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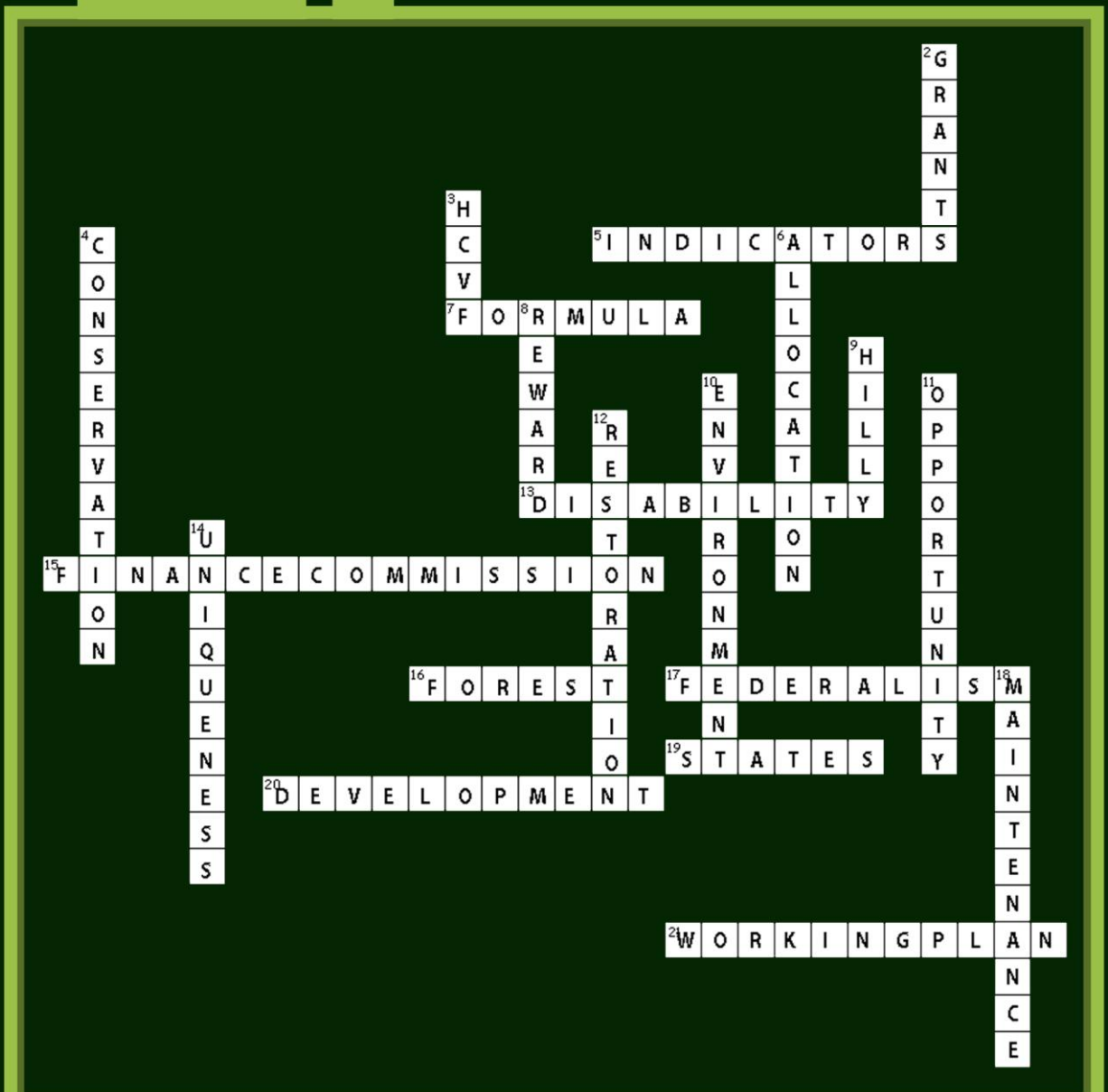
High Conservation Value Forests



an instrument for effective forest fiscal federalism in India

High Conservation Value Forests:

An Instrument for Effective Forest Fiscal Federalism in India

The Fourteenth Finance Commission of India

Centre for Ecological Services Management at Indian Institute of Forest Management (IIFM), Bhopal

In collaboration with:

Forest Survey of India (FSI), Dehradun

Iora Ecological Solutions (IES), New Delhi

June, 2014

High Conservation Value Forests: An Instrument for Effective Forest Fiscal Federalism in India

Supported by:

The Fourteenth Finance Commission of India
B-14/A, Chatrapati Shivaji Bhavan,
Qutab Institutional Area,
Near Katwaria Sarai,
New Delhi-110016

Authors:

Madhu Verma, Professor, Indian Institute of Forest Management
Dhaval Negandhi, Subject Expert, Indian Institute of Forest Management
Swapan Mehra, CEO, Iora Ecological Solutions
Rohit Singh, Subject Expert, Indian Institute of Forest Management
Anmol Kumar, Director General, Forest Survey of India
Rajesh Kumar, Sr. Dy. Director, Forest Survey of India

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Contact information:

Indian Institute of Forest Management, P. O. Box 357, Nehru Nagar, Bhopal (462003), Madhya Pradesh, India
Phone: +91-755-2775716 (Ext: 334) | Email: mverma@iifm.ac.in

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Disclaimer

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At the very outset, the author expresses her gratitude to Mr. A.N. Jha, Secretary, XIV Finance Commission for showing his confidence in delegating such a challenging task to the Indian Institute of Forest Management, Bhopal which gave us an opportunity to conduct thorough research to make our recommendations. We are deeply indebted to Dr. Y.V. Reddy, Chairman, XIV Finance Commission for his advice and direction during the commencement of the study which helped us shaping up its execution format. We are also thankful to Dr. Abhijit Sen (Member, XIV Finance Commission), Ms. Sushama Nath (Member, XIV Finance Commission), Dr. M. Govind Rao (Member, XIV Finance Commission), Dr. Sudipto Mundle (Member, XIV Finance Commission), Shri Mukhmeet Singh Bhatia (Joint Director, XIV Finance Commission), Prof Pinaki Chakraborty (Economic Advisor, XIV Finance Commission), and other members of XIV Commission who have provided valuable suggestions to the study which lead to its completion. We wish to put on record the unconditional support extended by Mr. Sanjay Pandey, Director, XIV Finance Commission throughout the currency of the project and facilitating its execution.

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Bhopal, June 20, 2014

(Madhu Verma)
Professor, Environment & Development Economics &
Coordinator, Centre for Ecological Services Mgmt.
IIFM

Dr. Giridhar Kinhal, IFS
DIRECTOR

भारतीय वन प्रबंध संस्थान
INDIAN INSTITUTE OF FOREST MANAGEMENT
(An Autonomous Institute of the Ministry of Environment & Forests, Government of India)
BHOPAL

FOREWORD

Forests are important for a variety of reasons including, inter alia, goods, ecosystem services, habitat, biodiversity and livelihoods. But the importance of forests which act as the backbone of life on this planet is always underestimated as they are falsely assumed to be a resource that the earth is rich in. But in times when the country is trying to revive economic growth, it is important to ask whether conservation of forests hinders country's economic progress. The critical question becomes – can development and environment conservation be mutually reinforcing?

The Finance Commission of India has always been keen to combine the two together and ensure that the country's economic growth is sustainable. Considering forests as a resource which is of very high value is important. With the proposal of green accounting, Green GDP, Green Bonus and Green Taxes in the country; it is clear that the ecological factors need to be urgently incorporated in to our National Accounting System. Keeping their land under forests and helping the country to attain ecological security & sustainability needs to be acknowledged in the form of enhanced financial allocation to mainstream development in such states.

I feel delighted with the fact that Indian Institute of Forest Management has been chosen by the Finance Commission of India yet again, with the XIV Finance Commission to undertake the study on "High Conservation Value Forests: An Instrument for Effective Forest Fiscal Federalism in India" to promote the case of conservation finance for country's forests and carrying forward the work done by the IIFM for the XIII Finance Commission of India. Following a rigorous research process in collaboration with the Forest Survey of India and Iora Ecological Solution, team of experts and a thorough consultation process with all concerned stakeholders, the study identifies forests across the country holding high conservation values inside. Such forests deserve a special attention for conservation and preservation of these values and most importantly for enhancing them.

The XII Finance Commission allocated a Grant-in-aid of ₹ 1000 Crore on the basis of the recorded forest area in each state while the XIII Finance Commission allocated ₹ 5000 Crore, based on the area under forest cover with an added parameter of Canopy density. While these are broad parameters in deciding the quality of the forests in each state, there

was a requirement to develop a tool that helps allocation of grants based on more scientific and pragmatic factors with ease of implementation. The current study has made some sincere efforts in that direction.

In consonance with the requirements of the XIV Finance Commission the current study estimates (a) a relative index on High Conservation Value Forest across States; (b) the potential revenue foregone by the States (c) the cost of restoring the health of degraded forest areas (d) the release and utilization pattern of the Grants-in-aid by the States in Developmental and Forest Conservation activities; and finally (e) the funds allocation required by States in effectively maintaining their land under forests.

I take this opportunity to compliment the study team for their sincere endeavor in bringing out this report. I hope that following the intense research process adopted in identifying the importance of forests from various aspects and introducing the concept of High Conservation Values in Indian context which will be of great use for the XIV Finance Commission to respond to its mandate of "the need to balance management of Environment, Ecology and Climate Change to be consistent with Sustainable Economic Development".

I am aware that during the course of the study, the team also faced difficulties in obtaining the required data as most of the agencies do not have such data collection processes in place to cater to such requirements. It was also observed that many States have not been using the forest grants in the manner mandated by the Finance Commission. The Finance Commission highlights the need for monitoring of the utilization of the grants released to the States, and for this purpose there is an urgent need create a mechanism that actively engages in such monitoring process.

The IIFM, having been an Institute associated with this activity, proposes to assist the Finance Commission to create and provide a platform for this important task of monitoring and evaluation of utilization of grants. Such a platform, Finance Commission Grant & Performance Monitoring Cell, if established at the Indian Institute of Forest Management, shall regularly collect, compile, analyze and monitor data across States on key parameters through an online internet based system wherein all the states will have access to feed in data related to different tasks accomplished and the utilization of funds. The Cell can also provide invaluable information which can be further used not only to incentivize proactively performing States but also continually refine allocation of forest grants across States.

I am sure that the findings of the report will assist the policy makers in particular and all stakeholders of forests in general to understand the economics of forest conservation in India which in turn will help managing our forests sustainably.

Bhopal, June 20, 2014 **(G. A. Kinhal)**

MANDATE OF THE 14TH FINANCE COMMISSION OF INDIA

"The need to balance management of Environment, Ecology and Climate Change consistent with Sustainable Economic Development"

TERMS OF REFERENCE OF THE STUDY

[*Vide MOU signed on 10th of October 2013 between The XIV Finance Commission and Indian Institute of Forest Management with reference D.O.No.11015/03/2013-FFC (Forests)]*

- Identify parameters to define High Conservation Value forest.
- Review of literature on robustness of parameters in identifying HCV forests.
- Identify High Conservation Value (HCV) forests, its area and characteristics across states in India.
- Identify expenditure on conserving/maintaining the geographical area under forests in states.
- Identify quantum of revenue forgone as a result of maintaining forest areas and not utilising for economic activities.
- Identify a set of parameters which would reflect the innate cost of conserving HCV forests and restoring degraded forests.
- Assessment of status of scientific work plans and its implementation by states as recommended by earlier Finance Commissions.

KEY MESSAGES

Even though forests provide a huge number of ecosystem services, these benefits are not reflected in the country's National Accounting System on account of the fact that many non-tangible services often do not have a price-tag attached to them. In contrast, the National Forest Policy (1988) and recent orders by the Hon'ble Supreme Court of India have put a regulation on green felling, thereby decreased the revenue from forests to States. Further, States also incur huge opportunity cost for keeping their land under forests which needs to be compensated.

The XII and XIII Finance Commission of India have recognized the importance of forests and allocated grants-in-aid of ₹ 1000 Crore and ₹ 5000 Crore respectively to states primarily on the basis of forest area/cover. While acknowledging the increased grant-in-aid to states based on forest area, it should be kept in mind that the economic value of forests is largely related to local factors such as forest dependency, biodiversity, and geographical location, among others apart from the area per se.

The current study attempts to modify the allocation formula for grants-in-aid to different states used in the XIII Finance Commission of India and allocations are recommended using Nationally Appropriate High Conservation Value (HCV) forests index scores to duly reflect multiple values of forests.

The state-wise index for High Conservation Value has been developed based on indicators identified through an extremely rigorous process of literature review and stakeholder consultations. These indicators broadly related to three different categories – natural endowment, actions undertaken to conserve this endowment and cross-cutting factors.

In addition to High Conservation Value Index, the study also argues that keeping areas under forests entails two major costs, apart from several others, and are broadly termed as 'Conservation Costs' for the study. These include the maintenance cost of keeping forests as well as the restoration cost required for improving the health of existing degraded forests in the state. Thus it is proposed that a part of the grants-in-aid for forests should also be used to compensate states for these Conservation Costs.

As the amount to be given for grants-in-aid for forests in XII and XIII Finance Commission have been regarded by States as too low for incentivizing forest conservation, an attempt has been made in this study using agricultural productivity potential to provide an estimate of the potential revenues forgone in keeping areas under forests as a base for estimating compensation amount though the entire amount cannot be compensated.

The study proposes that the total grants-in-aid should be distributed to the states based on the High Conservation Value Forest Index as well as the Conservation Costs in the ratio of 4:1. This recommended ratio has emerged out of extensive consultations carried out with relevant stakeholders[1].

It is proposed that a Finance Commission Grant & Performance Monitoring Cell may be established at the Indian Institute of Forest Management to regularly collect, compile, analyze and monitor data across States on key parameters related to different tasks accomplished and the utilization of funds. The Cell can also provide invaluable information which can be further used not only to incentivize proactively performing States but also continually refine allocation of forest grants across States.

[1] The objective of the study is drawing allocations for States as incentives for State's efforts for conservation. HCVF is the incentivising parameter needing more weightage as compared to Conservative cost which is a short term investment for areas to be HCVF. Moreover higher weightage to Conservation Cost may turn into a negative incentive.

SUGGESTED FORMULA

Incorporating the concept of High Conservation Value Forest in the allocation formula used by the XIII Finance Commission of India, the suggested allocation formula is as follows.

$$G_i = \frac{\left(\left[\left\{\frac{F_i}{\sum F_i} + R_i\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{C_i}\right)\right\}\right] + \frac{HCVF_i}{\sum HCVF_i}\right)}{\sum_{i=1}^{n}\left(\left[\left\{\frac{F_i}{\sum F_i} + R_i\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{C_i}\right)\right\}\right] + \frac{HCVF_i}{\sum HCVF_i}\right)}$$

G_i	Share for state *i*
A_i	Geographical area of state *i*
F_i	Total recorded forest area of state *i*
M_i	Moderately dense forest area of state *i*
H_i	Highly (very) dense forest area of state *i*
R_i	$max\left[0, \left\{\frac{F_i}{A_i} - \frac{\sum F_i}{\sum A_i}\right\}/10\right]$
C_i	Area under forest cover of state *i*
$HCVF_i$	High Conservation Value Forest index of state *i*
n	Number of States i.e. 28

Scenario 1 All indicators of HCVF carry equal weights

$$HCVF_i = \sum_{i=1}^{3} EF_i + \sum_{i=1}^{4} AF_i + \sum_{i=1}^{3} CF_i$$

Scenario 2 Indicators with differential weights i.e. Action Factors (0.5), Cross-cutting Factors (0.3) and Natural Endowment Factors (0.2)

$$HCVF_i = \left(0.2\sum_{i=1}^{3} EF_i\right) + \left(0.5\sum_{i=1}^{4} AF_i\right) + \left(0.3\sum_{i=1}^{3} CF_i\right)$$

EF_i	Natural endowment factor indicators of state *i*
AF_i	Action factor indicators of state *i*
CF_i	Cross-cutting factor indicators of state *i*

EXECUTIVE SUMMARY

The term "Forest" may be interpreted in a number of way. For some it may mean just any other resource from which benefits may be drawn, to some while it may mean non usable land and others may also feel it being of utter high importance. This is because forests usage is different for different stakeholders. For people using forest for wood, NTFP and other goods and services, it's just a resource reservoir where they can avail benefits for free. For states directed to maintain large forest areas it may mean a disability and it's an obstruction in using the land for different purpose that is economically more beneficial. And lastly for those who understand the criticality of forests for sustaining life on this planet, it is something of unimaginable high importance.

Further, on account of the absence of Total Economic Value (TEV) estimate for ecosystem services from forests, various ecological services provided by forest are used as free gifts of nature. The fact that no price tag is attached to such services currently due to poor or absence of markets for them, has resulted in overuse, misuse and abuse of forest resources. The current National Accounting System of the country reflects only the marketed value of few visible services supplied by forests. This is further reflected in terms of low budgetary allocations to the forestry sector as inter-governmental and intra-state transfers give significant weightage to the marketed benefits of forest ecosystems and income generating capacities of various states.

As per the mandate of the 1988 National Forest Policy, many states are directed to keep large part of their geographical areas under forest. In addition, there has been a directive from the Hon'ble Supreme Court of India regulating green felling and extraction of other forest produces in various forest-rich states unless working plan prescriptions are available in such states. On account of both the interventions, these forest-rich states, in spite of providing significant ecosystem services, are incurring revenue losses. Furthermore, these states incur heavy expenditure on forest management and cater the ecological services which are used as public goods by other regions without fiscal charges. These states, despite having abundant forest-wealth, lag behind in terms of economic growth and human development vis-à-vis many forest

sparse states which are either agriculturally or industrially developed or have established a strong tertiary sector.

The XII Finance Commission allocated a Grant-in-aid of ₹ 1000 Crore as compensation for created fiscal disabilities on the basis of the Recorded forest areas in each state and no quality aspect was considered while allocating the grant. As a result, the states having larger geographical areas had larger area of recorded forest areas and were compensated more and the smaller states struggled.

To broaden such single parameter approach, the XIII Finance Commission of India awarded a study to IIFM to 'Developing Mechanism for Compensating States for Managing Large Geographical Areas Under Forest' wherein various formulae were developed to incorporate protected areas, economic values, disability factors, opportunity cost, restoration cost among others but the eventual formula used by the XIII Finance Commission for allocation again considered the area under forest cover with an added parameter of Canopy density. This again created discrepancies in allocation, as for states in the arid region it is impossible to have high canopy density forests despite such forests having unique role in forest ecosystems, whereas the North-Eastern States would have very high density concentration. This is simply due to the difference in the bioclimatic zones that made the allocation somewhat skewed.

Hence, there was a requirement to allocate the grants based on the formula that is more scientific, objective and pragmatic most importantly easy to understand and implement. In this regard, the XIV Finance Commission commissioned a study to the Indian Institute of Forest Management to improve upon the existing allocation formula that can balance the distribution of grants among the states also based on the quality of their forests. The following TORs were given to IIFM for execution of the study:

- Identify parameters to define High Conservation Value forest.
- Review of literature on robustness of parameters in identifying HCV forests.
- Identify High Conservation Value (HCV) forests, its area and characteristics across states in India.
- Identify expenditure on conserving/maintaining the geographical area under forests in states.

- Identify quantum of revenue forgone as a result of maintaining forest areas and not utilising for economic activities.
- Identify a set of parameters which would reflect the innate cost of conserving HCV forests and restoring degraded forests.
- Assessment of status of scientific work plans and its implementation by states as recommended by earlier Finance Commissions.

To internalize the concerns of the XIV Finance Commission and to respond to the TOR of the XIV Finance Commission, the study uses High Conservation Value Forests (HCVF) index tool and ratifies that for sustainable provisioning of such values, requisite conservation finance shall be needed and thus recommends allocation of grants on the basis HCVF scores obtained by respective states.

The term HCV was coined by the Forest Stewardship Council (FSC) of United Kingdom, which had set the principles of effective and efficient management of the forests. HCV suggests those values of the forests which have global, national or regional significance and need added efforts to maintain and enhance such values. Such values may be endangered/threatened/endemic species of flora and fauna, large landscape level forests, threatened ecosystems, the forest providing critical services of nature like watershed, containing soil erosion, etc. and the forests providing livelihood, home and sustenance to the local communities and preserving their cultural values. The study is expected to identify such areas which are HCVF and allocating grants on the basis of their conservation values and also incorporating the different cost incurred by States in keeping and maintaining the health of their forests.

The study estimates various indices and costs & assesses scientific working plan status to which the Finance Commission grants are linked. These are briefly explained below.

1. **High Conservation Value Forests Index** – An index that, on the basis of a number of indicators relating to three types of factors – natural endowment, actions undertaken to conserve this endowment and cross-cutting factors, assesses the importance of forests in each state and allocated scores. These scores allocated to each indicator for each states which finally adds up to form an index that evaluates a relative importance of forests in each state. The HCVF

Index is a reflection of the ranking of the forests of all the states, considering the important values contained in them.

2. **Conservation Cost Index** – This Index accounts for two different costs incurred by states to keep their lands under forest cover. The two costs would add up to form a combined index which would reflect the cost incurred by states for conservation of forests. These costs are:
    a. **Maintenance Cost** – Maintenance cost may be defined as the monetary requirement of each state that is adequate to keep best possible health of their forests. Maintenance cost may differ according to different factors applicable to different states like additional cost of inaccessibility, cost of labour and other externalities. The maintenance cost is derived from the financial provisioning by the center and state to the Forest departments of each state to assess the average cost of maintenance per unit area. Then a further assessment of the states which are operating below the country average, and then bridging this gap by providing additional funds, which would further be performance driven.
    b. **Restoration Cost** - Each state possesses a degraded forest area, which due to some or the other reason has deteriorated from a healthy forest to a degraded one. The Open Forest cover of each state reflects the degraded area that needs restoration. To improve the land cover under forest in the country, the Central Ministry has initiated the compulsory afforestation schemes in India. This is being managed by the NAEB which is a part of Ministry of Environment and Forest. NAEB has per unit area cost for afforestation. The same rates have been uses to estimate the monetary requirement in each state for restoration of degraded forest areas.
3. **Opportunity Cost** – Opportunity Cost refers to the revenue forgone by states in not diverting the lands under forest cover for an economically potent land use. The opportunity cost has been calculated by a conservative approach to draw minimum possible opportunity cost value for the country and each state. For this the states were divided into the categories of Hilly States and Plains States. Then the Hilly states on basis on horticulture activities with 33% conversion ratio and Plains States on the basis of agriculture were assessed for the opportunity cost, which still came out to a high cost of ₹ 200000 Crore. The Opportunity cost helps

in suggesting the magnitude of the grants which should be provided by the XIV Finance Commission to compensate for created fiscal disabilities.

4. **Assessment of Scientific Working Plans** – As the release of grants of XIII Finance Commission for the last 3 years was tied to the number of working plans approved, a brief analysis of the release pattern of the funds viz-a-viz the allocated grants has also been conducted.

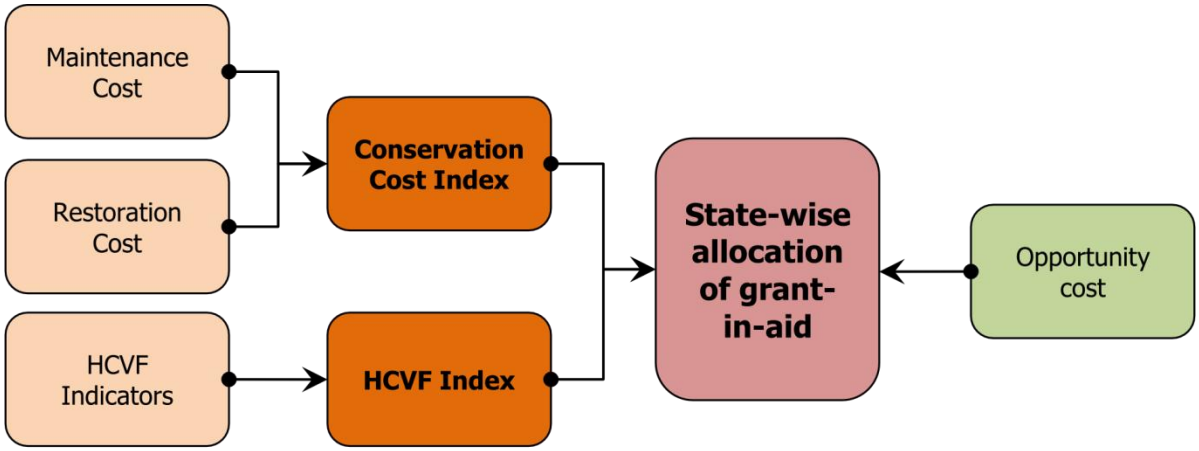

Figure A: Methodological framework

The figure above shows the pictorial representation of the methodology used in the study and how the three parts of the study may be interlinked conceptually

HCVF Index Estimation

For the HCVF identification, based on the literature reviewed and the categories defined, an exhaustive list of 62 indicators was drafted in consultation with experts. The basis of drawing such an elaborative list of HCVs was that the list should not exclude any possible value that can be of a high importance in Indian context. The initial list did not consider the factors such as data availability, unreliability of data, national significance, etc. as the prime focus was to cover each and every aspect of Indian forests. After the meeting at FSI & MoEF officials and consultation with the different stakeholders and experts, the list was screened for the irrelevant indicators and the other important indicators were added or replaced. Subsequently a Group Convergence Method Workshop was conducted at New Delhi wherein the indicators were discussed at length with deletion and addition process and the following 13 indicators were finalized to develop the HCVF Index. These 13 indicators can broadly be categorized into three

major factors – natural endowment Ⓔ, action undertaken to conserve this endowment Ⓐand cross-cutting factors Ⓒ.

Table A: Final list of indicators

Factor	Indicators	Code
Ⓔ	Proportion of geographical area under recorded forests	FAGA
	Canopy Density of Forest Areas	FCD
	Area under High Altitude Forests (Altitude >= 2000mtr)	HAF
	Number of endemic floral species	EMICFL
	Number of endemic faunal species	EMICFA
	Area under wetlands inside forests	WET
Ⓐ	Proportion of recorded forest areas designated as protected areas	PARF
	Proportion of recorded forest areas which are natural forests	NFRF
	Diversion of recorded forest area between 1980-2012	DIV
	Average patch size of forests	PATCH
Ⓒ	Growing stock (in forests) per unit area	GS
	Intensity of regeneration	REG
	Area under wildlife corridor	CORR

GCM workshop further discussed about allocation of weights to the indicator as per their importance but during the deliberations it was resolved to give equal weights for the matter of simplification and avoiding biases. Each indicator is assigned a score on a scale of 5, with 5 being the maximum score. The scores are allocated according to the value a state possesses which corresponds to the 5 or 6 categories defined for all indicators. The categories are derived using the mean and standard deviation of the existing data for all 28 states. Accordingly each state is allocated scores for each of the 13 indicators, which when totaled gives the state HCVF index. On account of non-availability of Faunal Endemism data at state-level, it was decided by the experts and the stakeholders that the Floral Endemism data can act as a proxy for the total endemism in the State (For both Floral and Faunal species). Thus, the study uses endemic floral species for each state as an indicator for the total endemism in each State.

The formula so developed was then presented to the members of the Fourteenth Finance Commission of India for their comments wherein it was decided that as the XIII Finance Commission allocation formula already covered two of the 12 finalized indicators i.e. FAGA and FCD (stated below), refinements should be done to the existing allocation formula by incorporating HCVF values in it rather than creating a complete new mechanism for allocations of Grants-in-aid.

The study process has brought out the understanding that the allocation of forest grants under the XIV Finance Commission needs to be refined to reflect three aspects viz – forests as endowment, actions for conservation initiated by the States and finally cross-cutting activities that link the forest areas with different conservation activities. Keeping this in focus, the allocation strategy is being proposed by imbibing these variations into the development of HCVF Index. Expert consultations during the study suggested that the forest areas in each of the States in the country provides a good articulation for 20% apportionment of Index to the Endowment Factors, 50% to pro-active Action Factors, and finally the rest 30% to the cross-cutting factors. Such a mechanism is envisaged to provide an equitable and pragmatic formula for allocation and distribution of funds.

The Allocation Formula used by the XIII Finance Commission and the suggested formula for the XIV Finance Commission are as follows:

Formula used by the XIII Finance Commission

$$G_i = \frac{\left[\left\{\frac{F_i}{\sum F_i} + R_i\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{A_i}\right)\right\}\right]}{\sum_{i=1}^{n} \left\{\frac{F_i}{\sum F_i} + R_i\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{A_i}\right)\right\}}$$

G_i	Share for state *i*
A_i	Geographical area of state *i*
F_i	Total forest cover of state *i*
M_i	Moderately dense forest area of state *i*
H_i	Highly dense forest area of state *i*
R_i	$max\left[0, \left\{\frac{F_i}{A_i} - \frac{\sum F_i}{\sum A_i}\right\}/100\right]$
n	Number of States i.e. 28

Suggested formula for the XIV Finance Commission by incorporating the HCVF Index Score

$$G_i = \frac{\left(\left[\left\{\frac{F_i}{\sum F_i} + \boldsymbol{R_i}\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{\boldsymbol{C_i}}\right)\right\}\right] + \frac{\boldsymbol{HCVF_i}}{\sum \boldsymbol{HCVF_i}}\right)}{\sum_{i=1}^{n} \left(\left[\left\{\frac{F_i}{\sum F_i} + \boldsymbol{R_i}\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{\boldsymbol{C_i}}\right)\right\}\right] + \frac{\boldsymbol{HCVF_i}}{\sum \boldsymbol{HCVF_i}}\right)}$$

G_i	Share for state *i*
A_i	Geographical area of state *i*
F_i	Total **recorded forest area** of state *i*
M_i	Moderately dense forest area of state *i*
H_i	Highly dense forest area of state *i*
R_i	$max\left[0, \left\{\frac{F_i}{A_i} - \frac{\sum F_i}{\sum A_i}\right\}/\mathbf{10}\right]$
$\boldsymbol{C_i}$	**Forest cover of state *i***
$\boldsymbol{HCVF_i}$	**High conservation value forest index of state *i***
n	Number of States i.e. 28

The suggested modifications (marked in red bold) in the formula are as follows:

1. **F_i:** The earlier formula was based on Forest Cover of a State as an indicator. Forest cover, as defined by the Forest Survey of India, is based on the canopy density of the trees inside the forest and does not include areas such as wetlands, grasslands and other sites where there the canopy density is less than 10% even though such areas form a part of forests and also do have high ecological importance. A better alternative to forest cover is the Recorded Forest Area of the State. Recorded forest area are areas identified as forests in the gazette irrespective of the tree cover density and tends to include the other areas which may be devoid of tree cover but still are important from conservation point of view. For example, the change would also incorporate important conservation areas in the arid part of the country such as Rann of Kutch and Rajasthan where the climate is unable to support good canopy density. Hence the Variable F_i which was earlier used for Forest Cover has been reassigned to the Recorded forest areas.

2. **R_i:** In the formula used by the XIII Finance Commission of India, R_i was based on the comparison between the forest cover of the state and the country's average. The rationale behind it was to provide added support and incentive to States conserving more forest areas than the country's average. But this incentive was too small to be really considered as an added allocation. The formula calculated the 100^{th} part of the difference between the State's forest cover and country's average which accounted to a negligible increase in the State's share. Hence the new allocation formula suggests that rather than 100^{th} part of the difference, the actual consideration should be 10^{th} part of the same. This will show a reasonable difference in the value of R_i and is expected to propel the agenda of State towards having more area under forests as the States with more forests than the country's average would be given greater entitlement.

3. **C_i:** The third suggested modification is in the calculation of forest canopy density index for the State based on Area under Very Dense Forest Cover and the Moderately Dense Forest Cover as a proportion of total geographical area of the State. This part of the formula doesn't take into consideration that different physiographic zones support different types of forest cover in the country. Thus States in the arid region would score lesser on the index as their climatic condition is the limiting factor for existence of high canopy density forests. Thus, the new

formula suggests swapping the geographical area of the State with the total forest cover of the State for a better representation of the quality of forests in the State.

4. **HCVF*i***: The last and perhaps the most significant change is the introduction of High Conservation Value Forest (HCVF) Index in the allocation formula. As mentioned earlier, the XIII Finance Commission of India acknowledged that the importance of forests cannot only be assessed based on area parameters. Considering this fact, an Index has been estimated for each State based on a total of 10 indicators that consider other important values of the forest. As indicated earlier, two scenarios are suggested for estimation of High Conservation Value Forest Index. One is based on all indicators constituting the HCVF Index carrying equal weights and the other based on differential weights for Action Factors (0.5), Cross-cutting Factors (0.3) and Natural Endowment Factors (0.2). The HCVF Index for these scenarios is estimated as follows:

Scenario 1 All indicators of HCVF carry equal weights

$$HCVF_i = \sum_{i=1}^{3} EF_i + \sum_{i=1}^{4} AF_i + \sum_{i=1}^{3} CF_i$$

Scenario 2 Indicators with differential weights i.e. Action Factors (0.5), Cross-cutting Factors (0.3) and Natural Endowment Factors (0.2)

$$HCVF_i = \left(0.2\sum_{i=1}^{3} EF_i\right) + \left(0.5\sum_{i=1}^{4} AF_i\right) + \left(0.3\sum_{i=1}^{3} CF_i\right)$$

EF_i	Natural endowment factor indicators of state *i*
AF_i	Action factor indicators of state *i*
CF_i	Cross-cutting factor indicators of state *i*

For each State, the proportion of HCVF Index of a State to the summation of HCVF Index across all States is suggested to be included as an additional part of the allocation formula.

As clearly reflected, the new allocation formula is built upon the work done by the XIII Finance Commission of India and suggested improvements acknowledged by the Commission by assimilating the High Conservation Values of the forests in the scheme of things so that the States may be compensated for conservational values for which they chip in enhanced efforts for conservation. The formula duly covers all major factors for

allocation of grants-in-aid i.e. natural endowment possessed by states, actions undertaken to conserve this natural endowment and other cross-cutting factors.

The table below shows the HCVF index for all 28 states followed by a bar chart for the same for each of the Scenarios.

Table B: HCVF allocation indicator-wise list (Scenario 1)

	Factors	**Natural Endowment**			**Action**				**Cross-cutting**			**Index**
	Weights →	1	1	1	1	1	1	1	1	1	1	
	STATE	HAF	EMICFL	WET	PARF	NFRF	DIV	PATCH	GS	REG	CORR	
1	Andhra Pradesh	0	1	3	1	5	4	3	1	2	1	21
2	Arunachal Pradesh	5	4	1	1	5	2	5	2	1	2	28
3	Assam	0	2	1	1	3	5	1	2	2	2	19
4	Bihar	0	1	1	3	3	4	1	1	4	0	18
5	Chhattisgarh	0	1	2	1	5	4	3	1	5	3	25
6	Goa	0	1	1	3	3	3	2	1	3	1	18
7	Gujarat	0	1	5	5	3	3	1	1	2	0	21
8	Haryana	0	0	1	1	3	0	0	1	3	0	9
9	Himachal Pradesh	3	2	1	2	1	4	1	5	4	0	23
10	Jammu and Kashmir	4	2	1	4	4	5	1	2	4	0	27
11	Jharkhand	0	1	1	1	5	4	1	1	4	1	19
12	Karnataka	0	2	2	2	4	3	1	2	2	2	20
13	Kerala	1	3	1	1	3	4	1	2	3	1	20
14	Madhya Pradesh	0	1	3	1	4	3	2	1	2	5	22
15	Maharashtra	0	3	2	2	3	4	2	1	2	3	22
16	Manipur	2	2	1	1	4	5	5	1	1	0	22
17	Meghalaya	0	1	1	1	4	5	4	1	1	0	18
18	Mizoram	1	1	1	1	4	4	5	1	1	0	19
19	Nagaland	2	1	1	1	4	5	5	1	1	0	21
20	Orissa	0	1	3	1	4	4	2	1	3	1	20
21	Punjab	0	1	1	1	1	0	0	2	4	0	10
22	Rajasthan	0	1	1	2	4	4	1	1	2	1	17
23	Sikkim	2	1	1	2	5	4	5	1	1	0	22
24	Tamil Nadu	2	5	1	2	4	5	1	2	2	1	25
25	Tripura	0	1	1	1	3	3	4	1	1	0	15
26	Uttar Pradesh	0	1	3	2	3	1	0	2	3	1	16
27	Uttarakhand	3	2	1	1	4	2	4	4	4	1	26
28	West Bengal	1	1	5	2	3	4	0	2	3	1	22

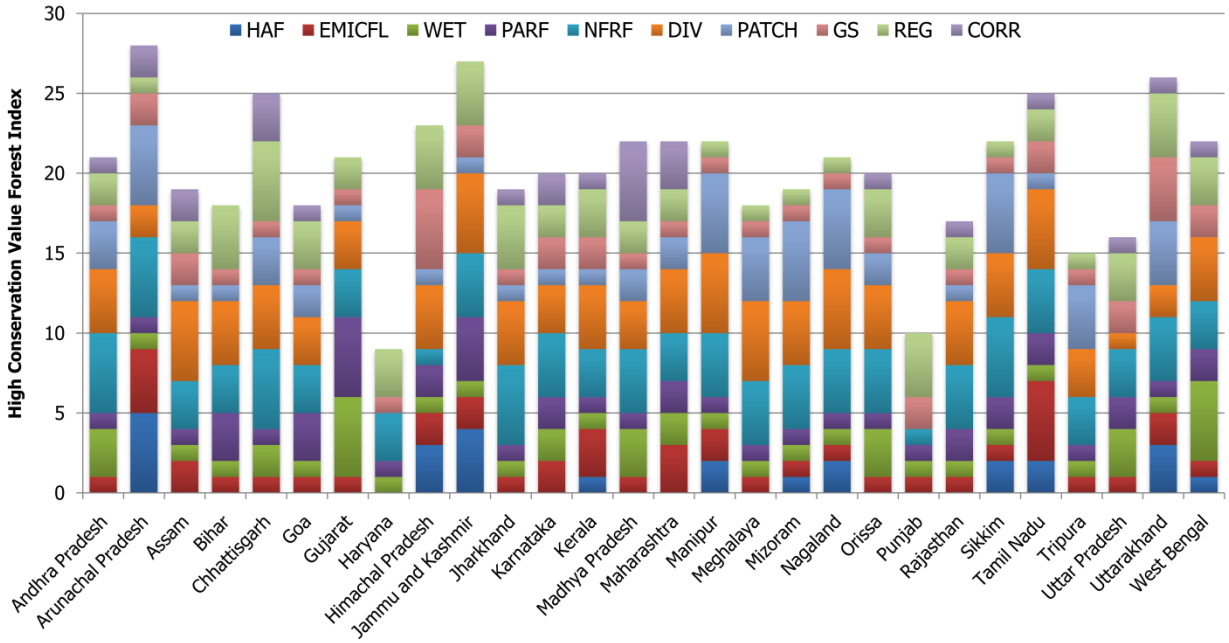

Figure B: State wise HCVF Index (Scenario 1)

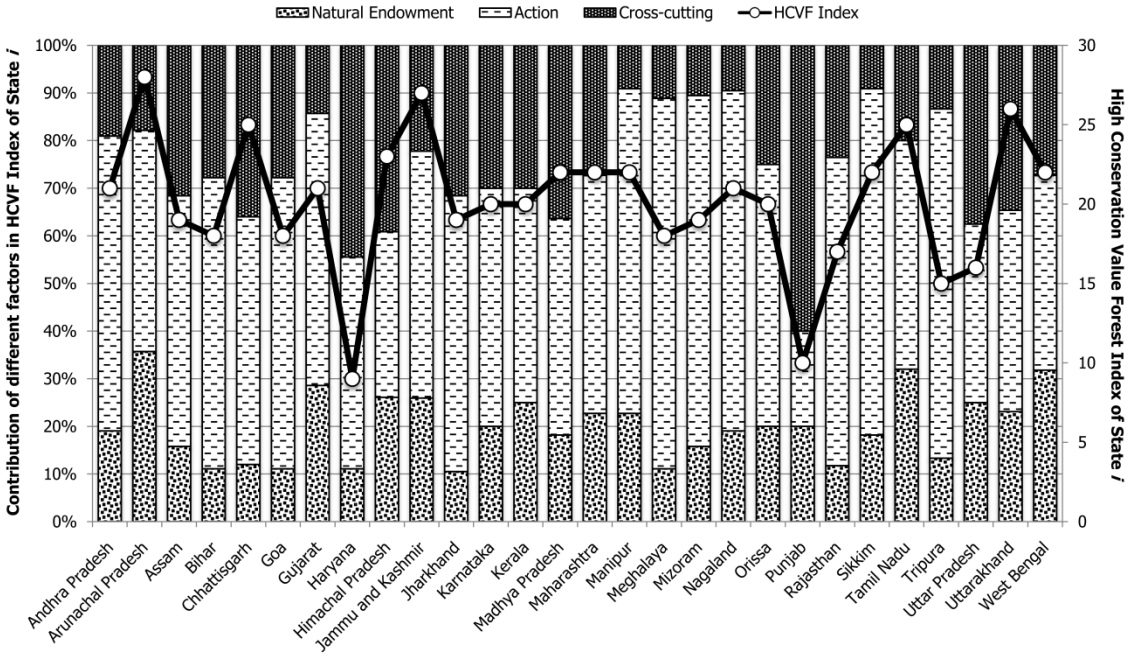

Figure C: State wise HCV Index aggregated according to major factors (Scenario 1)

Table C: HCVF allocation indicator-wise list (Scenario 2)

	Factors	**Natural Endowment**			**Action**				**Cross-cutting**			**Index**
	Weights →	0.2	0.2	0.2	0.5	0.5	0.5	0.5	0.3	0.3	0.3	
	STATE	HAF	EMICFL	WET	PARF	NFRF	DIV	PATCH	GS	REG	CORR	
1	Andhra Pradesh	0	1	3	1	5	4	3	1	2	1	8.5
2	Arunachal Pradesh	5	4	1	1	5	2	5	2	1	2	10.0
3	Assam	0	2	1	1	3	5	1	2	2	2	7.4
4	Bihar	0	1	1	3	3	4	1	1	4	0	7.4
5	Chhattisgarh	0	1	2	1	5	4	3	1	5	3	9.8

	Factors	Natural Endowment			Action				Cross-cutting			Index
	Weights →	0.2	0.2	0.2	0.5	0.5	0.5	0.5	0.3	0.3	0.3	
	STATE	HAF	EMICFL	WET	PARF	NFRF	DIV	PATCH	GS	REG	CORR	
6	Goa	0	1	1	3	3	3	2	1	3	1	7.4
7	Gujarat	0	1	5	5	3	3	1	1	2	0	8.1
8	Haryana	0	0	1	1	3	0	0	1	3	0	3.4
9	Himachal Pradesh	3	2	1	2	1	4	1	5	4	0	7.9
10	Jammu and Kashmir	4	2	1	4	4	5	1	2	4	0	10.2
11	Jharkhand	0	1	1	1	5	4	1	1	4	1	7.7
12	Karnataka	0	2	2	2	4	3	1	2	2	2	7.6
13	Kerala	1	3	1	1	3	4	1	2	3	1	7.3
14	Madhya Pradesh	0	1	3	1	4	3	2	1	2	5	8.2
15	Maharashtra	0	3	2	2	3	4	2	1	2	3	8.3
16	Manipur	2	2	1	1	4	5	5	1	1	0	9.1
17	Meghalaya	0	1	1	1	4	5	4	1	1	0	8.0
18	Mizoram	1	1	1	1	4	4	5	1	1	0	8.2
19	Nagaland	2	1	1	1	4	5	5	1	1	0	8.9
20	Orissa	0	1	3	1	4	4	2	1	3	1	7.8
21	Punjab	0	1	1	1	1	0	0	2	4	0	3.2
22	Rajasthan	0	1	1	2	4	4	1	1	2	1	7.1
23	Sikkim	2	1	1	2	5	4	5	1	1	0	9.4
24	Tamil Nadu	2	5	1	2	4	5	1	2	2	1	9.1
25	Tripura	0	1	1	1	3	3	4	1	1	0	6.5
26	Uttar Pradesh	0	1	3	2	3	1	0	2	3	1	5.6
27	Uttarakhand	3	2	1	1	4	2	4	4	4	1	9.4
28	West Bengal	1	1	5	2	3	4	0	2	3	1	7.7

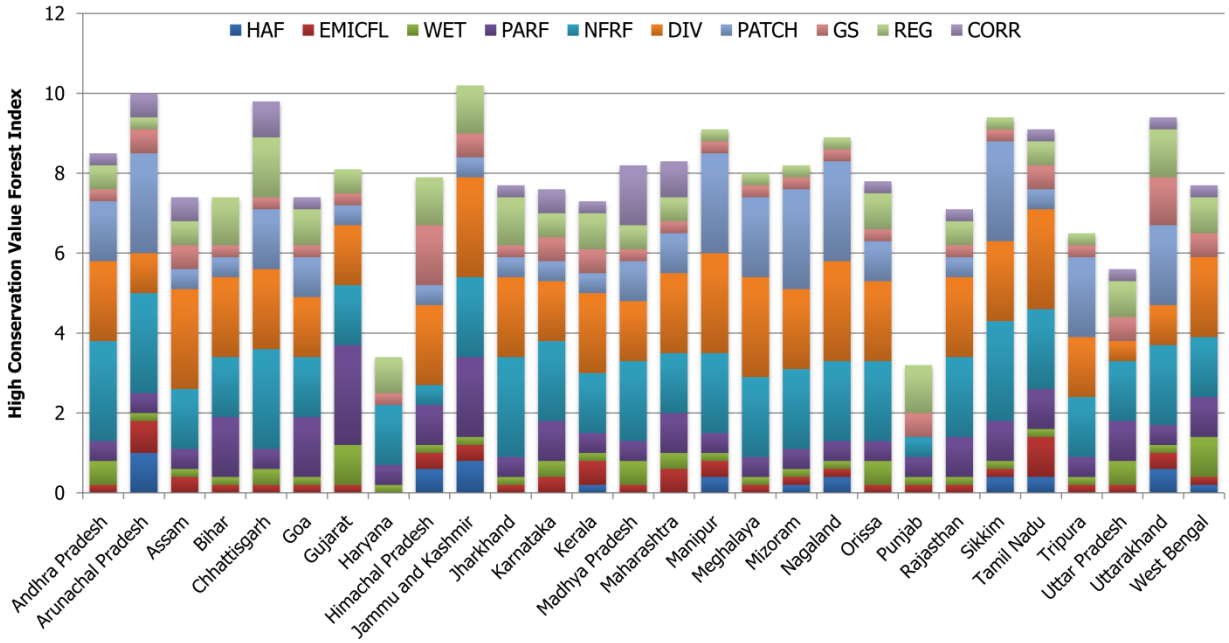

Figure D: State wise HCVF Index (Scenario 2)

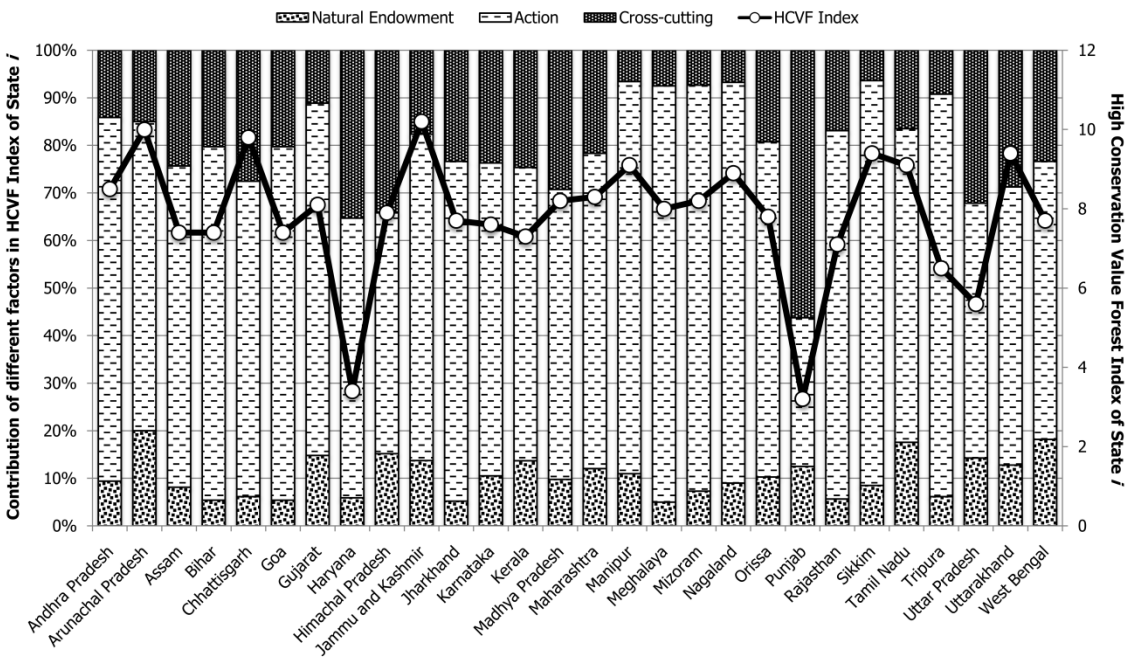

Figure E: State wise HCV Index aggregated according to major factors (Scenario 2)

Conservation Cost estimation

Conservation Cost for the study, as described earlier, is constituted of two costs incurred by the states in managing and maintaining their forests including the restoration of the degraded forest cover. Conservation cost thus cover:

1. Maintenance Cost - Maintenance cost, for this study, would refer to the adequate cost to state forest department for keeping their forest areas in healthy condition. Maintenance cost is essential aspect of forest conservation because forests have always been associated with factors such as inaccessibility, critical biodiversity values, etc. which makes the adequate monetary requirement to deal with such aspects becomes essential. State forest department gets budget from respective state governments as well as from center for maintenance as well as scheme based funding such as CAMPA. It is often a practice for the state governments to prune the state budget for forestry on the basis of central budgets. This practice should be discouraged as the inadequacy of funds for the forest departments would lead to lack of resources for maintenance and will ultimately result in degradation. Hence, to avoid such outcomes, the monetary requirements should be carefully assessed and granted. Maintenance cost in this study is calculated using the average cost of maintenance per unit area for India. This average cost is derived by averaging the budgetary allocations for each state and the area required to manage. As despite several efforts to seek

information from the States, data for all the States could not be obtained, and hence figures of States falling in each geographical region have been used to extrapolate the average unit area maintenance cost for the entire country. While due to lack of the data, the envisaged exercise could not be undertaken for maintenance costs, it is suggested that the states falling below the country average should be deemed as deficit states and should be assigned additional funding as a portion of grants. Further, this additional funding can be associated with performance based approach, wherein the more the states spend on conservation, the more funds would they be allocated.

2. Restoration Cost - Restoration cost is associated with the degraded forest areas in each state. Open Forest Cover is an indicator for degradation. It has been assumed that the entire Open Forest cover is the degraded forest areas in every state which require restoration to reach a healthier canopy density type such as Very Dense and Moderately Dense Forests. To improve the land cover under forests in the country, the Central Ministry has initiated the compulsory afforestation scheme in India known as CAMPA. CAMPA is being managed and monitored by the NAEB which is a part of Ministry of Environment and Forest. NAEB has rolled out a list of per unit area costs of afforestation as per the requirements of the sites under plantations. For the total clear lands the Artificial Regeneration is required which costs ₹ 17100/ha. For the areas already under vegetation yet requiring plantation activities would fall under the Artificial Natural Regeneration (ANR), which requires a relatively lesser cost and efforts for plantation and accounts for a cost of ₹ 9750/ha. Since the areas being considered for restorations are already under vegetation, ANR rates would be applicable. Approximately ₹ 32,776 Crore would be required for the restoration of degraded forests cover across the country.

Opportunity cost estimation

Opportunity Cost estimation can help in justifying the gap between the disability of states and the allocated grants. Opportunity cost estimation represents the magnitude of revenue that the state could have earned, had they diverted the area under forests to some other economically beneficial land use which has well established markets. The study adopts a conservative approach in the estimation of the opportunity cost. The land use selected is horticulture and cultivation of cereal crops for Hilly states and Plains

States respectively. The area under forest considered for the calculations is the recorded forest area in each state. The opportunity cost derived from even this conservative approach in calculation still accounted for a cost of ₹ 2,44,000 Crore.

Assessment of scientific working plan

XIII Finance Commission laid a very strong emphasis on the effective and efficient management of forest on the basis of scientific working plans. It was recommended that each forest zone should have a working plan which will be proposed by the State Forest Department and will be reviewed and approved by the Ministry of Environment and Forest. The vision in doing so was to ensure that the Grants-in-aid funds are actually utilized for the conservational practices in forests. To ensure the implementation, the release of Grants-in-aid amount was linked to the approval of scientific working plans though the Grants-in-aid for the initial two years was left untied. The basis behind this was to provide funds and time to the States for developing scientific working plans. The subsequent grants were to be released on the basis of approved working plans. If only more than 80% of the working plans were approved by MoEF, the complete funding was released to the state. Till this is achieved, releases shall be in the ratio of number of working plans approved to 80 per cent of the number of working plans for the state. The Allocation, Release and Utilization data for the Grant-in-aid was analyzed to find the status of working plans approved for each state. It was found that there were only 13 States which could manage the 100% release of the allocated funds. Thus, it can be inferred that only these States have more than 80% of their working plans approved by 2013-14.

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ACRONYMS

ANR	Artificial Natural Regeneration
BSI	Botanical Survey of India
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
CNFA	Culturable Non-Forest Area
DFE	Directorate of Forest Education
EAP	Externally Aided Projects
ES	Ecological Services
FC	Forest Conservation
FFC	Fourteenth Finance Commission
FMU	Forest Management Units
FSC	Forest Stewardship Council
FSI	Forest Survey of India
GCM	Group Convergence Method
GDP	Gross Domestic Product
HCV	High Conservation Value
HCVF	High Conservation Value Forests
ICFRE	Indian Council of Forestry Research and Education
IGNF	Indira Gandhi National Forest Academy
IES	Iora Ecological Solutions
IIFM	Indian Institute of Forest Management
MDF	Moderately Dense Forest
MFP	Minor Forest Produce
NAEB	The National Afforestation and Eco-Development Board
NAP	National Afforestation Program
NFI	National Forest Inventory
NPV	Net Present Value
NRM	Natural Resource Management
NTCA	National Tiger Conservation Authority
NTFP	Non Timber Forest Produce
NWFP	Non Wood Forest Produce
OF	Open Forest

PES	Payment for Ecosystem Services
RFA	Recorded Forest Area
SFR	India State of Forest Report
TEEB	The Economics of Ecosystems and Biodiversity
TEV	Total Economic Value
TOF	Tree Outside Forests
TOR	Terms of Reference
VDF	Very Dense Forest
WII	Wildlife Institute of India
WTA	Willingness To Accept
WTP	Willingness To Pay
WWF	World Wildlife Fund
ZSI	Zoological Survey of India

INDICATORS

CORR	Area under Wildlife Corridors in the State
DIV	Forest Area Diverted in the State excluding Regularization of Encroachments from 1980 to 2012
EMICFL	Total number of Endemic Floral Species found in the State
FAGA	Percentage of geographical area of a state under recorded forest area
FCD	Canopy density of forest areas
GS	Growing stock per hectare of forest cover
HAF	High Altitude Forest (Forest Area above 2000 msl) in the State
NFRF	Percentage of recorded forest area of a state which are natural forests
PARF	Percentage of recorded forest area of a state under protected area network
PATCH	Average Patch Size of Forests in the State
REG	Intensity of regeneration
WET	Area under Wetlands (In Forests) in the State

GLOSSARY

Canopy: The cover of branches and foliage formed by the crown of trees.

Canopy density: Percent area of land covered by the canopy of trees. It is expressed as a decimal coefficient, taking closed canopy as unity.

Carbon Sequestration: The removal and storage of carbon from the atmosphere in carbon sinks (such as oceans, forests or soils) through physical or biological processes, such as photosynthesis.

Carbon Stock: The quantity of carbon contained in a "pool", meaning a reservoir or system which has the capacity to accumulate or release carbon.

Crown area: It is the area of horizontal projection of a tree crown on the ground.

Culturable non forest area (CNFA): It is the net geographic area, lying outside recorded forest and forest cover, which can support tree vegetation (thus, excluding areas under wetlands, riverbeds, perennial snow covered mountains, etc.) CNFA is the area over which the sample data on tree cover is aggregated for the assessment of tree cover.

Cultural Services: The nonmaterial benefits obtained from ecosystems.

Dense forest: All lands with a forest cover having a canopy density of 40 percent and above.

Direct Use Value: The value derived from direct use or interaction with ecosystem's resources and services such as food and timber.

Ecosystem services: The benefits people obtain from functioning ecosystems.

Existence Value: Values reflecting a willingness to pay for the ecosystem in a conserved or sustainable use state, but the willingness to pay is unrelated to current or planned use in future.

Farm forestry: The practice of cultivating and managing trees in compact blocks on agricultural lands.

Forest area: The area recorded as a forest in the Government records. It is also referred to as "recorded forest area".

Forest blank: A patch within a forest which bears few or no trees.

Forest cover: All lands, more than one hectare in area, with a tree canopy density of more than 10 percent irrespective of ownership and legal status. Such lands may not necessarily be a recorded forest area. It also includes orchards, bamboo and palm.

Forest inventory: The measurement of certain parameters of forests to assess the growing stock and other characteristics of forests.

Growing stock: The sum (by number or volume) of all the trees growing/living in the forest or a specified part of it.

Hill district: A district with more than 50 percent of its geographic area under "hill talukas" based on criteria adopted by the Planning Commission for Hill Area and Western Ghats Development Programmes.

Indirect Use Value: Indirect support and protection provided by economic activity and property by ecosystem's natural functions, or regulatory 'environmental' services, such as flood protection.

Land cover: Broad land use classes interpreted from satellite data. It includes very dense forest, moderately dense forest, open forest, scrub and non-forest.

Market Price Method: Method that uses the exchange value (based on marginal productivity cost) that ecosystem services have in trade.

Moderately dense forest: All lands with forest cover having a canopy density between 40 to 70 percent.

National Park: Means an area declared, whether under Section 35 or Section 38 or deemed under sub section (3) of Section 66 of the Wildlife (Protection) Act, 1972.

Net change (in forest cover): The sum of positive and negative changes in forest cover over a period of two assessment for a given area.

Non forest land: Land without forest cover.

Open forest: Lands with forest over having a canopy density between 10 to 40 percent.

Opportunity Cost: The value of that which must be given up to acquire or achieve something.

Option Value: Values reflecting the willingness to pay to conserve the option of making use of a natural resource even though no current use is made of it.

Payment for Ecosystem Services: A PES is a voluntary transaction where a well-defined ecosystem service (ES) (or a land-use likely to secure that service) is being 'bought' by a (minimum one) ES buyer from a (minimum one) ES provider if and only if the ES provider secures ES provision (conditionality).

Protected forest: An area notified under the provisions of the Indian Forest Act or other State Forest Acts, having limited degree of protection. In protected forest all activities are permitted unless prohibited.

Provisioning Services: The goods or products obtained from ecosystems.

Recorded forest area (RFA): Same as 'forest area', i.e. geographic areas recorded as forests in Government records.

Regulating Services: The benefits obtained from an ecosystem's control of natural processes.

Reserved forests: An area so constituted under the provisions of the Indian Forest Act or other State Forest Acts, having full degree of protection. In Reserved forests, all activities are prohibited unless permitted.

Sanctuary: Means an area declared by notification under Section 18 of the Wildlife (Protection) Act, 1972, and includes a deemed sanctuary under sub section (4) of Section 66 of the Wildlife (Protection) Act, 1972.

Scrub: Degraded forest lands having canopy density less than 10 percent.

Shadow Pricing: The price 'adjusted' to eliminate any distortions caused by policies or market imperfections so as to reflect true willingness to pay (Market Price plus Externalities).

Supporting Services: Natural processes that maintain other ecosystem services.

Total Economic Value (TEV): It is as an aggregation of the main function based values provided by a given ecosystem. This includes the use and the non-use values.

Tree: A large woody perennial plant having a single well defined stem (bole or trunk) and a more or less definite crown. It also includes bamboos, palms, fruit trees, etc. and excludes non-perennial non-woody species like banana and tall shrubs or climbers. For the purpose of assessing growing stock and tree cover, only those trees having diameter at breast height (dbh) of 10 cm or more are measured.

Tree cover: It comprises tree patches outside the recorded forest area exclusive of forest cover and less than the minimum mappalbe area of 1 ha. Such small

patches comprising block, linear and scattered trees are not delineated as forest over during interpretation of satellite data. The areas of scattered trees are computed notionally.

Trees outside forests: Trees growing outside recorded forest areas.

Unclassed forests: An area recorded as forest but not included in reserved or protected forest category. Ownership status of such forests varies from state to state.

Very dense forest: Lands with forest cover having a canopy density of 70 percent and above.

Willingness to Pay (WTP): It is the amount an individual is willing to pay to acquire some good or service.

Willingness to Accept (WTA): It is the amount that a person is willing to accept to abandon a good or a service.

Working Plan: It is a document for recording the salient features of a forest bearing on its organization and prescriptions of that organization for the next working period.

SECTION – I

1 INTRODUCTION

KEY MESSAGES

The non-marketed nature of life-supporting ecosystem services provided by forests is reflected in low budgetary allocations to the forestry sector as the inter-governmental and intra-state transfers work on quid pro quo basis. While many States in India are mandated to keep large geographical area under forests, these States need to be better compensated for the fiscal disabilities created in the process. The XII and the XIII Finance Commission of India have recognized the importance of forests and have accordingly provided a grant of ₹ 1000 and ₹ 5000 Crore respectively, distributed mainly on forest area parameters. While acknowledging the increased grant-in-aid to States, it should be kept in mind that the economic value of forests is largely related to local factors such as forest dependency, biodiversity, and geographical location, among others apart from the area per se. The allocation formula used in the XIII Finance Commission of India can be improved further by internalizing the concept of High Conservation Value Forests in greater detail in addition to forest area.

1.1 Background

On account of the absence of Total Economic Value (TEV) estimate for ecosystem services from forests, various ecological services provided by forest are used as free gifts of natures. The fact that no price tag is attached to such services currently due to poor or absent markets for them has resulted in not only use but overuse, misuse and abuse of forest resources of the country. The current National Accounting System of the country reflects only the marketed value of few visible services supplied by forests. This is further reflected in terms of low budgetary allocations to the forestry sector as inter-governmental and intra-state transfers give significant weightage to the marketed benefits of forest ecosystems and income generating capacities of various states from various sectors.

As the inter-governmental and intra-state transfers work on quid pro quo basis, non-marketed ecosystem services from forests are given less importance compared to marketed benefits of various other sectors.

Further as per the mandate of the 1988 Forest Policy of the country, many states are directed to keep large part of their geographical areas under forest leaving limited land for high revenue raising activities like agriculture, industry and services. In addition, there has been a directive from the Hon'ble Supreme Court of India regulating green felling and extraction of other forest produces in various forest-rich states unless working plan prescriptions are available in such states. On account of both the interventions, these forest-rich states, in spite of providing significant ecosystem services, are incurring revenue losses. Furthermore, these states incur heavy expenditure on forest management or provide ecological services which are used as public goods by other regions without fiscal charges. These states, despite having abundant forest-wealth, lag behind in terms of economic growth and human development from many forest sparse states which are either agriculturally or industrially developed or have established tertiary sector (Verma, 2010).

Further many of these states also have more than proportionate tribal population with high dependency on forests and high levels of poverty. Thus forest resource 'abundance' which could have led to development of such states has proved to be resource 'curse' for them and the so called 'boon' of forest richness has actually become a 'bane' for them in exchange of created 'fiscal disabilities' to raise revenue and bearing high cost provisioning of public goods. These states have neither been adequately compensated nor have any incentive-based mechanisms been set up in the fiscal transfer process of the country for conserving their large forest areas in perpetuity. Moreover, fiscal devolution pattern in Indian planning process has been overwhelmed with centripetal biases, vertical and horizontal imbalances and inadequate equity and efficiency concerns. The main reason for this could be the narrow knowledge base of the forestry sector about the supply of various services to the economy because of inadequate methodology to generate complete set of information for both - marketed and non-marketed; priced and unpriced; provisioning, regulating, cultural and supportive services from forest ecosystem. While there is system of

As forest-rich states have neither been adequately compensated nor have any incentive-based mechanisms been set up in the fiscal transfer process of the country for conserving their large forest areas in perpetuity.

charging for diversion through Net Present Value (NPV) leading to increase in forest revenue, there is no mechanism for rewarding or compensating States for conservation.

With recent advances in forest database management and developments in the techniques of forest resource valuation it is now possible to demonstrate the immense contribution of forests to the growth and well-being of a country. The Government of India, in recognition of this has launched several processes to arrive at a better valuation of the various ecosystem services that our forests provide. This includes the Recalculation of Net Present Value of Forests, The Economics of Ecosystems and Biodiversity (TEEB) India Process, National Green accounting framework, among various others.

1.2 Forest Capital of India

Forests are critical resource of a country in terms of their social, environmental, ecological and economical implications. They not only provide a variety of goods such as fuel wood, timber, pulpwood, fodder, NWFP and act as basic sources of raw materials for industries and other commercial activities but also provide an array of ecosystem services which are pre-requisite for the sustenance of life on this planet. The benefits of these ecosystem services such as provisioning of clean air, recharge of groundwater and its purification, carbon sequestration and many more are not limited to the area under forest cover but extend well beyond. Depending on the ecosystem service, the service shed of these services from forests may be regional, national and even global. Forests occupy 21.05% of the total geographic area of India (SFR 2011, FSI) and are thus one of the major land uses in India. National policies have recognized the importance of forests for the country and have enacted a number of legislations to conserve them, including the National Forest Policy (1988) which aims to bringing one-third of country's land area under forest cover.

Till recent decades, forests were important sources of timber and fuel wood but since stricter regulations imposed by the Supreme Court of India, the feeling of green trees has been regulated. The implementation of Forest Conservation Act, 1980 has also helped remarkably in checking diversion of forest land for non-forestry activities. The pressure on forest areas for products like timber and other wood products have been decreasing as some of these demands are met by Tree cover outside forests. This area

constitutes to approximately 2.76% of the total geographic area of the country and is increasing each year, thanks to efforts by the government and the adoption of agro-forestry by the farmers.

The Forest Survey of India (FSI) is the central agency with the role of estimating the state of Indian Forests biennially and provides data on important forest parameters such as total forest cover, forest cover under various canopy density classes, trees outside forest and many others through its exhaustive data collection techniques. Forest cover, as classified by the Forest Survey of India, includes all lands which have a tree canopy of more than 10% when projected vertically on the horizontal ground, with a minimum areal extent of one hectare. In addition to forest cover which is assessed biennially, the Forest Survey of India also maintains information on the recorded forest areas in Government records in each State.

Table 1 - State of India's Forests[2]

State/UT	Geo. Area (km^2)	Recorded Forest Area (RFA) (km^2)			Total Forest Area (km^2)	RFA as a % of GA
		Reserved Forests	Protected Forests	Unclassed Forests		
Andhra Pradesh	275,069	50,479	12365	970	63,814	23.20
Arunachal Pradesh	83,743	10546	9,528	31466	51,540	61.55
Assam	78,438	17,864	0	8,968	26,832	34.21
Bihar	94,163	693	5,779	1	6,473	6.87
Chhattisgarh	135,191	25,782	24036	9,954	59,772	44.21
Delhi	1,483	78	7	0	85	5.73
Goa	3,702	253	845	126	1,224	33.06
Gujarat	196,022	14,122	479	4,326	18,927	9.66
Haryana	44,212	249	1,158	152	1,559	3.53
Himachal Pradesh	55,673	1,898	33,130	2,005	37,033	66.52
Jammu & Kashmir	222,236	17,643	2,551	36	20,230	9.10
Jharkhand	79,714	4,387	19,185	33	23,605	29.61
Karnataka	191,791	28,690	3,931	5,663	38,284	19.96
Kerala	38,863	11,123	142	0	11,265	28.99
Madhya Pradesh	308,245	61,886	31,098	1,705	94,689	30.72
Maharashtra	307,713	49,226	8,195	4,518	61,939	20.13
Manipur	22,327	1,467	4,171	11,780	17,418	78.01
Meghalaya	22,429	1,113	12	8,371	9,496	42.34
Mizoram	21,081	7,909	3,568	5,240	16,717	79.30
Nagaland	16,579	86	508	8,628	9,222	55.62
Orissa	155,707	26,329	15,525	16,282	58,136	37.34

[2] Source: Forest Survey of India, India State of Forest Report (2011)

Punjab	50,362	44	1,137	1,903	3,084	6.12
Rajasthan	342,239	12,454	17,416	2,769	32,639	9.54
Sikkim	7,096	5,452	389	0	5,841	82.31
Tamil Nadu	130,058	19,388	2,183	1,306	22,877	17.59
Tripura	10,486	4175	2	2117	6,294	60.02
Uttar Pradesh	240,928	11,660	1,420	3,503	16,583	6.88
Uttarakhand	53,483	24,643	9,885	123	34,651	64.79
West Bengal	88,752	7,054	3,772	1,053	11,879	13.38
A & N Islands	8,249	5,613	1,558	0	7,171	86.93
Chandigarh	114	31	0	3	34	29.82
Dadra & Nagar Haveli	491	199	5	0	204	41.55
Daman & Diu	112	0.24	0	8.03	8	7.38
Lakshadweep	32	0	0	0	0	0.00
Puducherry	480	0	2	11	13	2.71
Total	3,287,263	422,536	213,982	133,020	769,538	23.41

Table 1 shows the state-wise distribution of recorded forest areas of the country. Some forest rich states have more than 80% of their geographical area under forest cover, while the same in some states is as low as 4%. For forest rich states, one can imagine using less than 1/4th of their geographical area to support their economy, generating livelihoods, providing housing for residents and other developmental activities. These States are often cramped for availability of land for the development of the State and often lag behind on economic indicators.

The Forest Survey of India classifies the forest cover of the country under the categories as defined in Table 2.

Table 2 – Forest cover classification of India

Forest cover category	Description
Very Dense Forest	All lands with a tree canopy density of 70% and more
Moderately Dense Forest	All lands with a tree canopy density between 40% and 70%
Open Forest	All lands with a tree canopy density between 10-40%
Scrub	Degraded forest areas with a canopy density less than 10%
Non-Forest	Area not included in any of the above classes

Based on the above classification, the distribution of forests across canopy density classes and the country are as shown in Table 3 and Figure 1.

Table 3 - Forest cover classification in India[3]

Class	Area (km^2)	% of Geographical Area
Forest Cover		
a) Very Dense Forest	83,471	2.54
b) Moderately Dense Forest	3,20,736	9.76
c) Open Forest	2,87,820	8.75
Total Forest Cover	**6,92,027**	**21.05**
Scrub	42,176	1.28
Non-forest	25,53,060	77.67
Total Geographical Area	32,87,263	100.00

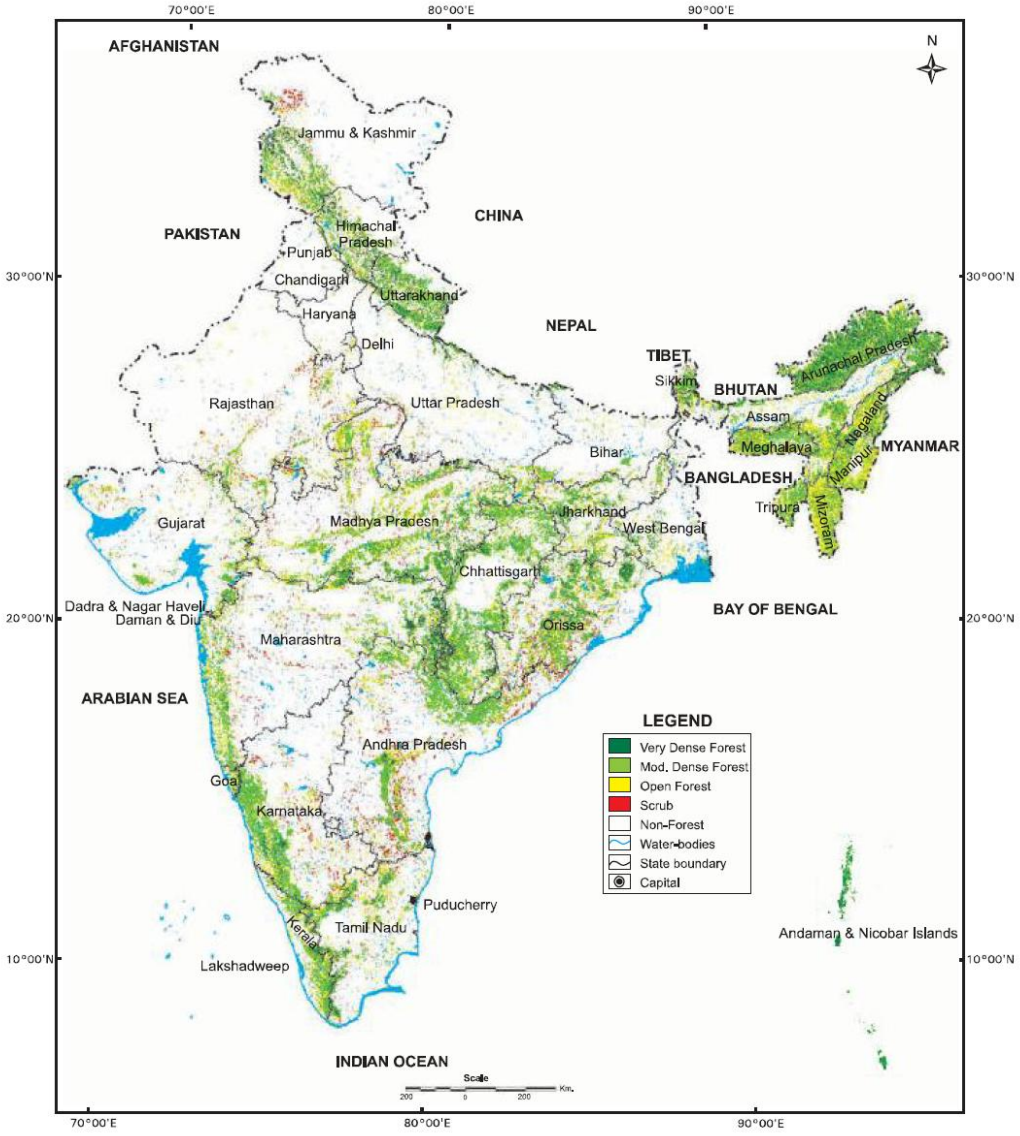

Figure 1 – Forest cover of India (SFR, 2011)

[3] Source: Forest Survey of India, India State of Forest Report (2011)

Table 4 - Forest cover assessment[4]

State	Geographical Area (km^2)	2011 Assessment (Area in Km^2)			
		Very Dense Forests	Mod. Dense Forests	Open Forests	Total Forests
Andhra Pradesh	275069	850	26242	19297	46389
Arunachal Pradesh	83743	20868	31519	15023	67410
Assam	78438	1444	11404	14825	27673
Bihar	94163	231	3280	3334	6845
Chhattisgarh	135191	4163	34911	16600	55674
Goa	3702	543	585	1091	2219
Gujarat	196022	376	5231	9012	14619
Haryana	44212	27	457	1124	1608
Himachal Pradesh	55673	3224	6381	5074	14679
Jammu & Kashmir	222236	4140	8760	9639	22539
Jharkhand	79714	2590	9917	10470	22977
Karnataka	191791	1777	20179	14238	36194
Kerala	38863	1442	9394	6464	17300
Madhya Pradesh	308245	6640	34986	36074	77700
Maharashtra	307713	8736	20815	21095	50646
Manipur	22327	730	6151	10209	17090
Meghalaya	22429	433	9775	7067	17275
Mizoram	21081	134	6086	12897	19117
Nagaland	16579	1293	4931	7094	13318
Orissa	155707	7060	21366	20477	48903
Punjab	50362	0	736	1028	1764
Rajasthan	342239	72	4448	11567	16087
Sikkim	7096	500	2161	698	3359
Tamil Nadu	130058	2948	10321	10356	23625
Tripura	10486	109	4686	3182	7977
Uttar Pradesh	240928	1626	4559	8153	14338
Uttarakhand	53483	4762	14167	5567	24496
West Bengal	88752	2984	4646	5365	12995
Total	3276302	79702	318094	287020	684816

Table 4 above shows latest (2011 assessment) state-wise forest area under different canopy cover density classes. Since this study deals with only the States of India, the Union Territories have been omitted from the analysis.

[4] Source: Forest Survey of India, India State of Forest Report (2011)

The National Forest Policy (1988) also aims at maintaining two-third of the geographical area under forests and tree cover in the hills of the country. The information on forest cover in Hilly states is as shown in Table 5 below.

Table 5 - Forest cover in Hilly Districts[5]

States	Geographical area under hill districts (km^2)	Forest Cover (km^2)				% of G.A.	Scrub (km^2)
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total Forest		
Arunachal Pradesh	83743	20868	31519	15023	67410	80.50	122
Assam	19153	741	5725	6519	12985	67.80	33
Himachal Pradesh	55673	3224	6381	5074	14679	26.37	328
Jammu & Kashmir	222236	4140	8710	9639	22539	21.20	2105
Karnataka	48046	1492	14920	6788	23200	48.29	506
Kerala	29572	1105	7305	5277	13687	46.28	52
Maharashtra	69905	318	7237	7947	15502	22.18	1384
Manipur	22327	730	6151	10209	17090	76.54	1
Meghalaya	22429	433	9775	7067	17275	77.02	485
Mizoram	21081	134	6086	12897	19117	90.68	1
Nagaland	16579	1293	4931	7094	13318	80.33	3
Sikkim	7096	500	2161	698	3359	47.34	363
Tamil Nadu	22789	962	3370	2040	6372	27.96	210
Tripura	10486	109	4686	3182	7977	76.04	72
Uttarakhand	53483	4762	14167	5567	24496	45.80	271
West Bengal	3149	714	663	912	2289	72.69	0
TOTAL	707747	41525	133837	105933	281295	39.74	5936

The information presented in above Tables clearly depicts the asymmetry in terms of forest cover across States. Some, in particular North Eastern States, are rich in this natural capital whereas some States have almost no forests left.

As mentioned earlier, forests provide a wide-variety of ecosystem services that are not only essential for our country's economy, but also for well-being of our growing population. For example, tt has also been observed that the quality of soil in the adjoining areas to forests is ideal for agriculture and allied activities because of the enhancement in the soil quality and productivity. Degradation of such areas is likely to impact provisioning of services from these forests, and will consequently impact land

[5] Source: Forest Survey of India, India State of Forest Report (2011)

and agricultural productivities in these regions. Degradation of forests results into impoverished agriculture, horticulture, lack of availability of fodder in such degraded forests and thus reduces productivity of livestock population and forces their trans-boundary movement and in turn trigger migration of dependent communities to urban areas where they end up in low paid, unsecured informal sector jobs (Verma, 2000). For forests to be conserved, they need to be perceived as being more valuable than the usual, standard, utilities they provide (Verma, 2005).

A likely reason why forests and the goods/services they provide are often overused and exploited is because they have been traditionally thought of as "free gifts of nature". Markets for most of these services do not exist and this exacerbates the problem. This undermines the importance of such services like ground water recharge, flood control, controlling soil erosion and landslides, pollution and climate control, carbon sequestration, regulation of water flow in streams, biodiversity conservation, natural evolution of species, recreational opportunities and religious and aesthetic values. Such values are often under-estimated and not considered in the development planning.

1.3 Problem(s) to be addressed

The Finance Commission of India recognizes that forests constitute the first line of defence against pollution resulting from economic activities. Recognizing this, the XII Finance Commission of India provided a grant of ₹ 1000 Crore to states, distributed between them in accordance with the share accounted for by each in the total forested acreage in the country. The XIII Finance Commission of India realized the paramount need to carry that grant forward and allocated a grant of ₹ 5000 Crore to states allocated primarily on the basis of forest area in the state with due consideration to total geographical area of the state, highly dense forest area and moderately dense forest area of the state. Through the study titled "Developing mechanisms for compensating states for managing large geographical areas under forest" executed by Indian Institute of Forest Management for the XIII Finance Commission of India recommended many parameters for consideration but eventually the grant was provided to various states on the basis of area parameters. In addition, while the sharing of Union Taxes was based on parameters of population (25%), area (10%), fiscal capacity distance (47.5%) and fiscal discipline (17.5%), the grants to local bodies was allocated based on population,

area, distance from highest per capita sectoral income, index of devolution, proportion of SC/STs in population and FC local body grants utilization index.

Comparison of formula used by the XIII Finance Commission of India and one of the proposed formula by IIFM for allocation of forest grants to various states

Formula used by the XIII Finance Commission for allocation of forest grants to various states	$$G_i = \frac{\left[\left\{\frac{F_i}{\sum F_i} + R_i\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{A_i}\right)\right\}\right]}{\sum_{i=1}^{n}\left[\left\{\frac{F_i}{\sum F_i} + R_i\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{A_i}\right)\right\}\right]}$$ Based on F_i (total forest area of state *i*), A_i (total geographical area of state *i*), M_i (total moderately dense forest area of state *i*) and H_i (total high dense forest area of state *i*). $$R_i = \max\left[0, \left\{\frac{F_i}{A_i} - \frac{\sum F_i}{\sum A_i}\right\}/100\right]$$
One of the proposed formula by IIFM for allocation of forest grants to various states	$$\boldsymbol{A = \frac{1}{4}\sum_{i=1}^{28} GS_i X + \frac{1}{4}\sum_{i=1}^{28} DC_i X + \frac{1}{4}\sum_{i=1}^{28} BPS_i X + \frac{1}{4}\sum_{i=1}^{28} CS_i X}$$ $$GS_i = \frac{Total\ Growing\ Stock\ of\ the\ i^{th} state\ according\ to\ SFR\ 2005}{Total\ Growing\ Stock\ of\ the\ Country\ according\ to\ SFR\ 2005}$$ $$Growing\ Stock\ of\ a\ state$$ $$= \sum_{j=1}^{14} \frac{Geographical\ area\ of\ all\ the\ districts\ of\ the\ state\ lying\ completely\ in\ j^{th}\ physic}{Total\ geographical\ area\ of\ the\ j^{th}\ physiographic\ zone}$$ $$\times\ Growing\ stock\ of\ j^{th}\ physiographic\ zone$$ $$+ \sum_{j=1}^{14} \frac{Geographical\ area\ of\ all\ the\ districts\ of\ the\ state\ lying\ partially\ in\ j^{th}\ physiog}{Total\ geographical\ area\ of\ the\ j^{th}\ physiographic\ zone}$$ $$\times\ Growing\ stock\ of\ j^{th}\ physiographic\ zone \times 0.5$$

$$DC_i = \frac{Total\ Dense\ Forest\ Area\ of\ the\ i^{th} state}{Total\ Dense\ Forest\ of\ the\ Country}$$

$$BPS_i = \frac{Total\ Bioprospecting\ value\ of\ the\ i^{th} state}{Total\ Bioprospecting\ value\ of\ the\ Country}$$

$$CS_i = \frac{Total\ Carbon\ Storage\ value\ of\ the\ i^{th} state}{Total\ Carbon\ Storage\ value\ of\ the\ Country}$$

$$X = Equalization\ Factor$$

$$\boldsymbol{A = \frac{1}{4}\sum_{i=1}^{28} GS_i\, X + \frac{1}{4}\sum_{i=1}^{28} DC_i\, X + \frac{1}{4}\sum_{i=1}^{28} \Delta GS_i\, X + \frac{1}{4}\sum_{i=1}^{28} \Delta DC_i\, X}$$

$$GS_i = \frac{Total\ Growing\ Stock\ of\ the\ i^{th} state\ according\ to\ SFR\ 2003}{Total\ Growing\ Stock\ of\ the\ Country\ according\ to\ SFR\ 2003}$$

$$DC_i = \frac{Total\ Dense\ Forest\ Area\ of\ the\ i^{th} state}{Total\ Dense\ Forest\ of\ the\ Country}$$

$$\Delta GS_i = \frac{Change\ in\ Growing\ Stock\ of\ the\ i^{th} state}{Change\ in\ Growing\ Stock\ of\ the\ Country}$$

$$Change\ in\ Growing\ Stock\ of\ a\ state = Growing\ stock\ of\ the\ state\ in\ 2003 \times \left[\frac{Total\ Forest\ Area\ of\ the\ state\ in\ 2003}{Total\ Forest\ Area\ of\ the\ state\ in\ 2005} - 1\right] + 15$$

$$\Delta DC_i = \frac{Change\ in\ Dense\ Forest\ Area\ of\ the\ i^{th} state}{Change\ in\ Dense\ Forest\ Area\ of\ the\ Country}$$

$$Change\ in\ Dense\ Area\ of\ a\ state = [Total\ Dense\ Cover\ of\ the\ state\ in\ 2005 - Total\ Dense\ Cover\ of\ the\ state\ in\ 2003] + 500$$

$$X = Equalization\ Factor$$

$$\boldsymbol{A = \frac{19}{100}\sum_{i=1}^{28} GS_i\, X + \frac{19}{100}\sum_{i=1}^{28} DC_i\, X + \frac{19}{100}\sum_{i=1}^{28} \Delta GS_i\, X + \frac{19}{100}\sum_{i=1}^{28} \Delta DC_i\, X + \frac{24}{100}\sum_{i=1}^{28} CF_i\, X}$$

$$GS_i = \frac{Total\ Growing\ Stock\ of\ the\ i^{th} state\ according\ to\ SFR\ 2003}{Total\ Growing\ Stock\ of\ the\ Country\ according\ to\ SFR\ 2003}$$

$$DC_i = \frac{Total\ Dense\ Forest\ Area\ of\ the\ i^{th} state}{Total\ Dense\ Forest\ of\ the\ Country}$$

$$\Delta GS_i = \frac{Change\ in\ Growing\ Stock\ of\ the\ i^{th} state}{Change\ in\ Growing\ Stock\ of\ the\ Country}$$

$$Change\ in\ Growing\ Stock\ of\ a\ state = Growing\ stock\ of\ the\ state\ in\ 2003 \times \left[\frac{Total\ Forest\ Area\ of\ the\ state\ in\ 2003}{Total\ Forest\ Area\ of\ the\ state\ in\ 2005} - 1\right] + 15$$

$$\Delta DC_i = \frac{Change\ in\ Dense\ Forest\ Area\ of\ the\ i^{th} state}{Change\ in\ Dense\ Forest\ Area\ of\ the\ Country}$$

$$Change\ in\ Dense\ Area\ of\ a\ state = [Total\ Dense\ Cover\ of\ the\ state\ in\ 2005 - Total\ Dense\ Cover\ of\ the\ state\ in\ 2003] + 500$$

$$CF_i = \frac{Correction\ Factor\ of\ the\ i^{th} state}{Total\ Correction\ Factor\ of\ the\ Country}$$

$$Correct\ Factor\ for\ a\ state = \frac{Total\ degraded\ forest\ area\ of\ the\ state}{Total\ forest\ area\ of\ the\ state}$$

$$X = Equalization\ Factor$$

While acknowledging the increased grant-in-aid to states based on forest area in XII and XIII Finance Commission, it should be kept in mind that the economic value of forests is largely related to local factors such as forest dependency, biodiversity, and geographical location, among others apart from the area per se.

While acknowledging the increased grant-in-aid to states based on forest area, it should be kept in mind that the economic value of forests is largely related to local factors such as forest dependency, biodiversity, and geographical location, among others apart from the area per se. The allocation formula used in the XIII Finance Commission of India can be improved further to internalize this concept in greater detail by focusing on other important aspects in addition to just forest area. It is proposed that the allocation should also be based on the identification Nationally Appropriate High Conservation Value (HCV) forests to actually reflect the contribution of forests in addition to parameters already used in the XIII Finance Commission. Inclusion of parameters that reflect the role of forests in mitigation and adaptation of climate change, various stock and flow values as well as important role of forested wetlands also needs to be highlighted.

1.4 Terms of Reference

In this regard, the XIV Finance Commission of India has commissioned the current study to the Indian Institute of Forest Management with the following terms of reference:

1. Review of literature on robustness of parameters in identifying HCV forests.
2. Identify parameters to define High Conservation Value forest.
3. Identify High Conservation Value (HCV) forests, its area and characteristics across states in India.
4. Identify expenditure on conserving/maintaining the geographical area under forests in states.
5. Identify quantum of revenue forgone as a result of maintaining forest areas and not utilising for economic activities.
6. Identify a set of parameters which would reflect the innate cost of conserving HCV forests and restoring degraded forests.

7. Assessment of status of scientific work plans and its implementation by states as recommended by earlier Finance Commissions.

1.5 Objectives of the Study

To internalize the concerns raised above, the study intends to improve upon the allocation formula used by the XIII Finance Commission for sharing of grants-in-aid to states by including the parameter of high conservation value forests using objective and scientific parameters[6] thereby constructing a composite index.

1.6 Structure of the Report

The report is organized into 9 chapters. Following the introduction chapter that discusses the need to improve the allocation formula for grant-in-aid to various States based on forests, Chapter 2 discusses the methodological framework used for suggesting improved allocation for the XIV Finance Commission. The chapter discusses the two major aspects based on which the allocation of grants-in-aid is suggested – the High Conservation Value Forest Index and the Conservation Cost Index. Various indicators used for deriving these two Indices are then subsequently discussed in Chapter 3 and Chapter 4 respectively. Chapter 5 discusses the opportunity cost incurred by States to maintain forest areas based on the next alternative use of the forest land which is economically beneficial to the States, Chapter 6 tried to assess the status of the scientific working plans in the states based on the XIII Finance Commission regulations on Grants release. Chapter 7 discussed the Results and Findings of the study. Chapter 8 discusses observations, suggestions and recommendations followed by Chapter 9 that consist of appendices which included the minutes of meetings and presentations conducted in the study. The report concludes after that.

[6] The allocation amount worked out in the study is focussed only on Grants-in-aid as this amount is to be determined based on fiscal disabilities created whereas the Union Taxes are tied to revenues generated by various tax efforts. Thus, the focus of this study was distribution of Grants-in-aid based on endowment and forest conservation.

2 METHODOLOGY

KEY MESSAGES

The basic building blocks of the study include (a) development of High Conservation Value Forest Index; estimation of (b) maintenance cost of keeping area under forests; (c) cost of restoring degraded forest areas; and (d) revenues forgone in keeping areas under forests. All the blocks are inter-linked.

The primary aim of the study is to develop an allocation formula that is basically a refinement of the earlier allocation formula used by the XIII Finance Commission for the allocation of Grant-in-aid for forestry sector among the 28 States of India. The formula needs to incorporate all important values existent in the forests of India and identify those States which hold forest of relatively higher importance in terms of biodiversity, ecological functions and other indicators in comparison to the forests of other States which are mandated to keep larger areas under forest cover and further constrained to undertake development by diverting forests due to Supreme Court and Forest Policy directives. Added to this, the formula also needs to inculcate the incentives for States to keep their land as forests. This becomes all the more important in the present day scenario, where States as well as the country, is striving hard for its economic development.

The format of the current study from the initiation was focused on identifying the High Conservation Values in Indian forests and building a country level relative Index based on these values. With advancement in the study it was realized that, just focusing on the important values existent in each forest undermines the importance of forest areas in totality. The objective of conventional High Conservation Value Forest study is oriented toward assessing the conservational need of the forests and assessing the maintenance and monitoring mechanism for such values. It does not cater to the monetary requirements of each value. This aspect makes this study different from other HCVF studies as the primary focus of this study is the use of HCVF value for monetary division of a fund among multiple States of India rather than evaluating the management of forests. Thus, this study intends to equip the policy makers and well as forest managers with the knowledge of relative importance of forests in each State in comparison to others and about their respective forests conservation status.

The basic methodology framework of the study is graphically shown below.

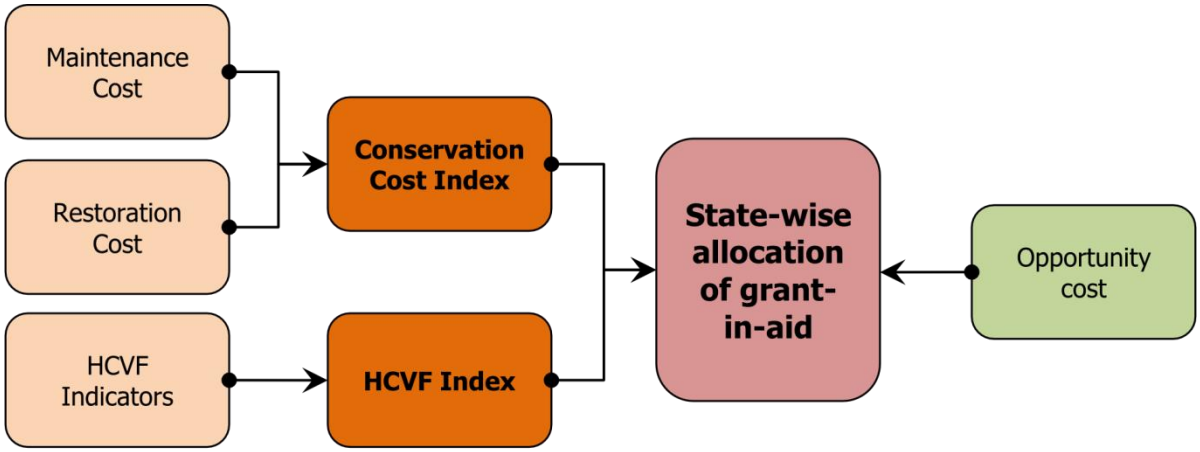

Figure 2 - Methodological framework of the study

The study responds to the TOR by developing the following indices:

1. **High Conservation Value Forests Index** – This index is constructed for each State based on the importance of their forests and addresses TOR 1, 2 and 3 of the study. The importance of forests of each State is determined by a set of 12 indicators which can be broadly categorized into three main factors – natural endowment, action undertaken to conserve this endowment and cross-cutting. 2 out of these 12 indicators (Forest Area of the State and Canopy Density) were already a part of the XIII Finance Commission's allocation formula. Thus the earlier formula has been modified by making modifications to these 2 indicators and incorporating the remaining 10 indicators as a High Conservation Value Forest Index in the final formula. These indicators reflect the importance and also the performance of States in retaining their lands as forest and refraining diversion of land for developmental activities. To bring different indicators to a common denominator, each indicator has been associated with categories whose score range from 0 to 5. The categories have been derived based on the mean, standard deviation and range of values obtained for each indicator after considering all States. For few indicators which had observations with extremely large deviations from the mean, trimmed mean and standard deviation been used. For each indicator, States were allocated score based on the category they fall into. Two scenarios are suggested to estimate the HCVF Index. One is based

on the assumption that all indicators have equal importance. The second scenario suggests that indicators relating to Action and Cross-Cutting Factors should be given higher weights compared to Natural Endowment Factors as the former two provide an indication of proactiveness on the part of States to conserve forests.

2. **Conservation Cost Index** – This index accounts responds to TOR 4 and 6with regards to various costs incurred by States in keeping their lands as forests. These costs are:

   i. **Maintenance Cost** – Forests are associated with huge landscapes, inaccessibility and numerous other challenges in their maintenance. Thus the States require an adequate budget to maintain the health of their forests. This cost will be reflected using the annual budgets allocated to the State from State and as well as Central Governments for forest activities and conservation plans. Accordingly the study attempts to estimate the average cost of maintaining forest per unit area in India. It is assumed that the average cost of maintenance in India would reflect the amount required by each state to maintain their per unit area of forests and doesn't include the externalities such as inaccessibility, cost of labour, and other factors for the sake of simplicity. The States operating in deficit will need additional funding for an efficient maintenance of their forest areas, as the cost requirements in such activities is quite high and inadequate funding is one of the reason that leads to the degradation of forests. It has been observed in the past that such an approach bears the risk of State Governments reducing their funding to State Forest Department in view of increased anticipated funding from Finance Commission in the next cycle to compensate the deficit. Thus, the existing funding of the State to respective forest department should also be considered for allocating grants-in-aid for maintenance cost. The overall approach should be to incentivize States for allocating more funds for forests and link the grants-in-aid to be allocated based on State's contribution. This part is with regards to addressing TOR 4 of the study.

   ii. **Restoration Cost** – For the healthy forests which, with time, have descended in health and have slipped down into the degraded forest

category, there is an urgent need to restore them back to good health so that they provide all those services which ideally a well conserved forest should. Usually degradation leads to loss of such services which can only be replenished, and that too to only a certain extent, once the forest reaches back to its healthy state. To estimate the cost required to restore 'low-quality' forests in each State, area under Open Forest category is assumed to reflect forest degradation. The study acknowledges the caveats of this assumption but on account of other reliable proxy indicator, the area under open forest has been used for forest degradation. The National Afforestation and Eco-Development Board (NAEB), has been working extensively on Afforestation plans in India and have recommend rates of afforestation practices per unit area for India based on the site requirements. The rates for assisted natural regeneration so derived are used in conjunction with the open forest area of each State to assess the monetary requirements to restore the degraded forest areas in a State. This part of the study addresses TOR 6.

3. **Opportunity Cost** – Although, forests-rich States provide considerable amount of ecosystem services as public goods and environmental externalities, they bear high opportunity costs for not using forest land for other high economic activities. These States, despite abundant forest wealth, lag behind many forest sparse States in terms of economic growth and human development which are either agriculturally or industrially developed or have established tertiary sector. To provide an indication of the amount that should be allocated to States for grant-in-aid on forests, the concept of opportunity cost has been used based on the premise that if these lands were not maintained as forests and would have been converted to next biological usage i.e. agriculture, what would have these States earned from it. To estimate the same, the States were broadly categorized into Plain and Hill States. The profit earned from practicing agriculture as well as horticulture in Plain and Hill States respectively were derived from the work done by IIFM for the XIII Finance Commission. Assuming 50% and 33% conversion ratio of forest land to agriculture and horticulture in Plain and Hill States respectively, the total opportunity cost at National Level has been derived. Though this is a underestimation of the opportunity cost for the forest areas, it

still reflects a huge opportunity cost of Indian Forests. The amount so derived can be used for allocation of grant-in-aid to various States based on the High Conservation Value Forests index and the Conservation Cost Index derived earlier. This section addresses TOR 5 of the study.

SECTION – II

Response to TOR 1, 2 and 3.

TOR 1 – Identify parameters to define High Conservation Value forest.

TOR 2 – Review of literature on robustness of parameters in identifying HCV forests.

TOR 3 – Identify High Conservation Value (HCV) forests, its area and characteristics across states in India.

3 HIGH CONSERVATION VALUE FORESTS OF INDIA

KEY MESSAGES

This chapter responds to TOR 1, 2 and 3. High Conservation Value Forest (HCVF) is an emerging concept used to identify important forest areas based on a variety of parameters including biodiversity, landscape context, threatened or endangered ecosystems, provisioning of basic ecosystem services, and dependence of local community, among others. The study started with generating an exhaustive list of potential indicators that can be used to identify HCVF in the Indian context. After various screening stages, a list of 12 indicators was chosen to identify HCVF in India in three major categories – natural endowment Ⓔ, action of States to conserve this endowment Ⓐ and cross-cutting factors Ⓒ . These are as follows:

Factor	Indicators	Code
Ⓔ	Proportion of geographical area under recorded forests	FAGA
	Canopy Density of Forest Areas	FCD
	Area under High Altitude Forests (Altitude >= 2000mtr)	HAF
	Number of endemic floral species	EMICFL
	Area under wetlands inside forests	WET
Ⓐ	Proportion of recorded forest areas designated as protected areas	PARF
	Proportion of recorded forest areas which are natural forests	NFRF
	Diversion of recorded forest area between 1980-2012	DIV
	Average patch size of forests	PATCH
Ⓒ	Growing stock (in forests) per unit area	GS
	Intensity of regeneration	REG
	Area under wildlife corridor	CORR

Two of these indicators i.e. FAGA and FCD are also included in the allocation formula used by the XIII Finance Commission of India. The remaining 10 indicators, with equal weights, have been used to develop the HCVF Index across States. Further, in order to keep the allocation formula simple yet internalize the concept of HCVF, the formula used by the XIII Finance Commission of India has been modified as follows.

$$G_i = \frac{\left(\left[\left\{\frac{F_i}{\sum F_i} + R_i\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{C_i}\right)\right\}\right] + \frac{HCVF_i}{\sum HCVF_i}\right)}{\sum_{i=1}^{n}\left(\left[\left\{\frac{F_i}{\sum F_i} + R_i\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{C_i}\right)\right\}\right] + \frac{HCVF_i}{\sum HCVF_i}\right)}$$

G_i *Share for state i*

A_i *Geographical area of state i*

F_i *Total recorded forest area of state i*

M_i *Moderately dense forest area of state i*

$HCVF_i$ *High conservation value forest index of state i*

R_i $max\left[0, \left\{\frac{F_i}{A_i} - \frac{\sum F_i}{\sum A_i}\right\}/10\right]$

C_i *Forest cover of state i*

n *Number of States i.e. 28* H_i *Highly dense forest area of state i*

Scenario 1 *All indicators of HCVF carry equal weights*

$$HCVF_i = \sum_{i=1}^{3} EF_i + \sum_{i=1}^{4} AF_i + \sum_{i=1}^{3} CF_i$$

Scenario 2 *Indicators with differential weights i.e. Action Factors (0.5), Cross-cutting Factors (0.3) and Natural Endowment Factors (0.2)*

$$HCVF_i = \left(0.2 \sum_{i=1}^{3} EF_i\right) + \left(0.5 \sum_{i=1}^{4} AF_i\right) + \left(0.3 \sum_{i=1}^{3} CF_i\right)$$

EF_i *Natural endowment factor indicators of state i*
AF_i *Action factor indicators of state i*
CF_i *Cross-cutting factor indicators of state i*

3.1 Introduction

Conservation, the meaning for which has been evolving for centuries, has been on a long journey from meaning just preservation to now an elaborative and complex concept which leaves even the prolific-most brains across the globe thinking over something that still seems missing in this jigsaw puzzle. The concept of Ecological Valuation, as compared to it ancestor Conservation, is relatively young and has entered the teen phase where it's sharp, effective and more importantly convincing. But another aspect which actually acts as an obstacle to this is the complexity and the associated challenges in implementing it. Valuing something for which no market exists is not an easy task and may lead to a flawed design which may further lead to devaluing something of high importance. Similarly in case of Forest there has been a long debate over the most-important and focus-worthy parameters that exist in such areas and thus there was a need for development of standards for the certification of forest management. High Conservation Values term was proposed in 1995 by Forest Stewardship Council, A.C. (FSC), which is an international accreditation association incorporated and in January 1999 the term high conservation value forests (HCVF) was formally included in the FSC Principles and Criteria of Forest Stewardship (Forest Stewardship Council , 1999).

Although there are various mechanisms for incentivising forest conservation such as market mechanism in Kyoto Protocol e.g. Clean Development Mechanism, Reducing Emissions from Deforestation and Forest Degradation, Payment from Ecosystem Services, these are often characterized with high transaction costs due to heterogeneity of the sector, large number of stakeholders and complex implementation. Thus, while countries such as Costa Rica, Mexico, Canada, Ecuador and United States have witnessed successful models of forest conservation, these are difficult to implement in developing countries such as India. Since the forests in India are State owned and involve a large number of stakeholders, the mechanism of compensation at State level reduces the transaction costs and is easy to implement. Mechanisms mentioned above estimate the absolute values of certain characteristics of forest. The concept of High Conservation Value Forest can determine the relative importance of the forests in a region or a country as a whole. This can help in identifying the ranking or the priority order of conservation between a numbers of forest areas. Though, HCVF was initially coined for standardizing the management principles across the globe to support Forest certification, the same concept has been used here to identify and compensate states for maintaining High Conservation Value Forests.

The Forest Stewardship Council defines High Conservation Value (HCV) forests as those that possess one or more of the following attributes:

- forest areas containing globally, regionally or nationally significant: concentrations of biodiversity values (e.g. endemism, endangered species, refugia); and/or large landscape-level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance

- forest areas that are in or contain rare, threatened or endangered ecosystems

- forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control)

- forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health) and/or critical to local communities' traditional cultural

identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities)

Later an Advisory Panel was formed by FSC to lay the guidelines for the implementation of HCVF and the precautionary principle. This involved publication of documents on how to identify HCVF, their indicators and verifiers. ProForest Ltd, a UK-based consulting company, produced a Global Toolkit on High Conservation Value in 2001. This toolkit is being used across the globe as the guiding document to adopt the HCVF as their standard on certification of forest management.

3.2 HCV Toolkits

The Global Toolkit on High Conservation Value defines the environmental and social values in the forests that are considered to be of outstanding significance or critical importance, such as endangered biodiversity, critical habitats or primitive tribe dwellings among others which need additional efforts for conservation, maintenance and enhancement are the High Conservation Value Forest (HCVF). The toolkit is divided into 3 parts:

Part 1 defines the concept of HCVF as those forest areas that need to be appropriately managed in order to maintain or enhance the HCVs and provides general implementation overlay which is intended for all users. The need of conserving, the FSC principle 9 – the basis of the toolkit which states forest managers are required to identify any High Conservation Values (HCVs) that occur within their individual forest management units, to manage them in order to maintain or enhance the values identified, and to monitor the success of this management, the use of toolkit by various user-groups like investors, donors, certifiers and for the use of land use conversion planning. This part focuses mainly on people who want to know what HCVF is, how it can be used as a tool to build a national standard for forest management. It also categorizes HCVF into 6 heads as shown in *Table 6*.

Table 6 – HCV Categories (Source: ProForest HCV Toolkit)

HCV 1 Globally, regionally or nationally significant concentrations of biodiversity values	
HCV 1.1 Protected Areas	HCV 1.3 Endemic species

HCV 1.2 Threatened and endangered species	HCV 1.4 Critical temporal use
HCV 2 Globally, regionally or nationally significant large landscape level forests	
HCV 3. Forest areas that are in or contain rare, threatened or endangered ecosystems	
HCV 3.1 The extent of each ecosystem within the country and region	HCV 3.2 How well each ecosystem is effectively secured by the protected area network
HCV 3.3 Threats to these ecosystems	
HCV 4. Forest areas that provide basic services of nature in critical situations	
HCV 4.1 Forests providing unique sources of drinking water	HCV 4.2 Forests critical to water catchments
HCV 4.3 Forests critical to erosion control	HCV 4.4 Forests providing barriers to destructive fire
HCV 4.5 Forests with critical impact on agriculture/ fisheries	
HCV 5. Forest areas fundamental to meeting basic needs of local communities	
HCV 6. Forest areas critical to local communities' traditional cultural identity	

The next part of the toolkit defines High Conservation Value Forests at a national level. This part is intended for the working group who are responsible for HCVF development process. This provides a practical methodology to be used at a national level so as to become a stepping stone for the working group. It describes the approaches of identifying the HCVF in the areas and the resources required. The two possible approaches in defining HCVF – either by Multi-stakeholder approach in a situation where the guidance has already been developed for standard setting or the technical adaptation approach, which will involve a representative working group which should have a proper amalgamation of expertise, range of views on setting thresholds to HCVs and with practical experiences so that the outcome is appropriate for the forest managers to implement. It then breaks down the entire process in two step methodology of identifying HCVs and then giving them a threshold values to judge the importance of a particular HCV as compares to the other HCVs. It also marks clear distinction between possible HCVs and non HCVs. The toolkit suggests a flowchart that may be referred by the working group to have a step by step approach for the entire

process based on availability and reliability of data. Finally it provides a detailed description of each of the 6 HCV categories, suggests the possible data sources, guidance on how to structure the definition to be interpreted universally and finally managing and monitoring each value for a better management of these HCVs.

The last part of the toolkit discusses identification and management of High Conservation Value Forests. This part is developed in particular for the forest managers but also may be referred by the investors, donors, and conservation practitioners who wish to implement HCVF even in the absence of national standards in a country. This part makes it sure that it is not a standard guidance for the world by provide the basic ingredients for the mangers to cook the management regimes that are appropriate for maintaining any identified HCVs taking into account the local conditions, resources and knowledge available to them. It suggests prioritizing among the various possible HCVs available in an area and building management plans accordingly. It again provides a flowchart for the delineation of HCVs considering the existent plans, schemes, maps or processes in an area by the FMU and provides guidance and possible information sources for the effective management of each of the 6 HCV categories. Later it suggests the range of consulting stakeholders to be considered in the process of identification and management of HCVs as that raises the extent of certainty in decision making and assurances to society that the HCVs are being dealt with in an appropriate manner. These stakeholders may be:

- Stakeholders directly affected by management. These would include communities or individuals living in or near to the FMU or that use the forest.

- Parties with special interest in the HCV (individuals and organisations). For example, special interest groups for HCV 1.2 (significant concentrations of threatened or endangered species) might include national, provincial and local government agencies responsible for conservation and environmental NGOs.

For the HCV5 and HCV6, special consideration is required as it needs consultation with the community itself. The toolkit also lists issues to be considered for such consultations. The document also provides the generic guidance for managing and monitoring HCVs and indicators for monitoring for each of the HCV categories.

3.3 Identification of Indicators

The FSC principles and criterions along with the categories and guidelines, suggested by the Toolkit, provided the heads for which the indicators were to be identified for the current study. This was a critical task for the study, as the toolkit provided a global perspective of the HCVF, which may or may not be applicable to a specific site, region or a country. Talking about India, there are numerous stakeholders who impact the forests and the vice versa. This makes it more complicated to finalize the indicators to define HCVF in Indian context. The conservation values of the forest differ from region to region and site to site and thus making it difficult to draw a relative comparison between two values as for one site the value may be extremely important while for the other it may just be of normal importance. Hence, selecting those indicators for the country which can reflect the important values of different forest area in an unbiased way and in process identifying the HCVF in India was one of the most complicated yet critical tasks of the study.

The study considered all possible sources to generate an exhaustive list of indicators for all the HCV categories as suggested in the HCV Global Toolkit, and also ensuring that no important value is left out in the process. The different sources considered for this process include the existing literature and consultations carried out with different experts, institutions and the stakeholders. The literature reviewed for the study varied from the global toolkits to some site specific works in India as well as the other countries. The HCV toolkit for Malaysia was referred to understandthe prerequisites of the study and most importantly, initiating the study. Based on the toolkit an initial list of possible indicators relevant in the Indian context was drafted . The rest were either left out completely or were included subjectively. The next phase was consultation with experts, institutions and the stakeholders to ensure that no critical/important value was left out and also to remove the indicators which held relatively lesser importance or relevance. This was to enhance the reliability and robustness of the study and eliminating the biasness. After these two phases of identifying the possible indicators an exhaustive list was generated which included more than 60 indicators in various sub-categories such as protected areas, threatened species, endangered species, critical temporal use, large landscape level forests, endangered ecosystems, critical services of

nature, basic needs of communities, and traditional cultural identity among others as shown in Table 7.

Table 7 – List of indicators screened for the study

Category	Sub Category	Indicators
HCV1 Biodiversity	**Protected Areas**	Percentage of Geographical area of a state under forest cover
		(Area under Protected Forests) / Total Area under Forest Cover of State
		Growing Stock of Wood in state
		Ratio of Natural Forest/ Man-Made forest in state
		Degraded forest area in a state
		High Altitude Forests (Altitude >= x meters> in a state
		Canopy Density of Forest Areas (Canopy Cover classification)
		Tree Cover outside forest area (TOF) in a state
		Total Number of Plant Species
		Total Number of Animal (Pisces, Mammals, Amphibians, Birds and Reptiles) Species
		Status of Natural Regeneration/Intensity of regeneration
		Areas of Occurrence of Weeds in the forest
	Threatened Species	Endangered (Pisces, Mammals, Amphibians and Reptiles) Animals
		Endangered Birds
		Endangered Plants
		Status of Species prone to Over-exploitation
	Endemic Species	Endemic Species of Animals
		Endemic Species of Birds
		Endemic Species of Plants
	Critical Temporal Use	Important Bird Areas (breeding/Roosting)
		Area under Wildlife corridor/No. of Wildlife corridor in State
		Number of Saltlicks inside forest
		Wetlands area inside the Forest
HCV2	**Large Landscape Level Forests**	Area under landscape level forests (area to be decided)
		Area of Pristine Forests in the state
HCV3	**Endangered Ecosystem**	Forest types having area <= x Km^2 in India
HCV4	**Critical Services of Nature**	Rivers/streams originating from the forest area (#, length, area of catchment, water flow)
		Area providing Watershed Treatment
		Duration of Water Flow in selected streams
		Area under forest cover/plantations acting barriers to

		Tsunami and other Catastrophic events
		Area of forests on Slope having inclination >= 30 Degrees
		Fuelwood Collection in the state (volume)
HCV5	**Basic Needs of Communities**	Recorded volume of NTFP (other than fuelwood)
		Forest Areas open for Grazing
		Number of Livestock grazing in forests
		Vulnerable Tribal Groups/ Primitive Tribal Groups
		Basic Livelihood for the communities
		Aggregate per Capita consumption of wood and Non-wood forest produce
		Direct employment in Forestry and Forest based industries
		Contribution of Forest to the income of Forest dependent people
HCV6	**Traditional Cultural Identity**	Area under cultural/sacred Landscapes (temples, hills etc)
		Area under Sacred Groves
		Use of indigenous technical knowledge
		Number of Visitors to Cultural/Sacred Landscapes
Other Indicators	**NFI Data**	Physiographic Zone
		State
		Legal Status
		land Use
		General Topography
		Position on Slope
		Altitude
		Origin of Stand
		Canopy Layer or Storey
		Top Height
		Size Class
		Intensity of Regeneration
		Species under regeneration
		Grazing Incidence
		Presence of Weeds
		Presence of Grass
		Distance from River/Stream to plot
		Degraded forests

For the first list of indicators, conditions like data availability, site specific, biasness, practicality and relative importance were not considered. The reason behind this was to generate a list which can later be edited by the process of elimination of less important or relevant indicators during the country level compilation. Another important reason of deriving such an exhaustive list was to ensure that no important value was left

unattended which may raise any crisis or conflicts in the later stages. The next scheduled step was considering externalities and constraints in the study. These included the existence of biases in the list, data unavailability and unreliable data and most importantly drawing a framework for indicators which can be applied to the country as a whole. The framework was required to be such that the indicators form a well knitted model which can suggest all those values which are subject to the following degree of importance:

1. Values which have been accepted of being highly important on the Global Platform (Endangered, threatened, Climate change etc.)

2. Country level Importance (in terms of conservation as well as the existing laws)

3. Area/Region specific Criticality which have and immense implications on specific areas environmentally, socially and economically.

After this phase, the process of screening and addition of proxies was carried out, in consideration of all externalities applicable to the initial drafted list of indicators. With the help of experts of forest management and data agencies the final list was created which contains the most important and over-arching indicators for the study and is shown in Table 8. The primary factor influencing screening of indicators was the availability of data for the indicators. For some indicators, even if the data was available, it was either site-specific or was limited to only a number of States, whilst the study required the same for all 28 states. Since, the HCVF identification process is purely dependent on secondary data; it requires every data in precisely the same form and units as required by the indicators for identification of important values. But availability of the same in practicality is not possible and the current study being one of the first study on HCVF in India, data for most of the indicators was either unavailable, incomplete or not in the form required by the study. The major chunk of the data that was available was provided by The Forest Survey of India, based on their rigorous collection of data from numerous blocks of land throughout India, for their National Forest Inventory. A Group Convergence Methodology Workshop was also conducted to allocate appropriate weights to each of the indicator and freeze the indicators that would appropriately represent the High Conservation Value of Forests in India. In the workshop, in consultation with a panel of experts a final list of 13 indicators was

finalized which would provide an unbiased relative value importance of forests in each State and help in drawing an index which can be used directly in the final allocation matrix.

Table 8 – Final list of indicators used for deriving HCV Index

Sr. No.	Indicators	Code
1	Percentage of Geographical area of a state under recorded Forest area	FAGA
2	(Area under Protected Area) / Total Area under Recorded forest Area of State I	PARF
3	Growing Stock of Wood in the Recorded forest areas	GS
4	Ratio of Natural Forest/ Recorded Forest Area	NFRF
5	High Altitude Forests (Altitude >= 2000mtr)	HAF
6	Canopy Density of Forest Areas	FCD
7	Intensity of regeneration	REG
8	Diversion of Recorded forest Area by different States (from 1980-2012)	DIV
9	Endemic Species of Flora	EMICFL
10	Area under Wildlife corridor/No. of Wildlife corridor in State	CORR
11	Wetlands area inside the Forest	WET
12	Average Patch Size for a state	PATCH

It may kindly be noted that the finalized set of indicators is quite different from the global toolkit that was referred to in earlier Section. It primarily lacks the threatened ecosystems, socio-economic and cultural values of the forests in India. The reason behind the exclusion of all these are data insufficiency, non-reliability of available data, constraint of time to carry out any sort of primary survey and the debatable viewpoint on the role of communities on the conservation of forests.

The final set of indicators focus on the forest area being preserved by the state and its importance in terms of biodiversity values they hold along with associated level of conservation required for them. India aspires to hold one-third of its total geographical area under forests hence the percentage area of state under recorded forests acts as an indicator. However, it can be said that though each forest area is important, but a forest declared as a national part or a wildlife sanctuary will be much more important than a normal forest area. Hence, the percentage of recorded forest areas in each state holding protected area carries an additional importance and is weighed accordingly. Along with this the biodiversity in terms of endemic flora and fauna also carries an additional value to an area. There is also an indicator for the area of forests that acts as a wildlife corridor in a state due to its criticality for biodiversity conservation. Similarly, forested

wetlands which nest various biodiversity species and have various ecological functions are also being reflected in the study. Finally an indicator is included which emphasizes on the average patch size of forests in each the state. It is a fact that large contiguous forest lands are richer in terms of the services they provide as well as potential biodiversity that they can support. Thus analysis of the fragmentation in each state is an important parameter. The more the fragmentation of forest areas in a state, the more has been the disturbance due to human interference and the more has been the exploitation of these natural resources. The larger patch would mean that the state has worked harder to control the land diversion and is conservation centric.

During the final consultation meeting, it was suggested that out of the 12 indicators finalized, 2 were already a part of the allocation formula used by the XIII Finance Commission namely the FAGA and FCD. Hence, it was decided to modify the existing allocation formula by incorporation the remaining 10 indicators in the formula while making the required modifications to the existing parameters in the formula.

3.4 Types of indicators

The list of 12 indicators stated above in **Table 8** can be broadly categorized into three types of factors:

(a) **Natural Endowment**: Certain indicators such as number of endemic floral species found in the State relate to the State's natural endowment. These gifts of nature need to be conserved at all costs. Out of the 12 indicators finalized for inclusion in the study, 5 relate to State's natural endowment. The indicators in this category are marked as Ⓔ and include the following:

i. FAGA: Recorded forest area as a percentage of total geographical area of the State
ii. FCD: Forest canopy cover density
iii. HAF: Area under high altitude forests (above an altitude of 2000 msl)
iv. WET: Area under wetlands inside forests
v. EMICFL: Total number of endemic floral species found in the State

(b) **Action**: A set of indicators such as diversion of recorded forest area as a proportion of recorded forest area of the State relates to State's action in conservation of the endowments it possesses. 4 of the 12 indicators finalized

relate to State's action (positive as well as negative) with respect to conservation of its endowments. The indicators in this category are marked as Ⓐ and include the following:

i. PARF: Proportion of recorded forest area under protected area network
ii. NFRF: Proportion of recorded forest area which is natural forests
iii. DIV: Recorded forest area diverted excluding regularization of encroachments between 1980-2012 as a percentage of total recorded forest area of the State
iv. PATCH: Average patch size of forests in the State

(c) **Cross-cutting**: The remaining indicators from the finalized list relate to cross-cutting factors, i.e. they are a combination of natural endowment and action factors. For example, the growing stock per hectare is not only a function of agro-climatic zone but also management effectiveness. 3 of the 12 indicators related to such cross-cutting factors. The indicators in this category are marked as Ⓒ and include the following:

i. GS: Growing stock (in forests) per unit area of forest cover
ii. REG: Intensity of regeneration
iii. CORR: Area under wildlife corridors in the State

3.5 Indicators other than HCVF Index

The 2 indicators which were also used by the XIII Finance Commission in the allocation formula tend to be a part of the list of final indicators for this study as well. But since the study tries to improve upon the existing allocation formula, the final list of 13 indicators for HCVF Index was restricted to 10 indicators, while the other 2 became the embedded part of the allocation formula. These 2 indicators are described below:

3.5.1 FAGA Ⓔ

Percentage of geographical area of a state under recorded forest area

Each state has a designated area which has been recorded as forests. These areas may not just be areas having forest cover but would also include areas such as grasslands, wetlands and other life-supporting ecosystems. Thus, forest cover is not an appropriate measure to identify a forest area in a State as it is only identified on the basis of tree

canopy density and excludes the above mentioned ecosystems. As India aspires to hold one-third of its geographical area under forest cover, the indicator represents States which would assist in achieving that target as well as States which may be well below the national average. Considering all these aspects, the area defined as the Recorded Forest Area in the State has been used as the Total Forest Area of a State. The allocation formula represents this indicator as F_i. The allocation formula also calculates the Country Average for the forests and tried to incentivize the States holding more percentage of forests than the country average. This is done to promote states in increasing their forest acreage in their geographical area, so as to maximise the forests in the country.

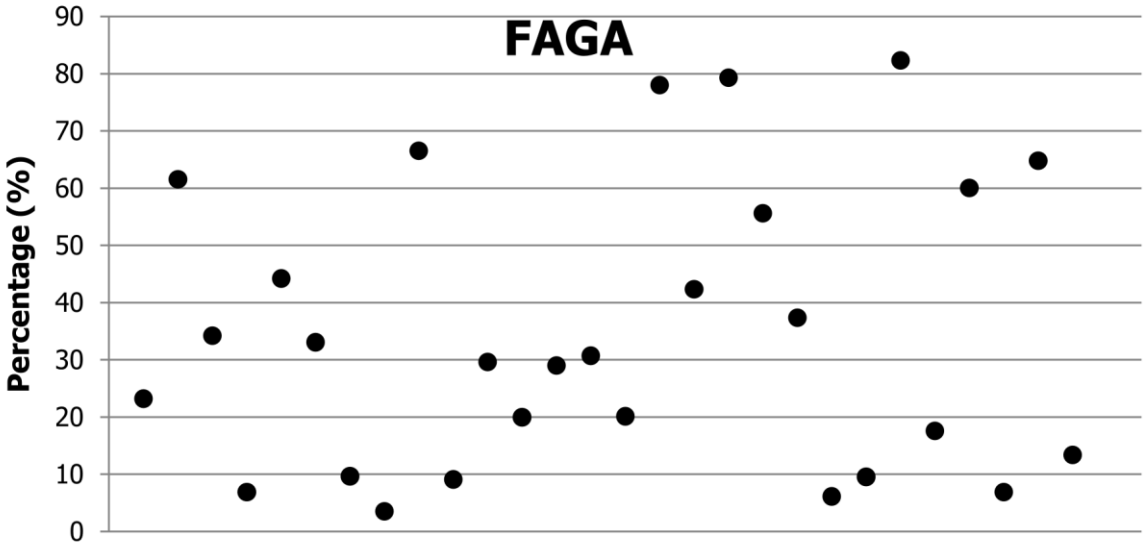

Figure 3 - Scatter Plot for FAGA

The **Table 9** shows the percentage of forest area held by each State relative to their geographical area. States holding more percentage land under forests than the country average are provided additional funding for which the magnitude of the incentive amount is dependent on the value of R_i which is the difference between the percent of State's land cover under forests and the country average forest area[7i].

Table 9 – State-wise FAGA

State	Recorded Forest Area[8]	Geographical Area[1]	FAGA	Ri

[7] Quantitative Linkage between forests and rainfall/natural factors and vice versa have not been reliably estimated and hence not considered.
[8]Source: State of Forest Report (2011), Forest Survey of India. Dehradun. India

	(km^2)	(km^2)	(%)	(%)
Andhra Pradesh	63,814	2,75,069	23.20%	-0.06%
Arunachal Pradesh	51,540	83,743	61.55%	38.29%
Assam	26,832	78,438	34.21%	10.95%
Bihar	6,473	94,163	6.87%	-16.38%
Chhattisgarh	59,772	1,35,191	44.21%	20.95%
Goa	1,224	3,702	33.06%	9.80%
Gujarat	18,927	1,96,022	23.20	-0.06
Haryana	1,559	44,212	61.55	38.29
Himachal Pradesh	37,033	55,673	34.21	10.95
Jammu and Kashmir	20,230	2,22,236	6.87	-16.38
Jharkhand	23,605	79,714	44.21	20.95
Karnataka	38,284	1,91,791	33.06	9.80
Kerala	11,265	38,863	9.66	-13.60
Madhya Pradesh	94,689	3,08,245	3.53	-19.73
Maharashtra	61,939	3,07,713	66.52	43.26
Manipur	17,418	22,327	9.10	-14.16
Meghalaya	9,496	22,429	29.61	6.35
Mizoram	16,717	21,081	19.96	-3.30
Nagaland	9,222	16,579	28.99	5.73
Orissa	58,136	1,55,707	30.72	7.46
Punjab	3,084	50,362	20.13	-3.13
Rajasthan	32,639	3,42,239	78.01	54.75
Sikkim	5,841	7,096	42.34	19.08
Tamil Nadu	22,877	1,30,058	79.30	56.04
Tripura	6,294	10,486	55.62	32.37
Uttar Pradesh	16,583	2,40,928	37.34	14.08
Uttarakhand	34,651	53,483	6.12	-17.13
West Bengal	11,879	88,752	9.54	-13.72

3.5.2 FCD

Canopy density of forest areas

Forest Cover under High Density was the principal aspect based on which the grants-in-aid for forests were allocated according to the XIII Finance Commission. This indicator is a parameter to judge the health and quality of the forests in each State. Although, it should be noted that it does not include consideration for the bioclimatic zones in India which is an important factor defining the canopy density, forest productivity and intensity of regeneration in an area. For the North-Eastern States the canopy density is significantly higher than the States falling in the Western part of the country e.g. Rajasthan. Despite this limitation, FCD can highlight the importance of having high

canopy density forests as it is an inverse indicator of disturbance due to anthropogenic activities. The indicator is calculated as the ratio of sum of Area under Very Dense Forest (VDF) cover and half of Area under Moderately Dense Forest (MDF) cover, to the total area under forest cover in respective States.

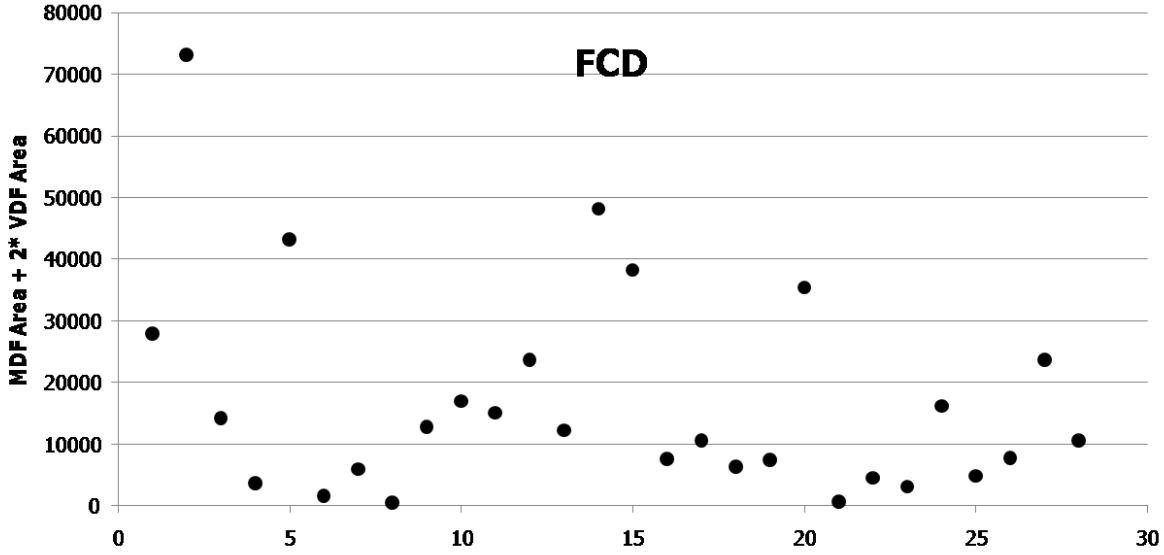

Figure 4 - Scatter Plot for FCD

Table 10 - State-wise FCD

State	Canopy Density (Area km^2)		
	VDF	MDF	MDF+2*VDF
Andhra Pradesh	850	26242	27942
Arunachal Pradesh	20868	31519	73255
Assam	1444	11404	14292
Bihar	231	3280	3742
Chhattisgarh	4163	34911	43237
Goa	543	585	1671
Gujarat	376	5231	5983
Haryana	27	457	511
Himachal Pradesh	3224	6381	12829
Jammu and Kashmir	4140	8760	17040
Jharkhand	2590	9917	15097
Karnataka	1777	20179	23733
Kerala	1442	9394	12278
Madhya Pradesh	6640	34986	48266
Maharashtra	8736	20815	38287
Manipur	730	6151	7611
Meghalaya	433	9775	10641
Mizoram	134	6086	6354

State	Canopy Density (Area km^2)		
	VDF	MDF	MDF+2*VDF
Nagaland	1293	4931	7517
Orissa	7060	21366	35486
Punjab	0	736	736
Rajasthan	72	4448	4592
Sikkim	500	2161	3161
Tamil Nadu	2948	10321	16217
Tripura	109	4686	4904
Uttar Pradesh	1626	4559	7811
Uttarakhand	4762	14167	23691
West Bengal	2984	4646	10614

3.6 Indicator Statistics

This section describes 10 indicators finalized to represent the High Conservation Value Forests in India as shown in the Table below:

Table 11: High Conservation Value Index for the formula

Sr. No.	Indicators	Code
Natural Endowment Factors E		
1.	High Altitude Forest (Forest Area above 2000 msl) in the State	HAF
2.	Total number of Endemic Floral Species found in the State	EMICFL
3.	Area under Wetlands (In Forests) in the State	WET
Action Factors A		
4.	Protected Area (National Parks, Wildlife Sanctuaries, Community Reserves and Conservation Reserves) as a proportion of Recorded Forest Area in the State	PARF
5.	Ratio of Natural Forest to Recorded Forest Area in the State	NFRF
6.	Forest Area Diverted in the State excluding Regularization of Encroachments from 1980 to 2012	DIV
7.	Average Patch Size of Forests in the State	PATCH
Cross-cutting Factors[9] C		
8.	Growing Stock per hectare (in Forest) in the State	GS
9.	Intensity of regeneration in the State	REG
10.	Area under Wildlife Corridors in the State	CORR

[9] Growing Stock and Intensity of Regeneration are dependent on natural factors (bio-geographic conditions) as well as anthropogenic activities and management practices (e.g. grazing, fire incidences)

This covers the categories identified for each indicator for allocation of scores to each State. This is followed by a table showing actual allocation to each state and the way it has been derived.

3.7 Natural Endowment factors

3.7.1 HAF

High Altitude Forest (Forest Area above 2000 msl) in the State

The Hilly States are mandated to have two-thirds of their geographical area under forests as mandated by the National Forest Policy (1988). This leads to various problems in such states such as inaccessibility, availability of labour, additional resource and financial requirements among others. Another aspect to look at the importance of HAF is that they act as source of water downstream due to their catchment and are also an indicator on number of streams and rivers originating from such areas. Both these factors support the inclusion of HAF as an indicator for the study. Such states need enhanced monetary support as well as resources to keep the health of these forests for water security of the country. The categories for HAF as well as the allocation of scores to different states based on this indicator are as shown in Table 12 and Table 13 respectively. It may kindly be noted that the categories for HAF have been developed based on the distribution of values across States and not on mean, standard deviation and range of values across all the States due to higher scattering among the values.

Table 12 – Categories for HAF

Indicator	Range (km^2)		Score
	From	To	
HAF = Area under forests at an altitude of more than 2000 msl	0	1	0
	2	500	1
	501	2000	2
	2001	10000	3
	10001	20000	4
	20001	40000	5

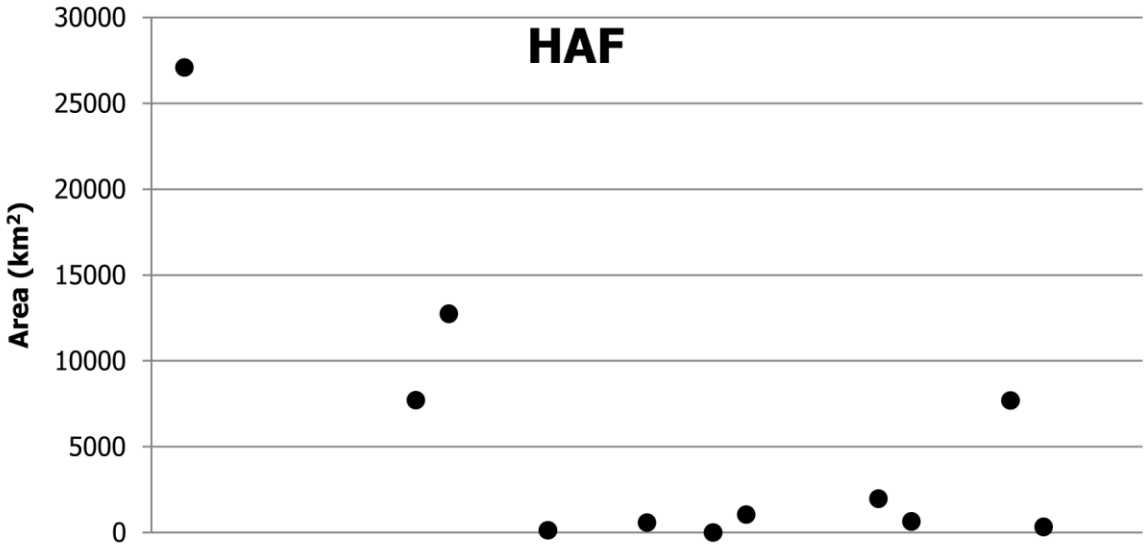

Figure 5 - Scatter Plot for HAF

Table 13 – State-wise scores for HAF

State	Total Forest Area above 2000 msl (km^2)	Score
Andhra Pradesh	-	0
Arunachal Pradesh	27086	5
Assam	-	0
Bihar	-	0
Chhattisgarh	-	0
Goa	-	0
Gujarat	-	0
Haryana	-	0
Himachal Pradesh	7706	3
Jammu and Kashmir	12741	4
Jharkhand	-	0
Karnataka	-	0
Kerala	135	1
Madhya Pradesh	-	0
Maharashtra	-	0
Manipur	580	2
Meghalaya	-	0
Mizoram	5	1
Nagaland	1046	2
Orissa	-	0
Punjab	-	0
Rajasthan	-	0
Sikkim	1974	2
Tamil Nadu	646	2
Tripura	-	0
Uttar Pradesh	-	0

State	Total Forest Area above 2000 msl (km^2)	Score
Uttarakhand	7691	3
West Bengal	328	1

3.7.2 EMICFL

Total number of Endemic Floral Species found in the State

The Endemic Floral Species of each State represent the biodiversity richness of the state. It is an indicator that the State needs extra focus on these species which are particular to their geographical area. Hence, conserving these species of flora becomes more important as these are not to be found anywhere else in the country. Endemism, thus, has been incorporated as an indicator in the study. EMICFL suggests the total species of Flora endemic to a particular State. The categories for EMICFL as well as the allocation of scores to different states based on this indicator are as shown in Table 14 and Table 15 respectively.

Table 14 – Categories for EMICFL

Indicator		Range (%)		Score
		From	To	
EMICFL =	Total number of endemic floral species in the State	0	0	0
		1	66	1
		67	135	2
		136	194	3
		195	253	4
		253	550	5
Timmed Mean ($\bar{x}$) = 66			Trimmed Standard Deviation (δ) = 58	

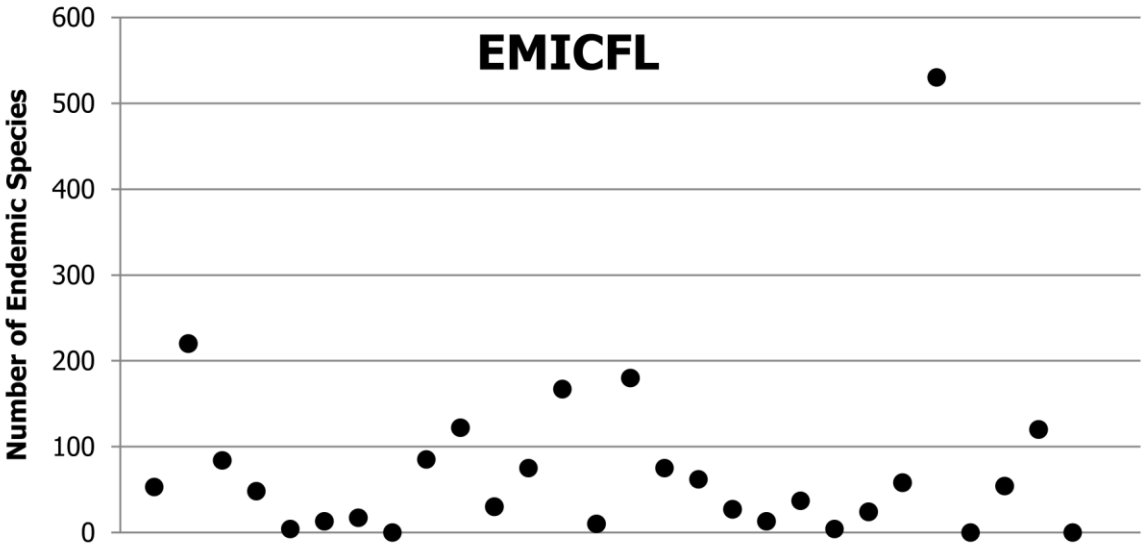

Figure 6 - Scatter Plot for EMICFL

Table 15 - State-wise scores for EMICFL

State	Number of Endemic Floral Species	Score
Andhra Pradesh	53	1
Arunachal Pradesh	220	4
Assam	84	2
Bihar	48	1
Chhattisgarh	4	1
Goa	13	1
Gujarat	17	1
Haryana[10]	0	0
Himachal Pradesh	85	2
Jammu and Kashmir	122	2
Jharkhand	30	1
Karnataka	75	2
Kerala	167	3
Madhya Pradesh	10	1
Maharashtra	180	3
Manipur	75	2
Meghalaya	62	1
Mizoram	27	1
Nagaland	13	1
Orissa	37	1
Punjab	4	1
Rajasthan	24	1
Sikkim	58	1
Tamil Nadu	530	5

[10] Correspondence from Dr. Amarinder Kaur, IFS, APCCF (WL) cum Chief Wildlife Warden, Haryana Forest Department dated May 23, 2014

Tripura[11]	7	1
Uttar Pradesh	54	1
Uttarakhand	120	2
West Bengal[12]	10	1

3.7.3 WET

Area under Wetlands (In Forests) in the State

Wetlands provide various ecosystem services such as providing water for the sustenance of biodiversity, carbon sequestration, micro-climatic regulation, habitat for various species, nutrient regulation, waste treatment among others. These ecosystems form a very important aspect of any area due to these services provided, particularly forests area. Since this study tries to capture the HCV of only the area under Forests, the consideration has just been the wetlands existent inside the Forest Areas. India State of Forest report provided the data on the area of forest wetlands which has been used to calculate this indicator. The higher the area of wetlands inside forests for a State the higher is the score allocated to it. The categories for WET as well as the allocation of scores to different states based on this indicator are as shown in Table 16 and Table 17 respectively.

Table 16 – Categories for WET

Indicator	**Range (%)**		**Score**
	From	**To**	
WET = Area under forested wetlands in the State	N.A.		0
	0	516	1
	517	1160	2
	1161	1804	3
	1805	2448	4
	2449	3200	5
Trimmed Mean ($\bar{x}$) = 517		Trimmed Standard Deviation (δ) = 643	

[11] Correspondence from Mr. Ajit Kumar Bhowmik, IFS, (Deputy Conservator of Forests) Tripura Forest Department dated May 28, 2014

[12] Data for the whole State of West Bengal was not obtained even after repeated correspondence with concerned agencies. The data used here pertains to number of endemic floral species found in Sundarbans Tiger Reserve and is the minimum number of endemic floral species found in West Bengal. It was learnt that the State Forest Department is in the process of compiling this information and the same shall be forwarded to the Finance Commission whenever obtained.

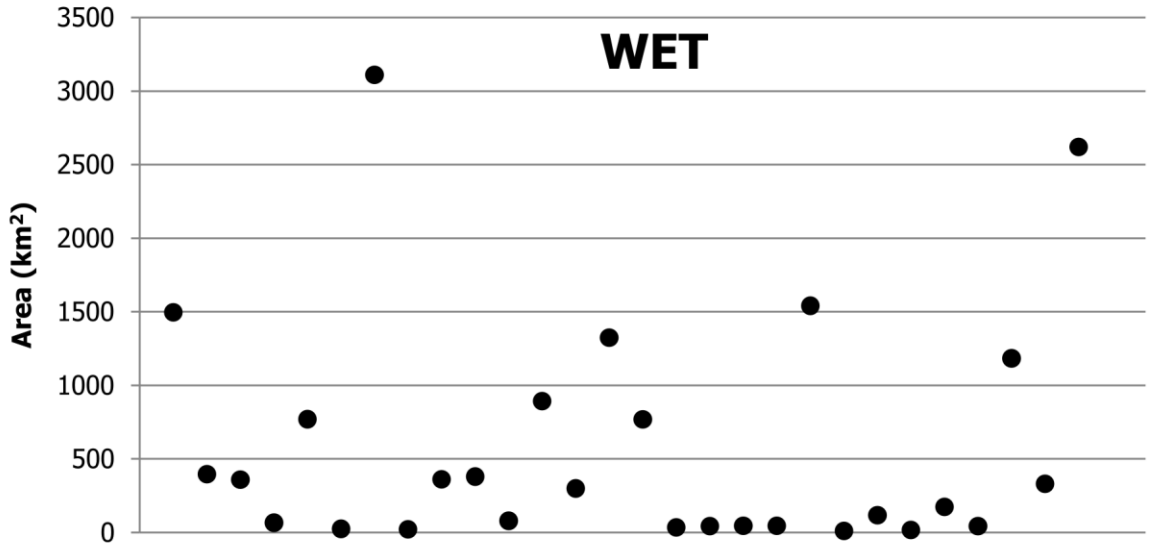

Figure 7 - Scatter Plot for WET

Table 17 - State-wise scores for WET

State	Water Bodies (Km^2)	% of forest cover	Score
Andhra Pradesh	1496	3.37	3
Arunachal Pradesh	396	0.58	1
Assam	359	1.29	1
Bihar	66	1.19	1
Chhattisgarh	770	1.37	2
Goa	25	1.16	1
Gujarat	3110	20.81	5
Haryana	22	1.45	1
Himachal Pradesh	361	2.52	1
Jammu and Kashmir	380	1.79	1
Jharkhand	79	0.35	1
Karnataka	893	2.45	2
Kerala	299	1.92	1
Madhya Pradesh	1324	1.73	3
Maharashtra	769	1.64	2
Manipur	35	0.2	1
Meghalaya	44	0.26	1
Mizoram	46	0.25	1
Nagaland	45	0.33	1
Orissa	1541	3.19	3
Punjab	11	0.7	1
Rajasthan	118	0.74	1
Sikkim	17	0.52	1
Tamil Nadu	174	0.77	1
Tripura	43	0.53	1

Uttar Pradesh	1184	8.38	3
Uttarakhand	331	1.35	1
West Bengal	2620	21.23	5

3.8 Action factors (A)

3.8.1 PARF (A)

Percentage of recorded forest area of a state under protected area network

Protected Areas include scheduled high conservation zones which have been assigned a special legal status as per their conservational importance. These may be established with the objective for biodiversity conservation or for communities inside the forest and include National Parks, Wildlife Sanctuaries, Community Reserves, Conservation reserves among others. Since these areas hold a high degree of importance, States holding a larger area under such Protected Areas need enhanced efforts to preserve the values they are holding. This indicator identifies the ratio of Protected Area to the Recorded forest area for each State and based on the ratio, States holding a higher percentage area to its recorded forest area are allocated a higher score[13].

Table 18 – Categories for PARF

Indicator	**Range**		
	From	**To**	**Score**
$PARF = \frac{Protected\ Area}{Recorded\ Forest\ Area}$	N. A.		0
	0.0%	22.0%	1
	22.1%	44.0%	2
	44.1%	66.0%	3
	66.1%	88.0%	4
	88.1%	100.0%	5
Mean ($\bar{x}$) = 24%	Standard Deviation (δ) = 22%		

[13] Protected Area is action already undertaken which, unlike regular forest areas, require enhanced efforts for maintenance and conservation in terms of both efforts and finances.

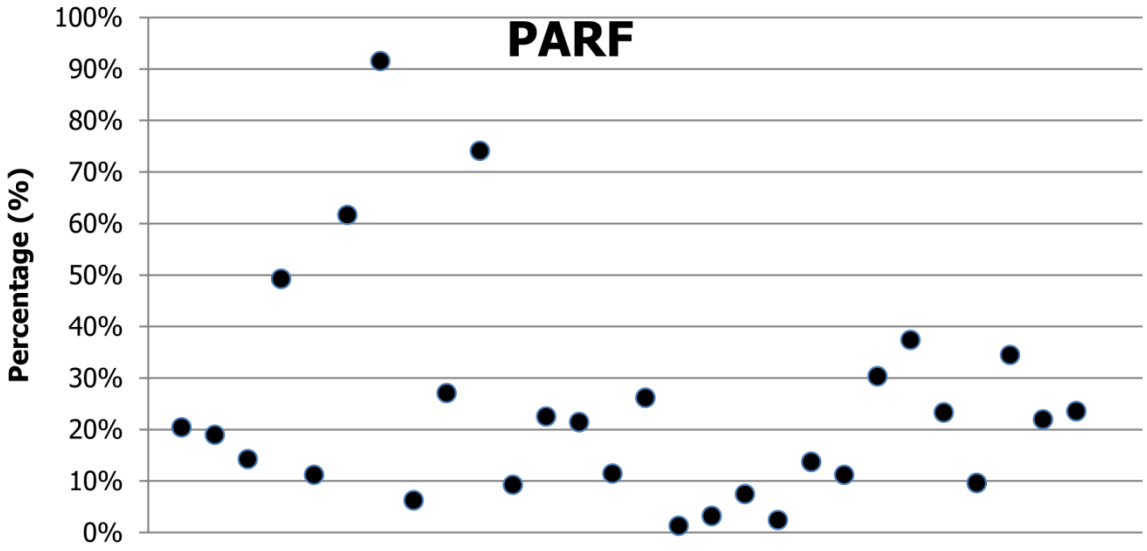

Figure 8 - Scatter Plot for PARF

The resultant allocation of scores for PARF based on categories defined above is as shown in Table 19 below.

Table 19 - State-wise scores for PARF

State	Protected Area[14] (km^2)	Recorded Forest Area[15] (km^2)	PARF (%)	Score
Andhra Pradesh	13,007	63,814	20%	1
Arunachal Pradesh	9,779	51,540	19%	1
Assam	3,818	26,832	14%	1
Bihar	3,187	6,473	49%	3
Chhattisgarh	6,690	59,772	11%	1
Goa	755	1,224	62%	3
Gujarat	17,326	18,927	92%	5
Haryana	97	1,559	6%	1
Himachal Pradesh	10,017	37,033	27%	2
Jammu and Kashmir	14,998	20,230	74%	4
Jharkhand	2,182	23,605	9%	1
Karnataka	8,612	38,284	22%	2
Kerala	2,413	11,265	21%	1
Madhya Pradesh	10,815	94,689	11%	1
Maharashtra	16,192	61,939	26%	2
Manipur	224	17,418	1%	1
Meghalaya	302	9,496	3%	1
Mizoram	1,241	16,717	7%	1

[14] ENVIS Centre on Wildlife & Protected Areas (wiienvis.nic.in/Database/Protected_Area_854.aspx)
[15]Source: State of Forest Report (2011), Forest Survey of India. Dehradun. India

State	Protected Area[14] (km^2)	Recorded Forest Area[15] (km^2)	PARF (%)	Score
Nagaland	222	9,222	2%	1
Orissa	7,960	58,136	14%	1
Punjab	345	3,084	11%	1
Rajasthan	9,898	32,639	30%	2
Sikkim	2,183	5,841	37%	2
Tamil Nadu	5,326	22,877	23%	2
Tripura	604	6,294	10%	1
Uttar Pradesh	5,712	16,583	34%	2
Uttarakhand	7,604	34,651	22%	1
West Bengal	2,795	11,879	24%	2

3.8.2 NFRF Ⓐ

Percentage of recorded forest area of a state which are natural forests

Natural forests provide the benefits or services which a man-made forest cannot. Natural forest facilitates natural evolution of species existent in the area and provide enhanced forest services like carbon sequestration, biodiversity preservation, water catchment and treatment and many others, which an artificial forest (or a tree cover) either cannot provide, or can provide at a considerably lesser quantity or a significantly higher cost. Thus, plantations need to be differentiated from natural forests. NFRF balances the existence of Natural Forest by giving them an additional weightage over the artificially created forests by afforestation or plantations. Though, even the artificially created forests, with time, start acting like natural forests due to natural succession processes, it usually take decades to reach that phase. The categories for NFRF as well as the allocation of scores to different states based on this indicator are as shown in Table 20 and Table 21 respectively.

Table 20 – Categories for NFRF

Indicator	Range (%)		Score
	From	To	
$NFRF = \frac{Area\ under\ Natural\ Forest}{Recorded\ Forest\ Area}$	0%	36%	0
	36%	48%	1
	48%	60%	2
	60%	72%	3
	72%	84%	4
	84%	96%	5
Mean ($\bar{x}$) = 72%	Standard Deviation (δ) = 12%		

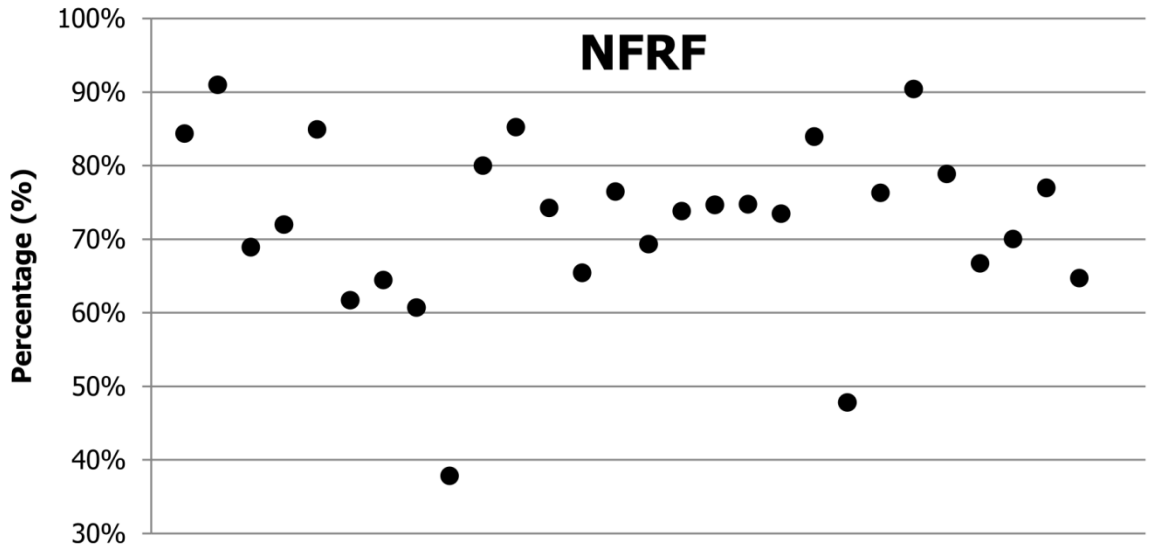

Figure 9 - Scatter Plot for NFRF

Table 21 – State-wise scores for NRFR

State	Recorded Forest Area (RFA)	Total area occupied by natural forests (NF)	NF/RFA	Score
	(km^2)	(km^2)	(%)	
Andhra Pradesh	63,814	53846	0.84	5
Arunachal Pradesh	51,540	46896	0.91	5
Assam	26,832	18495	0.69	3
Bihar	6,473	4661	0.72	3
Chhattisgarh	59,772	50770	0.85	5
Goa	1,224	755	0.62	3
Gujarat	18,927	12198	0.64	3
Haryana	1,559	946	0.61	3
Himachal Pradesh	37,033	14013	0.38	1
Jammu & Kashmir	20,230	16186	0.80	4
Jharkhand	23,605	20120	0.85	5
Karnataka	38,284	28425	0.74	4
Kerala	11,265	7371	0.65	3
Madhya Pradesh	94,689	72418	0.76	4
Maharashtra	61,939	42948	0.69	3
Manipur	17,418	12859	0.74	4
Meghalaya	9,496	7090	0.75	4
Mizoram	16,717	12497	0.75	4
Nagaland	9,222	6776	0.73	4
Orissa	58,136	48810	0.84	4
Punjab	3,058	1462	0.48	1
Rajasthan	32,639	24910	0.76	4
Sikkim	5,841	5281	0.90	5

Tamil Nadu	22,877	18043	0.79	4
Tripura	6,294	4199	0.67	3
Uttar Pradesh	16,583	11616	0.70	3
Uttarakhand	34,651	26677	0.77	4
West Bengal	11,879	7686	0.65	3

3.8.3 DIV Ⓐ

Forest Area Diverted in the State excluding Regularization of Encroachments from 1980 to 2012

Diversion of Forest Area is one aspect which describes the intent of the state and their approach on the balance between development and conservation. The pro-development states are more likely to divert forest lands for developmental activities which may fuel up economic growth in the state and increase their Gross State Domestic product. On the other hand, pro-conservation State are likely to keep their forests intact for enhancing their natural resources and in lieu of the benefits (ecosystem services) the State and the country receives from them. In the modern world when every country and as well as the states are striving to bolster their economies with developmental activities, conservation usually takes a back seat. Thus, incentivising states for not diverting their forest lands becomes important. Here for DIV indicator we have categorised the scores as the lesser the diversion the more will be the scores allocated. The categories for DIV as well as the allocation of scores to different states based on this indicator are as shown in Table 22 and Table 23 respectively.

Table 22 – Categories for DIV

Indicator	**Range (1/100th %)**		**Score**
	From	**To**	
$DIV = \frac{Forest\ area\ diverted\ since\ 1980}{Recorded\ Forest\ Area}$	50.0%	4.4%	0
	4.3%	3.4%	1
	3.3%	2.4%	2
	2.3%	1.4%	3
	1.3%	0.4%	4
	0.3%	0.0%	5
Timmed Mean ($\bar{x}$) = 1.42%	Trimmed Standard Deviation (δ) 1.83%		

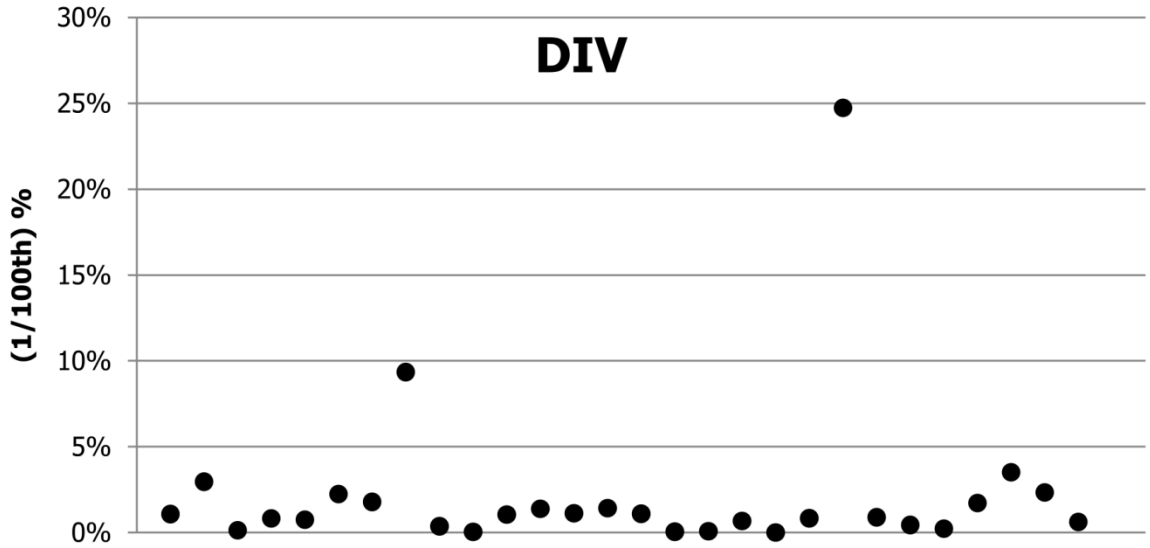

Figure 10 - Scatter Plot for DIV

Table 23 - State-wise scores for DIV

State	Diversion (Km^2)	RFA (Km^2)	Diversion/RFA (RFA 2011) (%)	Score
Andhra Pradesh	682	63814	1.07%	4
Arunachal Pradesh	1524	51540	2.96%	2
Assam	34	26832	0.13%	5
Bihar	53	6473	0.81%	4
Chattisgarh	444	59772	0.74%	4
Goa	27	1224	2.24%	3
Gujarat	337	18927	1.78%	3
Haryana	146	1559	9.34%	0
Himachal Pradesh	132	37033	0.36%	4
Jammu and Kashmir	7	20230	0.03%	5
Jharkhand	247	23605	1.05%	4
Karnataka	530	38284	1.38%	3
Kerala	125	11265	1.11%	4
Madhya Pradesh	1345	94689	1.42%	3
Maharashtra	676	61939	1.09%	4
Manipur	8	17418	0.04%	5
Meghalaya	6	9496	0.07%	5
Mizoram	112	16717	0.67%	4
Nagaland	0	9222	0.00%	5
Orissa	481	58136	0.83%	4
Punjab	763	3084	24.73%	0

State	Diversion (Km^2)	RFA (Km^2)	Diversion/RFA (RFA 2011) (%)	Score
Rajasthan	289	32639	0.89%	4
Sikkim	25	5841	0.44%	4
Tamil Nadu	50	22877	0.22%	5
Tripura	108	6294	1.72%	3
Uttar Pradesh	581	16583	3.50%	1
Uttarakhand	809	34651	2.33%	2
West Bengal	73	11879	0.62%	4

3.8.4 PATCH 

Average Patch Size of Forests in the State

Another important aspect that is considered for this study is the fragmentations of forests in the country. It is a well accepted fact that large contiguous patches of forests are richer in terms of the values they hold as compared to smaller, fragmented patches. These values may be with reference to the biodiversity they hold, their impacts on the ecology and the services they provide. In India, the data on large contiguous patches of forests is not available and thus as a proxy for the same the study uses the average patch size in each State as sourced from the Forest Survey of India. If the fragmentation of forests in a particular State is less, then the average patch size will be higher in that State and vice versa. This indicator will indicate the importance of keeping larger area under forest as well as keeping them in one single contiguous unit. The categories for PATCH as well as the allocation of scores to different states based on this indicator are as shown in Table 24 and Table 25 respectively.

Table 24 – Categories for PATCH

Indicator		Range (%)		
		From	To	Score
PATCH =	Average patch size of forests in the State	0	0.37	0
		0.38	1.03	1
		1.04	1.69	2
		1.7	2.35	3
		2.36	3.01	4
		3.02	15	5
Mean ($\bar{x}$) = 1.7		Standard Deviation (δ) = 1.3		

Figure 11 - Scatter Plot for PATCH

Table 25 - State-wise scores for PATCH

State	Average Patch Size (Km^2)	Score
Andhra Pradesh	2.01	3
Arunachal Pradesh	7.48	5
Assam	0.56	1
Bihar	0.40	1
Chhattisgarh	2.00	3
Goa	1.06	2
Gujarat	0.54	1
Haryana	0.19	0
Himachal Pradesh	0.78	1
Jammu and Kashmir	0.64	1
Jharkhand	0.62	1
Karnataka	0.95	1
Kerala	0.54	1
Madhya Pradesh	1.61	2
Maharashtra	1.16	2
Manipur	3.40	5
Meghalaya	2.58	4
Mizoram	13.73	5
Nagaland	3.29	5
Orissa	1.21	2
Punjab	0.33	0
Rajasthan	0.59	1
Sikkim	5.41	5
Tamil Nadu	0.59	1
Tripura	2.63	4
Uttar Pradesh	0.24	0

Uttarakhand	2.59	4
West Bengal	0.24	0

3.9 Cross-cutting factors

3.9.1 GS

Growing stock per hectare of forest cover

Total growing stock represents the volume of all trees inside the forest area. This also represents the total amount of carbon stored in the forests. In this study Growing Stock has been included as an indicator to identify forests that sequesters more carbon per unit area. A forest holding more carbon has more importance than a forest holding lesser amount of the same due to its role in mitigating climate change. The study thus tries to distinguish States and their forests based on this parameter. The more the growing stock per unit area, the more value the forests of a State would carry according to this parameter. The categories for allocation of scores to States and the resultant matrix showing scores allocated to different States are as shown below in Table 26 and Table 27 respectively.

Table 26 – Categories for GS

Indicator	Range (%)		Score
	From	To	
$GS = Growing\ Stock\ per\ hectare$	0.0	16.0	0
	16.1	61.0	1
	61.1	106.0	2
	106.1	151.0	3
	151.1	196.0	4
	196.1	241.0	5
Trimmed Mean ($\bar{x}$) = 60.9		Standard Deviation (δ) = 44.8	

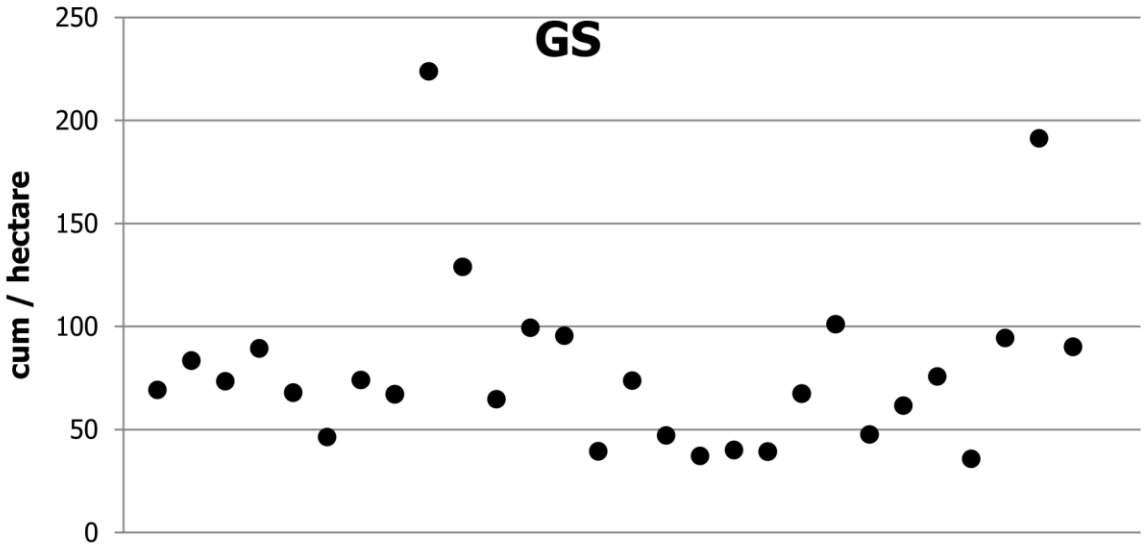

Figure 12 - Scatter Plot for GS

Table 27 – State-wise scores for GS

State	Total Growing stock in forest (million m^3)	Total Forest Cover (km^2)	Growing stock per unit area in forest (cum/ha)	Score
Andhra Pradesh	255.082	46389	55	1
Arunachal Pradesh	492.689	67410	73	2
Assam	173.494	27673	63	2
Bihar	35.186	6845	51	1
Chhattisgarh	334.381	55674	60	1
Goa	7.716	2219	35	1
Gujarat	48.261	14619	33	1
Haryana	4.893	1608	30	1
Himachal Pradesh	321.314	14679	219	5
Jammu and Kashmir	227.388	22539	101	2
Jharkhand	116.308	22977	51	1
Karnataka	315.156	36194	87	2
Kerala	142.582	17300	82	2
Madhya Pradesh	249.661	77700	32	1
Maharashtra	293.669	50646	58	1
Manipur	70.878	17090	41	1
Meghalaya	45.411	17275	26	1
Mizoram	68.042	19117	36	1
Nagaland	40.955	13318	31	1
Orissa	285.191	48903	58	1
Punjab	15.71	1764	89	2
Rajasthan	34.385	16087	21	1

State	Total Growing stock in forest (million m^3)	Total Forest Cover (km^2)	Growing stock per unit area in forest (cum/ha)	Score
Sikkim	18.832	3359	56	1
Tamil Nadu	144.404	23625	61	2
Tripura	21.864	7977	27	1
Uttar Pradesh	123.4	14338	86	2
Uttarakhand	460.089	24496	188	4
West Bengal	92.515	12995	71	2

3.9.2 REG ©

Intensity of regeneration

The process of replacing old crop with younger generation either naturally or artificially is called regeneration or reproduction. Forest regeneration process may also include interventions like assisted natural regeneration, enrichment planting, controls to reduce grazing and lopping activities, etc. This activity influences carbon storage through changes in the growth of above-ground and below-ground tree biomass. Intensity of regeneration refers to the extent the regeneration has been established in an area for a given species or a group of species. The establishment of regeneration depends upon many factors such as presence of weeds, climate, soil and moisture conditions, grazing intensity, diseases and insect attack, fire incidences and topographic factors viz; slope & aspect. This indicator uses data sourced from Forest Survey of India on percentage of forest area with 'Adequate' regeneration as defined in Forest Inventory Manual of FSI. It may be noted that a part of each State is classified as 'Not Applicable' and this area has been discounted to estimate the value of this indicator for all States. The categories for REG as well as the allocation of scores to different states based on this indicator are as shown in Table 28 and Table 29 respectively.

Table 28 – Categories for REG

Indicator	Range (%)		Score
	From	To	
$REG = \frac{\%\ Forest\ Area\ with\ ADEQUATE\ renegeration}{(100 - NOT\ APPLICABLE\ AREAS)}$	0%	36.8%	0
	36.9%	47.6%	1
	47.6%	58.4%	2
	58.4%	69.1%	3
	69.2%	80.0%	4

	80.1%	90.9%	5
Mean ($\bar{x}$) = 58%		Standard Deviation (δ) =14%	

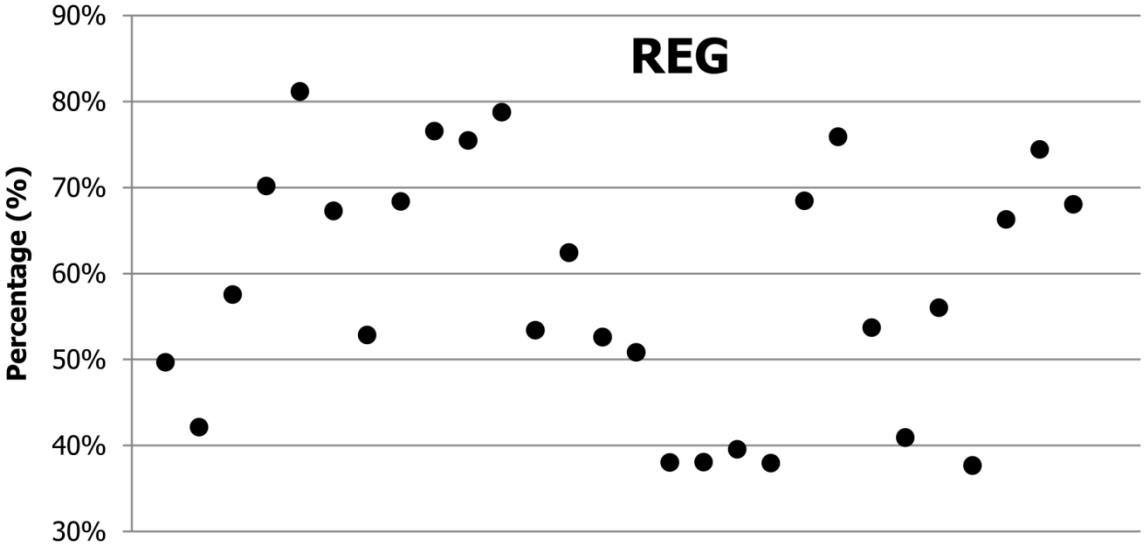

Figure 13 - Scatter Plot for REG

Table 29 - State-wise scores for REG

State	Not applicable (% area)	Adequate (% area)	RFA	Adequate (Discount NA)	Score
			(km^2)	(%)	
Andhra Pradesh	7.89	45.76	63,814	49.68	2
Arunachal Pradesh	11.77	37.18	51,540	42.14	1
Assam	16.92	47.81	26,832	57.55	2
Bihar	10.87	62.55	6,473	70.18	4
Chhattisgarh	13.31	70.37	59,772	81.17	5
Goa	28.42	48.16	1,224	67.28	3
Gujarat	26.94	38.62	18,927	52.86	2
Haryana	17.73	56.27	1,559	68.40	3
Himachal Pradesh	57.8	32.31	37,033	76.56	4
Jammu & Kashmir	19.6	60.69	20,230	75.49	4
Jharkhand	11.77	69.5	23,605	78.77	4
Karnataka	15.31	45.23	38,284	53.41	2
Kerala	21.91	48.75	11,265	62.43	3
Madhya Pradesh	16.01	44.19	94,689	52.61	2
Maharashtra	19.08	41.14	61,939	50.84	2
Manipur	26.53	27.95	17,418	38.04	1
Meghalaya	24.16	28.88	9,496	38.08	1

Mizoram	28.06	28.46	16,717	39.56	1
Nagaland	27	27.71	9,222	37.96	1
Orissa	12.1	60.17	58,136	68.45	3
Punjab	40.6	45.09	3,058	75.91	4
Rajasthan	14.55	45.9	32,639	53.72	2
Sikkim	17.95	33.58	5,841	40.93	1
Tamil Nadu	15.54	47.32	22,877	56.03	2
Tripura	25.95	27.9	6,294	37.68	1
Uttar Pradesh	14.14	56.92	16,583	66.29	3
Uttarakhand	20.5	59.17	34,651	74.43	4
West Bengal	9.71	61.45	11,879	68.06	3

3.9.3 CORR ©

Area under Wildlife Corridors in the State

Wildlife Corridors are important and highly critical for the biodiversity conservation and preservation. Wildlife corridors are patches of forest linking two wildlife population areas which are separated due to human activities or structures. Absence of these areas will result in the inbreeding of species which would increase the risk of species extinction. Corridors also help in the re-establishment of species which are vulnerable or are left with limited population. In addition, corridors also act as habitats for spill-over population of many important species such as tigers, elephants and others. Hence CORR as an indicator justifies itself to be a part of HCV. The study identifies the area of each State under the wildlife corridor as sourced from the Forest Survey of India and the state having a higher area under such landscapes is given a higher score. The categories for CORR as well as the allocation of scores to different states based on this indicator are as shown in Table 30 and Table 31 respectively.

Table 30 – Categories for CORR

Indicator		**Range (%)**		
		From	**To**	**Score**
CORR =	Total forest area under wildlife corridor in the State	-100	0	0
		1	1200	1
		1201	2100	2
		2101	3000	3
		3001	3900	4
		3901	4800	5
Mean ($\bar{x}$) = 1200		Standard Deviation (δ) = 1220		

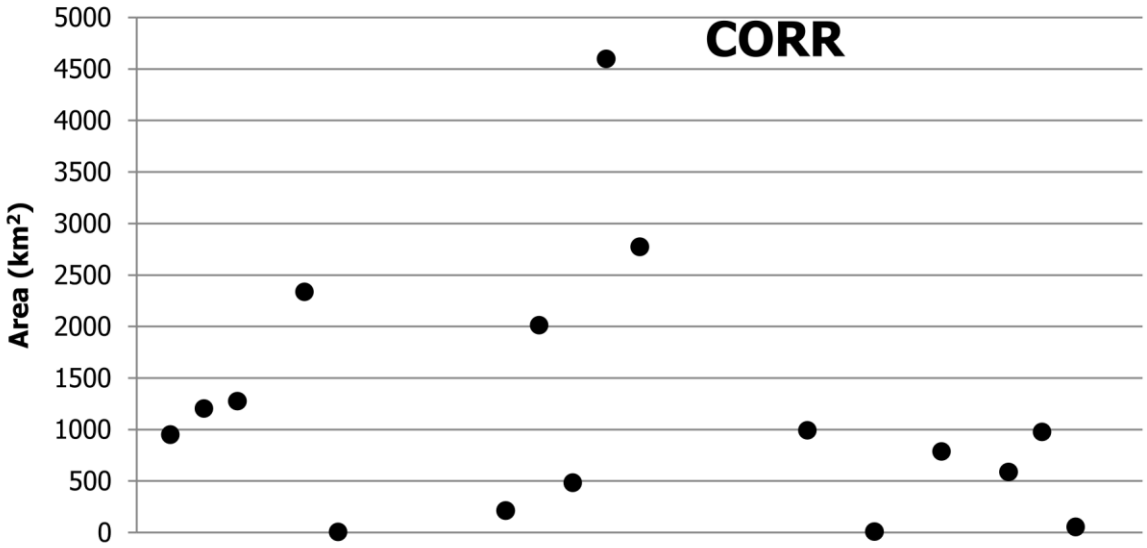

Figure 14 - Scatter Plot for CORR

Table 31 - State-wise scores for CORR

State	Area under Corridors (Km²)	Score
Andhra Pradesh	949.71	1
Arunachal Pradesh	1203.68	2
Assam	1274.28	2
Bihar		0
Chhattisgarh	2335.59	3
Goa	5.60	1
Gujarat		0
Haryana		0
Himachal Pradesh		0
Jammu and Kashmir		0
Jharkhand	212.16	1
Karnataka	2012.85	2
Kerala	483.01	1
Madhya Pradesh	4597.81	5
Maharashtra	2772.66	3
Manipur		0
Meghalaya		0
Mizoram		0
Nagaland		0
Orissa	990.64	1
Punjab		0
Rajasthan	8.23	1
Sikkim		0
Tamil Nadu	785.23	1
Tripura		0

Uttar Pradesh	586.41	1
Uttarakhand	975.78	1
West Bengal	53.45	1

3.10 Relative Importance of Indicators

Each of the 10 indicators used for calculating HCV Index have relative importance based on their degree of vitality to the study. While efforts were being made to estimate the weights for each of these indicators through Group Convergence Method, the desired exercise could not be conducted as the types of participants present would have given skewed results.

The study process has brought out the understanding that the allocation of forest grants under the XIV Finance Commission needs to be refined to reflect three aspects viz – forests as endowment, actions for conservation initiated by the States and finally cross-cutting activities that link the forest areas with different conservation activities. Keeping this in focus, the allocation strategy is being proposed by imbibing these variations into the development of HCVF Index. Expert consultations during the study suggested that the forest areas in each of the States in the country provides a good articulation for 20% apportionment of Index to the Endowment Factors, 50% to pro-active Action Factors, and finally the rest 30% to the cross-cutting factors. Such a mechanism is envisaged to provide an equitable and pragmatic formula for allocation and distribution of funds[16].

As a result, two scenarios are proposed here for estimation of the High Conservation Value Forest Index. One is based on the assumption that all indicators constituting the HCVF Index carry equal weights (Scenario 1) while the other scenario with differential weights (Scenario 2).

3.11 Evolution of the formula for XIV Finance Commission

The allocation matrix used by the XII and XIII Finance Commission was webbed around the forest cover possessed by a State and it contribution to the total forests in India. For

[16] Weights are representatives for the hierarchy of importance for the 3 set of parameters with management efforts for conservation being the most important. The positive actions of States need to be incentivized over natural endowments.

a country that is focussed to achieve one third of its land mass under forest cover, the concept of using forest cover of each state for allocation of Grant-in-aid seemed reasonable. But, still it lacked numerous other important values associated with forests which the formula doesn't account for. These values are often highly critical and there is an immense burden on the States preserving these values inside their forests. Hence, there was a need for the formula to be more scientific in approach and to include such values in it so as to divide the amount of Grant-in-aid in a rational way rather than just the forest cover area as forest area may be an indicator for the disability but a small patch of forest at a particular location may be more valuable than a larger patch of forests elsewhere.

The formula used by the XIII Finance Commission of India considered three aspects for the calculation of State's share in the total entitlement. These were

1. Contribution of a State in the total forest cover of the country
2. Proportion of geographical area of a State under forest cover
3. Proportion of geographical area of a State under forests with moderately and high canopy cover density

The XIII Finance Commission acknowledged the importance of incorporating the other values of the forests in the allocation matrix, but it required a rather complex mechanism which needed time to be built upon. The XIII Finance Commission itself acknowledged that, "the benefit externalities yielded by forests are a function of a host of factors, including, but not confined to, the density of the forest and the biodiversity contained within it. Ideally, the entitlement of each state should have factored these in…". The current study has worked upon improving the existing formula and the following modifications are suggested in the existing formula. The formulae used by the XIII Finance Commission of India and the suggested formula for the XIV Finance Commission of India are as follows.

Formula used by the XIII Finance Commission	**Suggested formula for the XIV Finance Commission**
$G_i = \frac{\left[\left\{\frac{F_i}{\sum F_i} + R_i\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{A_i}\right)\right\}\right]}{\sum_{i=1}^{n} \left\{\frac{F_i}{\sum F_i} + R_i\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{A_i}\right)\right\}}$	$G_i = \frac{\left(\left[\left\{\frac{F_i}{\sum F_i} + \boldsymbol{R_i}\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{\boldsymbol{C_i}}\right)\right\}\right] + \frac{\boldsymbol{HCVF_i}}{\sum \boldsymbol{HCVF_i}}\right)}{\sum_{i=1}^{n} \left(\left[\left\{\frac{F_i}{\sum F_i} + \boldsymbol{R_i}\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{\boldsymbol{C_i}}\right)\right\}\right] + \frac{\boldsymbol{HCVF_i}}{\sum \boldsymbol{HCVF_i}}\right)}$

G_i	Share for state *i*	G_i	Share for state *i*
A_i	Geographical area of state *i*	A_i	Geographical area of state *i*
F_i	Total forest cover of state *i*	F_i	Total **recorded forest area** of state *i*
M_i	Moderately dense forest area of state *i*	M_i	Moderately dense forest area of state *i*
H_i	Highly dense forest area of state *i*	H_i	Highly dense forest area of state *i*
R_i	$max\left[0,\left\{\frac{F_i}{A_i}-\frac{\sum F_i}{\sum A_i}\right\}/100\right]$	R_i	$max\left[0,\left\{\frac{F_i}{A_i}-\frac{\sum F_i}{\sum A_i}\right\}/\mathbf{10}\right]$
n	Number of States i.e. 28	$\boldsymbol{C_i}$	**Forest cover of state *i***
		$\boldsymbol{HCVF_i}$	**High conservation value forest index of state *i***
		n	Number of States i.e. 28

The suggested modifications (marked in red bold) in the formula are as follows:

1. **F_i:** The earlier formula was based on Forest Cover of a State as an indicator. Forest cover, as defined by the Forest Survey of India, is based on the canopy density of the trees inside the forest and does not include areas such as wetlands, grasslands and other sites where there the canopy density is less than 10% even though such areas form a part of forests and also do have high ecological importance. A better alternative to forest cover is the Recorded Forest Area of the State. Recorded forest area are areas identified as forests in the gazette irrespective of the tree cover density and tends to include the other areas which may be devoid of tree cover but still are important from conservation point of view. For example, the change would also incorporate important conservation areas in the arid part of the country such as Rann of Kutch and Rajasthan where the climate is unable to support good canopy density. Hence the Variable F_i which was earlier used for Forest Cover has been reassigned to the Recorded forest areas.

2. **R_i:** In the formula used by the XIII Finance Commission of India, R_i was based on the comparison between the forest cover of the state and the country's average. The rationale behind it was to provide added support and incentive to States conserving more forest areas than the country's average. But this incentive was too small to be really considered as an added allocation. The formula calculated the 100^{th} part of the difference between the State's forest cover and country's average which accounted to a negligible increase in the State's share. Hence the new

allocation formula suggests that rather than 100th part of the difference, the actual consideration should be 10th part of the same. This will show a reasonable difference in the value of R_i and is expected to propel the agenda of State towards having more area under forests as the States with more forests than the country's average would be given greater entitlement.

3. **C_i**: The third suggested modification is in the calculation of forest canopy density index for the State based on Area under Very Dense Forest Cover and the Moderately Dense Forest Cover as a proportion of total geographical area of the State. This part of the formula doesn't take into consideration that different physiographic zones support different types of forest cover in the country. Thus States in the arid region would score lesser on the index as their climatic condition is the limiting factor for existence of high canopy density forests. Thus, the new formula suggests swapping the geographical area of the State with the total forest cover of the State for a better representation of the quality of forests in the State.

5. **$HCVF_i$**: The last and perhaps the most significant change is the introduction of High Conservation Value Forest (HCVF) Index in the allocation formula. As mentioned earlier, the XIII Finance Commission of India acknowledged that the importance of forests cannot only be assessed based on area parameters. Considering this fact, an Index has been estimated for each State based on a total of 10 indicators that consider other important values of the forest. As indicated earlier, two scenarios are suggested for estimation of High Conservation Value Forest Index. One is based on all indicators constituting the HCVF Index carrying equal weights and the other based on differential weights for Action Factors (0.5), Cross-cutting Factors (0.3) and Natural Endowment Factors (0.2). The HCVF Index for these scenarios is estimated as follows:

Scenario 1 All indicators of HCVF carry equal weights

$$HCVF_i = \sum_{i=1}^{3} EF_i + \sum_{i=1}^{4} AF_i + \sum_{i=1}^{3} CF_i$$

Scenario 2 Indicators with differential weights i.e. Action Factors (0.5), Cross-cutting Factors (0.3) and Natural Endowment Factors (0.2)

$$HCVF_i = \left(0.2\sum_{i=1}^{3} EF_i\right) + \left(0.5\sum_{i=1}^{4} AF_i\right) + \left(0.3\sum_{i=1}^{3} CF_i\right)$$

EF_i Natural endowment factor indicators of state *i*
AF_i Action factor indicators of state *i*
CF_i Cross-cutting factor indicators of state *i*

For each State, the proportion of HCVF Index of a State to the summation of HCVF Index across all States is suggested to be included as an additional part of the allocation formula.

As clearly reflected, the modified allocation formula is built upon the formula evolved by the XIII Finance Commission of India and is modified as suggested by the XIV Finance Commission by assimilating the High Conservation Values of the forests in the scheme of things such that the States may be compensated for their enhanced conservation efforts.

3.12 Results and findings

3.12.1 Scenario 1

Table 32 - HCVF Allocation State Wise (Scenario 1)

Factors	Natural Endowment			Action				Cross-cutting			Index
Weights ->	1	1	1	1	1	1	1	1	1	1	
STATE	**HAF**	**EMICFL**	**WET**	**PARF**	**NFRF**	**DIV**	**PATCH**	**GS**	**REG**	**CORR**	
Andhra Pradesh	0	1	3	1	5	4	3	1	2	1	21
Arunachal Pradesh	5	4	1	1	5	2	5	2	1	2	28
Assam	0	2	1	1	3	5	1	2	2	2	19
Bihar	0	1	1	3	3	4	1	1	4	0	18
Chhattisgarh	0	1	2	1	5	4	3	1	5	3	25
Goa	0	1	1	3	3	3	2	1	3	1	18
Gujarat	0	1	5	5	3	3	1	1	2	0	21
Haryana	0	0	1	1	3	0	0	1	3	0	9
Himachal Pradesh	3	2	1	2	1	4	1	5	4	0	23
Jammu and Kashmir	4	2	1	4	4	5	1	2	4	0	27
Jharkhand	0	1	1	1	5	4	1	1	4	1	19
Karnataka	0	2	2	2	4	3	1	2	2	2	20
Kerala	1	3	1	1	3	4	1	2	3	1	20
Madhya Pradesh	0	1	3	1	4	3	2	1	2	5	22
Maharashtra	0	3	2	2	3	4	2	1	2	3	22
Manipur	2	2	1	1	4	5	5	1	1	0	22
Meghalaya	0	1	1	1	4	5	4	1	1	0	18
Mizoram	1	1	1	1	4	4	5	1	1	0	19
Nagaland	2	1	1	1	4	5	5	1	1	0	21
Orissa	0	1	3	1	4	4	2	1	3	1	20
Punjab	0	1	1	1	1	0	0	2	4	0	10
Rajasthan	0	1	1	2	4	4	1	1	2	1	17
Sikkim	2	1	1	2	5	4	5	1	1	0	22

Tamil Nadu	2	5	1	2	4	5	1	2	2	1	25
Tripura	0	1	1	1	3	3	4	1	1	0	15
Uttar Pradesh	0	1	3	2	3	1	0	2	3	1	16
Uttarakhand	3	2	1	1	4	2	4	4	4	1	26
West Bengal	1	1	5	2	3	4	0	2	3	1	22

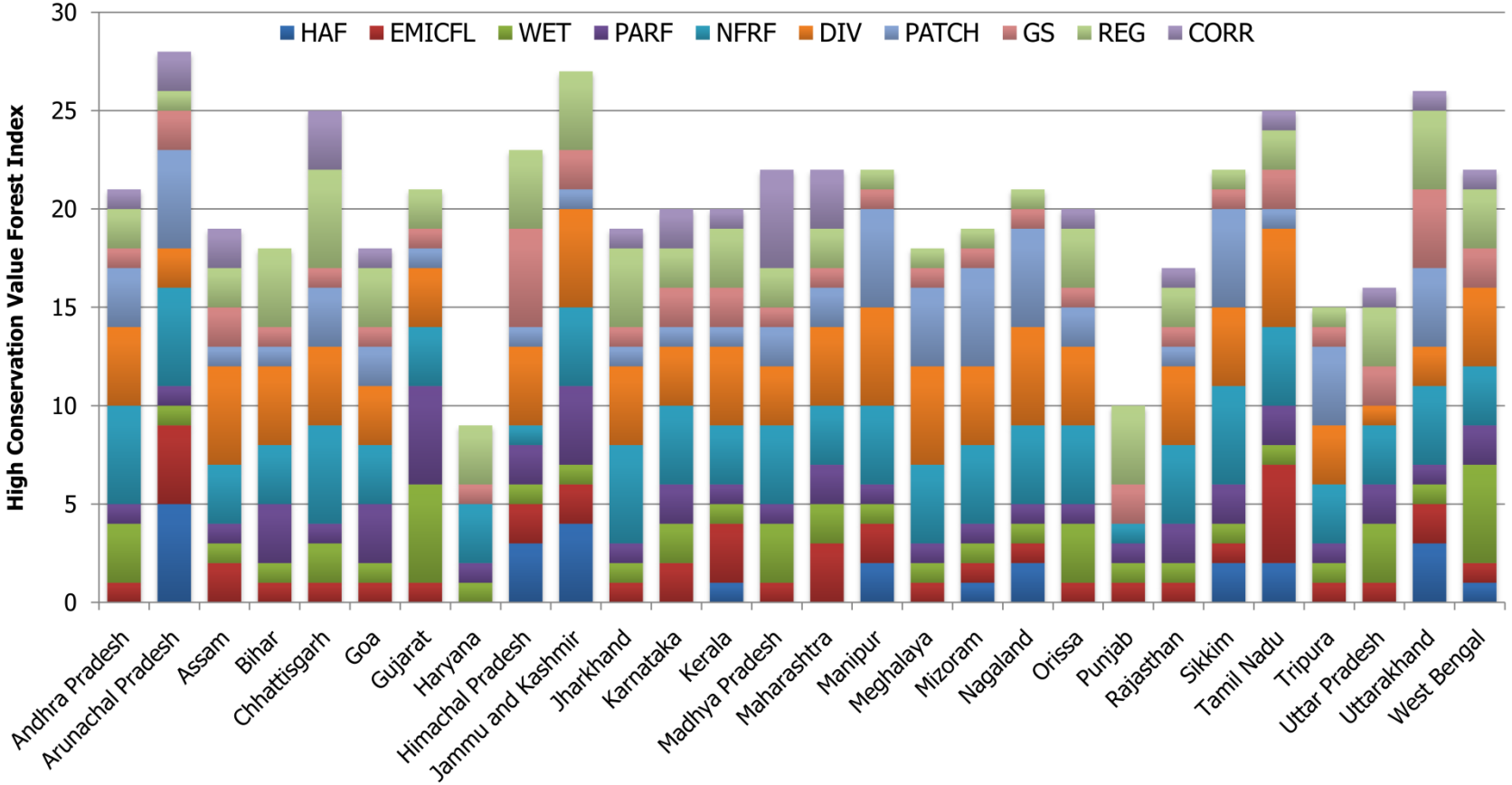

Figure 15 - State wise HCVF Index (Scenario 1)

The High Conservation Value Forest Index aggregated at the three types of factors defined earlier i.e. natural endowment, action and cross-cutting factors is as follows. It may kindly be noted that the figure only provides indication on 3 of the 5 natural endowment factors used in the estimation of High Conservation Value Forest Index. The other two factors are used separately in the suggested allocation formula.

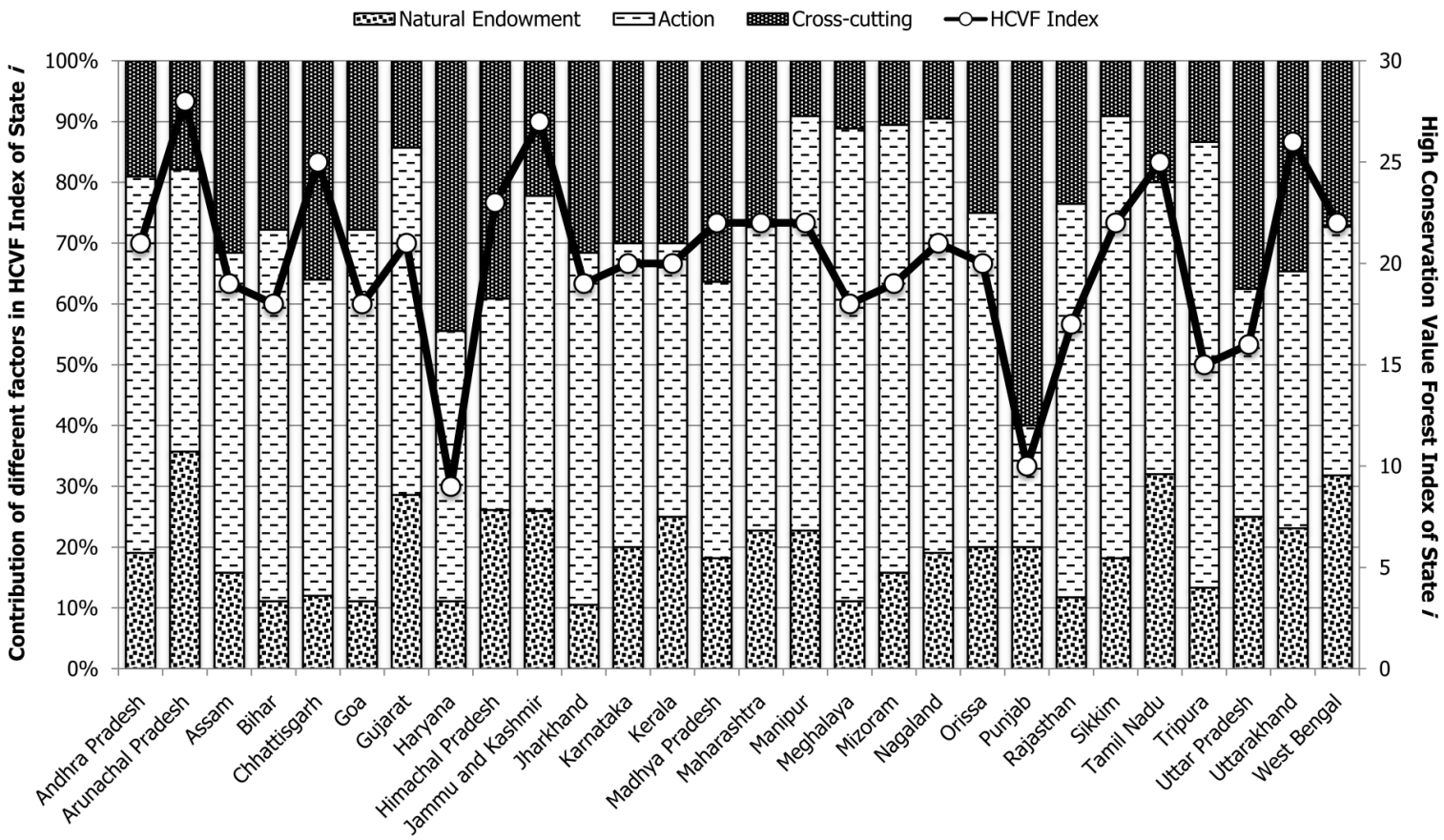

Figure 16 – State wise HCVF Index aggregated according to major factors (Scenario 1)

3.12.2 Scenario 2

Table 33 - HCVF Allocation State Wise (Scenario 2)

Factors	Natural Endowment			Action				Cross-cutting			**Index**
Weights ->	0.2	0.2	0.2	0.5	0.5	0.5	0.5	0.3	0.3	0.3	
STATE	**HAF**	**EMICFL**	**WET**	**PARF**	**NFRF**	**DIV**	**PATCH**	**GS**	**REG**	**CORR**	
Andhra Pradesh	0	1	3	1	5	4	3	1	2	1	8.5
Arunachal Pradesh	5	4	1	1	5	2	5	2	1	2	10.0
Assam	0	2	1	1	3	5	1	2	2	2	7.4
Bihar	0	1	1	3	3	4	1	1	4	0	7.4
Chhattisgarh	0	1	2	1	5	4	3	1	5	3	9.8
Goa	0	1	1	3	3	3	2	1	3	1	7.4
Gujarat	0	1	5	5	3	3	1	1	2	0	8.1
Haryana	0	0	1	1	3	0	0	1	3	0	3.4
Himachal Pradesh	3	2	1	2	1	4	1	5	4	0	7.9
Jammu and Kashmir	4	2	1	4	4	5	1	2	4	0	10.2
Jharkhand	0	1	1	1	5	4	1	1	4	1	7.7
Karnataka	0	2	2	2	4	3	1	2	2	2	7.6
Kerala	1	3	1	1	3	4	1	2	3	1	7.3
Madhya Pradesh	0	1	3	1	4	3	2	1	2	5	8.2
Maharashtra	0	3	2	2	3	4	2	1	2	3	8.3
Manipur	2	2	1	1	4	5	5	1	1	0	9.1
Meghalaya	0	1	1	1	4	5	4	1	1	0	8.0
Mizoram	1	1	1	1	4	4	5	1	1	0	8.2
Nagaland	2	1	1	1	4	5	5	1	1	0	8.9
Orissa	0	1	3	1	4	4	2	1	3	1	7.8
Punjab	0	1	1	1	1	0	0	2	4	0	3.2
Rajasthan	0	1	1	2	4	4	1	1	2	1	7.1
Sikkim	2	1	1	2	5	4	5	1	1	0	9.4
Tamil Nadu	2	5	1	2	4	5	1	2	2	1	9.1
Tripura	0	1	1	1	3	3	4	1	1	0	6.5

Uttar Pradesh	0	1	3	2	3	1	0	2	3	1	5.6
Uttarakhand	3	2	1	1	4	2	4	4	4	1	9.4
West Bengal	1	1	5	2	3	4	0	2	3	1	7.7

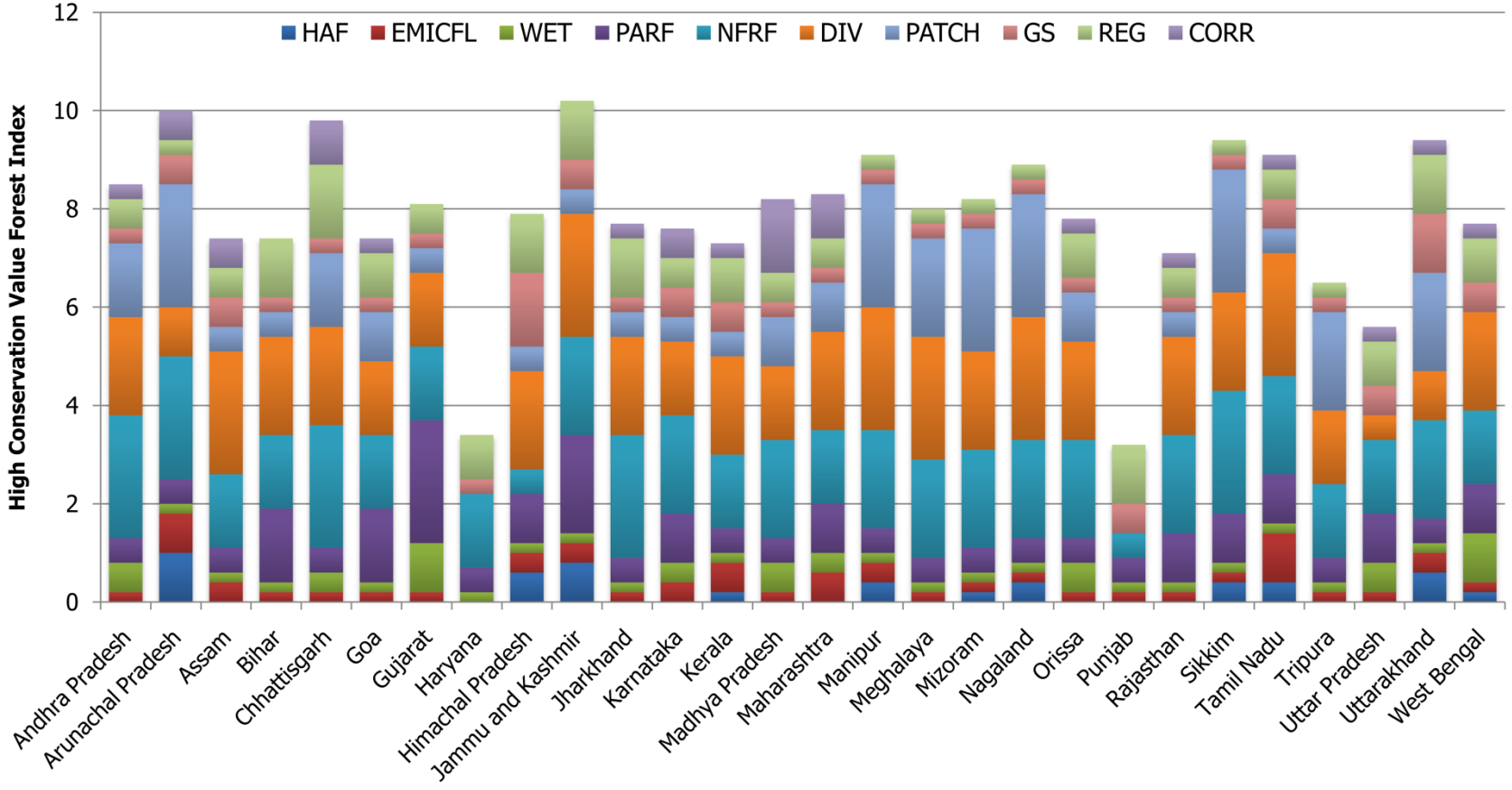

Figure 17 - State wise HCVF Index (Scenario 2)

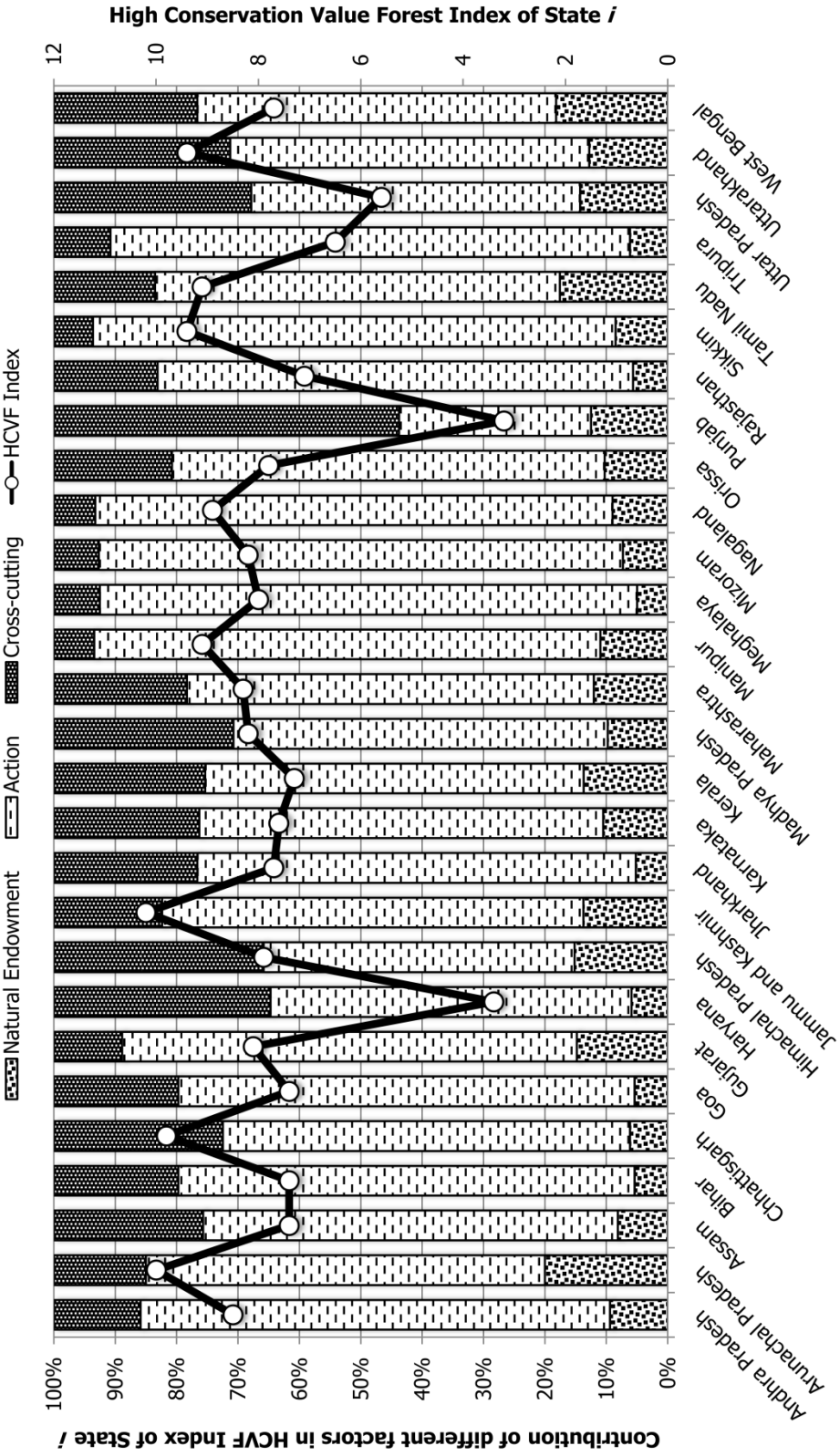

Figure 18 – State wise HCVF Index aggregated according to major factors (Scenario 2)

SECTION – III

Response to TOR 4 and 6.

TOR 4 – Identify expenditure on conserving/maintaining the geographical area under forests in states.

TOR 6 – Identify a set of parameters which would reflect the innate cost of conserving HCV forests and restoring degraded forests.

4 CONSERVATION COST

KEY MESSAGES

This chapter responds to TOR 4 and 6 i.e. estimation of expenditure on maintaining areas under forests and estimation of expenditure on restoring degraded forest areas respectively. For the former, the projections of the XIII Finance Commission for Non-Plan Revenue Expenditure have been used. The maintenance cost so derived is approximately equal to ₹ 36,000 Crore for all States combined for the period of 2015-16 to 2019-20. It is suggested that any grant given for compensating the maintenance cost should be performance based wherein the more the States spend on forest conservation, the more funds they would be allocated. For estimation of expenditure on restoring degraded forest areas of the country, the area under 'Open Forests' is used in conjunction with the unit cost of assisted natural regeneration. The total restoration cost thus calculated is approximately equal to ₹ 32,776 Crore for all States combined.

4.1 Maintenance Cost of the Forest Areas

Maintaining the heath of good forest areas in terms of the services, conservation of the biodiversity and other benefits being provided by the forests is a tough ask as it is associated with a lot of factors that hinders its execution. These conditions may be inaccessibility for such areas, a holistic view of conservation and planning and many others. This is currently the task of the Forest Departments of each State and the have been doing the job of maintaining and increasing the forest cover of India. Forest Areas are naturally associated with inaccessibility, tough conditions, genuine need of resources and much more severe conditions to cope up with. Hence the need of adequate funding becomes a critical aspect of the forest operations in each State. This includes the regular maintenance, buying equipments, labour wages, coping up with encroachments, poaching, timber theft among others. The source of funding for the State forest departments includes budgetary allocation from the State, Centrally Sponsored Schemes as well as other mechanisms such as the grant-in-aid received through the Finance Commission. The forest department financial provisioning is released every year in their annual report which shows the allocation under each scheme and the utilization heads. But this is also associated with a few problems. The scheme funding, central funding

and the state funding all act complementary to each other which may result in the overall crisis of funds by the State forest departments. In case of funding for various schemes the state allocation for forest departments is pruned, like in case of CAMPA funding. This results in overall financial restrictions to the scheme funding and expectations to the scheme targets plus the regular maintenance, for which the forest departments find it hard to cope up with the limited funding. The state budget should ensure that this doesn't happen, to ensure a smooth functioning of the forest departments.

Another major factor that greatly influences the maintenance of these forest areas is the pilgrimage. In many forest areas there are a number of religious and heritage sites which attract a huge number of visitors. Religious sites are the major entities among all these. People from all over India gather in very large numbers and it becomes the responsibility of the forest departments to strike a balance between the maintenance of their forest areas as well as ensuring not to hurt the religious sentiments of people. Managing such a huge crowd in the forest areas which are normally restricted for human intervention/activities, becomes a major issue for the state departments. Considering the examples of Sabrimala in Periyar and Ganesh temple in Ranthambore both of these are Tiger Reserves are the top priority sites for conservation are exposed open due to the pressure of visitors. Such situations need extra focus of both state and centre in terms of monetary requirements. Managing forests in such situations incur a large sum to ensure that human activities do not hamper the quality of forests as well as the benefits and services they provide. The extra funding will help the forest departments to come up with ways to balance the situation and more importantly managing these forests efficiently.

Maintenance cost, for this study, would refer to the 'adequate' cost to State Forest Department for keeping their forest areas in healthy condition. It has been observed that in light of funding from different sources to forest department, the state budget to the same is being reduced. This practice should be discouraged as the inadequacy of funds for the forest departments would lead to lack of resources for maintenance and will ultimately result in degradation. To avoid such outcomes, the monetary requirements should be carefully assessed and granted. The XIII Finance Commission had laid special emphasis on the same and had recommended that the 25% of the

grants to be used in the preservation of forest health should be over and above the non-plan revenue expenditure projected by the XIII Finance Commission and should be monitored regularly.

The study had originally envisaged analysis of estimating the expenditure incurred in maintaining area under geographical area under forests by analyzing state-level actual expenditure. However, data could only be obtained for a handful of States and hence the projections for non-plan revenue expenditure (NPRE) under Forestry and Wildlife (Major Head 2406) have been used to estimate the maintenance cost for keeping area under forests. It is assumed that the projected NPRE would increase at an annual rate of 8% uniformly across the States. The projected NPRE for the cycle of XIV Finance Commission – 2015-16 to 2019-20 – thus derived in given in the Table below.

Table 34 – Projections for Non-plan Revenue Expenditure under Forestry and Wildlife (Major Head 2406)

(₹Crore)

State	2015-16	2016-17	2017-18	2018-19	2019-20	Total
Andhra Pradesh	278.29	300.56	324.60	350.57	378.62	1632.64
Arunachal Pradesh	54.29	58.63	63.33	68.39	73.86	318.51
Assam	223.59	241.48	260.80	281.66	304.19	1311.73
Bihar	66.70	72.04	77.80	84.02	90.75	391.31
Chhattisgarh	508.05	548.70	592.59	640.00	691.20	2980.55
Goa	12.97	14.01	15.13	16.34	17.65	76.09
Gujarat	255.15	275.56	297.61	321.42	347.13	1496.86
Haryana	90.93	98.20	106.06	114.54	123.70	533.42
Himachal Pradesh	212.24	229.22	247.56	267.36	288.75	1245.14
Jammu & Kashmir	441.02	476.30	514.40	555.56	600.00	2587.28
Jharkhand	132.04	142.60	154.01	166.33	179.64	774.63
Karnataka	403.10	435.35	470.17	507.79	548.41	2364.82
Kerala	214.61	231.78	250.32	270.34	291.97	1259.01
Madhya Pradesh	785.37	848.19	916.05	989.33	1068.48	4607.42
Maharashtra	768.67	830.16	896.57	968.30	1045.76	4509.47
Manipur	12.69	13.71	14.80	15.99	17.26	74.45
Meghalaya	48.90	52.81	57.04	61.60	66.53	286.89
Mizoram	20.35	21.97	23.73	25.63	27.68	119.37
Nagaland	25.97	28.05	30.30	32.72	35.34	152.38
Orissa	158.39	171.06	184.75	199.53	215.49	929.23
Punjab	48.62	52.51	56.71	61.25	66.15	285.24
Rajasthan	304.73	329.11	355.44	383.88	414.59	1787.75
Sikkim	20.20	21.81	23.56	25.44	27.48	118.48
Tamil Nadu	163.53	176.62	190.75	206.01	222.49	959.39

(₹Crore)

State	2015-16	2016-17	2017-18	2018-19	2019-20	Total
Tripura	46.15	49.84	53.83	58.13	62.78	270.73
Uttar Pradesh	335.49	362.33	391.32	422.62	456.43	1968.19
Uttarakhand	297.55	321.35	347.06	374.83	404.81	1745.61
West Bengal	242.88	262.31	283.30	305.96	330.44	1424.89
TOTAL	**6172.48**	**6666.28**	**7199.58**	**7775.55**	**8397.59**	**36211.48**

As calculated above, the total amount projected for non-plan revenue expenditure under Forestry and Wildlife is estimated to be more than ₹ 36,000 Crore for the period of 2014-15 to 2019-20.

It is suggested that any efforts to compensate states for this maintenance cost should ideally be associated with performance based approach, wherein the more the states spend on conservation, the more funds would they be allocated.

4.2 Correction factor/Restoration cost

Overuse of resources due to ever increasing anthropogenic pressure, more than that can be replenished naturally or by external aid in a given timeframe leads to degradation and depletion of natural resources. This may be partially due to mis-management as well, but in most of the cases it is because of overuse as these resources are considered as a free gifts and do not have a price tag attached to them. Human need will rise more with the time and the pressure to cope up with the demand is already huge and will increase further. The importance of an impeccable natural resource management (NRM) is thus the need of an hour. With the Government continuously pondering over this issue, monitoring it and rolling out plans like NAP, Forest plus and many others, shows the intensity of the issues and the desperation of controlling the existent rate of degradation. Huge inflow of investments may be seen for the restoration of wastelands which shows the extent of economic cost associated with the degradation of natural resources.

Forestry has also been subjected to a similar fate. The increasing population, livestock units and the increased demand of wood and non-wood products from the forests has led to over extraction of the forests produce, a lot more than their carrying capacity in the recent past. Though the regulations on green felling and other laws have led to a considerable drop in the extractions but hasn't been eliminated completely because of

the dependency of local communities. The impact can only be the degradation of the existent forest cover. The current Forest cover in India (SFR 2011) is 692,027 km^2 out of which 287,820 km^2 is categorized as the Open Forest (defines as the area having a canopy density of 10-40%). Though the entire area under Open Forest may not be classified as the degraded forest but there is a huge chunk out of this which is the degraded forests which have descended from either the Very Dense Forests (VDF) or the Medium Dense Forests (MDF) in recent decades. Added to it the forest area under scrub which is defined as "degraded" by the SFR constitute 42,176 km^2 of the total forest cover in India. Adding the two comes out to be 44.94% of the total forest cover in India. This not just seems alarming but also shows how much investments and efforts are required and how much the afforestation and restoration work is undone with a healthy forest falling in the category of degraded forests each year. This degradation doesn't only cover the loss of forest cover density but severely impacts the critical services rendered by the forest areas. The levels of services lost with the healthy forest areas stepping into the degraded forests are highly difficult to assess and the constraints associated to this study proves it impractical to be calculated. Yet it is widely known that degradation of forests leads to the raise in issues like soil erosion, reduction in water recharge potential, decrease in the carbon sequestration capacity, loss of biodiversity and others. Besides these services, degradation also severely impacts the soil quality and fertility of the land, decrease in the water level and some more. The longer the degradation continues, the larger is the cost of restoring the same to the healthier state in monetary, efforts and timely aspects. So the holistic view suggests it loud and clear that the degradations is a very critical aspect which needs to be addressed before it turns into the last stage of conservational cancer. It means that not only the existing healthy forests need to be conserved and maintained in the same or better state but also the degraded forests should be reclaimed and restored into their healthier state in terms of the ecosystem services they provide, biodiversity they conserve and the tangible products they provide. This would mean a sustainable flow of benefits which are critical as well as essential for the existence of humankind.

The study tries to assess the monetary requirement for the restoration of the degraded forest and adds restoration cost as a part of the final allocation matrix for the distribution of grants-in-aid. Since the importance of Restoration aas the degraded

forest cover has considerable significance, as it has been discussed above, the selection of the area that can be considered as degraded becomes highly important. During the Group Convergence Method Workshop it was agreed that Open Forest cover of each State is a good indicator for the Degraded Forest Cover. The next critical issue was deciding upon the cost of restoration. NAEB has been working on Afforestation in India, as a part of its CAMPA scheme. For the same it has decided the rates per hectare as the cost of afforestation for India as a whole. The different rates per hectare decided by NAEB as per the site specific requirement are shown in the diagram below.

Table 35 - NAEB plantation rates

Model / Intervention	Unit Cost of Plantation including, Maintenance (per Ha)
Aided Natural Regeneration (200 plants/hectare)	9750
Artificial Regeneration. (1100 plants/hectare)	17100
Pasture Development/ Silvipasture (400 plants/hectare)	11100
Bamboo plantation (625 plants/hectare)	9300
Planting of canes4 (625 plants/hectare)	11100
Mixed Plantations of trees having MFP and medicinal value (1100 plants /hectare)	17100
Regeneration of perennial herbs and shrubs of medicinal value (2000 plants/hectare)	20400

Since, we are dealing with existing forest cover which has fallen under the category of degraded due to lack of maintenance, the cost requirement may not be as high as the Assisted Regeneration category. The prevailing conditions will automatically assist the regeneration, provided the restoration is as per the scientific norms. The cost of Assisted Natural Regeneration would suffice for the Restoration of the Degraded forest cover. Thus, the cost of restoration per hectare was selected for ANR and was applicable to the entire Open Forest Cover in each state. Though, this method undermines the actual cost to a certain extent, but it still provides a considerable assessment of the cost requirement by each state for the restoration of degraded forest areas. The **Table** 36 below shows the restoration cost for each State.

Table 36 - Cost of Restoring degraded forests

State	Geographical Area (km^2)	Forest cover (km^2)	Restoration Cost (₹ Crore)

		Open Forests	Scrub	Total Degraded Forests	ANR(9750) x OF (ha)
Andhra Pradesh	275069	19187	10465	29652	2891.07
Arunachal Pradesh	83743	15079	121	15200	1482
Assam	78438	14882	182	15064	1468.74
Bihar	94163	3664	115	3779	368.4525
Chhattisgarh	135191	16603	117	16720	1630.2
Goa	3702	1091	0	1091	106.3725
Gujarat	196022	9057	1492	10549	1028.5275
Haryana	44212	1106	150	1256	122.46
Himachal Pradesh	55673	5078	298	5376	524.16
Jammu & Kashmir	222236	9638	2105	11743	1144.9425
Jharkhand	79714	11219	670	11889	1159.1775
Karnataka	191791	14176	3216	17392	1695.72
Kerala	38863	6992	29	7021	684.5475
Madhya Pradesh	308245	35969	6389	42358	4129.905
Maharashtra	307713	21142	4157	25299	2466.6525
Manipur	22327	10168	1	10169	991.4775
Meghalaya	22429	7150	372	7522	733.395
Mizoram	21081	13016	0	13016	1269.06
Nagaland	16579	7010	2	7012	683.67
Orissa	155707	22007	4424	26431	2577.0225
Punjab	50362	1036	37	1073	104.6175
Rajasthan	342239	11590	4211	15801	1540.5975
Sikkim	7096	697	311	1008	98.28
Tamil Nadu	130058	10697	1212	11909	1161.1275
Tripura	10486	3116	66	3182	310.245
Uttar Pradesh	240928	8176	806	8982	875.745
Uttarakhand	53483	5612	262	5874	572.715
West Bengal	88752	9688	111	9799	955.4025
Total	3276302	294846	41321	336167	32776.2825

The table above represents the magnitude of cost requirements for the restoration of degrades forest cover. The total for India accounts for approximately ₹ 32,776 Crore which suggests the huge monetary implications of the States to restore the forest areas that are already degraded. This also gives the policy makers a kind reminder on the requirements forest areas have and the amount they are provided as budgets and

grants. Madhya Pradesh boasts a huge area under forest cover, primary because of being the second largest state of India. The state also has the largest Open Forest Cover in India and alone requires ₹ 4,129 Crore for restoration, whilst the grants in total provided by the XIII Finance Commission were mere ₹ 5000 Crore.

SECTION – IV

Response to TOR 5.

TOR 5 – Identify quantum of revenue forgone as a result of maintaining forest areas and not utilising for economic activities.

5 OPPORTUNITY COST

KEY MESSAGES

This chapter responds to TOR 5 i.e. estimation of revenues forgone in keeping area under forests. The net profit per hectare from agriculture in two types of regions – plains and hills – is used to estimate what each State would have received had the forests areas been converted to agriculture. While the revenues from diverting forests to secondary and tertiary sectors are likely to be much greater, the study has used a conservative approach to estimate the same by assuming the next best biological use of the land. The opportunity cost so derived is approximately equal to ₹ 250,000 Crore annually for all States combined. It is suggested that the opportunity cost incurred by States should be considered while deciding on the total grant-in-aid given to States for forest conservation.

It's a proven fact that forests are important for sustainability. For a country like India, having one-fifth of its geographical area under forest cover, forests occupy a major chunk of land area that is restricted from diversion. Forests provide critical services on which the life of humans depends on. These services are not restricted to just the stretch of the forest areas but extend beyond and thus have a great influence on the country as a whole. The entire area that a forest influences is known as its service shed. The services provided by forests are clean air, habitat for a variety of flora and fauna, protection of biodiversity, carbon sequestration, water through watershed function and many more like medicinal plants, livelihoods of tribal communities, cultural benefits etc. These "public" services provided by forests are majorly look down upon as "free gifts, and such a thought has lead to degradation of these areas. The economic significance of forests is often downplayed or is not even though about. The most basic thought on this is, "what if there forests were not there and something the same land could have been used for some other use", explains the economics of land use pattern and the cost incurred in keeping the land as forests which could have been otherwise used for various much more "profitable" uses. It is a proven fact that the land use patterns influence the prosperity of the populations.

Since the unveiling of the National Forest policy of 1988, India has been striving hard to reach the golden mark of one-third of the overall land mass under forest and tree cover, which is two-third for the hilly and mountain regions. This would simply mean that only about two-third of the land in the country would be reserved for the forest in these States. This reservation would mean that the remaining one-third of the total geographical area of the country would be available for a 1.237 Billion strong population and State Governments to create an economy which the generates livelihoods, housing and basically everything. Another aspect of this scenario is that, excluding a minority share, the forest in India are State owned and hence managing such a huge chunk of land will have its own implications on management as well as the revenue generated. With the National Forest Policy highly keen on conservation added up by the Supreme Court imposing strict regulations on the green-felling the capacity to raise revenues from forestry has dried up completely and the commercial purview of the forestry is negligible to make any statement to the GDP.

Such a scenario connotes that the land use pattern affects the country's economy and keeping the land under forests and its maintenance has its economic implications. The land under forests may have been used for other developmental purposes like agriculture, mining (for the buried minerals under the forests), building of schools, hospitals, setting up of hydro-power plant or thermal power plants and so on. Thus the forest rich states pay a huge price in keeping and maintaining their geographical areas under forest cover for which the concept of Opportunity cost has popped up. The theoretical concept of Opportunity Cost describes the revenue forgone by the states by keeping their land under forest cover and maintaining them, which they could have used for some alternative use which in turn could have fetched them a better monetary benefit. Hence the calculation of Opportunity Cost is dependent on the possible alternative use of the forest land which could have yielded them the maximum benefit and thus fuelling up the state's economic growth.

Now, there has been a huge debate on the possible alternate use of the forest areas. Alternative use may stretch from having the land under agriculture to setting up a factory or a power plant to establishment of mines for the forests having high mineral reserves buried under them. Compensating each area on the basis of tertiary sector potential will give the government an exorbitant sum to compensate, which in

practicality may not be possible. Considering the example of mining potential of an area valued somewhere around say ₹ 2000 Crore, it would be impossible for the country to compensate a state for this amount, that too under the head of Opportunity Cost. Thus the alternate use of the land should be the one that maintains the biological productivity of the land, minimized the alteration to the land use fabric and retains the availability of various services provided by the forests like water catchment, biodiversity conservation, carbon sequestration, micro-climatic features, among others. Considering the above conditions the probable alternative usages may be horticulture, agriculture, floriculture, pasturelands and other similar land uses. Using lands for tertiary sector activities will not only impact the land use fabric but would also impose the total loss of the services that forests provided[17].

The table below shows the calculation of Opportunity cost for different States of India. The approach in the calculation has been very conservative to provide a figure that is way lower than the actual, considering the least possible prices to calculate the final sum. The States of India have been divided into two categories based on their topography – Hilly and Plains. It is assumed that for Hilly states horticulture would be a conservative alternate biological usage of the forest land and hence the opportunity cost is the net profit per hectare of land if the forest area was under horticulture. Added to this, it is again assumed that for hilly areas the conversion ratio of the land under horticulture is only 33% i.e for each 100 hectare of forest area, it will only be feasible to convert 33 hectare for horticulture use. Similarly for the other category, Plains, it is assumed that the alternative biological usage is cultivation of cereals (mainly rice or wheat) and the conversion ratio is 50%. Still the cumulative opportunity cost, considering the entire recorded forest area was diverted for such activities comes out to a whooping figure of approximately ₹ 250,000 Crore annually.

Table 37 - Opportunity cost of keeping forests

State	Category	(RFA) (Km^2)	Opportunity Cost/Ha[18]	Including Inflation (2010-2014) 1.286%

[17] Agriculture, though may undervalue the opportunity cost compared to tertiary sector activities, provides a uniform alternative activity that can be applied for forests throughout India. This undervaluation is still 2% of what was allocated by the XIII Finance Commission as Grant-in-aid.

[18] Source: Study titled "Developing mechanism for compensating states for managing large geographical area under forests" conducted by Indian Institute of Forest Management commissioned by the Thirteenth Finance Commission of India.

				Conversion Ratio (%)	**Total cost (₹ Crore)**
Andhra Pradesh	Plain	63814	48,535	50%	19915
Arunachal Pradesh	Hill	51540	80245	33%	17552
Assam	Hill	26832	80245	33%	9137
Bihar	Plain	6473	48,535	50%	2020
Chhattisgarh	Plain	59772	48,535	50%	18654
Goa	Plain	1224	48,535	50%	382
Gujarat	Plain	18927	48,535	50%	5907
Haryana	Plain	1559	48,535	50%	487
Himachal Pradesh	Hill	37033	80245	33%	12611
Jammu and Kashmir	Hill	20230	80245	33%	6889
Jharkhand	Plain	23605	48,535	50%	7367
Karnataka	Plain	38284	48,535	50%	11948
Kerala	Plain	11265	48,535	50%	3516
Madhya Pradesh	Plain	94689	48,535	50%	29551
Maharashtra	Plain	61939	48,535	50%	19330
Manipur	Hill	17418	80245	33%	5932
Meghalaya	Hill	9496	80245	33%	3234
Mizoram	Hill	16717	80245	33%	5693
Nagaland	Hill	9222	80245	33%	3140
Orissa	Plain	58136	48,535	50%	18143
Punjab	Plain	3084	48,535	50%	962
Rajasthan	Plain	32639	48,535	50%	10186
Sikkim	Hill	5841	80245	33%	1989
Tamil Nadu	Plain	22877	48,535	50%	7139
Tripura	Hill	6294	80245	33%	2143
Uttar Pradesh	Plain	16583	48,535	50%	5175
Uttarakhand	Hill	34651	80245	33%	11800
West Bengal	Plain	11879	48,535	50%	3707
Total					**244509**

SECTION – V

Response to TOR 7.

TOR 7 - Assessment of status of scientific work plans and its implementation by states as recommended by earlier Finance Commissions.

6 ASSESSMENT OF SCIENTIFIC WORKING PLANS

KEY MESSAGES

The release of grants for the last three years (2012-13, 2013-14 and 2014-15) as recommended by the XIII Finance Commission were tied to the percentage of approved working plans in the State. Analysis carried out on release of grants viz-a-viz the actual allocation to each State reveals that only 13 States had more than 80% of the working plans approved by 2013-14, the condition set by the XIII Finance Commission for the release of entire grant allocated.

The XIII Finance Commission laid a very strong emphasis on the effective and efficient management of forest on the basis of scientific working plans. It was recommended that each forest zone should have a working plan which will be proposed by the State Forest Department and will be reviewed and approved by the Ministry of Environment and Forest. The vision in doing so was to ensure that the Grants-in-aid funds are actually utilized for the conservational practices in forests. To ensure the implementation, the release of Grants-in-aid amount was linked to the approval of scientific working plans though the Grants-in-aid for the initial two years was left untied. The basis behind this was to provide funds and time to the States for developing scientific working plans. The subsequent grants were to be released on the basis of approved working plans. If only more than 80% of the working plans were approved by MoEF, the complete funding was released to the state. Till this is achieved, releases shall be in the ratio of number of working plans approved to 80 per cent of the number of working plans for the state.

In this regard, data was requested from respective States in terms of the total number of working plans and total number of approved working plans. However, data was received only from 12 States and even within that, only few responded to the actual data being sought. As a result, the information was derived indirectly from the grants released for last two years i.e. 2012-13 and 2013-14 as compared to the actual

allocations for these two years. As the XIII Finance Commission had mandated that till 80% of the working plans are approved by MoEF, the releases shall be in the ratio of number of working plans approved to 80% of number of working plans for the State.

The analysis found that there were only 13 States which could manage the 100% release of the allocated funds. Thus, it can be inferred that only these States have more than 80% of their working plans approved by 2013-14.

Table 38 - Working Plans status State wise

State	Release as a percentage of allocation	Percentage of working plans approved	Release as a percentage of allocation	Percentage of working plans approved
	2012-13	2012-13	2013-14	2013-14
Andhra Pradesh	100%	>80%	100%	>80%
Arunachal Pradesh	70%	56%	57%	46%
Assam	25%	20%	25%	20%
Bihar	42%	34%	42%	34%
Chhattisgarh	100%	>80%	100%	>80%
Goa	25%	20%	50%	40%
Gujarat	100%	>80%	100%	>80%
Haryana	88%	71%	92%	73%
Himachal Pradesh	88%	70%	98%	79%
Jammu and Kashmir	25%	20%	25%	20%
Jharkhand	98%	78%	100%	>80%
Karnataka	99%	79%	100%	>80%
Kerala	75%	60%	88%	70%
Madhya Pradesh	100%	>80%	100%	>80%
Maharashtra	100%	>80%	100%	>80%
Manipur	75%	60%	88%	70%
Meghalaya	0%	0%	38%	30%
Mizoram	45%	36%	66%	53%
Nagaland	75%	60%	71%	57%
Orissa	92%	74%	100%	>80%
Punjab	100%	>80%	100%	>80%
Rajasthan	68%	55%	100%	>80%
Sikkim	100%	>80%	88%	70%
Tamil Nadu	100%	>80%	100%	>80%
Tripura	75%	60%	75%	60%
Uttar Pradesh	100%	>80%	100%	>80%
Uttarakhand	75%	60%	75%	60%
West Bengal	100%	>80%	100%	>80%

Further analysis also revealed that some States which do not have more than 80% of the working plans approved have in turn received associated percentage of allocated grants from the XIII Finance Commission, have utilized less than 25% of the grant-in-aid for preservation of forest health. Many States in this regard have used the entire money for developmental purposes. It may be noted that if these States continue to have less than 80% of their working plans approved and the released money is spent entirely on developmental purposes at the end of the XIII Finance Commission cycle, the grant actually used for preservation of forest health is likely to be much lower than the one envisaged i.e. ₹ 1250 Crore for the period of 2010-11 to 2014-15.

SECTION – VI

7 RESULTS AND FINDINGS

A major aim of this study is to provide a justified share of the Grant-in-aid to each state based on the forest and the values stored within. Earlier this share was merely based on the forest acreage of the state and the canopy density of the forests. The land under forest is a crude parameter to judge the share of each state as it is possible for a larger area under forest to hold less value compared to a smaller patch in terms of conservation which may extend from biodiversity to ecological services provision. The XIII Finance Commission has also acknowledged this fact that other values apart from forest area should also be considered while deciding the share of each State. For the canopy density, the States with arid climate tend to get a lower share as the climatic conditions in these states do not allow the existence of dense forest cover. Added indicators are thus required to be incorporated which can measure the state on an equal and unbiased footing. Each state's forests have some unique values which play an important role in the ecology of local forests and resilience. A carefully chosen list of 10 indicators attempts to cover such important values so that a rational and justified allocation can be suggested for Grant-in-aid to the States for forest conservation. These 10 indicators in addition to the two used in the allocation formula (FAGA and FCD) relate broadly to three different factors – natural endowment, action undertaken to conserve this endowment and cross-cutting.

Acknowledging the needing to move beyond forest area parameters in the allocation formula for deciding the share of entitlement to each State, the High Conservation Value Forest Index has been incorporated in the allocation formula used by the XIII Finance Commission of India. Other minor modifications in the formula have also been suggested as follows.

$$G_i = \frac{\left(\left[\left\{\frac{F_i}{\sum F_i} + R_i\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{C_i}\right)\right\}\right] + \frac{HCVF_i}{\sum HCVF_i}\right)}{\sum_{i=1}^{n}\left(\left[\left\{\frac{F_i}{\sum F_i} + R_i\right\} \times \left\{1 + \left(\frac{M_i + 2H_i}{C_i}\right)\right\}\right] + \frac{HCVF_i}{\sum HCVF_i}\right)}$$

G_i Share for state *i*
A_i Geographical area of state *i*
F_i Total recorded forest area of state *i*

M_i Moderately dense forest area of state *i*

H_i Highly dense forest area of state *i*

R_i $max\left[0, \left\{\frac{F_i}{A_i} - \frac{\sum F_i}{\sum A_i}\right\}/10\right]$

C_i Forest cover of state *i*

$HCVF_i$ High conservation value forest index of state *i*

n Number of States i.e. 28

Two scenarios are suggested for estimation of High Conservation Value Forest Index. One is based on all indicators constituting the HCVF Index carrying equal weights and the other based on differential weights for Action Factors (0.5), Cross-cutting Factors (0.3) and Natural Endowment Factors (0.2). The HCVF Index for these scenarios is estimated as follows:

Scenario 1 All indicators of HCVF carry equal weights

$$HCVF_i = \sum_{i=1}^{3} EF_i + \sum_{i=1}^{4} AF_i + \sum_{i=1}^{3} CF_i$$

Scenario 2 Indicators with differential weights i.e. Action Factors (0.5), Cross-cutting Factors (0.3) and Natural Endowment Factors (0.2)

$$HCVF_i = \left(0.2\sum_{i=1}^{3} EF_i\right) + \left(0.5\sum_{i=1}^{4} AF_i\right) + \left(0.3\sum_{i=1}^{3} CF_i\right)$$

EF_i Natural endowment factor indicators of state *i*

AF_i Action factor indicators of state *i*

CF_i Cross-cutting factor indicators of state *i*

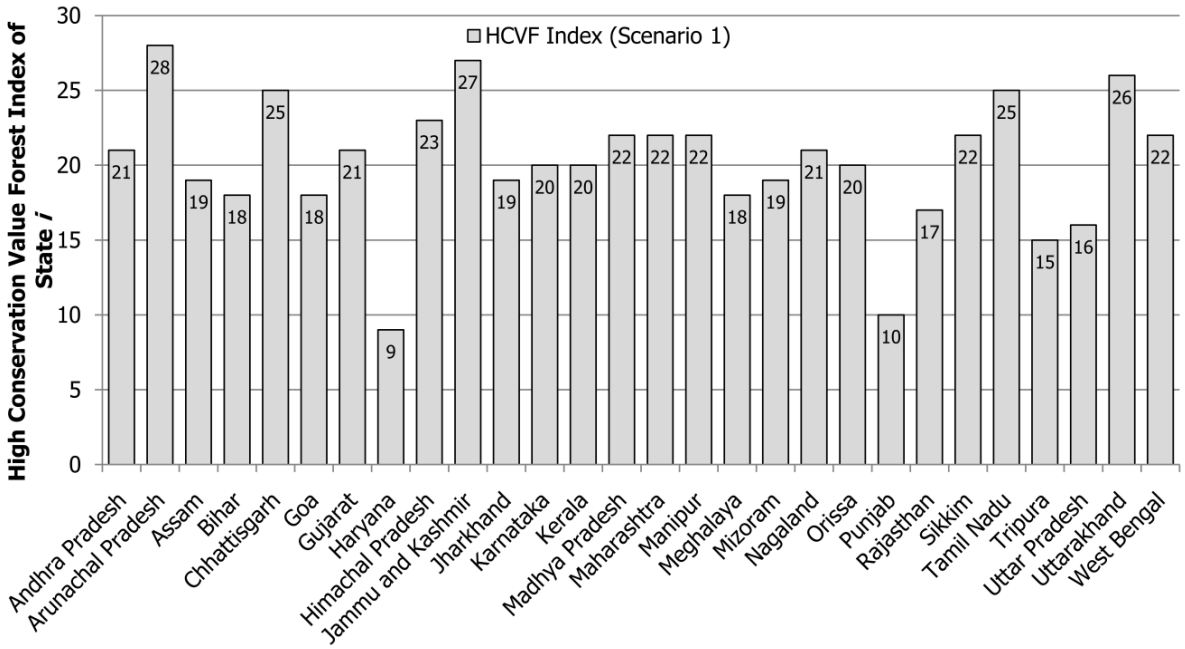

Figure 19 – High Conservation Value Forest Index (Scenario 1)

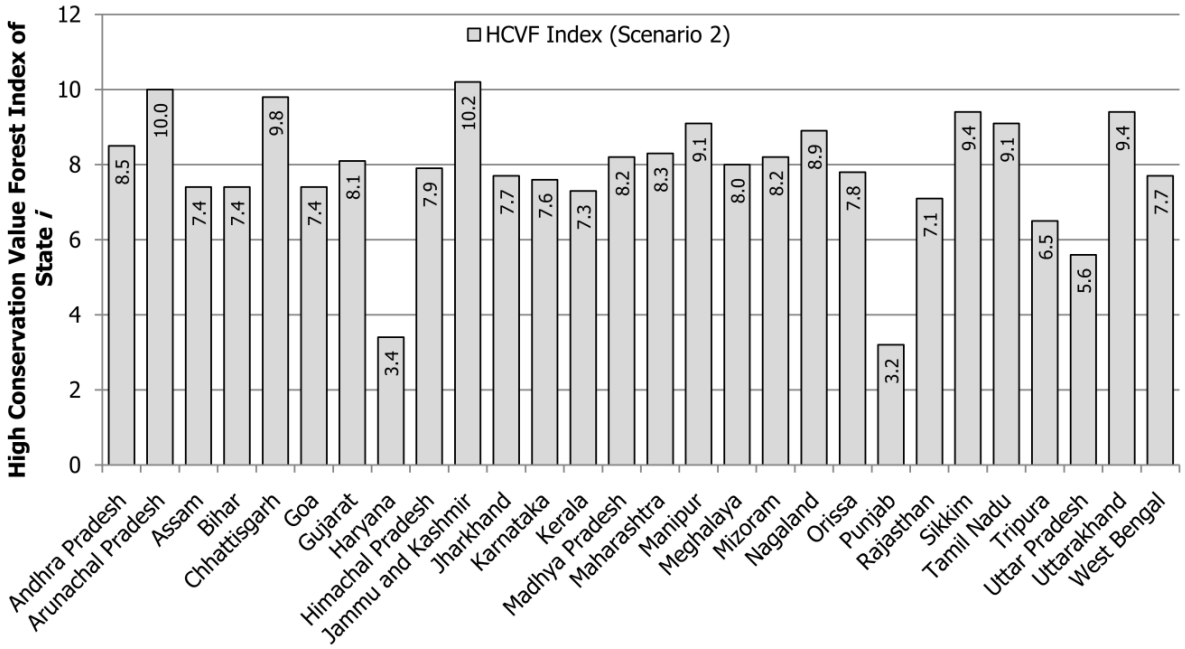

Figure 20 –High Conservation Value Forest Index (Scenario 2)

Assuming a total of ₹ 5000 Crore has to be distributed to States, the share of each State according to the suggested formula for the XIV Finance Commission of India (for both proposed scenarios) is compared in the Table below with the actual allocations given by the XIII Finance Commission of India.

Table 39: Comparison of Allocation in XIII FC and Suggested Formula for XIV FC

STATE	Actual allocation by the XIII Finance Commission (₹ Crore)	Allocation based on Suggested Formula – Scenario 1 (₹ Crore)	Difference between suggested and XIII FC allocation – Scenario 1 (₹ Crore)	Allocation based on Suggested Formula – Scenario 2 (₹ Crore)	Difference between suggested and XIII FC allocation – Scenario 2 (₹ Crore)	Difference between suggested allocations in Scenario 1 and 2 (₹ Crore)
Andhra Pradesh	268.64	247.22	-21.52	249.44	-19.20	2.32
Arunachal Pradesh	727.84	390.36	-337.61	384.55	-343.29	-5.68
Assam	184.64	149.54	-35.19	149.64	-35.00	0.19
Bihar	38.40	64.97	26.49	67.63	29.23	2.74
Chhattisgarh	411.12	318.59	-92.64	319.14	-91.98	0.66
Goa	36.88	74.88	37.91	77.54	40.66	2.74
Gujarat	81.92	104.18	22.16	103.77	21.85	-0.31
Haryana	8.80	26.90	18.06	26.26	17.46	-0.60
Himachal Pradesh	100.64	307.07	206.32	300.23	199.59	-6.73
Jammu and Kashmir	133.04	136.27	3.11	134.34	1.30	-1.81
Jharkhand	151.44	137.79	-13.73	139.87	-11.57	2.16
Karnataka	221.04	171.10	-50.03	169.97	-51.07	-1.05
Kerala	135.52	101.71	-33.90	98.60	-36.92	-3.02
Madhya Pradesh	490.32	364.22	-126.20	361.92	-128.40	-2.21
Maharashtra	309.60	262.10	-47.60	260.45	-49.15	-1.55
Manipur	150.32	218.03	67.61	221.65	71.33	3.72
Meghalaya	168.08	119.53	-48.63	126.14	-41.94	6.69
Mizoram	171.20	198.42	27.13	203.78	32.58	5.45
Nagaland	138.56	154.02	15.37	158.88	20.32	4.95
Orissa	330.96	276.04	-55.01	276.22	-54.74	0.27
Punjab	9.20	33.77	24.53	29.26	20.06	-4.47
Rajasthan	88.32	122.87	34.48	126.12	37.80	3.32
Sikkim	40.56	243.02	202.36	248.61	208.05	5.69
Tamil Nadu	142.48	136.94	-5.65	132.89	-9.59	-3.94
Tripura	95.52	143.20	47.62	147.61	52.09	4.48
Uttar Pradesh	80.48	89.39	8.84	85.32	4.84	-4.00
Uttarakhand	205.44	313.30	107.75	308.67	103.23	-4.52
West Bengal	79.04	94.54	17.96	91.50	12.46	-5.49

The shares for some States have been reduced significantly such as for Arunachal Pradesh, Chhattisgarh and Madhya Pradesh while for some States the allocation has risen significantly such as Uttarakhand, Sikkim and Himachal Pradesh. A graphical representation of the difference in share of each State as a result of the suggested formula is as shown in Figure below.

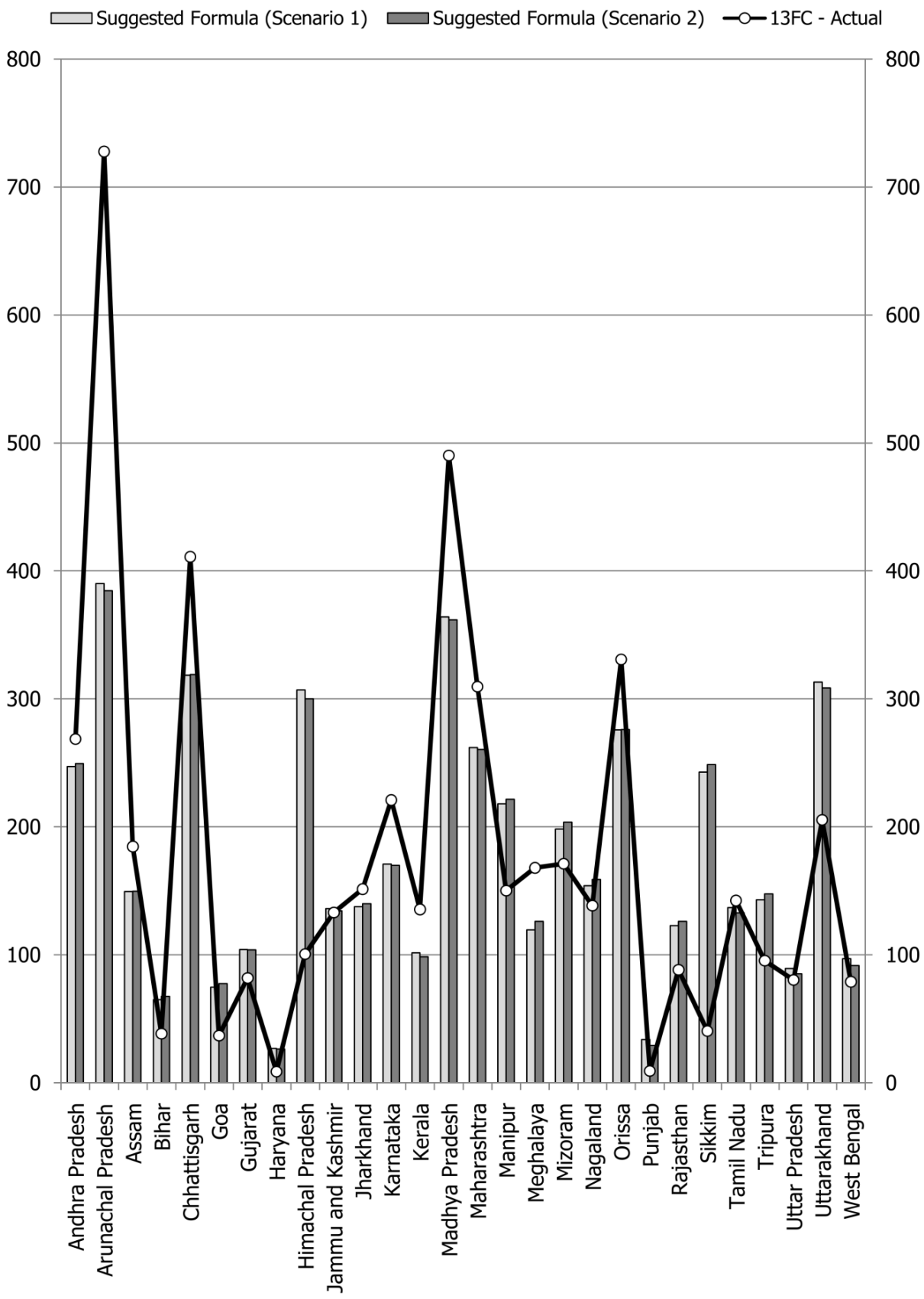

Figure 21 – Comparison of actual 13 FC allocations viz-a-viz suggested allocation in 14 FC (Amount in ₹ Crore)

The reason behind this rise and drop in the magnitude of allocation is because the quality in the forest differs between regions. It is not necessary that a dense forest is always better than a lower density cover forest or even grassland. It may be based on the ecological services being provided by the forest areas. A lower canopy forest may provide habitat to the most critical species of flora and fauna while a forest with higher canopy density might not. The HCVF indicators incorporated in the suggested allocation formula account for such important values which need added efforts and monetary requirements. Moreover, it also describes the uniqueness of the forest areas of each state and hence the allocation based on the suggested formula is justified.

For estimation of expenditure on maintaining areas under forests, the projections of the XIII Finance Commission for Non-Plan Revenue Expenditure have been used. The maintenance cost so derived is approximately equal to ₹ 36,000 Crore for all States combined for the period of 2015-16 to 2019-20. It is suggested that any grant given for compensating the maintenance cost should be performance based wherein the more the States spend on forest conservation, the more funds they would be allocated. For estimation of expenditure on restoring degraded forest areas of the country, the area under 'Open Forests' is used in conjunction with the unit cost of assisted natural regeneration. The total restoration cost thus calculated is approximately equal to ₹ 32,776 Crore for all States combined.

The net profit per hectare from agriculture in two types of regions – plains and hills – is used to estimate what each State would have received had the forests areas been converted to agriculture. While the revenues from diverting forests to secondary and tertiary sectors are likely to be much greater, the study has used a conservative approach to estimate the same by assuming the next best biological use of the land. The opportunity cost so derived is approximately equal to ₹ 250,000 Crore annually for all States combined. It is suggested that the opportunity cost incurred by States should be considered while deciding on the total grant-in-aid given to States for forest conservation.

Lastly, analysis carried out on release of grants viz-a-viz the actual allocation to each State reveals that only 13 States had more than 80% of the working plans approved by

2013-14, the condition set by the XIII Finance Commission for the release of entire grant allocated.

8 RECOMMENDATIONS & SUGGESTIONS

- The study suggests that apart from the existing criteria of incentivizing the States in accordance with their % forest area, dense/moderately dense forest cover, open forest cover area of the state may also be given due weightage in the new formula for distribution of grants to **address drivers of degradation** and to accelerate their greening efforts, including support to agro-forestry.

- The **grants should be linked to the States budgetary allocation for forestry**. The enhanced efforts by the states to conserve and maintain the health of forests should be incentivized by providing a higher grant by the Finance Commission. This would fuel the pro-conservation approach by the States.

- The Finance Commission should ensure that the process of improving the approach on conservation and maintenance of forests along with the improvement of allocation matrix for the subsequent finance commission should keep up and running even after the current Finance Commission's terms ends. This would lead to **continual improvement** in the momentum of conservation and monitoring of forests in India.

- For the exhaustive list indicators for HCVF suggested as shown in Table 7 – List of indicators screened for the study, which were not included in the final list of indicators used due to data unavailability and insufficiency, provision should be made for the **collection of data** on these indicators which may be commissioned to concerned agencies at regular intervals and based on scientific methodology by the current Finance Commission.

- There is also a need to internalize concerns of **vulnerable ecosystems** like mangroves, Shola forests, bugiyas (meadows) and others as an indicator in HCVF, but such data is needed to be consolidated for the country, which seems of considerable high importance.

- The Grants provided should be looked upon by the States only as an **investment opportunity** to enhance and maintain the health of forests and the values associated and not as a regular source of funds as the budgets are.

- **Restoration cost should be one time allocation** to States and regular commissioning of such funds should be discouraged as it acts as perverse incentive to States. For this a monitoring mechanism should be built to check the newly added areas under degradation and the extent of areas restored back to

good health. Thus the next grants should be allocated based on performance of each State based on this monitoring.

- Although the parameter of Corridors has been included in HCV, it should be ensured that they are not disrupted due to construction of roads and railway lines. If in case, building such constructions is inevitable, it should be ensured that the corridors are kept intact by constructing artificial passages such as under-passes and over-bridges, to keep a regular mobility of animals in these areas.

- **Forest productivity varies from state to state** due to difference in the agro-climatic zones they are exposed to. This needs to be internalized while considering the quality of forests in states for the allocation of grants as the forest quality may differ substantially because of this. E.g. Forests of North-East India and Forest of Rajasthan.

- Emphasis should be given on the role of forest in ensuring **food and water security** of the country and it needs to be highlighted by the Finance Commission.

- The Finance Commission should provision a study on developing a **Sustainable Livelihood Support Index** which can reflect the number of people deriving livelihoods from forests and so that they can keep deriving their livelihoods from forest without hampering the values of the forests and ensuring sustainable practices. The Index should be based on the number or percentage of people to drive the attention of the policy makers that conservation of these resources has positive implication on numerous people.

- During the analysis of utilization of grants by different States, it was also observed that the partially released grants (based on status of approved working plans) are not always utilized in the proportion mandated by the XIII Finance Commission of India with respect to development (75%) and preservation of forest wealth (25%). It is recommended that the proportion of grants utilized for development and forest conservation should always be in the proportion mandated by the Finance Commission, irrespective of complete or partial release of allocated grants to the State. Further, an **incentive mechanism** that encourages States for the same may be put in place.

- During the course of the study, the team faced difficulties in obtaining the required data as most of the agencies do not have such data collection processes in place to cater to such requirements. It was also observed that many States have not been using the forest grants in the manner mandated by the Finance Commission. The Finance Commission highlights the need for monitoring of the utilization of the grants released to the States, and for this purpose there is an urgent need create a mechanism that actively engages in such monitoring

process. The IIFM, having been an Institute associated with this activity, proposes to assist the Finance Commission to create and provide a platform for this important task of monitoring and evaluation of utilization of grants. Such a platform, **Finance Commission Grant & Performance Monitoring Cell, if established at the Indian Institute of Forest Management**, shall regularly collect, compile, analyze and monitor data across States on key parameters through an online internet based system wherein all the states will have access to feed in data related to different tasks accomplished and the utilization of funds. The Cell can also provide invaluable information which can be further used not only to incentivize proactively performing States but also continually refine allocation of forest grants across States. It is proposed that an amount of ₹ 5 Crore may be earmarked for establishment and operation of the Cell at IIFM.

Apart from the above recommendations of the study, the team also interacted with the Ministry of Environment & Forests (MoEF), Govt. of India and the following suggestions were received from MoEF for the XIV Finance Commission of India:

- The XIII Finance Commission allocated ₹ 5000 Crore with the condition that minimum 25% should be spent on forestry activities. The Ministry of Environment and Forest recommends that this should be raised to 50% by the XIV Finance Commission. This portion of the Grant should be earmarked for sustainable management of forests, protected areas and mitigation of human-wildlife conflicts. The remaining 50% of the forest grants should be spent on various developmental activities like health, education, livelihoods and social empowerment of the forest dependent communities.

- MoEF recommends that these funds so provided should be over and above the plan grants available to the forestry & wildlife sector. Over and above the current funding trend. Purpose is different to compensate for fiscal disabilities and other factors

- Earmarking about 5% of the Forest Grants for MoEF's Institutions like IIFM, IGNFA, ICFRE, FSI, WII, DFE, ZSI and BSI etc. for undertaking capacity building of officials from the States, infrastructural development, & awareness raising of stakeholders and meeting the growing research needs of the forestry sector.

- The degradation of forests due to developmental activities which end after a period of time like mines and also for natural disasters, a separate grant of 1000 Crore should be provisioned for allocation to state for which allocation matrix need to be worked out. The funds may be diverted from the Calamity Contingency fund and Natural Disaster Fund which may be given as a subsidy to States.

■ ■ ■

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10 APPENDICES

Appendix 1 - Minutes of the First Meeting on the "High Conservation Value Forests: An Instrument for Effective Forest Fiscal Federalism in India" on 5th March 2014, at the 14th Finance Commission Building, New Delhi

The Following Members were present:-

Mr. A. N. Jha	Secretary
Mr. Mukhmeet Bhatia	Joint Secretary
Mr. Sanjay Pandey	Director
Dr. Madhu Verma	Professor, IIFM & PI TFFC Project
Mr. Dhaval Negandhi	Subject Expert, CESM, IIFM
Mr. Rohit Singh	Subject Expert, CESM, IIFM

The Secretary and Joint secretary along with the Director welcomed the team from IIFM with the main agenda being

(i) Progress and developments in the project, to the Fourteenth Finance Commission at IIFM
(ii) Assessing the requirement of the commission more precisely
(iii) Discussion on the recommendations and suggestion by different sates

Dr. Madhu Verma opened up the conversation with the draft project methodology and upcoming plans to the commission members which would be based on the literature review, the HCV toolkit and the planned workshop for a different study of NTCA on tigers that is complementing the TFFC (The Fourteenth Finance Commission) project at certain aspects like the valuation of environmental services and tiger reserves and their contribution to Green GDP which is scheduled in late March and is to be organized at Delhi. A possible interaction with Dr. Robert Costanza and Dr. Gopal Kadekodi during the workshop, can help the project with their valuable suggestions of the critical parameters in the report and additions to the current draft methodology. She also cleared that the study would be based on the latest date from FSI which has yet not been published and is expected in matter of days.

Mr A. N. Jha then expressed the concerns raised by about 6-7 states on Western Ghats primarily by the state of Kerala. He also stressed on the Green Dividend (Green Bonus)

that is being demanded by all the states. Further he enquired about the possible roles of various wetlands and their importance to the report along with the Coastal preservation aspect and their possible incorporation in the allocation matrix (again raised by Kerela). Dr. Madhu Verma discussed about the roles of wetlands falling inside the forest area as well as the ones falling outside and their importance to the reports and also the environmental services provided by them. She said that this data may be available with FSI as they earlier used to collect this data on Wetlands falling in forest areas.

Mr. A. N. Jha reported that Tamil Nadu had enquired about Environment Performance Index and Eco Tax for which Dr. Verma replied that some key works have been done by organizations like IFMR on Enrichment of Environmental regions and Environment Performance Index which is available state-wise but their findings are too subjective to be incorporated in the report. Mr. M. S. Bhatia enquired about the carbon sequestration role of wetlands and their capacity for the same as compared to the forest areas. Dr. Verma responded with examples of her recent studies at Hokerser Wetland and Loktak in Manipur about their carbon sequestration roles and she highlighted the difference between good carbon and bad carbon. She also requested the commission to provide the recommendations coming from the different states so that they can be considered for the study, for which Mr. M. S. Bhatia assured the availability by talking to the state heads.

The concept of Service-shed was also discussed with regard to the wetlands along with a small briefing on InVEST mapping software used for the valuation of environmental services, but the same was labelled as non-applicable to the current study, due to fund, data and expertise constraints. Dr Verma also suggested the appointment of a mentor by the TFFC so that proposed methodology may be shared with the TFFC and may be discussed and refined so that both IIFM and TFFC are in tandem, giving the example of incorporation of degraded forest (Restoration cost) as suggested by Dr. Rajaraman in the Thirteen Finance Commission report.

Mr. A. N. Jha also emphasized on 3 factors that the states have been suggesting to be incorporated in the allocation matrix to be developed. These factors were:

1. Loss of revenue to the states due to ban on green-felling, as earlier it was providing a steady flow (increasing with time) of non tax revenue but now that has stopped.
2. Opportunity Cost lost for keeping the forest areas intact as for some states the forest occupies a major part of the geographical area and so less area available for development. This should now be turned into a Green Bonus (rewards) to states for losing out on this Opportunity cost.
3. Disability cost factor because of forest, terrain etc as they cannot divert the land for any other use.

He also iterated that the present formula being used in allocation is too simple for rewarding the states as currently it is based on area, the increase or decrease in forest cover etc. based on the data provided by FSI. The states have apprehensions if the allocation methodology might be taken up by either the Finance Commission or MoEF. But he also emphasized that the recommendations are required to be simple to comprehend and implement but still robust, so as to avoid any doubts being raised by states. Further he added that this study is not expected to calculate the Cost Disability, as the same has been taken up in a different study commissioned to Institute of Economic Growth by the Finance Commission.

Dr. Madhu Verma informed that the last study was based on two models one being the Economic Value Model and the other being the Opportunity cost (considering only the next biological use of forests). She further added that this study would try to suggest the disability factor for not reviving the degraded forests. Mr. Jha expressed his concerns over the Forest survey report stating the area under the Moderately Dense Forests (MDF) which is deteriorating to the category of the Degraded Forests at a gradual and steady rate. Mr. M.S. Bhatia enquired if IIFM is getting all the data they require from the government organizations for which Dr. Verma replied in affirmation. Mr. Jha stated the example of Assam where they were directed to start afforestation in the surrounding hills to stop water runoff and hence avoiding flooding of areas of Assam.

Finally there was a brief discussion on Green Accounting as a part of National GDP and then the meeting signed off.

Appendix 2 - Minutes of the Meeting and Suggested Approach on the "High Conservation Value Forests: An Instrument for Effective Forest Fiscal Federalism in India" Study on 16th April 2014, at Forest Survey of India (FSI), Dehradun

The Following Members were present:-

Dr. Anmol Kumar	Director General, FSI
Mr Rajesh Kumar	Joint Director, FSI (NFDMC)
Mrs. Richa Dwivedi	Deputy Director, FSI (FCM)
Mr. Kamaljeet Singh	Deputy Director, FSI (GPU)
Mr. Abhay Saxena	Asst. Director (NFDMC)
Mr. Swapan Mehra	CEO, Iora Ecological Solutions (IES)
Mr. Rohit Singh	Subject Expert, FFC Study

The Study team involving FSI, IES and IIFM attended the meeting with the main agenda being:

(iv) Progress and developments in the study
(v) Assessing the list of indicators for the study and possible data sources
(vi) Discussion on the next step and Execution plan

Mr. Swapan Mehra initiated the meeting with a presentation to brief FSI about the background, scope and objectives and the TOR of the study.

The first topic that opened up the discussion was on Large Landscape Level Forests (HCV2). The study considers large landscape level forests as large unfragmented and continuous patches of forests. Mr. Mehra explained the way to identify large landscape forests. He explained further that, at first the boundaries need to be defined for the areas to be assessed and then the fragmentation needs to be identified in these boundaries. He also added that the areas having lesser fragmentation may then become an indicator for this parameter. He also reported, that currently, the fragmentation is being identified on the basis tree cover in the area, and expressed his concerns for the areas where there is no tree cover and how the contiguity of forests may be calculated considering them as a part of it. He asked FSI if the mapping has been done for such areas and if the data available for use. The FSI team informed the group that WII and NTCA had done a study on large landscape forest that primarily focused on the Tiger

Reserves, but the scope for that is limited to the States of Rajasthan, Gujarat and Madhya Pradesh and the same information is not available for the country as a whole.

Mr. Mehra queried FSI about the availability of map for cold desert and mountain habitats, for which Mr. Rajesh Kumar replied that the layer for only the protected areas, having these parameters, is available with FSI. Mr. Mehra then asked if mapping of fragmentations can be done using the same layer. Mr. Rajesh Kumar responded about it being possible but it requires of a lot of time which already is a constraint for the study. Dr. Anmol Kumar added to it that if a protected area falls in continuity with a large unfragmented patch of forest it becomes an added factor (for a higher Weightage), else not. Hence the first factor to be considered here should be the continuity of the forest and then second being the presence of protected areas in it and also stated that these areas ought to have important and threatened species of fauna in it if not just flora. The next question put up by Mr. Mehra was on assigning the weights to these parameters. Mr. Rajesh Kumar suggested that the fragments per unit of areas may be used as an index, as the forest cover data and even the unfragmented patches data is available with FSI which may be used to calculate this index.

Dr. Anmol Kumar further stated that the identification of large landscape forest should be based on area as a parameter and which may be derived from the FSI maps. He suggested that a threshold value for such areas may be decided and the areas exceeding this value may be considered as large landscape while the others might not. He also added that such isolated patches should also be comparable to each other and differential weights should be assigned as per their importance, giving the example of incomparability of a small patch of Shola Forests with an unfragmented forest of an area of more than 1000 km^2. Mr. Mehra stated that some of the smaller isolated patches of forests may carry a higher value than some of the bigger patches, explaining it using the example of Shola Forests which are small yet rich in endemism. He also queried about what should be the critical minimum area (threshold value) for large landscape forests. Dr. Anmol Kumar suggested considering published literatures on this and considering the variation of range as suggested by them for defining the threshold value. In the end it was decided that rather than considering fragmentation as a unit, the minimum area should be set for the forests to be considered as landscape level forest.

Mr. Kamaljeet Singh said that, both flora and fauna are considered as units of biodiversity, but in certain areas it may be possible that the faunal part is a lot more as compared to the floral part and the vice versa may also be true and for all these areas, the fauna and flora should be merged to form a single biodiversity value. Mr. Mehra suggested taking the biodiversity index for a site as a parameter for the study. Dr. Anmol Kumar clarified the index further needs to be quantified into endangered and threatened species to provide a true weightage.

Mr. Mehra then summarized the entire biodiversity values into 3 heads:

1. Gross index like Shannon Whiner distribution
2. Threatened and endangered species
3. Endemism in the area

He also said that a site may have only the faunal part or the flora part, but if some of that part is endemic or threatened it will automatically be assigned a higher value.

Mr. Mehra then queried about the biodiversity data availability for the states/country. He said that one time data may be obtained from BSI, ZSI and other organization but there is no mechanism for continuous monitoring of these values and if this monitoring is a prerequisite for this study. The FSI group ruled out the possibilities of getting such data as for them no such National Studies are carried out in India. Mrs. Dwivedi suggested obtaining the faunal data from IUCN, Red book and other sources as they tend to update their lists periodically and which may prove to be effective for the study. Mr. Rajesh Kumar also informed that BSI does not use Shannon and Whiner index, as their focus is mainly on taxonomy and identification of new species and not on the population study.

Mr. Mehra asked the group that since the data on biodiversity is only available site-specific like for protected areas and others what should be the possible approach in assigning weights to these at the state level. Dr. Anmol Kumar responded to the question and said that before the entire set of indicators has been developed and finalized for the country, it is not possible to draw a weighting mechanism for an individual attribute. Mrs. Dwivedi suggested building a country list of the species mainly for the faunal part and then providing a composite weight for their area of existence. So

it would mean which state has how many endangered/endemic species of fauna and for which they can be assigned weights accordingly. Dr. Anmol Kumar remarked on a possible issue with this approach that it would not be able to incorporate the first time reporting of a species and thus the weightage may not reflect the true value. He suggested consultation with experts on this to reach a conclusion.

On the topic of Critical Services provided by the Forests, Mr. Mehra asked the group if shelter belts, wind breaks, watersheds, plantations and tree cover protecting areas from floods, tsunami etc. should be included in the HCVs. For this Dr. Anmol Kumar suggested that these values, though critical, do not fall in the purview of HCVF or even the opportunity cost and thus should not form a part of the study. But the group emphasized on the inclusion of Mangroves under this head. Dr. Anmol Kumar emphasized on considering the forests as the foremost aspect in the study, followed by the benefits being derived from these areas and not considering the vice versa. Mr. Mehra then summarized the hierarchy to be followed as:

1. Percentage of land area under forests
2. Percentage of that forest that is critical
3. Percentage of forest that acts as watershed and provides other benefits
4. Percentage of the forest that is contiguous
5. How much of the area helps in sustainability of species

This was agreed upon by the group. He further stated that this approach would give this study funnel type formation to the indicators for which appropriate weights may be assigned at each step.

The next topics on discussion were the slope and altitudinal aspects of the forests. As per Mr. Mehra most of the international treaties and high conservation value forest have Slope as a critical parameter for the forests and it has a high impact on issues like soil erosion and others. So he popped a question on whether such forests on high angled slopes and altitude, be given extra weightage. For this Mr. Rajesh Kumar suggested considering the altitude gradation of forests, provided in the SFR, as the data source. Giving the example of Coorg, Mr. Mehra emphasized the importance of forests on the slope to the area lying on the valley floor. Mrs. Dwivedi again suggested considering altitude as the only parameter for the study. Mr. Mehra then differentiated between the

forest areas of Western Ghats and forest of Andhra Pradesh where slope adds to the criticality of the forests. He again kept a question to FSI, if the layer of forest cover in India along with the DEM can possibly map the forests on slopes. Mr. Rajesh Kumar said that it is difficult a task to execute but still doable. The groups converged to use altitude as the main parameter in the study and providing a proper justification about its importance so as to allay the possible disputes between the states on this.

Next topic to be discussed was the Socio-economic parameters. Mr. Mehra raised the question, if the dependence of the communities on forest should be considered as one of the parameters for the study and if yes, what can may the possible indicators for that. He also added that there are states where the forest cover is high and the dependence is high as well, while some may have high forest cover but still the dependence is low, maybe because of low population of the state or some other factors. Mr. Rajesh Kumar suggested considering Per capita data for it. Mr. Mehra also queried if the gross forest cover is a good parameter to represent the dependence. Dr. Anmol Kumar requested clarity on the topic and then suggested considering only the opportunity cost of the forest (for keeping the land as forests and considering the situation where the community or the state had removed the forests for some developmental use). Mr. Mehra also asked the group if for the states where the forest cover is high as well as the community dependence is high, should be compensated more. For this Dr. Anmol Kumar reiterated that this would complicate the study and the focus should only be on the opportunity cost and that it would cover all the other values.

Mr. Mehra further discussed if the opportunity cost should be based on population as a factor. He asked if for a state having lesser population, the opportunity cost should be less than the state having higher population. For which Dr. Anmol Kumar replied that it shouldn't be linked with population taking the example of Arunachal Pradesh and its Hydro-electric potential, of which only 20% is being used comparing it with the state of Bihar which has very less of the forests left. The group then decided that the study doesn't need socio-economic parameters to be considered as these are covered by other parameters which may act as proxy for this.

On the topic of Opportunity cost, Dr. Anmol Kumar suggested the use of NPV as the basis of calculation for the allocation of 5000 Crore Grant-in-aid, even though the opportunity cost may come a lot higher than the total grant. On the topic of valuation based on timber, Dr. Anmol Kumar said it is not correct or even a good measure to calculate the opportunity cost for the forests. Mr. Mehra then stated that the stratification would be required for the country under the different heads as suggested by the NPV study for its proper application. He also raised the issue with NPV method of not covering factors like endemism and Threatened/Endangered species. For which the group suggested adding up these as variables to NPV calculations to include them in the valuation process.

Lastly the topic of the monitoring of grants, Mr. Mehra raised the question if the monitoring should be incorporated in the study. Dr. Anmol Kumar observed that it was beyond the expectations of the study to which the entire group agreed and it was not discussed further.

The Group Convergence Method (GCM) was explained by Mr. Rajesh Kumar as a tool for assigning weights to indicators in an unbiased way and also about it helping the convergence of all parameters having different units, under one common unit for calculations. The Group finally ended with the discussion on the GCM and its requirement for the study. The group recommended GCM to be organized mainly for two factors – The weights and The Threshold values for the indicators. After this the meeting was declared over.

Appendix 3 - Meeting Notes on the "High Conservation Value Forests: An Instrument for Effective Forest Fiscal Federalism in India" Study on 21st April 2014, at Paryavaran Bhawan, New Delhi

The Following Members were present:-

Ms. Vandana Aggarwal	Economic Advisor, MoEF
Mr Rajesh Kumar	Joint Director, FSI (NFDMC)
Dr. Madhu Verma	Professor IIFM and PI FFC Study
Mr. Rohit Singh	Subject Expert, FFC Study

Ms. Aggarwal initiated the meeting by asking the support expected from MoEF by the Fourteenth Finance Commission (FFC) study team. On this Dr. Verma briefly described the work done in the Thirteenth Finance Commission Study, executed by IIFM, and explained the concept of Opportunity cost and Correction cost used in the same. She also described the final allocation formula used by the FC (Finance Commission) for allocation of Grant-in-aid to states which was based on the area under forest cover in each state and their difference from the National Average. She also stated the primary focus of the current study (FFC) to be the based on High Conservation Value of Forests.

Ms. Aggarwal expressed that the Grants-in-aid amount proposed by the FFC to be incomparable to the Economics of Preserving the Forest areas. She said that she expects it to be much higher than what it is at present and that it is highly below the expected valuation and the cost incurred in keeping the area as forests. According to her, the possible revenues that can be earned for these areas should be calculated in the units of **Amount/acre**. She also added that if such areas are near to the urban lands, giving the example of areas in vicinity to the NCR, their valuation should be higher than the other areas which are not. Further, she asked if the possession value was at all different from shadow pricing and if the same was covered in the Partha Dasgupta's Report. Dr. Verma replied on this and said that the actual value for the same was not provided by the Partha Dasgupata's report but the same was incorporated in the 13th FC report with the help of an additional parameter.

Ms. Aggarwal emphasised on the addressing the gap between the allocation as grants to the states to the actual cost incurred (opportunity cost). She suggested incorporating some qualitative parameter in the study like the total area of a state under the

protected area network and the extent of the degraded areas by considering their Open Forest areas. According to her the parameters, the study should focus on are:

1. Species richness
2. Species Endemism
3. Alpine Meadows area

Mr. Kumar then explained about the drafted indicators for the study and the requirement of Group Convergence Method to enhance the quality of indicators and also setting the threshold values for each of them (in consultation with the stakeholders).

Ms. Aggarwal then expressed that the philosophy of Forest conservation is too Carbon Centric at present and it should include other aspects as well such as water regeneration potential of the forest areas and these should be incorporated in the undergoing study. She also proposed incentivizing the holistic availability of the forest services by an area and replenishment of the water benefits, over and above the normal allocation of grants, giving an emphasis to the importance and criticality cum scarcity of water in the country. She also stated that the Grants usage should be maximised on conservation and the hefty administrative expenses should be pruned. She also suggested that the 25% utilization of the grants (as mandated by the earlier FC) on Forest conservation should be raised to 50%.

Dr. Verma then requested MoEF to provide the Activity-wise utilization of grants by the states for which Ms. Aggarwal agreed to provide. Ms. Aggarwal also wanted clarity on the JFMC interventions and raised the question if the communities be incentivised for, with the Green Bonus. She also suggested the equal usage of grants (50-50) for administrative and service usage as administrative costs differ for the areas under VDF, MDF and OF and also considering the disability cost due to slope and hilly terrain of some states. Finally she recommended the incorporation of an Overall Protection Index for forestry which can be used to describe the relative importance of forests of each state.

Due to constraint of time the meeting ended hereafter.

Appendix 4 - Address of Mr. A.K. Shrivastava, ADG (Forest Conservation) Ministry of Environment and Forests, Govt of India during the Group Convergence Method Workshop held in MoEF, New Delhi on 15th May 2014

I thank Dr G.A Kinhal and Prof Madhu Varma for giving me an opportunity to attend this Group Convergence Method Workshop on High Conservation Value Forests: An Instrument for Effective Forest Fiscal Federalism in India. It is indeed heartening that the XIV Finance Commission has choosen to assign this important Study to IIFM, a premier institution of the Ministry of Environment and Forests to define the parameters for award of forestry grants to the states. I complement IIFM for having undertaken this Study in in collaboration with Forest Survey of India (FSI), Dehradun and Iora Ecological Solutions (IES), New Delhi.

The 14th Finance Commission is tasked to make recommendations regarding the sharing of Union taxes, principles governing grants-in-aid to states and transfer of resources to local bodies. IIFM's is mandated to to submit a concept paper relating to TOR 3(X) of the 14th Finance Commission i.e. *"The need to balance management of Environment, Ecology and Climate Change consistent with Sustainable Economic Development".* The concept paper is expected to highlight the critical issues that need to be explored and studied in the overall context of the TOR of the Commission,which are:

i. Identifying parameters to define High Conservation Value Forests:
ii. Expenditure on conserving / maintaining forests:
iii. Quantum of revenue foregone:
iv. Cost of restoring degraded forests:

Forests provide a wide range of ecosystem services that benefit mankind. Due to incomplete or absent economic valuation of these services, it is difficult for policy makers to implement appropriate measures of forest conservation in the context of growing developmental pressures. The current system of national accounting (SNA) reflects only the marketed value of few visible services supplied by forests viz. Timber,NTFPs and raw material for the biomass based industries. This is further reflected in terms of low budgetary allocations to the forestry sector as significant weightage is given to the marketed benefits of forest ecosystems and income generating capacities of various states from different sectors, while allocating funds to the states.

As as per the mandate of the 1988 Forest Policy, many states are directed to keep large part of their geographical areas under forest leaving limited land for high revenue raising activities like agriculture, industry and services. In addition, there has been a ban on green felling and extraction of other forest produces by the Hon'ble Supreme Court of India in various forest-rich states unless working plan prescriptions are available in such states. On account of both the interventions, these forest-rich states, in spite of providing significant ecosystem services, are incurring revenue losses. Furthermore, these states incur heavy expenditure on forest management or provide ecological services which are used as public goods by other regions without fiscal charges. These states despite having abundant forest wealth lag behind in terms of economic growth and human development from many forest sparse states which are either agriculturally or industrially developed or have established tertiary sector.

With recent advances in forest database management and developments in the techniques of forest resource valuation it is now possible to demonstrate the immense contribution of forests to the growth and well being of a country. The Government of India, in recognition of this has launched several processes to arrive at a better valuation of the various ecosystem services that our forests provide. This includes the Re-calculation of Net Present Value of Forests, The Economics of Ecosystems and Biodiversity (TEEB) India Process, National Green accounting framework etc.

Recognizing the importance of forests for sustainable development of the country, the XII Finance Commission of India provided a grant of ₹ 1000 Crore to states, distributed between them in accordance with the share accounted for by the states to the total forested area in the country. The XIII Finance Commission allocated a grant of ₹ 5000 Crore to states, allocated primarily on the basis of forest area in the state with due consideration to total geographical area of the state, highly dense forest area and moderately dense forest area of the state. Though the study executed by IIFM for the XIII Finance Commission of India recommended many parameters for consideration, eventually the grant was provided on the basis of area parameters.

While acknowledging the idea behind allocating grant-in-aid to states based on forest area, it should be kept in mind that the economic value of forests is largely related to local factors such as forest dependency, biodiversity, and geographical location, among

others apart from the area per se. The allocation formula used in the XIII Finance Commission of India can be improved further to incorporate this concept by focusing on other important aspects in addition to just the forest area of a state. I am sure this study by IIFM will internalize these concerns.

MoEF has made its submission to the XIV Finance Commission. It has been stated that:

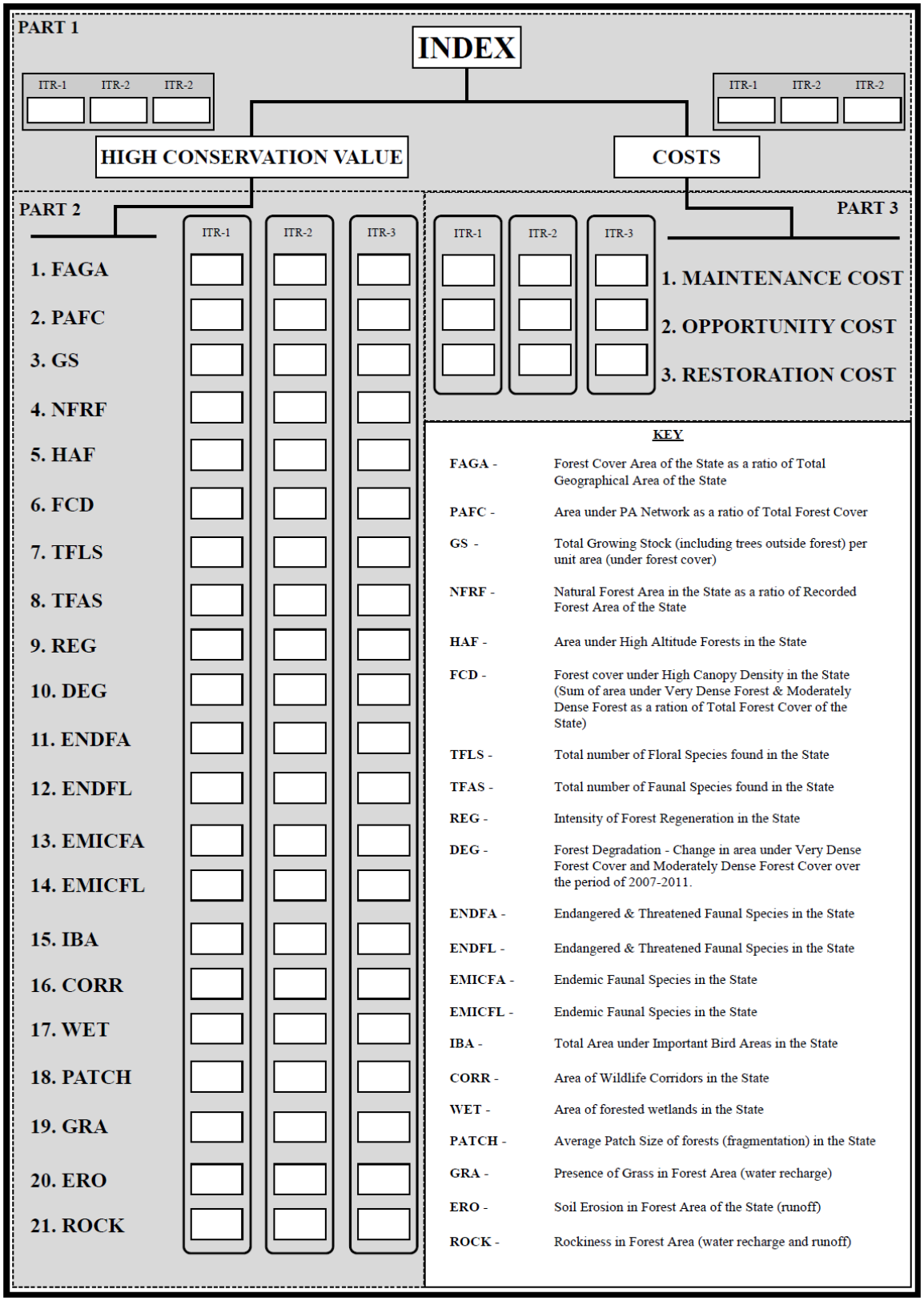
- 13th FC allocated ₹ 5000 Crore with the condition that minimum 25% should be spent on forestry activities.
- Recognising the ecological, economic,social, aesthetic and cultural services provided by the forests, the 14th FC may consider enhancing the grants considerably, say to ₹ 20000 Crore.
- 50% of forest grants should be earmarked for sustainable management of forests, protected areas and mitigation of human-wildlife conflicts. Remaining part of the forest grants should be spent on the activities like health, education, livelihoods and social empowerment of the forest dependent communities.
- The funds so provided should be over and above the plan grants available to the forestry & wildlife sector.
- Apart from the existing criteria of incentivizing the States in accordance with their % forest area, dense/moderately dense forest cover, open forest cover area of the state may also be given due weightage in the new formula for distribution of grants to address the drivers of degradation and to accelerate their greening efforts,including support to agroforestry.
- Earmarking about 5% of the Forest Grants for MoEF's Institutions like IIFM, IGNFA, ICFRE, FSI, WII, DFE, ZSI and BSI etc. for undertaking capacity building of officials from the States, infrastructural development, & awareness raising of stakeholders and meeting the growing research needs of the forestry sector.

I am told that the team from IIFM has been intensively working on the study and have identified indicators for the concerns raised. These indicators need to be put in an appropriate framework so that we can come up with a value for each state which can become a basis of allocation for the XIV Finance Commission. This is however easier said than done. All these indicators vary in context, relevant stakeholders, scale, among many other factors. It is thus important that the framework assigns appropriate level of importance to each indicator based on these factors. This is what the Group Convergence Method Workshop seeks to accomplish today.

I am sure that the deliberations today will provide valued inputs to IIFM in completion of the Study. I wish the workshop a great success.

Thank You.

Appendix 5 – Worksheet used for Group Convergence Method Workshop



Appendix 6 - Minutes of presentation on preliminary outcomes of the study on High Conservation Value Forests to the Members of the Fourteenth Finance Commission by the study team from Indian Institute of Forest Management

Date: 02 June 2014, 1130 to 1300 hours
Venue: Fourteenth Finance Commission, Qutub Institutional Area, New Delhi

Attendees: Dr. A. N. Jha (Secretary, XIV Finance Commission), Dr. Abhijit Sen (Member, XIV Finance Commission), Dr. Sushama Nath (Member, XIV Finance Commission), Dr. M. Govind Rao (Member, XIV Finance Commission), Dr. Sudipto Mundle (Member, XIV Finance Commission), Shri Mukhmeet Singh Bhatia (XIV Finance Commission), Prof Pinaki Chakraborty (Economic Advisor, XIV Finance Commission), Mr. Sanjay Pandey (Director, XIV Finance Commission), Dr. Madhu Verma (Professor, IIFM and PI of the study), Mr. Rohit Singh (Subject Expert, IIFM) and Mr. Dhaval Negandhi (Subject Expert, IIFM)

Dr. A. N. Jha, Secretary, XIV Finance Commission welcomed all the attendees to the presentation and invited Dr. Madhu Verma, Principal Investigator of the study assigned by the XIV Finance Commission on High Conservation Value Forests to present the findings of the study to the members of the Commission.

The minutes are categorized according to the terms of reference for clarity.

TOR 1, 2 and 3: Identify parameters to define High Conservation Value forest; Review of literature on robustness of parameters in identifying HCV forests; Identify High Conservation Value (HCV) forests, its area and characteristics across states in India.

- The study team presented the list of 13 indicators used for estimating the High Conservation Value Forests Index for each State.
- The team indicated that a Group Convergence Method Workshop was organized in MoEF, New Delhi for arriving at relative weights for these indicators but as stakeholders from different departments were not available, the exercise for estimating weights was not carried out. The calculations done for the first draft involve giving equal weights to all the indicators. The Commission members suggested that considering the policy implications of the results, it may be advisable to estimate the weights of these indicators through Principal Component Analysis or other related methods.
- The Commission members were also of the opinion that High Conservation Value Forest Index was complex and its use needs to be simplified. The additionality brought about by increasing complexity needs to be especially considered.

- As the previous Finance Commissions have used forest area as an indicator for ranking States, the Commission suggested that if the same indicator can be used with inclusion of quality parameter of these forest areas in each State derived from the High Conservation Value Index, then this could be very useful and easy to understand.

- As most of the data for deriving the High Conservation Value Forest has already been collected, the Commission requested the study team to provide raw data for these indicators as well as ranking of States based on the final Index. Separate ranking may also be provided for Very Dense Forest Areas and Moderately Dense Forest Areas if available.

TOR 4: Identify expenditure on conserving/maintaining the geographical area under forests in states.

- The study team indicated that in spite of repeated reminders to States for providing the required data on maintenance cost for forests, not many States have responded. Thus, the results for this TOR have not been presented.

- The Commission suggested that some of the data for States may be available with the Commission and it shall be happy to provide the information. It was suggested that the study team provide a list of information sought from the Finance Commission in this regard.

TOR 5: Identify quantum of revenue forgone as a result of maintaining forest areas and not utilizing for economic activities.

- The team presented the results for the opportunity cost forgone for maintaining forest areas to the Commission. The methodology involved estimating the income from agricultural production if a part of forest area in each State was converted to agricultural land. The States were broadly categorized into Hilly and Plain States and a conversion factor of 0.33 and 0.50 was used respectively for these categories.

- The Commission members suggested that the current methodology for estimating income from agriculture assumes equal agricultural productivity across States which is not true. In addition, the use of forest land for use in secondary and tertiary sectors is likely to provide much higher income per unit area.

TOR 6: Identify a set of parameters which would reflect the innate cost of conserving HCV forests and restoring degraded forests.

- The team also presented the methodology used for estimating the innate cost of conserving High Conservation Value forests and restoring degraded forests. The team suggested that 'Open Forests' as classified by the Forest Survey of India as

those having crown cover between 10% to 40% may be used as a proxy for estimating the extent of degraded forests in each State.

- The study team as well as the members of the Commission noted the limitation of use this indicator as a proxy for degraded forest areas as this will also include those areas where presence of higher crown cover may be constrained by ecological and bioclimatic conditions.

- The study also indicated the use of estimates suggested by NAEB, MoEF for 'Assisted Natural Regeneration' for deriving the costs of restoring these degraded forests.

TOR 7: Assessment of status of scientific work plans and its implementation by states as recommended by earlier Finance Commissions.

- The team indicated that the information for status of scientific working plans was still being sought from the States and hence the results for the same were not presented.

- The Commission suggested that as the grants for 3rd, 4th and 5th Year of the XIII Finance Commission was tied to the status of scientific working plans; the information can be indirectly obtained by looking at the grants sanctioned in these years to different States.

General Comments

- The Commission suggested that the Terms of Reference for the study does not include derivation of allocations to different States and hence may be excluded from the study.

- The Commission suggested as the writing work of the Commission has already commenced, the team should submit the final report to the Commission by the 18th of June 2014 after carefully internalizing suggestions received during this meeting.

- As indicated earlier, the Commission also suggested providing the raw data of indicators used for deriving the High Conservation Value Forests Index as well as the ranking of States based on the Index by 10th of June 2014 for further processing and analysis.

The meeting ended with Dr. A. N. Jha thanking all the participants for their inputs.

STUDY TEAM

MADHU VERMA

mverma@iifm.ac.in

Dr. Madhu Verma is a Biological Science graduate with Masters, M.Phil & Ph.D in Economics and works as a Professor of Environment & Developmental Economics and Coordinator for the Centre for Ecological Services Management, Indian Institute of Forest Management, Bhopal. She has been a Visiting Professor at the University of Massachusetts, Amherst and a Visiting Scholar at the University of California, Berkeley, USA (2001) for her Post Doctoral research work. She is a Lead International Fellow (2007) and a Fulbright Fellow (2012). She does action and policy research in the areas of valuation & environmental modeling of forest, wetland and agriculture ecosystems and biodiversity; green accounting; PES, livelihoods economics; conservation finance. In her career of 30 years she has worked with various Ministries and Commissions of Govt. of India and several national and international funding and research organizations. She has large number of publications to her credit and her many research recommendations have been internalized in the decision making process of the government and creation of conservation instruments.

DHAVAL NEGANDHI

dhaval.negandhi@mespom.eu

With Post-Graduate Diploma in Forestry Management and Erasmus Mundus Master's in Environmental Science, Policy and Management from three universities across Europe, Dhaval Negandhi possesses a multi-disciplinary and macro-level understanding of environmental concerns. He is currently working as a Subject Expert at the Centre for Ecological Services Management at Indian Institute of Forest Management. His research interests, publications and areas of expertise include valuation of ecosystem services (especially those from forest, wetland and agriculture ecosystems), spatial analysis, climate change, carbon accounting and statistical analysis. He has contributed to many policy-driven research including the recalculation of Net Present Value rates for forest diversion, cost-benefit analysis for forest diversion, and regional research to inform High Level Panel on assessment of resources for implementing the Strategic Plan for Biodiversity 2011-20 for South Asia.

SWAPAN MEHRA

swapan@ioraecological.com

Swapan is an environmental finance expert with extensive experience in developing carbon mitigation projects across coal mine methane, forestry, fuel switch, solar, hydro, biomass and wind power. Prior to founding Iora, Swapan held top management positions with some of the largest carbon finance firms in the world including EcoSecurities, AES and Evolution Markets. In these roles, he led multi-disciplinary teams across South Asia and Middle East, identifying and implementing climate change mitigation projects that generated over 5 million Carbon Credits. Swapan is deeply passionate about biodiversity and ecosystem conservation and works with unique environmental finance mechanisms to catalyze effective climate change solutions in India. He was recently selected as a LEAD International Fellow for 2011 and awarded the prestigious Donella Meadows Fellowship by the Balaton Group. When not trekking in some of his favorite parts of India, Swapan spends his spare time, helping NGOs create sustainable development training programs.

ROHIT SINGH

rohitsingh415@gmail.com

Rohit is a sustainability professional who has had diverse professional experiences. After completing his Post Graduate Diploma in Forestry Management, he initiated his professional career working with Axis Bank Ltd. in the Rural and inclusive Banking Vertical, in particular the Agri Business Division (focusing on the credit requirement of the Poor and Marginal farmers, its assessment and providing advances). He managed the operations for the state of Rajasthan and was responsible for maintaining the Agri-portfolio's health. He is currently working as a Subject Expert on Ecological Economics at the Centre for Ecological Services Management (CESM) at Indian Institute of Forest management. His subjects of interest include Climate Change, Valuation of ecosystem Services and Policy research in Environment and Development sectors.

ANMOL KUMAR

anmolkumar56@gmail.com

Dr. Anmol Kumar is an IFS Officer of 1982 batch from Maharashtra Cadre. Presently, he is working as Director General, Forest Survey of India, Dehradun. While working as Dy. Inspector General of Forests, he has been deeply involved with Wildlife Institute of India, Ministry of Environment & Forests, Govt. of India; Wildlife Action Plan and its Implementation; Wildlife (Protection) Act – Application and amendments; Management of natural resources in Protected Areas; National Board for Wildlife and Standing Committee of National Board for Wildlife; Critical examination of different proposals recd for the consideration of the Standing Committee of the National Board for Wildlife; International Co-operation and International Conventions – Convention on Migratory Species, (International) Convention on Heritage, International Union for Conservation of Nature, International Whaling Commission; Wildlife Institute of India, Central Zoo Authority and National Zoological Park at New Delhi; Eco-tourism and others. In addition to PhD in Botany from Meerut University, he successfully completed Post Graduation in Rural Social Development from the University of Reading, UK and advance professional programme in Public Administration from IIPA, New Delhi. He has published more than 20 research papers and articles in various journals and seminars.

RAJESH KUMAR

rajsus@rediffmail.com

With M.Sc. (Statistics) from Allahabad University, Shri Rajesh Kumar joined the Indian Statistical Service in 1986. Since then, he has worked in various capacities at premier institutions for forest management in India including Forest Research Institute, Indian Council of Forestry Research and Education, NSSO and CSO. Shri Rajesh Kumar currently serves as the Senior Deputy Director (Forest Inventory) at the Forest Survey of India and is an expert in the area of forests and Tree Outside Forests (TOF) Inventory and Forest Statistics.

INVOLVED INSTITUTIONS

Indian Institute of Forest Management (IIFM)

Established in 1982, the Indian Institute of Forest Management is a sectoral management institute, which constantly endeavours to evolve knowledge useful for the managers in the area of Forest, Environment and Natural Resources Management and allied sectors. It disseminates such knowledge in ways that promote its application by individuals and organizations. The mandate of IIFM is appropriately reflected in its mission statement, "to Provide Leadership in Professional Forestry Management Aimed at Environmental Conservation and Sustainable Development of Ecosystems."

Centre for Ecological Services Management (CESM), IIFM

CESM is a centre of excellence established in 2006 at Indian Institute of Forest Management with a mission to conduct action and policy research for ecosystem services management. The goal of the centre is to function as a think tank to generate useful database and an appreciation for ecosystem services, their physical assessment, valuation and establish incentive based mechanisms to promote conservation. The centre has contributed significantly to many important policy-decisions in the area of forest and natural resource management in the country.

Forest Survey of India (FSI)

Forest Survey of India (FSI) is an organisation under the Ministry of Environment & Forests, Government of India The objectives of FSI include, inter-alia, preparation of State of Forest Report biennially, providing assessment of latest forest cover in the country and monitoring changes in these; conduct inventory in forest and non-forest areas and develop database on forest tree resources; function as a nodal agency for collection, compilation, storage and dissemination of spatial database on forest resources. In addition, it is also engaged in providing the services of training, research and extension.

Iora Ecological Solutions (IES)

IES is an environmental finance, policy advisory and project development group with a mission to enable sustainable development in India by promoting ecosystem conservation and low carbon technologies through customized financing and distribution models. IES is currently working with socially responsible investors, carbon buyers, technology providers, governments and project developers based in North America, India and South East Asia in areas of Strategic Sustainability and Consulting, Action Research – Policy and Economics, Program Management and Implementation, Financial structuring and Capacity Building / Training.

Contact information:

Centre for Ecological Services Management
Indian Institute of Forest Management,
P. O. Box 357, Nehru Nagar, Bhopal (462003), M.P., India
Tel: +91-755-2775716 (Ext: 334)
Fax: +91-755-5772878
Email: mverma@iifm.ac.in; cesm@iifm.ac.in
Web: www.iifm.ac.in/cesm

प्रगतेः मूलं प्रकृतिः