

# **SMART HIGHWAY USING GREEN ENERGY**

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Abstract - Smart highways, which are characterised by cutting-edge technology and intelligent systems, have attracted a lot of interest as a way to boost transportation efficiency, safety, and sustainability. The use of green energy sources in this situation has enormous potential to lessen environmental impact and improve energy efficiency. In order to achieve sustainable transportation, this abstract emphasises the importance of the idea of smart roads powered by green energy.Intelligent transportation systems, communication networks, sensors, and data analytics are a few of the cutting-edge technology that are included into smart roads. These components allow for the real-time monitoring, regulation, and optimisation of traffic flow, road conditions, and vehicle information, improving safety and easing congestion. There are various benefits to using green energy in smart highways. First off, it lessens dependency on energy sources derived from fossil fuels, which helps lower greenhouse gas emissions and prevent climate change. Second, because renewable energy is decentralised, there is a greater assurance of a more dependable and robust power supply, which lessens vulnerability to grid failures. The significance of smart, renewable-energy-powered highways in attaining sustainable transportation is highlighted in this abstract. The design. implementation, and performance of smart roads powered by green energy need to be improved, taking account aspects like cost-effectiveness, into scalability, and environmental impact.

**Key Words:** Green energy, renewable energy sources, solar

power, wind power, kinetic energy harvesting, sustainability, energy efficiency, carbon emissions, decentralised energy, resilient power supply, operational costs, transportation infrastructure, costeffectiveness, scalability, and environmental impact.

#### **1.INTRODUCTION**

The creation of "smart highways," which incorporate cutting-edge technology and intelligent systems, has become recognised as a game-changing strategy to improve the effectiveness, safety, and sustainability of transportation. The use of green energy sources in smart highway systems has drawn more attention in this context as a strategy to lessen environmental impact and boost energy efficiency. This introduction gives a general overview of the idea of smart roads that run on green energy and emphasises how important they are to developing a sustainable transportation system.A wide range of cutting-edge technology, such as intelligent transportation systems, communication networks, sensors, and data analytics, are all included in "smart highways." These components make it possible to monitor, regulate, and optimise traffic flow, road conditions, and vehicle data in real-time, which increases safety, eases congestion, and boosts overall effectiveness. But because these sophisticated systems have high energy needs, adopting sustainable energy solutions is necessary to reduce reliance on fossil fuels and reduce carbon emissions. Utilising renewable energy sources like solar power, wind power, and kinetic energy collecting are part of the integration of green energy sources in smart roads. Solar panels incorporated into the highway infrastructure can capture solar energy and transform it into electricity, powering a variety of elements including lighting systems, signage, and electric vehicle charging stations. Additionally, correctly positioned wind turbines can collect wind energy and add to the overall power supply. Green energy integration with smart highways offers a number of appealing benefits. The first benefit is that it dramatically lessens reliance on non-renewable energy sources, lowering carbon emissions and addressing the urgent problem of climate change. Furthermore, the decentralised nature of renewable energy offers a more dependable and resilient power supply, lowering sensitivity to grid failures and



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improving the overall stability of the transportation system. Additionally, using green energy encourages energy independence, reduces operating expenses, and helps create a transportation system that is more environmentally friendly and sustainable.This introduction underscores the importance of smart highways powered by green energy in achieving transportation infrastructure. sustainable The subsequent sections of this paper will delve deeper into the various aspects of smart highways and their integration with green energy, including technological advancements, benefits, challenges, and potential future developments. By leveraging the convergence of smart highways and green energy, we can create a transportation system that is not only efficient and safe but also environmentally responsible and resilient to meet the needs of future generations.

#### 2. LITERATURE REVIEW

The first large distances travelled by humans were on foot. As time went on, however, the development of the wheel gave humans the ability to travel farther and faster-the time spent travelling was reduced from months to years to days and months to months. The next best idea, given that we now have fastmoving automobiles all over the world and worldclass highways to ride on, was to build roads that the vehicle could easily move on. Making the roadways smart highways is now necessary. Energy efficient for producing electricity from solar, wind, vibration, and other sources, charging vehicles with it, illuminating it, and covering the state of the road. The vibrational energy produced by moving automobiles on the road is a significant amount of energy that is completely squandered. They also produce hothouse feasts, which contribute to global warming and ozone depletion. Therefore, some radical adjustments in how roads are thought of are required. In the past, numerous articles had demonstrated how to implement the new and improved smart highways by incorporating numerous novel elements and methods. By utilising an improved version of the currently used procedures, we are accomplishing the same thing in this study. We are introduced to small-scale renewable energy generation as a preferable enabling source for highway lighting due to the global need to reduce the escalating energy problem. We are making use of the vibration energy that vehicles produce and turn into power.

Additionally, several methods are used to transform solar energy, wind energy, and other types of green power created on the planet into electricity. The world is vibrating at some sort of pace. Nobody is really standing still. The movement of cars on the road causes large-scale vibrations. So in this case, we're harnessing vibration energy produced by on-highway traffic [5]. The interrupt signals are provided to the motor via the relay by a smart irrigation system that is configured to water the plants. The sensor detects changes in the soil's condition content and sends a signal to the little controller to turn on the pump (motor) whenever there is a change. Our two main sources of energy generation are solar panels and vertical axis wind turbines (VAWT), which harness energy from aerodynamic losses created by moving automobiles on roadways. With this hybrid system, electricity can be continuously produced by solar throughout the day and by VAWT at all times of the day and night anytime a car passes the lamppost [3]. The outcome shows that, depending on the degree of traffic on the highway, there is less energy needed in the hybrid lighting system as a result of the withdrawal of solar dependent. There is no cost to using wind energy, and it doesn't release any greenhouse gases. As a result, it provides a reliable source of energy production for any developing state. The second-fastest expanding economy on earth is in Asia.

#### **3. PROPOSED SYSTEM**

By using green energy to power various parts and processes, the proposed system intends to build a smart highway infrastructure and a network of transportation that is both sustainable and energyefficient. For optimum traffic flow, increased safety, and minimal environmental effect, the system intelligent transportation combines systems, renewable energy technologies and control mechanisms..



# **3.1. BLOCK DIAGRAM**



# **3.2.SYSTEM ELABORATION**

System consists of solar panels, LCD,IR sensors ,LDR sensors, Battery ,inverter circuit, moisture sensor, DC motor, Resistor, PCB ,Capacitor, Wifi module.

# **3.3.SYSTEM DESIGN**



In this system, a smart highway system that makes use of the controller concept has been built. This project makes use of a variety of sensors, including soil moisture sensors, relays, and LDRs.A innovative idea for monitoring the collision over the highways and sensors that using wireless communication will send a message to another vehicle is offered in order to avert it. GSM is used to identify many types of accidents. The technology is designed to use less power at night. Even when there is no car present, street lights are turned on at night. An LDR sensor is used by the system to detect an object and turn on the light. It will be OFF if the car is not there. A soil moisture sensor determines whether the soil is damp or dry. If the soil is dry, the controller receives pulses from the soil sensor, turning on the water pump until

the soil is moist. Electricity is produced using a wind turbine and solar panels, and the battery is utilised to store the charge.

### **4.CONCLUSION**

The system's capacity to serve automatically has been tested. The humidity detectors gauge the water content (humidity position) of various plants. However, if the humidity level falls below the necessary level, the humidity detector sends a signal to the Arduino board, which activates the water pump and supplies water to a separate factory. The mechanism automatically stops when the desired humidity level is attained, and the water pump is shut off. As a result, the system's functioning has been thoroughly tested and is said to work as intended. The project's goals were to reduce the side effects of this street lighting system and find a way to use less energy.

# **5.FUTURE SCOPE**

The smart highway gaining ground in the developed world essentially uses a suite of technologies that are intended to be both interactive and largely selfpowering.

This large road asset can be leveraged for a lot more than it currently is, implementing technology innovations that yield significant improvements in the driving experience. In order to enhance and reimagine the driving experience across three thematic areas communication, convenience, and safety—we have identified a number of such technologies that can be used to build smart highways. Accident victims' lives can be saved because to the Smart Highway. It offers an intelligent irrigation system that will minimise human labour.

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