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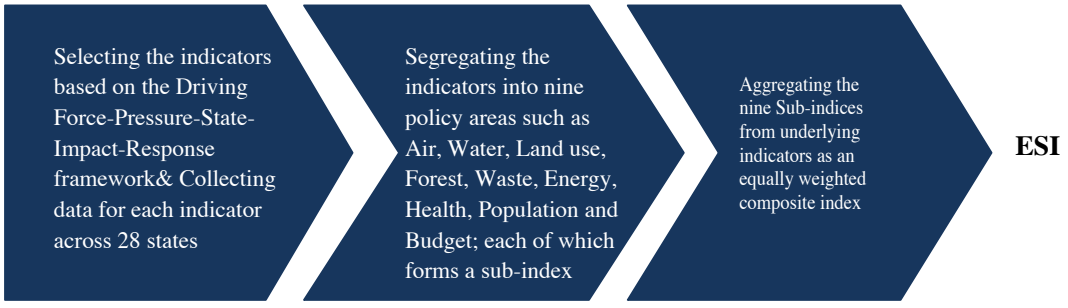
Environmental Sustainability Index (ESI) for Indian States 2011

Environmental Sustainability Index (ESI) is a comparative analysis of environmental achievements, challenges and priorities of Indian states. It reflects a state's general environmental condition by aggregating quantitative information on its historical endowments, resource use trajectory, magnitude and impacts of pollution, and policies taken by various stakeholders in conserving natural resources. ESI maps the current sustainability levels of the state, while simultaneously projecting its ability to protect the environment in the future. ESI, formulated primarily as a diagnostic tool for informing and empowering policy makers, citizens, researchers and activists, seeks to fulfil three main objectives. First, to provide information to ensure evidence-based policy making; second, to facilitate prioritisation of budget allocation between various resource sectors and lastly, to measure and monitor sustainable development at the state level over time.

Dimensions of sustainability are captured through forty-one indicators, culled from a wide range of themes such as air, water, land, forests, impacts of pollution on ecosystem and human health and policy responses by various stakeholders. These indicators are then combined to construct a composite ESI index. Based on the aggregate score, states are categorised into five groups: 'most' sustainable (top 20 percentile), 'more' sustainable (60-80 percentile), 'moderately' sustainable (40-60 percentile), 'less' sustainable (20-40 percentile) and 'least' sustainable (bottom 20 percentile). A higher ESI score implies that a state enjoys the benefits of better environmental quality currently and/or has been able to create the potential to maintain its environment. A lower ESI reflects greater pressures on the ecosystem and/or less responsive policies and institutions.

ESI is developed based on the Driving Force-Pressure-State-Impact-Response (DPSIR) framework. The chain of causal links starts with 'driving forces' (anthropogenic activities) which, exert 'pressures' (pollution& waste) on the 'state' of environment (air quality, water quality), which in turn 'impacts 'ecosystem and human health. This triggers 'responses' (conservation, emission reduction) to preserve and/or ameliorate environmental conditions. Categorisation of indicators as per DPSIR components highlights overall sustainability trajectory of the state. Indicators are additionally, grouped under nine sub-indices according to broad areas across which policies are formulated and state bureaucratic and administrative institutions are organised. For example, all land related indicators such as grazing land, soil erosion, pesticide and fertiliser consumption intensity are grouped under the rubric of 'Land Use & Agriculture'. These sub-indices provide insights on particular drivers with implications for policy and action. The aggregate index is derived from these underlying nine sub-indices.



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How the indicators are selected and mapped into sub-indices is shown below:

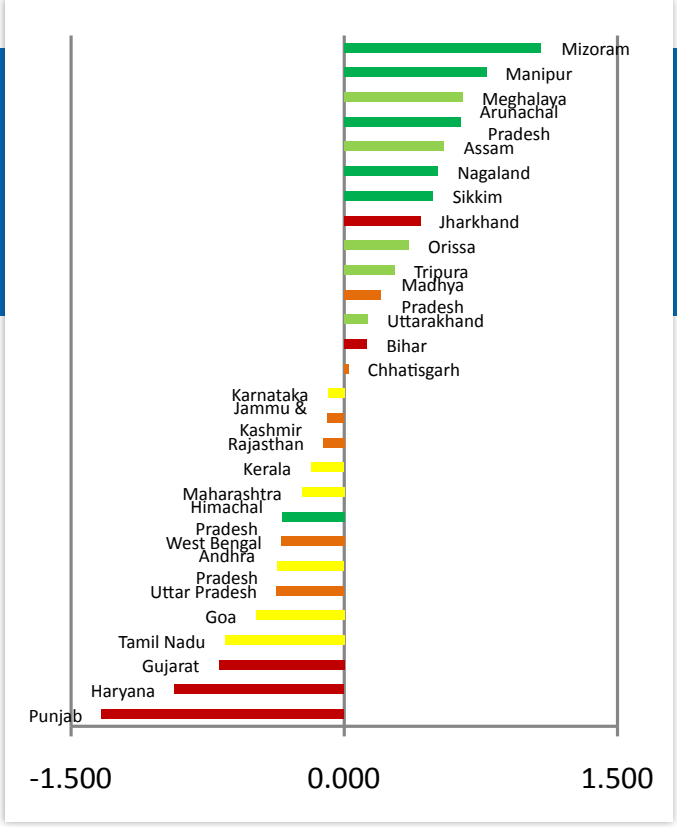
	Driving Force (D)	Pressure on Ecosystem (P)	State of Environment (S)	Impact on Health & Ecosystem (I)	Policy Response (R)
Air Quality & Pollution		Density of Motor Vehicle Usage	Annual average SO_2, NO_2, SPM and RSPM concentration		
Water Quality & Availability		Annual Groundwater extraction Irrigated Land	Mean BOD Mean Coliform Replenishable Ground Water Piped Drinking Water		
Land Use & Agriculture		Grazing Land Fertiliser Consumption Intensity Pesticide Consumption Intensity	Land under Cultivation Wasteland	Salinity, Acidity, Water Logged Land Soil Erosion	
Forests & Biodiversity		Change in Forest Cover	Forest Cover		Protected Area Wetland Compensatory Afforestation (CAMPA) Joint Forest Management (JFM)
Waste Generation & Management		Municipal Solid Waste (MSW) Hazardous Waste			Gap in sewage treatment
Energy Management					Non-efficient fuel use Renewable Energy Energy Efficiency
Impact on Human Health & Ecosystem				Respiratory Disease Incidence Water borne Disease Incidence Flood affected Area Drought Affected Area Disaster Deaths	
Population Pressure on Ecosystem	Population Density Population Growth Total Fertility Rate				
Environmental Budget					Environmental Budget Expenditure Outlay Gap Renewable Energy Expenditure

The colour-coded map presents a snapshot of sustainability across States according to the ESI. As per the results of ESI 2011, the States that are 'most sustainable' (lie in the top 20 percentile) are largely the north-eastern states (Arunachal Pradesh, Manipur, Mizoram, Nagaland, Sikkim). The 'least sustainable' (bottom 20 percentile) are Bihar, Haryana, Gujarat, Punjab, Rajasthan and Uttar Pradesh.

While these results are largely congruent with common perceptions on environmental conditions across states, there are a few unexpected patterns as well. As expected, states with abundant initial endowments of natural resources, viz., forests, such as the Himalayan States and Kerala lie in the top 20 percentile. However, other resource rich states, viz., minerals, such as Chhattisgarh and Madhya Pradesh, Jharkhand and Bihar lie under the 'moderate sustainability' and 'very low sustainability' categories respectively. Also, States such as Meghalaya and Tripura have not scored as high as their other north-eastern counterparts, and are found in the 'high sustainability' category. Also some of the larger states that have experienced intensive industrialization and/or agricultural development like Gujarat, Punjab and Uttar Pradesh have done so at the expense of environmental health and fall in the 'least' category. Others such as Tamil Nadu, Karnataka and Andhra Pradesh, have maintained environmental conditions and lie in the 'moderately' sustainable category.

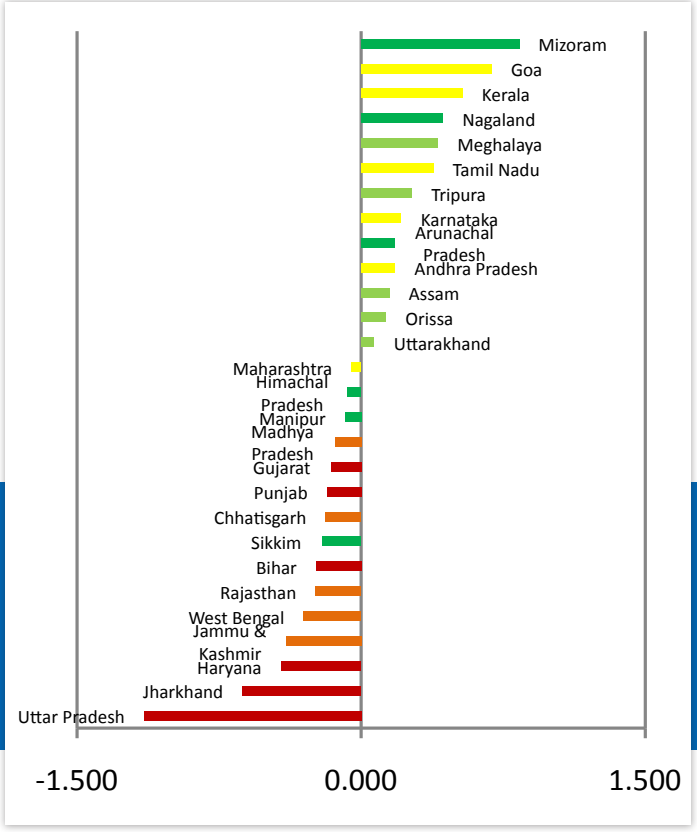
Such revelations emphasise both the value and weaknesses of the macro snapshot that the summary ESI offers. One the one hand, ESI succinctly aggregates contributions of state's initial endowments as well as rate of consumption and replenishment of its environmental assets with the help of the DPSIR analytical framework.

On the other hand a high ESI score is hard to interpret as either a summary of State performance or a guide for policy. What is oft-found is that States that face lower 'pressures' or have better 'state of environment do not necessarily fall into the 'most' or 'more' sustainable categories. This fact can be further understood by considering a disaggregated ESI in terms of the five components of the DPSIR.



State of the Environment

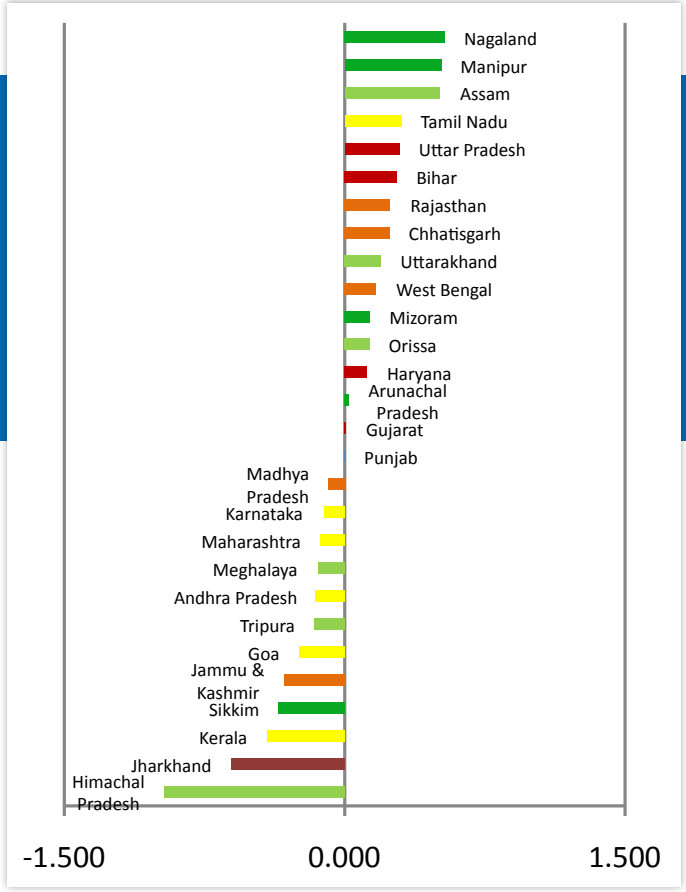
Better performing states are a combination of those that lie in the 'most', 'more' and 'moderately' sustainable categories



Pressure on the Environment

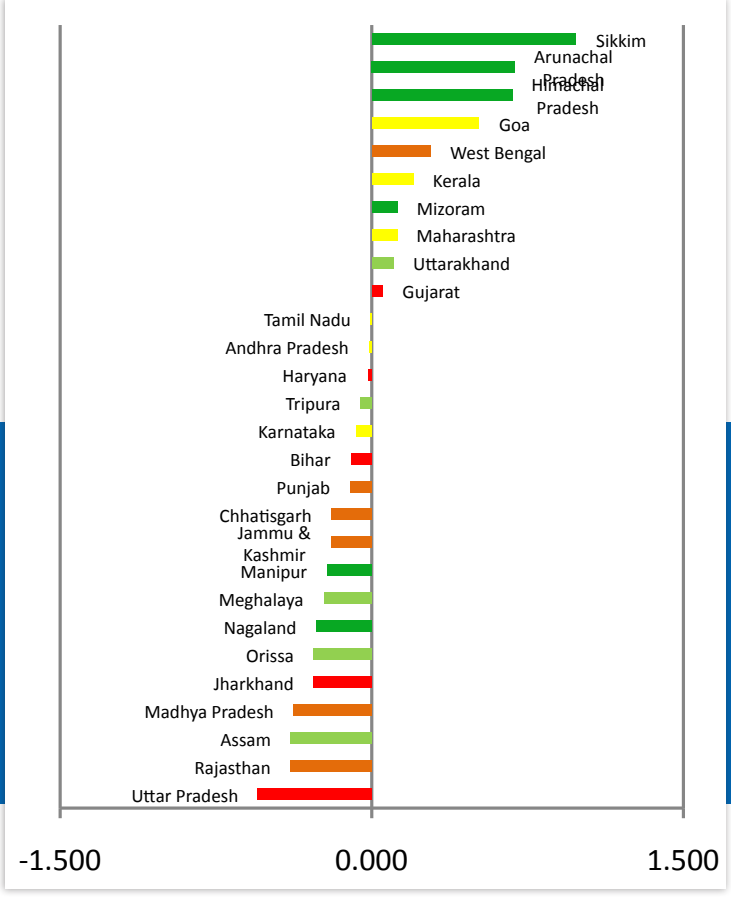
Better performing states are largely those that fall in the 'most' and 'more' sustainable categories

In the graphs above, states on the right side of the y-axis are performing better that states on the left side. Longer bars indicate better performance. All values are in standardised scores.



Impact on human health and ecosystem

'Most sustainable' States like Himachal Pradesh and Sikkim reveal a significant negative impact, other 'less' sustainable (Rajasthan) and 'least' sustainable states (Uttar Pradesh and Bihar) face a lower impact even though their overall sustainability is low.



State Policy Response

"Most states need to develop more proactive policies and strategies to maintain and preserve the environment. "Most sustainable" states like Sikkin and Arunachal Pradesh take the lead."

ESI is designed to inform the policy process by advocating an empirical, data driven approach to environment policy since decision making based on systematic and analytical information is expected to produce better outcomes. It highlights environmental concerns at the sub-national level, targeting states as the agencies that can change policy and environmental outcomes. India's federal structure allows the states considerable jurisdiction and autonomy to formulate policies and implement strategies at the state level. Moreover, each state's environmental challenges are different from others and so is their resources and capability to address such issues. ESI accumulates information on all the above aspects and compresses them into a simple and actionable format. By revealing patterns of sustainability in terms of the sub-indices, it also acts as a pointer to areas that require further analysis and possible action.

ESI is a measure of relative sustainability which is founded on the pattern and degree of variation within the dataset, not a proximity-to-target approach where a state's performance is measured and compared in absolute terms. Being a relative measure it does not reflect how states fared this year as compared to previous years, rather it identifies peer groups, leaders and laggards. While the comparison will tend to create peer pressure with each state wanting to perform better than the other; there is also a scope of mutual learning from best practices and the peer groups can analyze the relative situations and design policies accordingly.

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