TEAM 077

High-speed Railroad Network and Station Designs for the Eastern Province

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Introduction

In the Eastern Province, where car reliance is significant, population growth projections indicate a rise in car ownership, leading to increased environmental pollution and more vehicles being scrapped due to traffic accidents. A potential solution to mitigate these risks is the implementation of high-speed Railway (HSR) network.

This project focuses on the initial phase of establishing a HSR network, emphasizing route planning and the strategic placement of stations across the province. Additionally, transportation hubs will be designed to integrate elements inspired by the Arabian Gulf, balancing modern functionality with regional and cultural aesthetics.

Mission Statement

I. Product Description

- A HSR network, including hubs (stations), locomotives, and routes, covering strategic locations in the Eastern Province.

II. Key Business Goals

1. Introduce the product to secure a funding sponsor by 2025.
2. Complete the remaining design phases by 2027.
3. Complete the construction and initiate the product utilization by 2033. One year before the world cup at 2034.

III. Customers:

- Saudi Ministry of Transportation.
- Eastern Region Municipality.
- Saudi Arabian Railways (SAR).

IV. End Users:

- Daily Commuters.
- Business Delegates.
- Tourists/visitors.

V. Assumptions:

- Safer than automobile travelling.
- Reduces Travel Time, especially at long distances.
- Accessible to all.

VI. Stakeholders:

- Saudi Citizens.
- The Saudi Government.
- SAR corporation.
- Automobile dealers.
- Gas station corporations.

Objective Statement

I. Goal:

- Establish an HSR network design and design a hub that connects it to its users

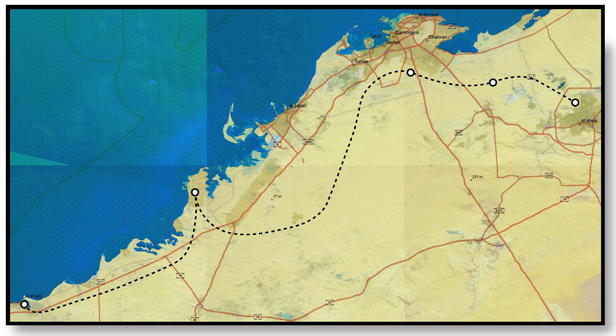
II. Specifications and Constraints:

Constaints and Specifications	Off the shelf	Project specific	ISE	ARE	CE	ME
Maximum of 7 main stations		✓	✓			
Minimum distance of 50 km between stations		✓	✓			
Building capacity of 31,000 per day		✓		✓		
HSC minimum endurance of 50 MPa		✓			✓	
Solar panels provide at least 20% of energy		✓				✓
At least 1 section for future metro projects		✓		✓	✓	
Deployment of at least 2 types of IoT Devices	✓		✓	✓		
At least 50 pickup/drop off parking spots		✓		✓	✓	

Prototype Design

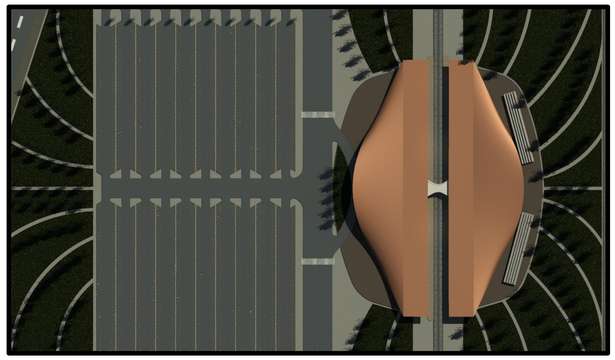
I. HSR Network:

- A detailed map including topography and major highways showing the stations' locations and pathing across the province:



II. Station:

- A showcase model of the station site, including the building itself, artificial roads, artificial grass, and solar-powered lights:



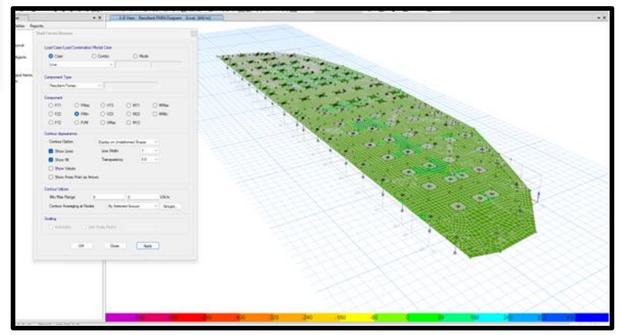
Validation

I. HSR Network:

1. Number of stations
   - The number of stations are 5 (less than 7), the first constraint is not violated.
2. Distance between stations
   - The minimum distance between any two connected hubs is 50 km, the second constraint is not violated.

II. Station:

- Simulation of load and shear indicated the building is stable, meeting the specs



Conclusion

The HSR project in the Eastern Province ushers in an ambitious initiative to tackle travelling times and environmental challenges, aiming to revolutionize mobility & minimizing pollution. While the project covers the first step, it sets the stage for future expansions, reflecting a commitment to a sustainable, clean, and interconnected future.