Science & Technology · GS - III

Examine the opportunities and challenges associated with promoting 100% ethanol-powered vehicles in India, with particular reference to energy security and food security.

EXAM YEAR	PAPER	SUBJECT
DAILY PRACTICE 30/10/2026	GS - III	Science & Technology

MARKS	WORD LIMIT
10	~150 words

Answer Hint

Biofuel policy; energy import dependence; agricultural feedstocks; food-fuel competition; engine compatibility; fuel infrastructure; environmental sustainability

Model Answer

Introduction

Ethanol is a renewable biofuel that can partially or substantially replace fossil fuels in transport. Promoting E100 vehicles may support India's energy transition, but requires adequate production and distribution capacity.

Opportunities

1. Energy Security

Domestic ethanol production can reduce dependence on imported crude oil and improve resilience against global energy-price fluctuations.

2. Agricultural Benefits

Ethanol production can create additional markets for sugarcane, maize and agricultural residues, potentially increasing farmers' incomes.

3. Environmental Benefits

Ethanol blending can reduce fossil-fuel consumption and certain tailpipe emissions, depending on feedstock and production methods.

Challenges

- **Supply constraints:** Ensuring adequate year-round ethanol availability across regions.
- **Food security:** Competition between fuel production and food crops.
- **Water stress:** Sugarcane cultivation can increase pressure on groundwater.
- **Infrastructure:** Dedicated storage, transportation and compatible dispensing systems are necessary.
- **Technology:** E100 vehicles require suitable engines and fuel-system components.

Way Forward

India should diversify towards agricultural-waste-based and second-generation ethanol, assess regional feedstock availability and establish robust supply-chain infrastructure.

Conclusion

E100 mobility can contribute to energy diversification, but its expansion must be guided by supply feasibility, technological readiness and the principle of food and water security.

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