1. Introduction

With the increasing demand for renewable energy, harvesting energy from road traffic presents a promising solution. This project explores how mechanical energy from moving vehicles can be converted into electrical energy using piezoelectric sensors embedded in roadways.

2. Objective

To design and prototype a system that captures mechanical stress from road traffic and converts it into usable electrical energy using piezoelectric transducers.

3. Working Principle

When vehicles pass over a piezoelectric material, the pressure generates an electric charge due to the piezoelectric effect. This energy is then stored in a battery or capacitor and can be used to power streetlights, sensors, or stored for later use.

4. Components Required

Hardware:

Piezoelectric sensors (e.g., PZT or piezo strips)

Bridge rectifier (for AC to DC conversion)

Voltage regulator (e.g., LM7805)

Rechargeable battery or capacitor

Arduino Uno (for monitoring)

LCD Display (optional)

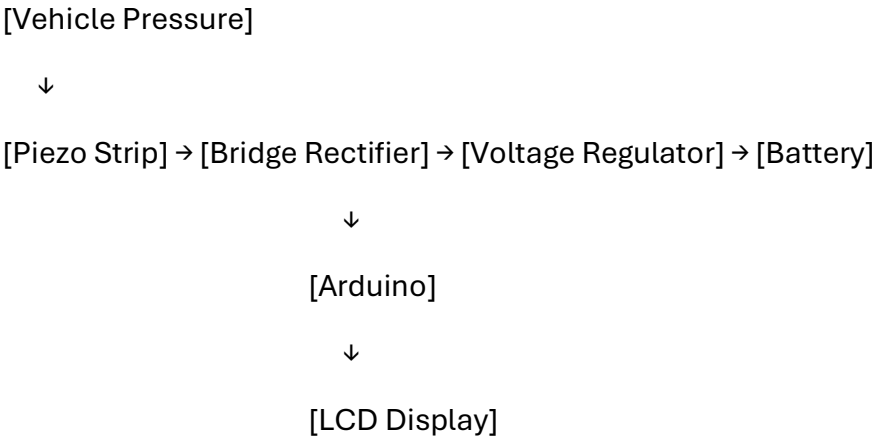
Load (e.g., LED or small fan)

Software:

- Arduino IDE

- Embedded C/C++ for microcontroller programming

5.Circuit Diagram



7. Applications

- Powering streetlights or traffic signals
- Charging batteries for roadside sensors
- Smart city infrastructure
- Emergency power in remote areas

8. Advantages

- Utilizes existing infrastructure
- Clean and renewable energy
- Scalable and low maintenance

9. Limitations

- Energy output depends on traffic density
- Initial installation cost
- Requires robust piezo materials for long-term use

10. Future Scope

- Integration with IoT for real-time monitoring
- Use of advanced materials like PVDF for higher efficiency
- Hybrid systems combining solar and piezoelectric harvesting