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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 **SO_x, NO_x, 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 (NO_x):** 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.
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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.