**Indian Emission Norms**

India has progressively implemented stringent emission norms for vehicles to reduce air pollution. These are based on Bharat Stage (BS) standards, aligned with European emission standards.

**Current Norm: Bharat Stage VI (BS-VI)**

* Implemented from **April 1, 2020**.
* Equivalent to Euro 6 emission standards.
* Significant reduction in **SOx, NOx, CO, PM**, and unburnt hydrocarbons.

**Key Features of BS-VI:**

1. **Sulfur Content**:
   * Reduced to **10 ppm** (from 50 ppm in BS-IV fuels).
2. **Emission Reductions**:
   * **Nitrogen Oxides (NOx)**: Reduced by ~70% for diesel vehicles.
   * **Particulate Matter (PM)**: Reduced by ~80%.
3. **On-Board Diagnostics (OBD)**:
   * Mandatory for real-time monitoring of emissions.
4. **Ethanol Compatibility**:
   * BS-VI vehicles are designed to handle ethanol-blended fuels like **E10** and **E20**.

**Challenges in Ethanol Blending**

1. **Feedstock Availability**:
   * Dependence on sugarcane, a water-intensive crop.
   * Need for diversification to other sources like corn and rice straw.
2. **Infrastructure**:
   * Lack of ethanol production plants and blending facilities.
   * Storage and distribution networks need upgrades.
3. **Vehicle Compatibility**:
   * High ethanol blends (>20%) may require modifications to engines and fuel systems.
4. **Economic Viability**:
   * Ethanol prices and blending costs can be volatile.

**Future Prospects**

* **E20 Rollout**: Scheduled for nationwide implementation by **2025**.
* **Flex-Fuel Vehicles**: Encouraging automobile manufacturers to produce engines compatible with higher ethanol blends (e.g., E85, E100).
* **Second-Generation Ethanol**: Focus on advanced biofuels using agricultural waste to avoid competition with food supply.