Problem Statement #2

Multi-Modal Cross-Border Route Selector

## Scenario

A small logistics provider wants a quick way to determine the best shipping route for cargo traveling across borders using different transportation modes (e.g., only air, only sea, only land, or combinations like sea-air, land-sea, air-land, and so on).

You need to create a tool that accepts shipment details and returns optimal routing suggestions ( a small set of ranked options) based on estimated costs, transit times, and feasibility when crossing borders.

## Key Tasks

### 1. Multi-Modal Route Data Simulation

Prepare or simulate a small database of possible routes and modes:

**Examples:**

**Air:** Airport A → Airport B (cost, transit time)

**Sea:** Port C → Port D (cost, transit time)

**Land:** City X → City Y (cost, transit time)

* Each segment should note which countries or border crossings are involved.
* Include a simple capacity or size limit per mode if you like (optional).

### 2. Shipment Inputs

Allow user to input shipment details such as -

* Origin (city/airport/port)
* Destination (city/airport/port)
* Cargo details (weight, volume, or just one simplified parameter)
* Priority (e.g., do they prefer lowest cost or fastest transit?)

### 3. Route Assembly & Logic

Determine the possible multi-modal routes between the origin and the destination, and calculate the cost and the transit time required.

E.g., City X → (Land) → Airport A → (Air) → Airport B → (Land) → City Y

For each potential route, calculate:

Total estimated cost (sum of segment costs, converted to a prominent currency)

Total transit time involved including all the transfers from the origin to the destination.

Filter out the impossible routes (e.g., cargo too large for a small aircraft segment).

### 4. Ranking & Output

* Show at least two or three top route options ranked on the basis of their cost and estimated transit time.
* Let the user choose if they want the fastest vs. cheapest route or see a combined ranking

### 5. User Interface

* A simple form to input shipment data (including, but not limited to origin, destination, cargo specs, priority).
* A results page listing route options (mode sequences, cost, time).

### Stretch Goals (Optional)

**Carbon Footprint:** Provide an approximate CO₂ emission estimate per route, letting users see an “eco-friendly” option.

**Real-Time Updates:** Simulate a small “delay” event or cost change in one of the modes and recalculate routes.

**Mode-Specific Constraints:** Weight limits for air vs. sea vs. land.

**Perishability:** Select the mode depending on the perishability of the goods (e.g., if cargo is perishable, air might be mandatory to ensure that the cargo reaches before it gets perished)

## Evaluation Criteria

* Completion of Objectives & Functionality
* Business Viability & Real-World Applicability
* Quality and Realism of Data Simulation
* User Interface (UI) & User Experience (UX) Design
* Innovation & Technical Complexity