

Project in Design Thinking Laboratory

# DESIGN IDEA FOR DIMLY LIT ROADS IN INDIA

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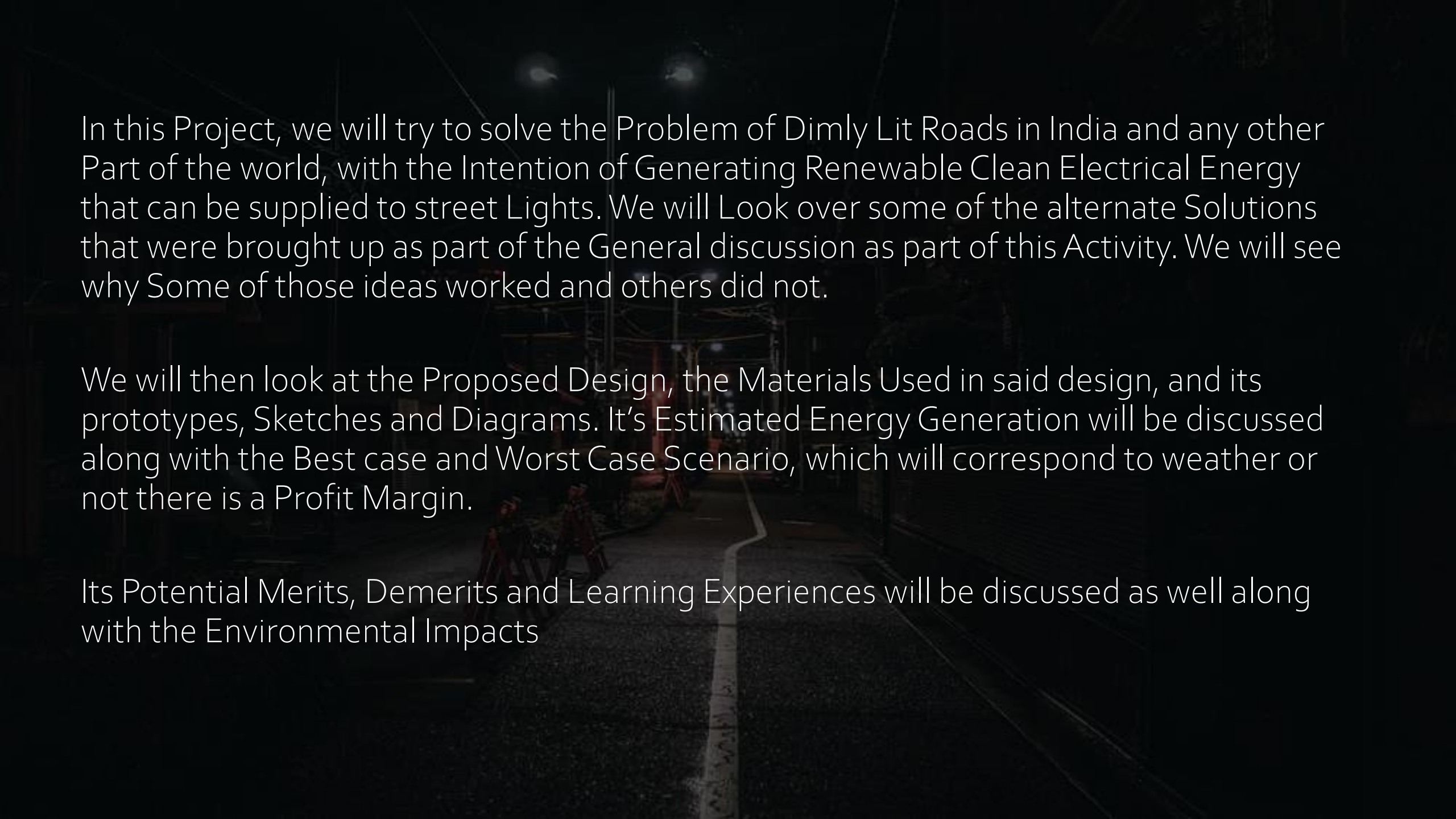
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# *Introduction*

Devanshu Surana



In this Project, we will try to solve the Problem of Dimly Lit Roads in India and any other Part of the world, with the Intention of Generating Renewable Clean Electrical Energy that can be supplied to street Lights. We will Look over some of the alternate Solutions that were brought up as part of the General discussion as part of this Activity. We will see why Some of those ideas worked and others did not.

We will then look at the Proposed Design, the Materials Used in said design, and its prototypes, Sketches and Diagrams. It's Estimated Energy Generation will be discussed along with the Best case and Worst Case Scenario, which will correspond to weather or not there is a Profit Margin.

Its Potential Merits, Demerits and Learning Experiences will be discussed as well along with the Environmental Impacts



# PROBLEM STATEMENT

*"Many Roads in India and Other Parts of the World are Dimly Lit because of Absence of Electricity for Street Lights"*

While City Corporations claim that more than 90 Percent of the conventional street lights in the city have been converted into LED lights to provide better illumination, several roads in the city still remain pitch dark. Even the arterial roads including VOC Road near the Central bus stand lack adequate streetlights and the existing streetlights are defunct posing a danger to people, particularly working women.

As per the best lighting practices suggested by the Bureau of Energy Efficiency (BEE), the spacing between two successive streetlight poles should not exceed 25 metres. However, the streetlights on VOC Road are installed at a distance of 70 metres.

*Many Working Women and men have to use these roads to Walk Home or Travel Home Every single Night, and this has led to a widespread Fear among them.*

So this problem is not only an Electricity and development one, it is also one of safety and Security of Our citizens.



An aerial photograph of a road at sunset. The road is paved with solar panels and has speed breakers installed. The sun is low on the horizon, casting a warm glow over the scene.

# IDEA RACK

1. Solar Panels On the top of street lights
2. Tiles or Roads paved with Flywheels for electricity Generation
3. Wind Turbines near the roads.
4. Piezo Electricity from Speed Breakers.

## SELECTED IDEA

### *Tiles or Roads paved with Flywheels for electricity Generation*

This Idea has the Potential to work Because:

1. It does not depend on Cars.
2. Electricity can be stored in Batteries below the Street Lights.
3. Tiles can be installed Slowly, and can thereby be installed according to available Budget and Cost.



# WHY OTHER IDEAS WERE REJECTED

## *Idea 1*

*Solar Panels On the top of street lights*

This Idea may not work because -

1. Installation of Solar Panels is Costly
2. Sunlight may not be available in enough amounts throughout the Year.
3. Buildings and Shadows May block Sunlight.



## IDEA 2

*Wind Turbines near the roads.*

This Idea may not work because-

1. Installation of Wind Turbines is costly
2. Wind may not be available throughout the Year
3. Nearby Buildings may Block the Wind
4. Wind Turbines are Huge and they require more space



# IDEA 3

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*Piezo Electricity in Speed Breakers.*

This Idea may not work because-

1. Not All roads have cars that pass through them every day.
2. A Human's Weight is not enough to create the Pressure needed to power the Piezo-Electric Batteries.
3. Maintenance is Difficult







# WORKING AND CALCULATIONS

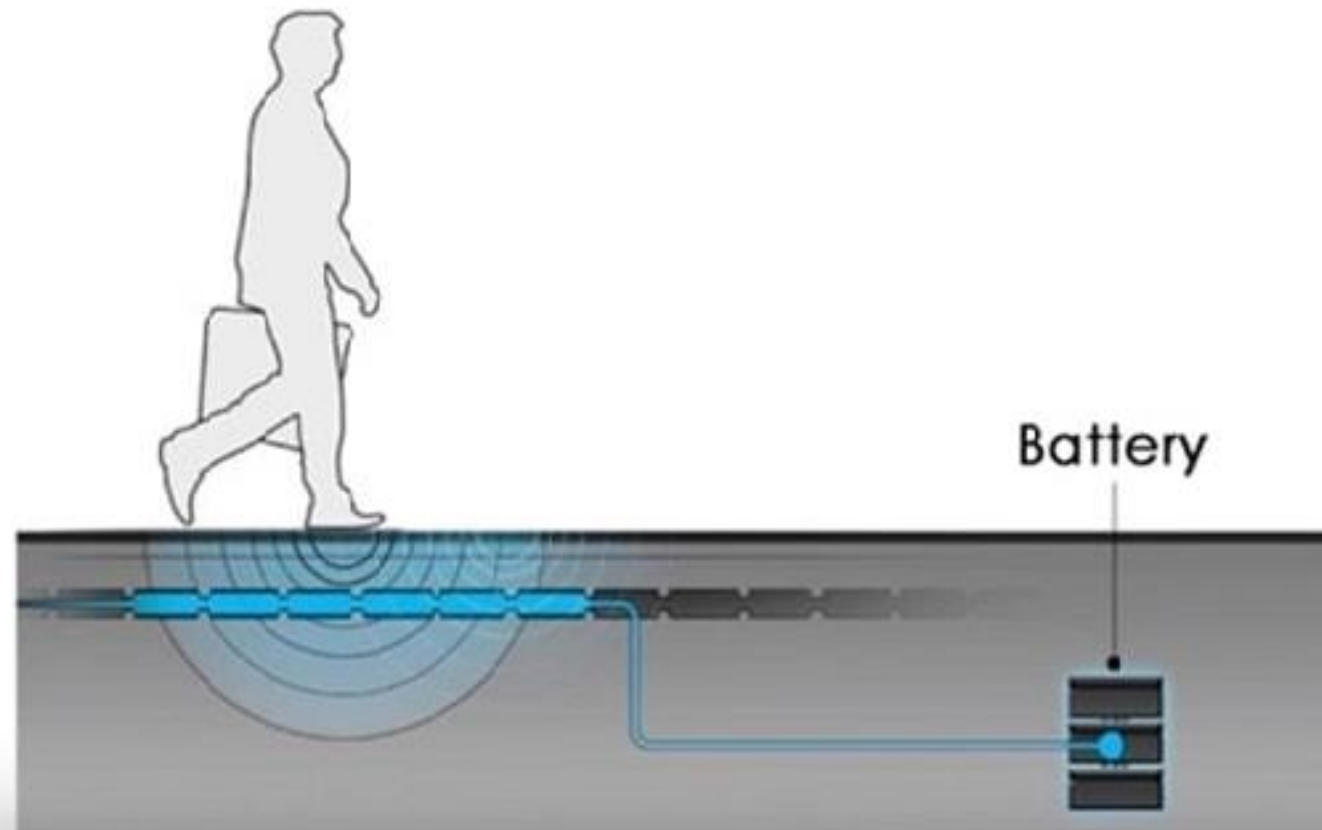
Krishnaraj Thadesar

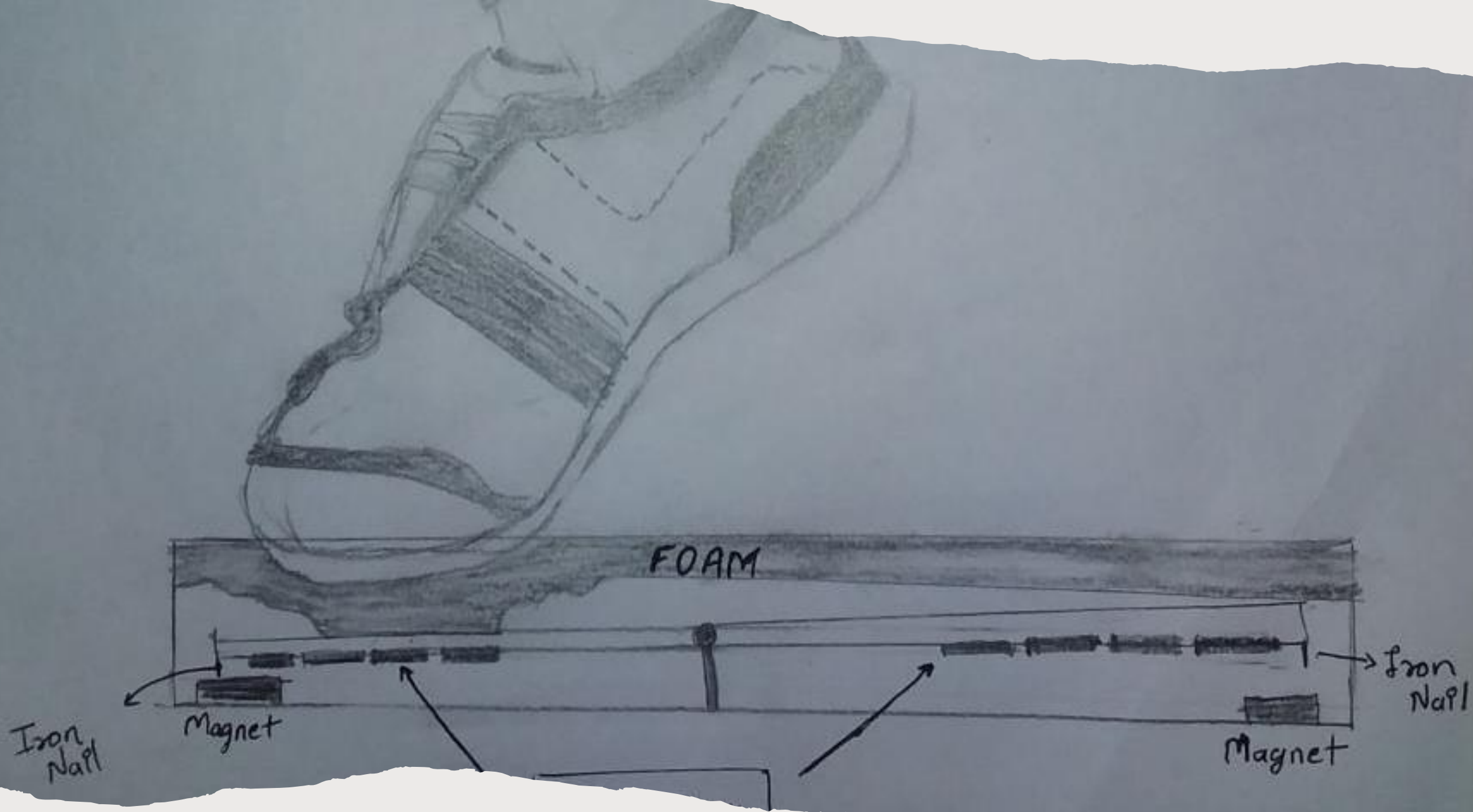


HOW TILES WOULD LOOK LIKE TILES



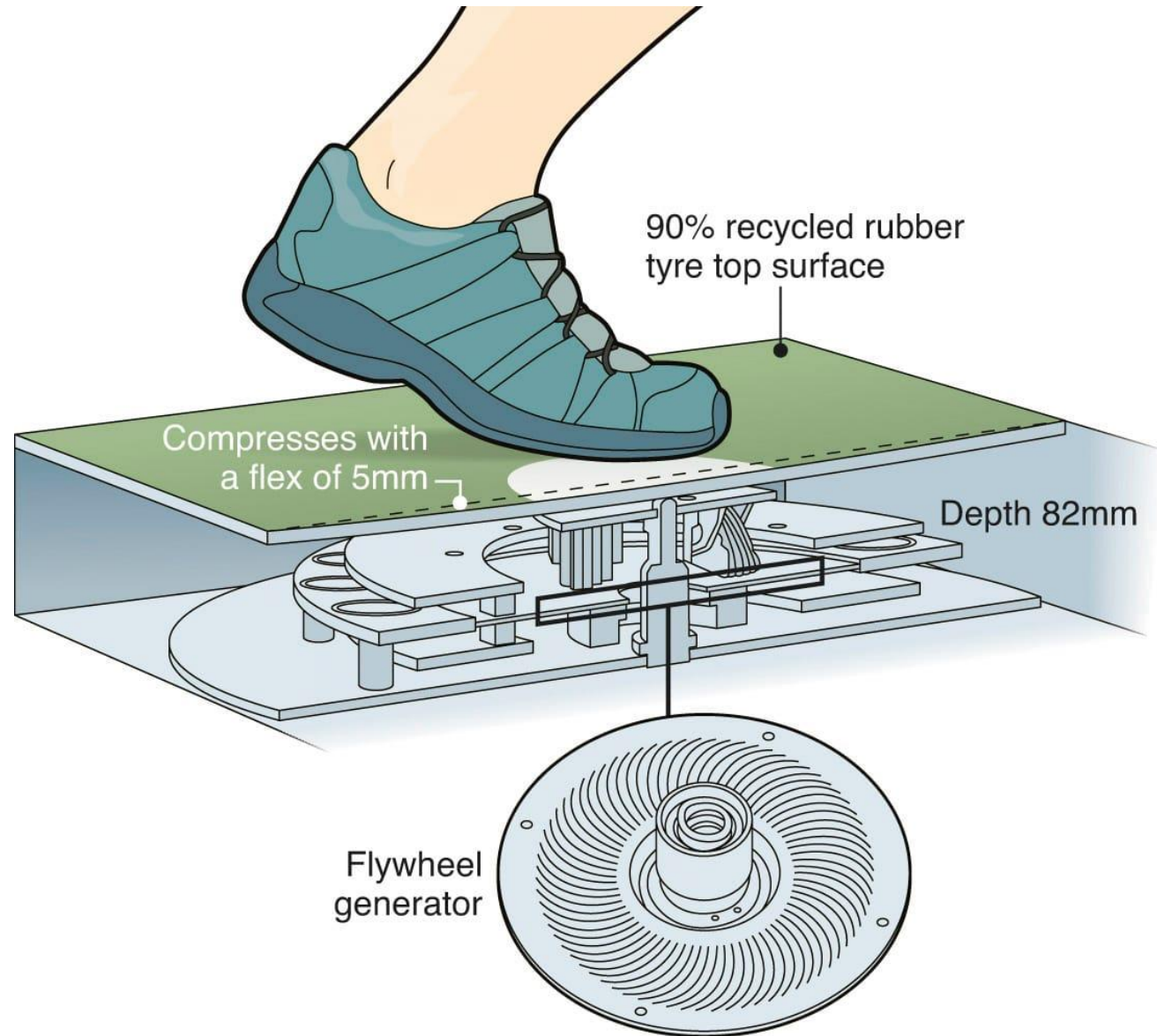
# POWER GENERATING SIDEWALK

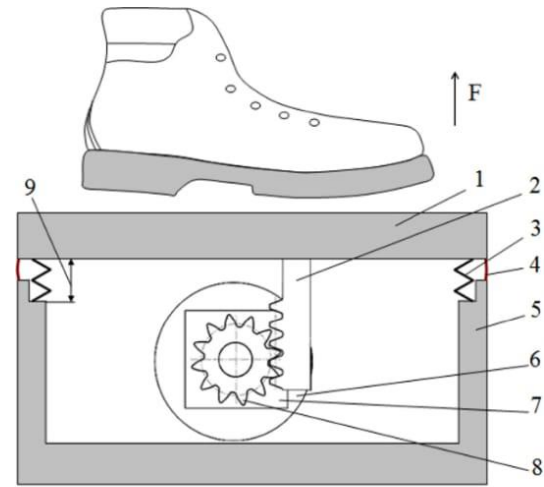




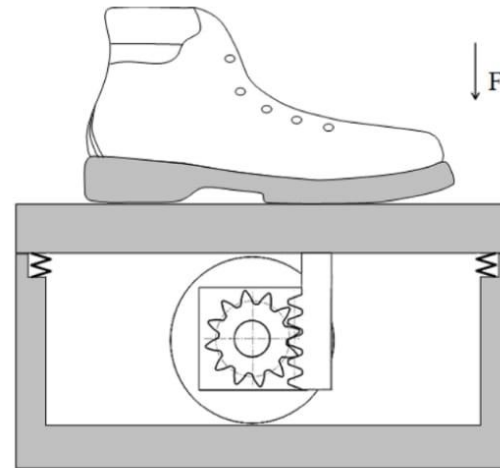
Courtesy: Tirth Thesiya





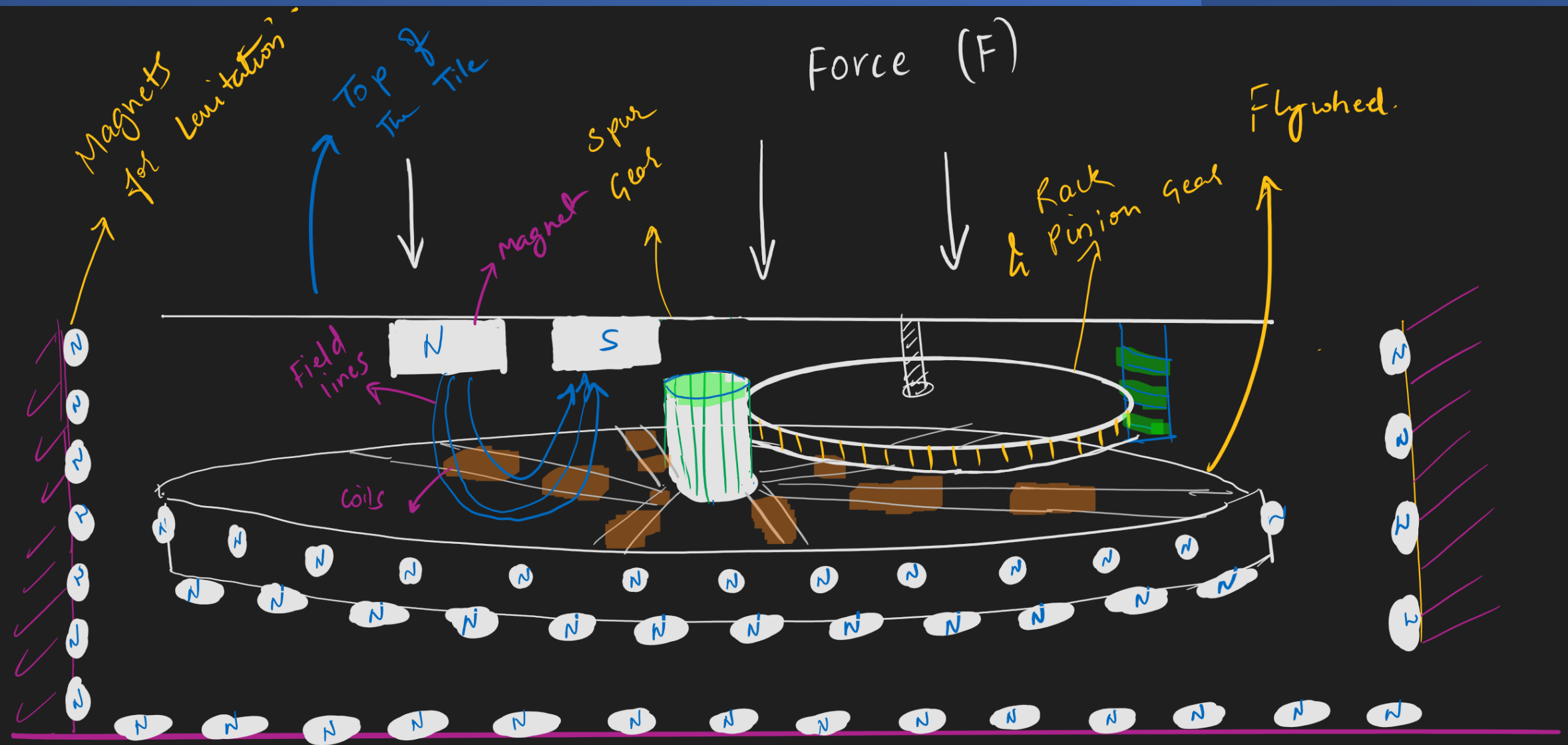


(a) before pressing



(b) at the time of pressing





# CALCULATIONS

On Every step, the tile is pressed	= 1 cm.
Number of Teeth on the Rack and corresponding Pinion Gear	
That will be travelled in that 1 cm	= 5 (say)
Number of Turns on Each Coil	= 500
Number of Coils = 5 Magnetic Field	= B = 0.1 T
Area	= 20 cm x 10 cm
Time taken for one rotation	= 0.2 s
Total Rotations	= 5
So Electromagnetic Induction	

$$E = 5 * N * \frac{d\phi}{dt}$$

E = 100 V for Each Step



Time Walked by People in a Day	= 10 Mins
With each push, the Flywheel, due to inertia will spin for	= 1 Min
Number of Estimated Steps	= 500
so Time Spun in Total with coils	= 3 Hours in a Day
Energy in the Battery	= 20W * 3H = 60 Wh
Cheap and Efficient LED Tubelights	= 20W
Brighter LED Street Lights	= 100W
Time Required to Last	= 10 Hr
Energy Needed by One Street Light	= 100W * 10 = 1 Kwh = 1 Unit Daily.
So Tiles Needed	= 1000/ 60 = <b>16 for Each Street Light Per Night.</b>

# MERITS AND DEMERITS

Tirth Thesiya







# MERITS

1. Environment Friendly
2. Controls Climate pollution and global warming
3. Streets wont be dimly lit, and so will be safer and prevent crimes.
4. Cost Efficient
5. Will make use of the Energy expended by vehicles and people walking.
6. Recycling materials

# ROOMS FOR IMPROVEMENT

1. Reduce Resistance in Circuit and Wires to Increase Power
2. Increase number of coils to increase EMF Generated.
3. Use more Efficient LED Lights.
4. Disadvantages may include Maintenance due to Delicate Electric Components



The background is an abstract composition of various textures and colors. It includes a dark grey grid-like pattern on the left, a dark blue-grey textured area at the top, a reddish-brown brick pattern in the center, and a light brown textured area on the right. The title 'MATERIALS AND COMPONENTS' is centered in white, bold, sans-serif capital letters. A thin white horizontal line is positioned below the title.

# MATERIALS AND COMPONENTS

Pranaav Suratwala



# MATERIALS

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The tiles are made from nearly 100-percent recycled materials (mostly rubber) and some marine grade stainless steel.

They can be retrofitted to existing structures and are waterproof as well as designed to withstand outdoor conditions. The tiles are completely waterproof, so they can endure rain, snow, and ice.


Tiles are made from recycled polymer, with the top surface made from recycled truck tires.





# COMPONENTS





# HEAVY METAL FLYWHEEL





MAGNETS



COILS



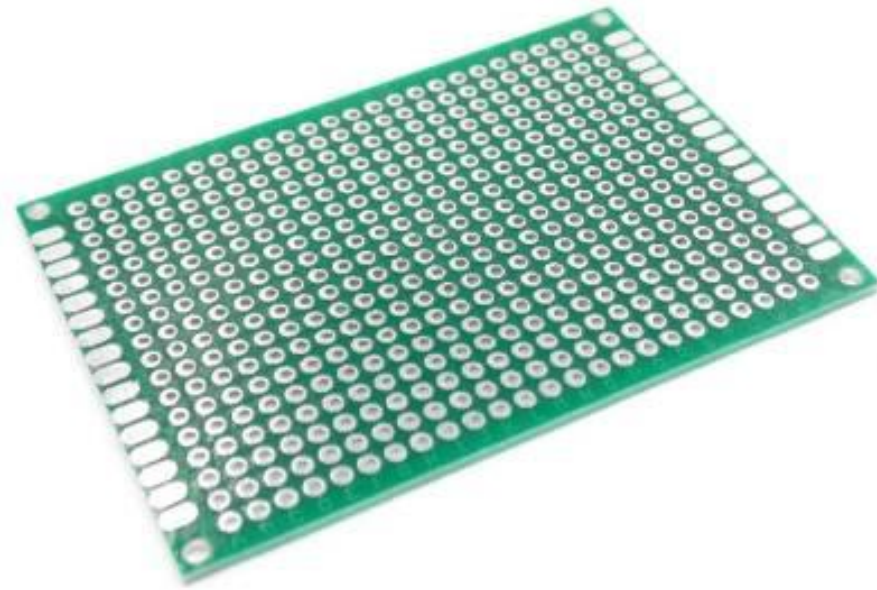


BATTERY

# GEARS

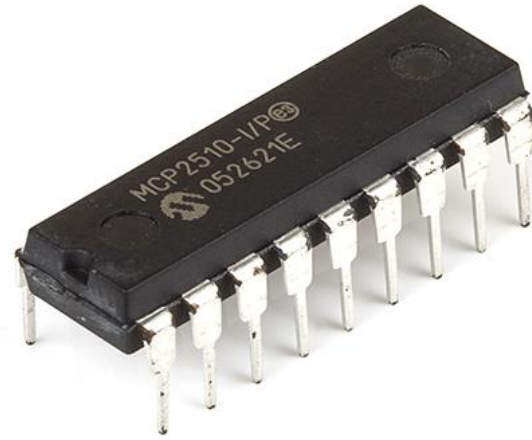
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CIRCUIT BOARD





CONTROLLER IC

# PROTECTION IC



These tiles, from manufacturing to installation should cost about 5000 Rs - 12000 Rs per square foot. With more localization these tiles would be cheaper and accessible in rural areas.



# PRICING



# CONCLUSION AND RESULTS

It was a learning Experience, and the Process of Designing a Product and Finding a Solution to a Problem statement was understood. A Product was Designed and the Problem Statement was provided a viable solution to.

It was found that Each Tile can produce about 20W of power in a day. For one Streetlight we would just need 16 tiles

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[5] Inertia and Mass

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# *Prepared By:*

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Krishnaraj PT - Presentation,  
Calculations, Report

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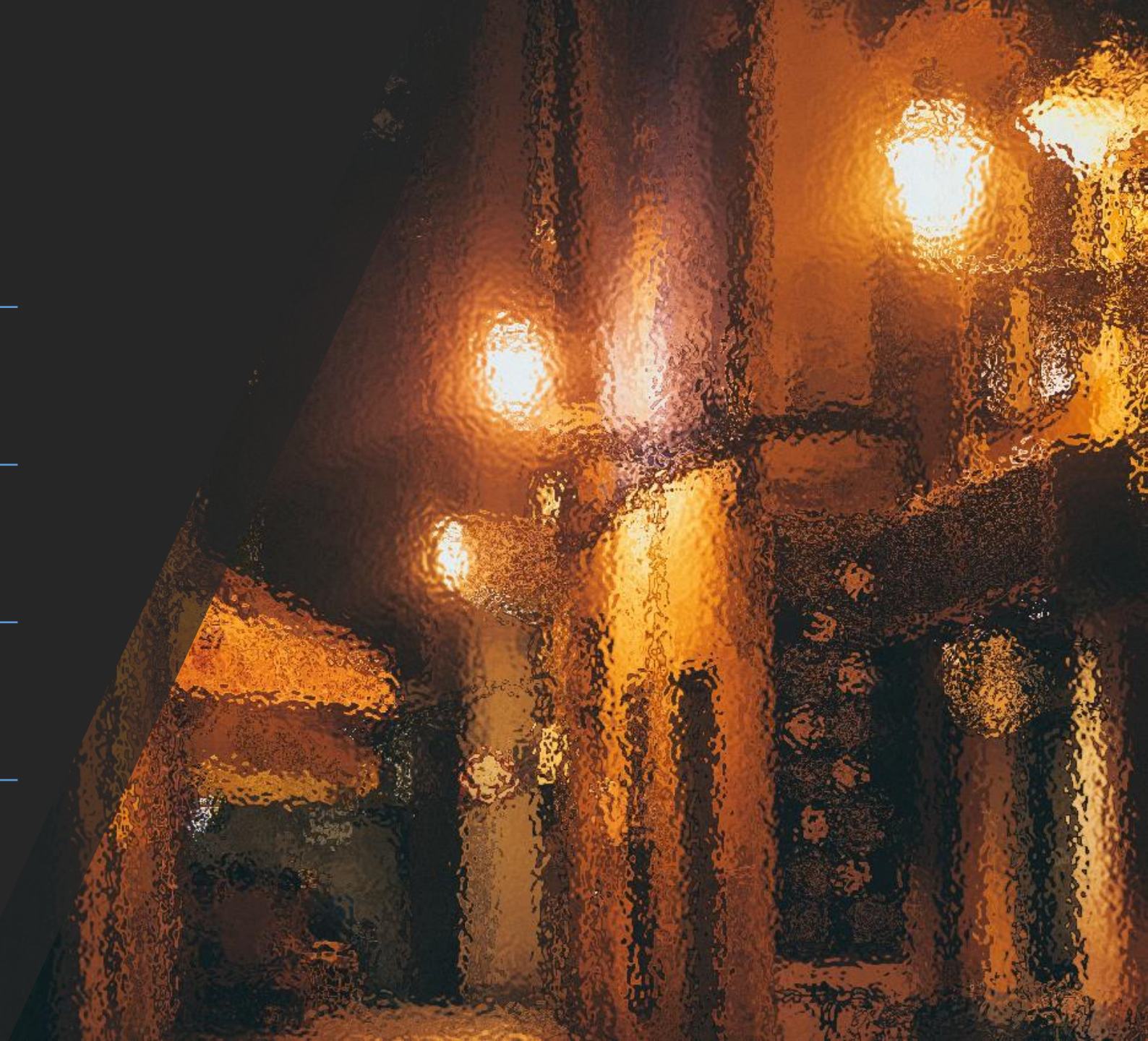
Tirth Thesiya –  
Merits Demerits and Diagrams

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Pranaav Suratwala –  
Materials and Components

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Devanshu Surana –  
Theory and Idea Rack Analysis







*Thanks for  
listening!*