

ALTERNATIVE CRITERIA FOR DEVOLUTION: LOOKING BACK TO MOVE AHEAD

Discussion Paper

Abstract

This paper contextualises the previous efforts of improving the green grant while highlighting the notable deficits that they faced. Considering the availability of new and improved dataset from the government it is evident that some of the shortcomings can be addressed. This paper is an effort in that direction. It attempts to create an index that is inclusive for all ecosystems, irrespective of their green cover and it attempts to be sensitive to the performance of the states on ecosystem conservation. Moving away from devolution based on absolute area to the change in area under each ecosystem. This makes the index more inclusive to states recovering from loss of ecosystems. It simulates a variety of indices based on the new dataset. For every index lays out allocations highlighting the gainers and losers on each of the circumstances.

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Introduction

The 15th Finance Commission (FC) instated a 10% weightage for the ‘forest & ecology’ criterion under its tax revenue devolution framework. 10% of the total fund pool was designated to be distributed among the States based on their share in national ‘dense forest’ cover. The FC based this devolution upon the reported forest acreage as identified and enumerated by the Indian State of Forest Report (ISFR) 2019. The preceding FC used the ISFR 2013 report, to devolve funds under the same criterion with a lower, 7.5%, weightage.

The Nature Conservancy (TNC) sought to project and compare the allocations under to States under the criterion, based on their performance across three ISFRs- 2013, 2017 and 2019. The highest and worst performing States were identified and the financial change in their allocations, given the report used, illuminated. This approach brings to fore the inherent incentivization introduced by the 15th FC to award better performing States- by changing the reference year from 2013, as used by 14th FC, to 2017. TNC proposes a continuation of this ‘dynamism’ by now using ISFR 2019 instead of 2017 during the 15th FC’s financial period. The financial gains/losses accruing to States given this change, have been projected and contrasted with the previous switch from 2013 to 2017.

The effort has been crucial in highlighting the performing States and assessing their gains over time. However, the approach undertaken by TNC and the 15th FC does not differentiate between forests and plantations. TNC cites this inability to differentiate as a limitation, too. Both institutions have forgone the crucial opportunity to use satellite data as stored by the Bhuvan platform, updated quinquennially, much like the FC. This dataset is robust to the extent that it identifies and differentiates among forest types, most importantly listing plantations separately. Additionally, it provides Land Use-Land Cover (LULC) data for other ecosystems like grasslands and wetlands for all States.

This article rectifies and augments the projections in some ways. A critical improvement is the accounting for and acknowledgement of the opportunity costs associated with forests vis-a-vis plantations. Plantations are responsible for producing private goods like timber, rubber, fuelwood, etc., and are profit-making enterprises by themselves. Forests, however, are not remunerative in this fashion and hence the higher opportunity costs of conservation. Land under forests may derive significantly higher private monetary returns when converted to other short-term uses like mining. Therefore, an equal weightage for forests and plantations in determining grants is an effort to equate two inherently unequal ecosystems, insinuating a trade-off between public good provision and private profits.

First, this exercise employs the LULC dataset to calculate States’ shares in total forest acreage sans the plantations. Second, it creates a weighted average of States’ shares in the terrestrial ecosystem at large- including plantations, scrub forests and swamps/mangroves. Third augments the second by the addition of grass/grazing lands enumerated separately in the dataset. Fourth is an attempt to address the ‘ecology’ part of the FC’s criterion- a weighted average of more than one ecosystem. This attempt results in a weighted average of terrestrial and aquatic ecosystems, and the allocations projected, therefore.

Ecosystems cannot be ranked based on their importance; each of these plays a vital role in maintaining the natural balance. Thus, an equal weightage for every ecosystem is the ideal goal.

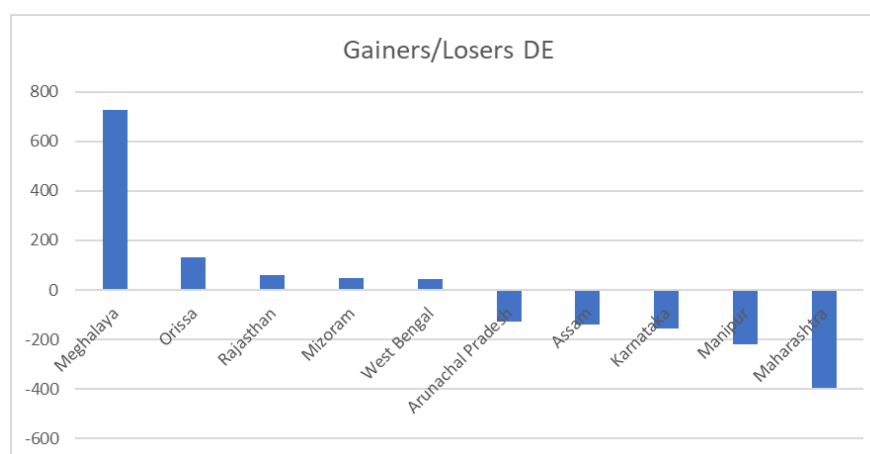
The Indices

A summary of the varied indices computed can be found [here](#).

1. Forest Cover

The LULC data is readily available for 2011-12 and 2015-16. The same time periods have been used for the present analysis and may be a limitation, owing to the parallels drawn with the TNC projections. Removing plantations from the forest cover, data under ‘deciduous’ and ‘evergreen/semi-evergreen’ (DE) forest types is compiled to calculate the total forest acreage and the required shares. The total amount of 85526 crore rupees was demarcated for devolution under the FC criterion. This amount has been used to calculate projections for both years, 11-12 and 15-16. The net gain/loss has been obtained as the difference between the projected allocations for the two years.

The top 5 gainers and losers based on said calculations are graphed below.



The TNC report compares two scenarios- the switch from ISFR 2013 to 2017 & the switch from ISFR 2017 to 2019. The gainers and losers from both are listed alongside the LULC dataset calculations as under.

Top-Bot5DE		TNC netgainer/loser ISFR 2017		TNC netgainer/loser ISFR 2019	
States	net gain/loss	States	gain/loss	States	gain/loss
Meghalaya	727.3381999	Karnataka	606	Karnataka	685
Orissa	132.037182	Andhra Pradesh	514	Himachal Pradesh	508
Rajasthan	59.65778425	Tamil Nadu	299	Kerala	439
Mizoram	47.71881471	Tripura	243	Odisha	140
West Bengal	43.94918455	Manipur	115	Assam	64
Arunachal Pradesh	-125.802314	Maharashtra	-96	Gujarat	-157
Assam	-138.065659	Madhya Pradesh	-196	Manipur	-188
Karnataka	-156.601339	Arunachal Pradesh	-255	Arunachal Pradesh	-207
Manipur	-218.81873	Uttarakhand	-277	Maharashtra	-222
Maharashtra	-396.477489	Telangana	-710	Madhya Pradesh	-290

Maharashtra and Arunachal Pradesh are the common poor performers across the three combinations, with different magnitudes. Karnataka is a striking State featuring as a loser when LULC data is used, and the best performer under ISFR-driven calculations. The

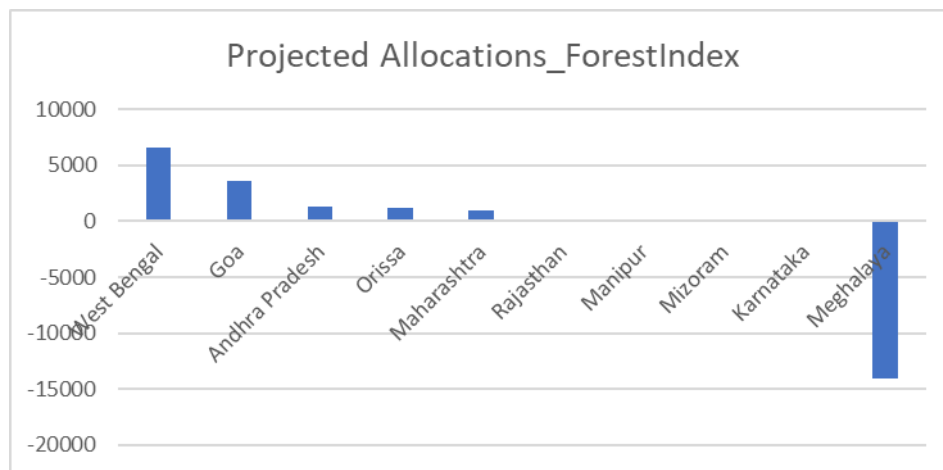
subtraction of plantations and an absence of a ‘dense forest’ definition have produced a relatively new ranking of performers.

2. A Forest Index:

A weighted average of terrestrial ecosystems grouped under ‘forest’ in the LULC dataset has been constructed. Share in exclusive forest area i.e., the deciduous and evergreen as calibrated above, is accorded 50% weightage. The remaining is divided between plantations, scrub forests and mangroves/swamps. Plantations carry a 10% weightage owing to their already remunerative nature which does not warrant a high need for compensation; given that plantations do generate some biodiversity benefits, therefore some reward is a must.

Mangroves are a threatened ecosystem and thus have been assigned a higher weightage, as opposed to scrub forests- 30% and 10% weightage, respectively. At a national level, the total area under mangroves was one-tenth the area under scrub forests and has observed a 44% decline over the five-year period studied here. Scrub forests command a larger area and have grown in the same period. Studies also believe that these ecosystems are a result of anthropogenic activities which caused the degradation of tropical forests. However, scrub forests support biodiversity and hence have been assigned a 10% weightage.

Based on this metric, the following gainers and losers can be ascertained:



Meghalaya is the biggest loser based on this calculation. This owes itself to the complete loss of its share in mangroves/swamps, a 56% share in 2011-12, to near 0 in 2015-16. The modest increase in forest acreage has been met with this drastic fall in mangroves accompanied by a fall in scrub forests. West Bengal, on the other extreme, recorded an increase in its share of mangroves from 20% to 46%, securing a big gain in projected allocations for this State.

3. All Terrestrial Ecosystems: Adding Grasslands

The composite forest average in itself captures a modest variety of terrestrial ecosystems. The addition of grasslands is an attempt towards a cohesive and exhaustive computation. This exercise projects allocations under different weightage combinations: 50-50, 60-40, 70-30, 80-20 and 10-90. The 50-50 is the ideal circumstance wherein these two ecosystems are given an equal weightage. The other combinations may precede the ideal, as deemed acceptable by the polity.

The table below ranks the top gainers and losers based on three combinations:

	States	PA1 equal	States	PA3 70-30	States	PA3 90-10
T o p 5	West Bengal	3292.685672	West Bengal	4623.147	West Bengal	5953.609
	Goa	1809.475132	Goa	2531.479	Goa	3253.483
	Himachal Pradesh	788.729323	Andhra Pradesh	967.8905	Andhra Pradesh	1236.987
	Andhra Pradesh	698.7938751	Orissa	817.9538	Orissa	1051.655
	Orissa	584.252743	Maharashtra	692.6419	Maharashtra	890.5396
B o t 5	Haryana	-252.3058993	Haryana	-151.353	Arunachal Pradesh	-78.4619
	Uttar Pradesh	-363.3688947	Uttar Pradesh	-206.549	Karnataka	-97.986
	Arunachal Pradesh	-370.6634235	Arunachal Pradesh	-224.563	Mizoram	-105.041
	Jammu&Kashmir	-635.935252	Jammu&Kashmir	-383.806	Jammu&Kashmir	-131.677
	Meghalaya	-7007.919572	Meghalaya	-9811.13	Meghalaya	-12614.3

An

increase in the weightage for grasslands from 10% to 50% reduces the gain accruing to West Bengal, Goa, Andhra Pradesh and Orissa, Maharashtra fares worse. Himachal Pradesh gains significantly with the 50% weightage for grasslands.

The allocations projected here in the table, represent a gain/loss over the five-year period. So, West Bengal's 3292 crore allocation under an equal weightage accorded to the two ecosystems, is a gain implying a better performance on some metrics during 2011-12 to 2015-16. This gain is lesser when compared to the 90-10 weightage combination.

4. Wetlands & Water Bodies (WWB) Indices

The LULC dataset presents four categories of land use data under the Wetlands and Water Bodies- Inland wetlands, coastal wetlands, rivers/streams/canals, and water bodies. Given these four, two combinations of weights have been used to calculate two indices- WWB1 and WWB2. The combinations are as follows:

	WWB1	WWB2
Inland Wetlands	25%	30%
Coastal Wetlands	25%	20%
Rivers/streams/canals	25%	30%
Water bodies	25%	20%

The WWB1 is an equally weighted index. WWB2 weighs inland wetlands and rivers/streams/canals higher than the other two categories. Coastal wetlands are concentrated along coastal states alone, which are also likely to have inland wetlands. Therefore, a lesser weightage is accorded. Rivers/streams/canals have a flow component and water quality is dependent on varied factors, in the varied states they flow through. This aspect can, in future, account for States located at the downstream of a river, attracting compensation for their respective quality of water.

5. Forests & Wetlands

Based on the Forest and WWB indices, two combinations of projections were estimated under different weightage systems as calibrated for all the terrestrial ecosystems in 3. The first combination is of the equal WWB1 and forests as shown under:

	States	PA1 equal	States	PA3 30-70	States	PA5 10-90
T o p 5	West Bengal	3261.007	West Bengal	4604.13973	West Bengal	5947.273
	Goa	1810.961	Goa	2532.3706	Goa	3253.78
	Andhra Pradesh	667.528	Andhra Pradesh	949.1309084	Andhra Pradesh	1230.734
	Orissa	601.0452	Orissa	828.0293323	Orissa	1055.013
	Maharashtra	347.5302	Maharashtra	604.3135211	Maharashtra	861.0968
B o t 5	Mizoram	-46.6608	Punjab	-49.20879575	Jammu&Kashmir	-64.4547
	Karnataka	-60.9912	Mizoram	-66.21203926	Manipur	-66.3413
	Punjab	-83.9303	Karnataka	-81.86364558	Mizoram	-85.7633
	Jammu&Kashmir	-299.822	Jammu&Kashmir	-182.1381197	Karnataka	-102.736
	Meghalaya	-6999.29	Meghalaya	-9805.957099	Meghalaya	-12612.6

The gainers remain the same across the different weightages assigned to the two ecosystems. However, the change in their allocation is negative- all these States lose amount as weightages change. Meghalaya loses the most when forests are assigned the highest weightage, losses reducing as a more equal weightage is approached. Mizoram and Karnataka observe an improvement in the same direction as well. Jammu & Kashmir and Punjab have fared worse across weightages and in the same time period.

The second combination of WWB2 and forests is as shown under:

	States	PA1 equal	States	PA3 30-70	States	PA5 10-90
T o p 5	Punjab	3241.66	Punjab	4592.532	Punjab	5943.403
	West Bengal	1823.436	West Bengal	2539.856	West Bengal	3256.275
	Uttar Pradesh	665.0205	Uttar Pradesh	947.6264	Uttar Pradesh	1230.232
	Gujarat	536.8853	Gujarat	789.5334	Gujarat	1042.181
	Chhattisgarh	382.6648	Chhattisgarh	625.3943	Chhattisgarh	868.1237
B o t 5	Mizoram	-46.7894	Jammu&Kashmir	-2024.07	Bihar	-65.3873
	Karnataka	-58.8894	Mizoram	-3900.01	Sikkim	-74.7837
	Jammu&Kashmir	-103.474	Karnataka	-4595.04	Mizoram	-85.789
	Sikkim	-351.467	Sikkim	-5572.08	Karnataka	-102.316
	Rajasthan	-6997.56	Rajasthan	-6797.79	Rajasthan	-12612.3

The top gainers remain the same across the different weights assigned to the two ecosystems. Rajasthan loses very high amounts in the five-year period when WWB are assigned a 10% weightage and Forests are assigned 90%. Its losses reduce considerably upon an equal assignment of weights between the two ecosystems. Sikkim and Jammu & Kashmir lose more as WWB gain weightage from 10% to 50%. Mizoram and Karnataka improve under the same combinations.

6. Forests, Wetlands and Grasslands

Finally, a composite index accounting for the three ecosystems is calibrated using four different combinations of allocating the sum total of 85526 crore INR as devolved by the FC. The 10% weightage assigned to 'forest and ecology' criterion has been split between the three ecosystems, in the four different combinations as shown below:

	C1	C2	C3	C4
WWB1	(20%)17105.2	(30%)25657.8	(40%)34210.4	(33.5%)28651.21
ForestInd	(60%)51315.6	(50%)42763	(40%)34210.4	(33.5%)28651.21
Grass/Grazing	(20%)17105.2	(20%)17105.2	(20%)17105.2	(33%)28223.58

The gain or loss incurred by the States was projected under each of these combinations resulting in the following:

	States	C1	States	C2	States	C3	States	C4
T o p 5	West Bengal	3945.245	West Bengal	3273.678	West Bengal	2602.112	West Bengal	2173.83
	Goa	2171.071	Goa	1810.367	Goa	1449.662	Goa	1214.817
	Andhra Pradesh	820.8358	Andhra Pradesh	680.0343	Andhra Pradesh	539.2328	Himachal Pradesh	522.3791
	Orissa	707.8203	Orissa	594.3282	Orissa	480.8362	Andhra Pradesh	455.841
	Maharashtra	534.8075	Maharashtra	406.4158	Himachal Pradesh	318.3323	Orissa	402.7003
B o t 5	Mizoram	-94.9922	Haryana	-85.5114	Haryana	-80.3897	Haryana	-149.338
	Karnataka	-136.322	Uttar Pradesh	-140.413	Uttar Pradesh	-144.505	Uttar Pradesh	-243.778
	Punjab	-155.575	Arunachal Pradesh	-157.607	Arunachal Pradesh	-159.639	Arunachal Pradesh	-253.284
	Jammu&Kashmir	-375.425	Jammu&Kashmir	-434.267	Jammu&Kashmir	-493.109	Jammu&Kashmir	-618.745
	Meghalaya	-8406.08	Meghalaya	-7002.74	Meghalaya	-5599.41	Meghalaya	-4689.49

The top 2 gaining States remained constant with an increasing share in the allocation as the weightage of forests in the index increased. Himachal Pradesh features in the top when near equal weightage is laid upon all three ecosystems. Maharashtra, Andhra Pradesh, and Orissa mirror the trend of West Bengal and Goa. Meghalaya is likely to incur the most losses under this scheme of allocation, losses increasing as the weightage for the ecosystems becomes more unequal and forests centric. Jammu & Kashmir is projected to face the opposite trend. Arunachal Pradesh gains significantly when forests are weighed at 60%; Haryana and Uttar Pradesh mirror the same.

The same exercise was repeated with WWB2 along with forests and grasslands. The results were as follows:

	States	C1	States	C2	States	C3	States	C4
T o p 5	West Bengal	3937.506	West Bengal	3262.07	West Bengal	2586.634	West Bengal	2160.868
	Goa	2176.062	Goa	1817.852	Goa	1459.642	Goa	1223.176
	Andhra Pradesh	819.8328	Andhra Pradesh	678.5298	Andhra Pradesh	537.2269	Himachal Pradesh	522.1942
	Orissa	682.1563	Orissa	555.8323	Orissa	429.5083	Andhra Pradesh	454.161
	Maharashtra	548.8613	Maharashtra	427.4966	Himachal Pradesh	318.1114	Assam	390.5807
B o t 5	Mizoram	-95.0436	Mizoram	-85.2937	Punjab	-82.852	Haryana	-146.707
	Uttar Pradesh	-136.694	Uttar Pradesh	-140.971	Uttar Pradesh	-145.248	Uttar Pradesh	-244.4
	Arunachal Pradesh	-156.531	Arunachal Pradesh	-159.04	Arunachal Pradesh	-161.549	Arunachal Pradesh	-254.884
	Jammu&Kashmir	-396.083	Jammu&Kashmir	-465.254	Jammu&Kashmir	-534.425	Jammu&Kashmir	-653.348
	Meghalaya	-8405.38	Meghalaya	-7001.7	Meghalaya	-5598.02	Meghalaya	-4688.33

While most of the States and ranks mirror that of the previous index combination, magnitudes depict marginal changes. Goa's gains are higher in this version as opposed to the previous, likewise for Maharashtra. Orissa, West Bengal, and Andhra Pradesh fare worse in terms of magnitude. Meghalaya's losses are marginally lower in this version, contradicting the trend of Jammu & Kashmir. Uttar Pradesh and Arunachal Pradesh incur a loss under the first combination in this version and fare significantly better in the previous.

Summary Table

Sr. no.	Criterion	Description	Weightage & Variables	Gainers	Losers
1.	Deciduous-Evergreen (DE)	Using the forest cover under deciduous and evergreen forests instead of the ISFR 'dense forest' variable which includes plantations.	Equal, 50% each	Meghalaya Orissa Rajasthan Mizoram West Bengal	Arunachal Pradesh Assam Karnataka Manipur Maharashtra
2.	Forest Index (FI)	Augmenting the DE version with plantations, scrub forests and swamps/mangroves.	50% DE 30% Swamps/Mangroves 10% Plantations 10% Scrub forests	West Bengal Goa Andhra Pradesh Orissa Maharashtra	Rajasthan Manipur Mizoram Karnataka Meghalaya
3.	All terrestrial ecosystems	Addition of grasslands in the Forest Index.	i) 50% FI & grasslands, each. ii) 70% FI, 30% grasslands. iii) 90% FI, 10% grasslands	i) West Bengal Goa Himachal Pradesh Andhra Pradesh Orissa ii) West Bengal Goa Andhra Pradesh Orissa Maharashtra iii) West Bengal Goa Andhra Pradesh Orissa Maharashtra	i) Haryana UP Arunachal Pradesh J&K Meghalaya ii) Haryana UP Arunachal Pradesh J&K Meghalaya iii) Arunachal Pradesh Karnataka Mizoram J&K Meghalaya
4.	Wetlands & Water Bodies (WWB)	Accounting for said ecosystems by creating a separate index to be used in combination with the other ecosystems.	WWB1: equal weightage, 25% each. WWB2: 30% Inland Wetlands 20% Coastal Wetlands 30% Rivers/streams/canals 20% Water bodies	--	--
5.	Forest Index & WWB1	Weighing forests and water bodies together, using the equally weighted WWB.	i) 50% FI & WWB1. ii) 70% FI, 30% WWB1. iii) 90% FI, 10% WWB1.	West Bengal Goa Andhra Pradesh Orissa Maharashtra Same for all three cases.	i) Mizoram Karnataka Punjab J&K Meghalaya ii) Punjab Mizoram Karnataka J&K Meghalaya

					iii) J&K Manipur Mizoram Karnataka Meghalaya
6.	Forest Index & WWB2	Weighing forests and water bodies together, using the unequally weighted WWB.	i) 50% FI & WWB2. ii) 70% FI, 30% WWB2. iii) 90% FI, 10% WWB2.	Punjab West Bengal Uttar Pradesh Gujarat Chhattisgarh	i) Mizoram Karnataka J&K Sikkim Rajasthan ii) J&K Mizoram Karnataka Sikkim Rajasthan iii) Bihar Sikkim Mizoram Karnataka Rajasthan
7.	Forest Index, Grasslands & WWB1	Allocating 85526 crores between the three ecosystems, with four combinations of weightages.	i) 60% FI, 20% WWB1, 20% Grasslands. ii) 50% FI, 30% WWB1, 20% Grasslands. iii) 40% FI, 40% WWB1, 20% Grasslands. iv) 33.5 % FI, 33.5% WWB1, 33% Grasslands	i) West Bengal Goa Andhra Pradesh Orissa Maharashtra ii) West Bengal Goa Andhra Pradesh Orissa Maharashtra iii) West Bengal Goa Andhra Pradesh Orissa Himachal Pradesh iv) West Bengal Goa Himachal Pradesh Andhra Pradesh Orissa	i) Mizoram Karnataka Punjab J&K Meghalaya ii) Haryana UP Arunachal Pradesh J&K Meghalaya iii) Haryana UP Arunachal Pradesh J&K Meghalaya iv) Haryana UP Arunachal Pradesh J&K Meghalaya

8.	Forest Index, Grasslands & WWB2	Allocating 85526 crores between the three ecosystems, with four combinations of weightages.	<p>i) 60% FI, 20% WWB2, 20% Grasslands.</p> <p>ii) 50% FI, 30% WWB2, 20% Grasslands.</p> <p>iii) 40% FI, 40% WWB2, 20% Grasslands.</p> <p>iv) 33.5 % FI, 33.5% WWB2, 33% Grasslands</p>	<p>i) West Bengal Goa Andhra Pradesh Orissa Maharashtra</p> <p>ii) West Bengal Goa Andhra Pradesh Orissa Maharashtra</p> <p>iii) West Bengal Goa Andhra Pradesh Orissa Himachal Pradesh</p> <p>iv) West Bengal Goa Himachal Pradesh Andhra Pradesh Assam</p>	<p>i) Mizoram UP Arunachal Pradesh J&K Meghalaya</p> <p>ii) Mizoram UP Arunachal Pradesh J&K Meghalaya</p> <p>iii) Punjab UP Arunachal Pradesh J&K Meghalaya</p> <p>iv) Haryana UP Arunachal Pradesh J&K Meghalaya</p>
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