka Nitturkar | Deptt. of Audiology, BVU |
| 116 | Sachin J Patil | Deptt. of Audiology, BVU |
| 117 | V Arya Anil Kumar | Deptt. of Audiology, BVU |
| 118 | Sanchid Kashmiri | Deptt. of Audiology, BVU |

## List of participants in public consultation on mining in Goa on 27th September 2010

| No. | Name | Organization |
|---|---|---|
| 1 | Abhijit Prabhudesai | Goenchea Xetkarancho Ekvott |
| 2 | Carmen Miranda | Save Western Ghats campaign |
| 3 | Kamalakar Sadhale | Nirmal Vishwa |
| 4 | M.K. Janarthanam | Goa University |
| 5 | G.H. Karkare | ICPL |
| 6 | Maria A Couro | --- |
| 7 | B.S. Kantak | Chowgule & Co. Ltd |
| 8 | Shridhar Hegde | Farmto Kamas Pvt Ltd |
| 9 | Hartman Desouza | Save Western Ghats campaign |
| 11 | Rebouri Saha | GBA |
| 12 | Gabriella D'cruz | Goa Foundation |
| 13 | Pandurang Patil | Utkarsh Mandal, Rivona |

| No. | Name | Organization |
|---|---|---|
| 14 | Anirudh P Dev | Ruskiray Gram Vikas Kendra |
| 15 | Rama P Velip | Colomba village |
| 16 | Dr. A.R. Prabhudesai | Colomba vilage |
| 17 | A.J. Simon | Goa Foundation |
| 18 | G. Shirish | M/s V.M. Salgaocar |
| 19 | Asavari Kulkarni | -do- |
| 20 | Dr. A.G. Chachati | Goa University |
| 21 | Dayeedar Gaonka | Gakuved Federation |
| 22 | Sanjay Alberto | Timblo Private Ltd |
| 23 | Saroj Kumar | -do- |
| 24 | Nirmal Kulkarni | Mhadei Research Centre |
| 25 | Rajendra P Kerkar | Goa Foundation Wildlfie Core Group |
| 26 | Nyla Coelho | Goa Foundation (SEF) |
| 27 | Sujeet Dongre | CEE Goa State Office |
| 28 | Dr. Manoj Borkar | BRC, Carmel College |
| 29 | Baban Ingole | NIO Goa |
| 30 | Ayesha Madan | Goa Foundation |
| 31 | U S Tilla | Fomento |
| 32 | Satyam Vaiude | Fomento |
| 33 | Rajendra Kakodkar | Kaizen Consultants |
| 34 | P F X D'Lima | GIM |
| 35 | Claude Alvares | Goa Foundation |
| 36 | D.N.F. Carealho | Forest Deptt |
| 37 | M.V. Karkhanis | -do- |
| 38 | Yogesh | -do- |
| 39 | V. Khulhring | -do- |
| 40 | Debendra Dalei | -do- |
| 41 | Devika Sequeira | Deccan Herald |
| 42 | A. Nayak | V.M.S.B. |
| 43 | Rajagopal Prashant | ACF (N) |

| No. | Name | Organization |
|---|---|---|
| 44 | S.Sridhar | GMOEA |
| 45 | D.V.Pichamuthu | Federation of Indian Mineral industries (FIMI) |
| 46 | Glenn Kalavanpara | GMOEA |
| 47 | M.V. Khenderpuskar | Chowgule |
| 48 | S.Y. Waluse | -do- |
| 49 | H.P. Nandey | RBSMPL |
| 50 | Hector Ferrandes | Directorate of Mines and Geology |
| 51 | Parag Rangnekar | MFG |
| 52 | M.K. Shambhu | Forest Department Goa |
| 53 | John Fernandes | NGO Quepem |
| 54 | Dr. Sachin Tendulkar | MFG Panaji |
| 55 | Dr. G.T. Kumar IFS | DCF ( North Goa) |
| 56 | Harish Rasani | DMC |
| 57 | Babu T Gowta | GAKUVED |
| 58 | Lisa Dias-Noronha | Concerned Citizen |
| 59 | Andrea Pereira | Concerned Citizen |
| 60 | Terence Jorge | Concerned Citizen |
| 61 | Punkaj Vaju | Affected Parties |
| 62 | Loena Fernandes | GOACAN |
| 63 | Roland Martins | GOACAN |
| 64 | Edgar Ribeiro | --- |
| 65 | Gayatriraje Chowgule | Conan Agro marine |
| 66 | Tillottama Chowgule | Conan Agro marine |
| 67 | Dean D'cruz | -- |
| 68 | Patricia Pinto | PMCA |
| 69 | Christopher Foensea | AITUC |
| 70 | Rakesh Y Kandolkanti | Prudent Media |
| 71 | Jagdish Desai | SESA Goa |
| 72 | Rahul Alvares | Goa Foundation |
| 73 | Anil Patil | Zee News |
| 74 | Tulsidas Chail | CNN IBN |

| No. | Name | Organization |
|---|---|---|
| 75 | Manoj Thakur | Samruddha Resources |
| 76 | Zarina Dacunha | GXE-Margoa |
| 77 | Paul Fernandes | Times of India |
| 78 | Dr. Joe D'souza | CCP |
| 79 | Mahesh Patil | SESA Goa |
| 80 | Sharon Dcosta | CSJP |
| 81 | Fr. Maverick Fernandes | CSJP |
| 82 | Satish S Naik | Samruddha Resources |
| 83 | Pradeep Kr Dolei | Samruddha Resources |
| 84 | Dinesh Dias | GRID |
| 85 | Alok Patil | SIPLtd |
| 86 | AEM Ventures | Amit Patkar |
| 87 | Sanghmitra Mainkar | Journalist " Gomantak" |

# Annexure F: Field Visits

## Karnataka

| Date | Place | Issues/Remarks | Participants |
|---|---|---|---|
| 16.9.2010 | Gundia | Ecologically Sensitive area. Rare and endangered species of flora and fauna, amphibians, snakes and reptiles, Pushpagiri Sanctuary, Elephant Reserve, Demand for more compensation, Elephant and Human conflict, strong opposition for Gundia Hydal Project from local people and Panchayat's. No further fragmentation of W.Ghats. No Mini/Micro Hydel Project, No River Diversion. | Prof.Madhava Gadgil; Dr.Subramanyam; Vidya Nayak, Prof.Subhashchandran, Dr.Harish Bhat, IISc; Y.B.Ramakrishna, Chairman, Bio Fuel Task Force-K. ; Ranjan Raol Yerdoor, W.Ghats Task Force; DFO, ACF, KPCL representatives; Environmentalists; Peoples representatives; Wild Life Warden; Agriculturists; Anganawady Workers; SHG Leaders; Women's Forum members. |

## Maharastra

| Date | Place | Issues/Remarks |
|---|---|---|
| 4/10-12/10/2010 | Ratanagiri-Sindhudurg-Kolhapur districts (Visit to project sites) | Visit to Ratanagiri-Sindhudurg-Kolhapur districts in Maharashtra |
| 28/11-1/12/2010 | Aamby Valley, Matheran, Lonavala, Lavasa | Development of Townships in Western Ghats from perspective of Regional Planning |
| 19/01/2011 | Lavasa City | Lavasa Field Visit |
| 1/3-4/3/2011 | Mahabaleshwar-Panchgani | Problems of ESZ rules to Local People |
| 16/3-19/3/2011 | Ratnagiri District in Maharashtra | Konkan Field tour for long term ecology monitoring site and cumulative impact assessment |
| 14/04/2011 | ENERCON wind mill sites near BhImashankar Wildlife Sanctuary | Environmental Impact of Wind mill project in Proposed ESA adjoining BhImashankar Wildlife Sanctuary |
| 15/05-16/05/2011 | Mahabaleshwar | Mahabaleshwar-Panchgani ESZ field visit |
| 19/05/2011 | ENERCON wind mill sites near Bhimashankar Wildlife Sanctuary | Environmental Impact of Wind mill project in Proposed ESA adjoining Bhimashankar Wildlife Sanctuary |

## Tamil Nadu

| Date | Place | Issues/Remarks |
|---|---|---|
| May, June, July, 2010 | Ootacamund, Coimbatore | To assess the status of ecology, environmental pollution in Western Ghats areas. |
| Jan, Feb, Mar, 2011 | Kodaikanal, Valparai | To assess the status of ecology, environmental pollution in Western Ghats areas. |

## Goa

| Date | Place | Issues/Remarks |
|---|---|---|
| 28.9.2010 | Site Visit to iron ore mines, Madei and Bhagwan Mahavir Wildlife Sanctuary | Iron ore mining |
| 12/1-24/1/2011 | Goa | Mining in Goa |

## Kerala

| Date | Place | Issues/Remarks |
|---|---|---|
| 29 January 2011 | Athirappilly, Vazhachal, Trichur | Athirappilly project: WGEEP site visit, consultation at the Athirappilly Panchayath, Public consultation and Technical consultation with officers of the Kerala State Electricy Board, |

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Given the environmental sensitivity and ecological significance of the Western Ghats region and the complex interstate nature of its geography, The Ministry of Environment & Forests constituted a Western Ghats Ecology Expert Panel.

The Terms of Reference of the Committee are as under:

i. to assess the current status of ecology of the Western Ghats region.

ii. to demarcate areas within the Western Ghats Region which need to be notified as ecologically sensitive and to recommend for notification of such areas as ecologically sensitive zones under the Environment (Protection) Act, 1986. In doing so, the Panel shall review the existing reports such as the Pronab Sen Committee report and Dr. T.S. Vijayraghavan Committee Report, Hon'ble Supreme Court's directions, Recommendations, of the National Board for Wildlife and consult all concerned State Governments.

iii. to make recommendations for the conservation, protection and rejuvenation of the Western Ghats Region following a comprehensive consultation process involving people and Governments of all the concerned States.

iv. to suggest measures for effective implementation of the notifications issued by the Government of India in the Ministry of Environment and Forests declaring specific areas in the Western Ghats Region as Eco-sensitive zones under the Environment (Protection) Act, 1986.

v. to recommend the modalities for the establishment of Western Ghats Ecology Authority under the Environment (Protection) Act, 1986 which will be a professional body to manage the ecology of the region and to ensure its sustainable development with the support of all concerned states.

vi. to deal with any other relevant environment and ecological issues pertaining to Western Ghats Region, including those which may be referred to it by the Central Government in the Ministry of Environment and Forests.

जहाँ है हरियाली।
वहाँ है खुशहाली।।

Ministry of Environment and Forests
Government of India