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The Road of the Future

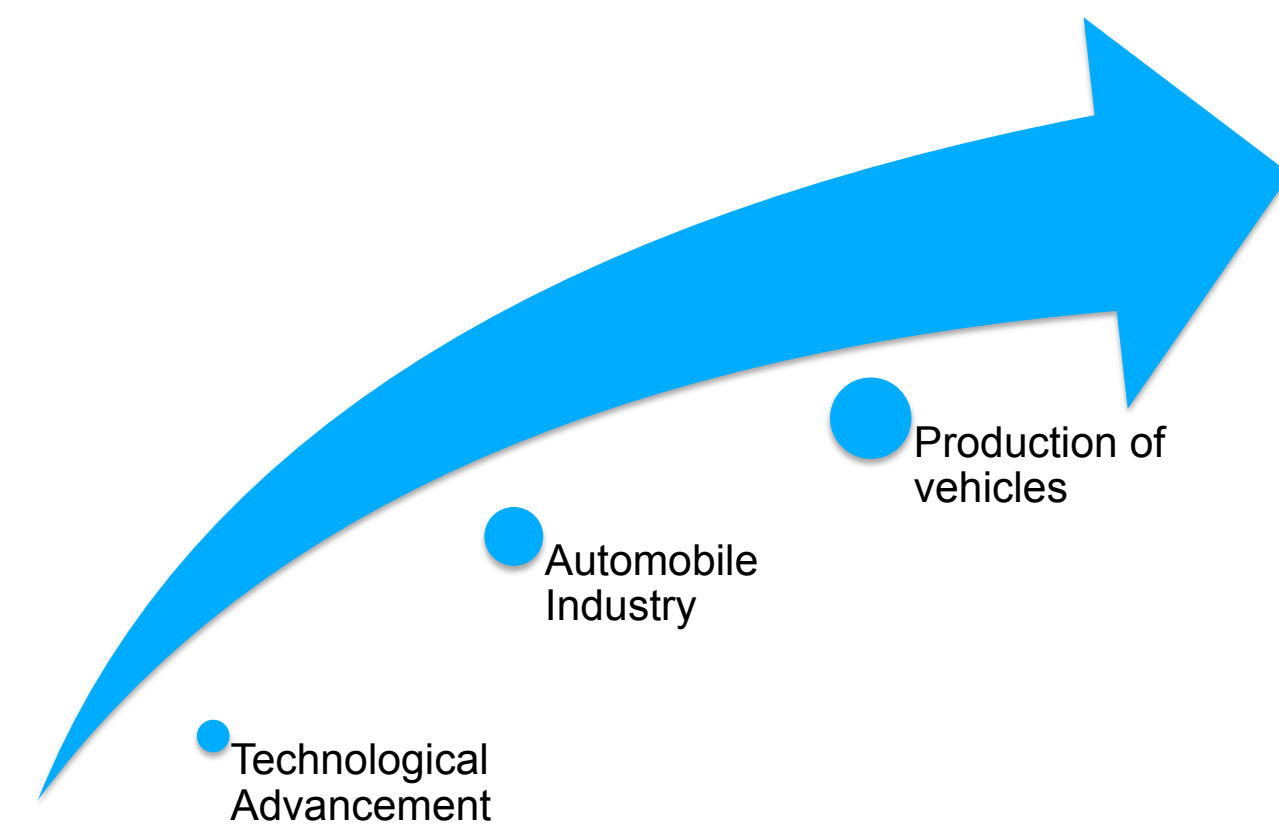
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THE ROAD OF THE FUTURE

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Situation

Roads are an integral part of a nation's infrastructure. They have become permanent additions to our geography. With the technological advancements that are heralding the new age, the implementation of smart roads will benefit society and the environment. The focus of the project is on roads rather than cars because roads are shared by the whole community. By developing roads the whole community will benefit rather than only those who can afford cars. Figure 1 shows the importance of roads on society.



According to the International Energy Agency: "By 2035 the number of vehicles will double to 1.7 billion." [1]

The earth is covered in roads...

33,421,323km (20,767,047.3 miles) of road covers the surface of the earth.
That's enough road to wrap around the equator 833 times – or enough road to get you over halfway to Mars.

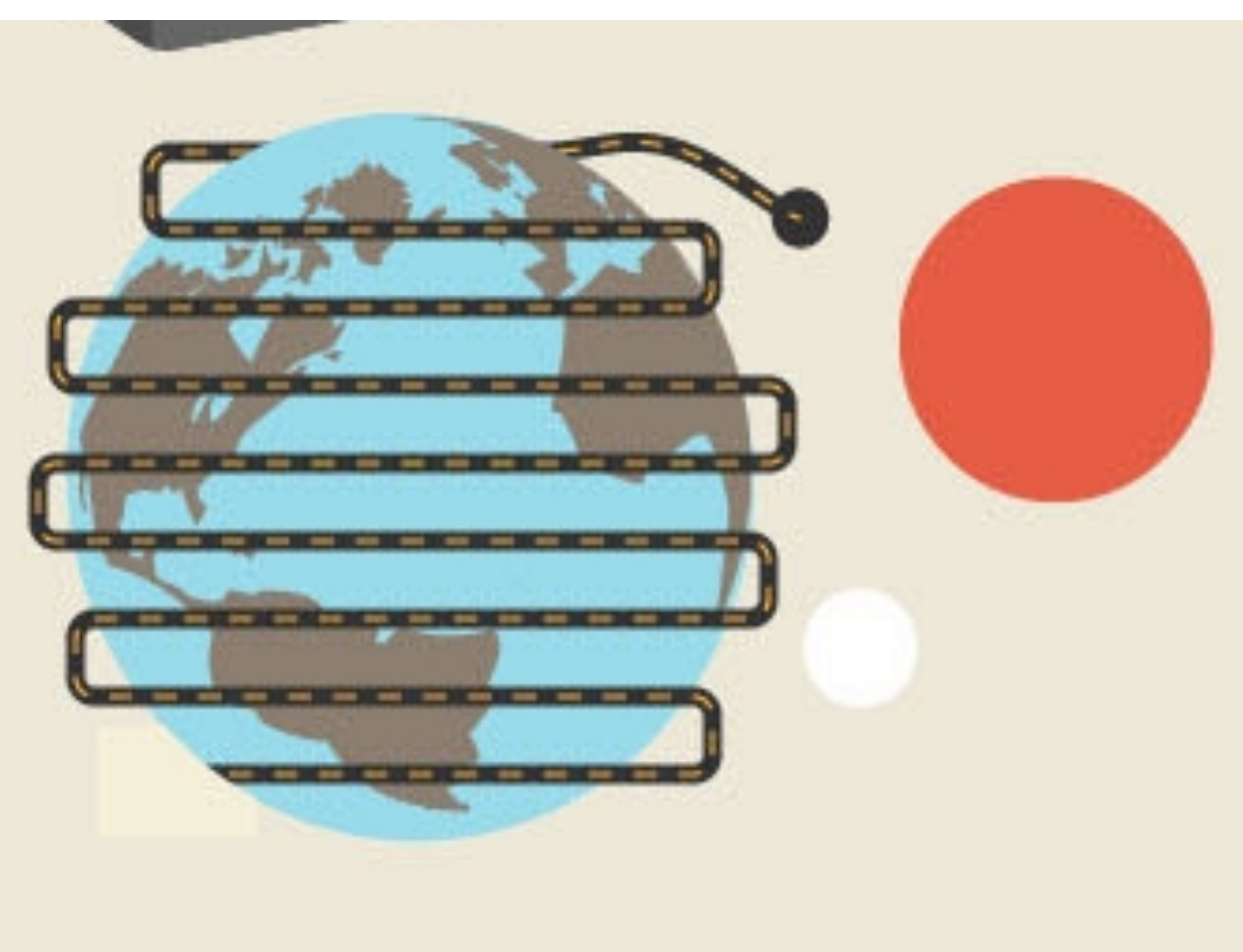


Figure 1: Existing roads [2]

Problems

❖ Roads are constructed from asphalt, bitumen and tar.

"Hazardous materials leach into the soil (Pb) harming vegetation and polluting groundwater." [3]

❖ Roads consume large quantities of energy through street lighting

"13% of electricity produced in the US is used for street lighting." [4]

❖ Roads are not electric car friendly
➢ low mileage
➢ long time required to charge

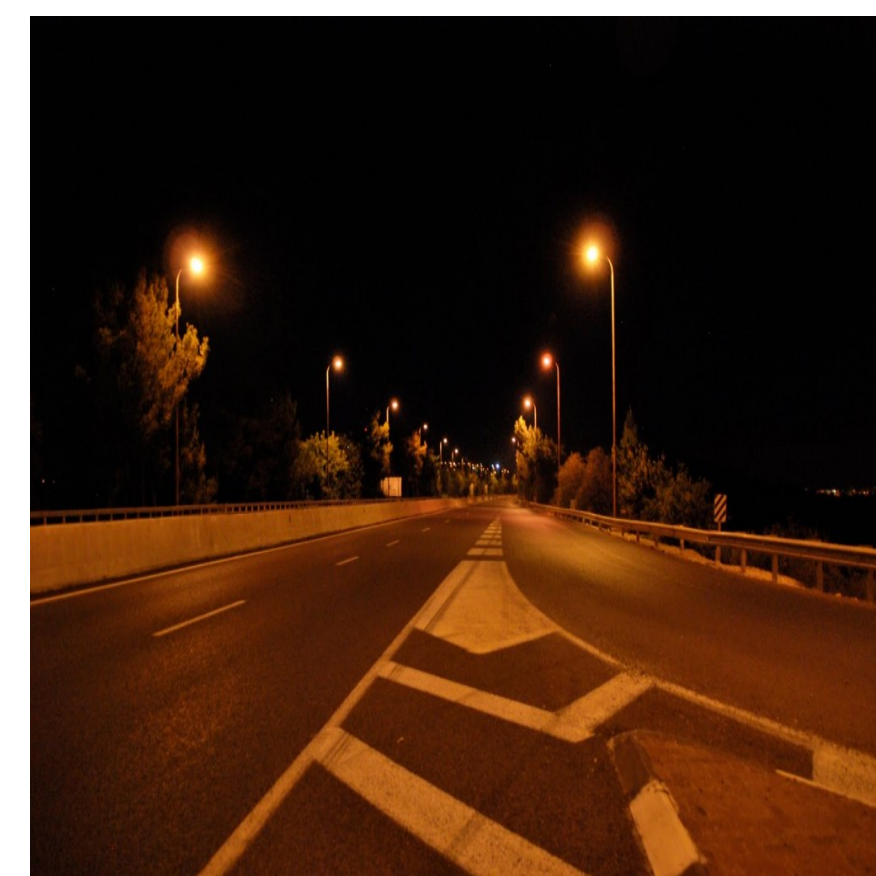
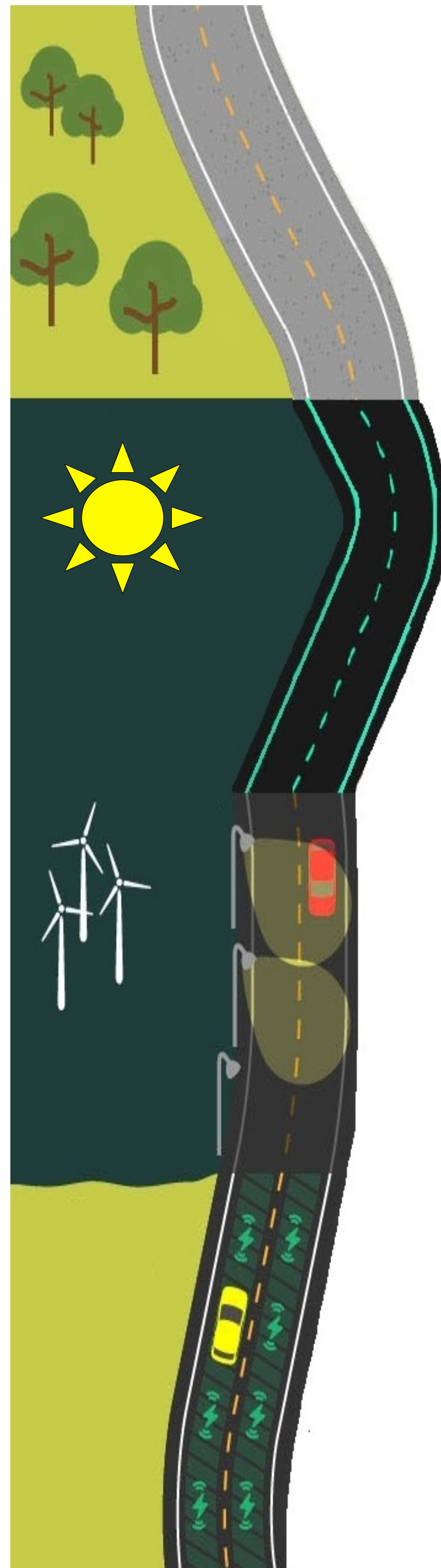


Figure 2: Empty road[5]

Solutions



➤ ECO-PAVE

A non-asphaltic material under the commercial name of ECO-PAVE. It is composed of a natural organic resin based material hence it does not damage the environment.

➤ Photo-luminescent paint

Absorbs energy from the sun during the day and self-lights during the night. Can last up to 10 hours

➤ Motion sensor lights

Detect oncoming traffic and light the road ahead only when required. Powered by a renewable source of energy such as wind turbines or solar panels.

➤ Priority induction lanes

Enables electric cars to charge wirelessly and on the go eliminating the need to stop for recharging. Uses a technique called Magnetic Resonance Coupling (MRC).

Figure 3: Solutions

Evaluation

Proposed Solution	Advantages	Disadvantages
Eco-Pave	<ul style="list-style-type: none"> Doesn't require maintenance Long lasting and very durable Easier application Made from natural products and does not harm the environment 	<ul style="list-style-type: none"> The initial cost of installation is expensive
Sensor activated street lights	<ul style="list-style-type: none"> Uses energy only when vehicles approach Can be easily applied to existing roads Not very expensive to implement 	<ul style="list-style-type: none"> Only applicable on highways in remote areas
Photo-luminescent paint	<ul style="list-style-type: none"> Does not require a power source-gets its energy from the sun. Can be easily applied on existing roads. Long lasting-lights for up to 10 hours. 	<ul style="list-style-type: none"> Not as strong as street lighting Needs areas that receive sufficient sunlight
Induction charging lanes	<ul style="list-style-type: none"> Eliminates the need for cars to stop. Encourage people to buy electric cars Significantly decrease CO2 emissions 	<ul style="list-style-type: none"> Initial cost is very expensive Cars will have to be compatible to charge along the road (existing electrical cars may not operate)

Figure 4: Evaluation factors

Conclusion

Implementation of smart roads will reduce the consumption of crude oil, protect our environment, reduce our carbon footprint and pave the way for electric cars.

References

- [1] E. Sendjaveric, "How Designers Plan To Create 'The Route 66 Of The Future'," *popsci.com*. para 3, Oct. 26, 2012. [Online]. Available: <http://www.popsci.com/cars/article/2012-10/how-dutch-designers-want-build-super-smart-highway> [Accessed: Nov. 27, 2013].
- [2] Image taken from <http://www.smartplanet.com/blog/bulletin/heres-the-smart-road-of-the-future>
- [3] T.G. Townsend, "Leaching Characteristics of Asphalt Road Waste," Florida, USA: University of Florida, 1998. [Online]. Available: http://www.beyondroads.com/visual_assets/RAP_Leachability_Study.PDF
- [4] "How much electricity is used for lighting in the US?" Jan. 9, 2013. [Online]. Available: <http://www.eia.gov/tools/faqs/faq.cfm?id=99&t=3>
- [5] Image taken from <http://transgrediendo.com/blogs/todoestoparaque/?tag=lulu>