Vecto Hill Line

Introduction:
Transportation, one of the crucial task in the present world. After many innovations, advancements we are using a wide range of transportation systems as per the requirement. But what about the transportation in Hilly terrains and mountains ? Though there are many advancements in the plains like metro networks, EVs and else, the scenario in these hilly terrains remained at the roads. It might be a bit easy for local people to reach the far places in these hills and valleys, but for visitors, the connectivity is again a big challenge.

Let the inner engineer in you handle this by creating an efficient solution.
< Metro Network in Hills >

Problem Statement:

The participants are required to provide a solution for the following:

<u>Main</u>: A solution of a vehicle and network design is required for the efficient transportation between 2 hills where there should be a stop in the valley between them. You can also use these natural resources available (River, Hills, Rocks) to power your vehicle partially. (or even use any waste from cities)

<The geographics of the venture are as below:
  - Altitude of hills
  - Length of Valley in between
  - >

Bonus: The proposed solution needs to be expanded to a network of 10 hills which are shown in the picture for the given conditions.

<The geographics of the venture are as below:
  - Altitude of hills
  - Steepness of the hills
  - Length of Valleys in between
  - Wind speed formulation>

You need to cleverly design a transportation system and propose a schedule for a vehicle to cover all these places in a ride, the maximum capacity of the vehicle and finally a project budget for implementing this.

Note: The geographic and a 3d map will be provided.

Guidelines:
  1. You can used any of the following CAD softwares:
     SolidWorks, Catia, Creo, Fusion360

2. Don't forget to label the model, measurements and annotations are a must.
3. You can also use some manual paper drawings to explain. (Incase the design is only submitted on paper instead of CAD model the marks will be allotted accordingly)
4. Use the links given in the references section to get familiar with the context and get some inspiration if required.
5. Showcase your physics by cleverly formulating the parameters of the vehicle.
6. Calculations can be Handwritten or a latex based pdf
7. Use as many natural resources as possible.
8. Include the images of the designs too in the relevant section of the presentation as it adds more clarity to the text.
9. You can interrelate any ongoing research too to your context and add to your supportive hypothesis.
10. Don't forget to include the references of each and every resource you included in the presentation
11. Finally make a proper presentation including all the required aspects. (preferably submit a pptx/pdf of the report)

Submission requirement
Main:
The design should include:
- The CAD model of the Vehicle. [strictly a CAD model]
- The CAD model or a design of the tracks or supporting mechanisms.
- A demo simulation video or a detailed explanation on the complete mechanism of how the vehicle works.
The calculations should include:
- Time taken for the Transportation (for the particular route given in the PS).
- The speed, power consumption, maximum load per vehicle and any other factors of the vehicle
 Supportive theories for the following are required:
- Stability of the Vehicle under fluctuating weather conditions
- Safety mechanism/ Backup plan
Bonus:
The bonus level submission should include:
- Plan for the expansion of the transportation network with
    - A possible schedule of a vehicle (single vehicle) as per the given route and stops. (Consider the starting time of the ride is 6:00 AM)
    - Power consumption of the vehicle for the whole ride.
    - Total Budget required for the project to be implemented.
A report explaining/including all the above mentioned points.

Zip all the files (CAD Models, Calculations,) with the naming as follow and submit your work.

Sl.No	File	Naming Format
1	CAD Models	[TeamName]_cad_[modelName]
2	Calculations	[TeamName]_calcs.pdf
3	Report	[TeamName]_report
4	Zip file	[TeamName]_metro_Xpecto

Evaluation (250pts)

Aspect	Points	Weightage
Creative usage of the available natural resources	25	10%
The proposed design of the vehicle (based on the mechanism)	75	30%
Simulation and Calculations	40	16%
Bonus plan	60	24%
End presentation	50	20%

References

Prob
- https://www.businessworld.in/article/Challenges-Of-High-Altitude-Logistics-Rough-Terrain-Logistics/10-04-2021-386205

Solutions
- The Top 10 Coolest Funiculars of the World - YouTube
- What are Funiculars and How do they Work? - YouTube
- How do metro systems cope with whopping great hills? - City Monitor

Team Size
3-5 members

Duration
4 days

Prize pool
Winner 5k
Runner 3k
Special mentions 2 X 1k

(Special 3d printed momentos/prizes can be offered too)

Budget: 10k + 2k = 12k (Excluding judges)

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How will the participants be benefited ?
By doing this amazing work students will be able to
- Get the crisp of designing a practical vehicle by putting the concepts of physics they learnt into action.
- Can know about the gap between the theoretical and practical aspects involved in the engineering design.
- Know the value of efficiency and creativity by effectively using the available resources as instructed in the PS