TRADE ANALYSIS AT INDIAN PORT

1. Project Overview and Objective

This project focuses on cleaning, transforming, and analyzing raw data in Excel, followed by developing an interactive Power BI dashboard to generate valuable business insights.

The main objective of this project is to analyze India's port-level import and export performance by cleaning, transforming, and visualizing trade data using Excel and Power BI. The goal is to develop an interactive dashboards and insights. Enabling a comprehensive understanding of India's international trade dynamics.

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2. Data Sources

- **Source Description and Timeline:** INDIA DATA PORTAL / 2018-2024
- **Domain**: Commerce

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3. Problem Statement

- To study import and export patterns across ports, states, and years for better trade planning and analysis.
- To identify top-performing ports and commodities contributing most to India's international trade.
- To analyze country-wise trade distribution to understand key trading partners and market dependencies.
- To evaluate trade balance trends to assess overall export–import performance and economic impact for Indian ports.

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4. Attribute (EXPORTS & IMPORTS column) Details:

Attribute Name	Data Type	Description
Month	String	Month of the export transaction
Year	Integer	Year of the export transaction
State Name	String (Text)	State in which the export port is located
State Code	Integer (Numeric)	Numeric code assigned to each state
Port to Export & Import	String (Text)	Name of the port used for exporting goods
Export & Import Country	String (Text)	Destination country for the exported goods
Principle Commodity Code	String (Text)	Alphanumeric code (e.g., J6, T9) representing the principal export commodity
Commodity Name	String (Text)	Name or category of the exported commodity

Quantity Unit Measurement	String (Text)	Unit of measurement for quantity (e.g., Kg, TONNES, LITRES, NOS)
Value of Commodity QTY	Numeric (Integer/Decimal)	Quantity of goods exported
Value of Commodity QTY in USD	Numeric (Decimal)	Value of the exported commodity in U.S. Dollars (USD)
Value of Commodity QTY in INR	Numeric (Decimal)	Total export value in Indian Rupees (₹)
Port Type	String (Text)	Type of port (e.g., Sea Port, ICD, Air Cargo, etc.)

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5. Tools & Technologies

- **Excel:** Performed comprehensive data cleaning and transformation to prepare datasets for analysis.
- **Power BI:** Developed robust data models, implemented DAX calculations, and designed interactive dashboards with insightful visualizations to support data-driven decision-making.

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6. Data Pre-Processing (Excel / Power Query)

Tasks Performed:

- **Data Cleaning & Transformation:** Removed duplicates, handled missing values, standardized formats, Find and replace, trim, clean, separate the date column in month and year only and created calculated column (port type), month name.
- **Filtering & Sorting:** Organized data to focus on relevant records.

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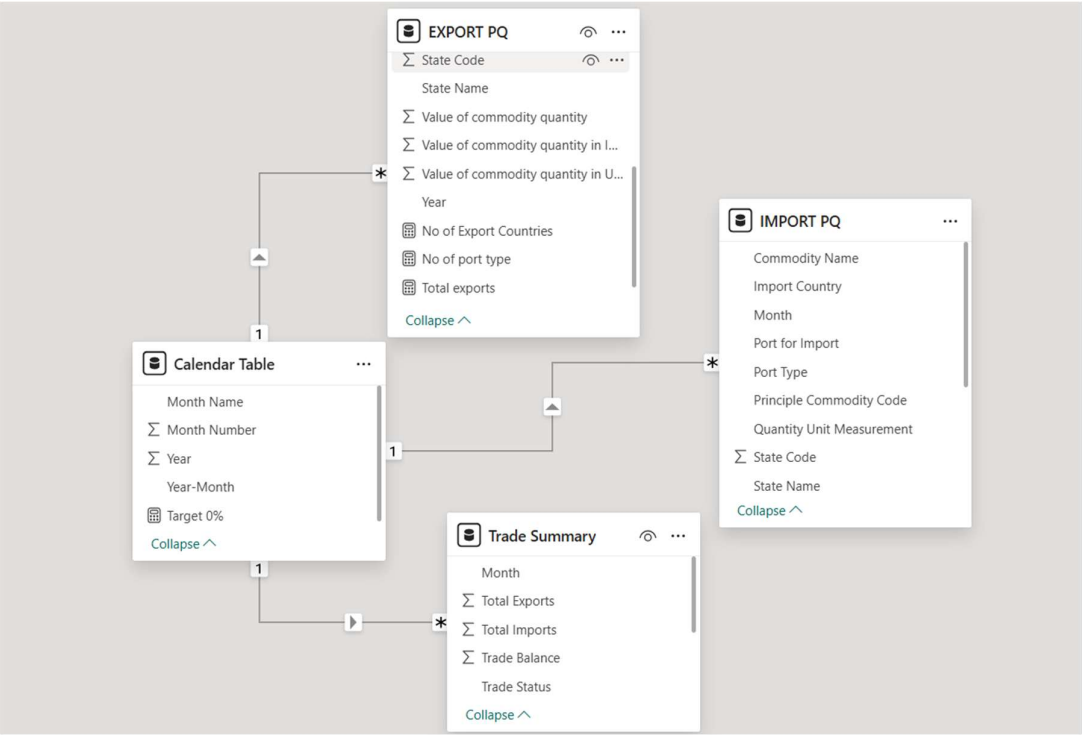
7. Data Modelling and DAX (Power BI)

- **Data Model:**

  Established a relational data model by connecting the **Export PQ**, **Import PQ**, **Trade Summary**, and **Calendar Table**. Defined appropriate **one-to-many cardinality** relationships to ensure accurate time-based and port-wise analysis. Created a **Calendar lookup table** to support time intelligence functions and maintain consistency across all trade datasets.



- **Calculated Columns & DAX Measures:** Implemented DAX formulas for key metrics, such as Calendar table, trade summary table, and created measures are Total Exports, Total imports, Trade Balance (total exports – total imports), Trade balance in percentage (((Total Exports - Total Imports) / (Total Exports + Total Imports)×100)), No of export country and import country. And No of port type. Port type full form in detail. Following :
    - ICD/ Dry port - Inland Container Depot / An inland terminal connected to a seaport by rail or road.
    - SEZ - A Special Economic Zone (SEZ) is a designated area within a country that has different economic
    - CFZ - Cargo / Commercial Free Zone
    - Others = Private terminals, minor ports, or specialized logistics hubs).

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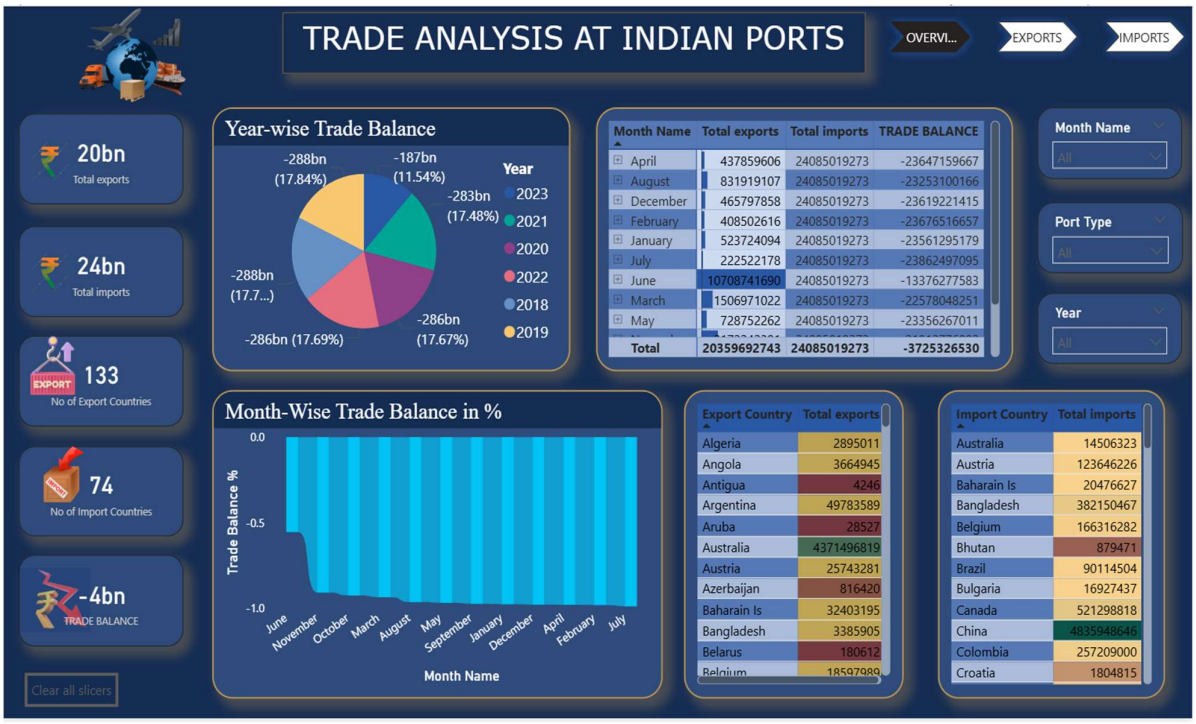
8. Analysis and Visualizations (Power BI)

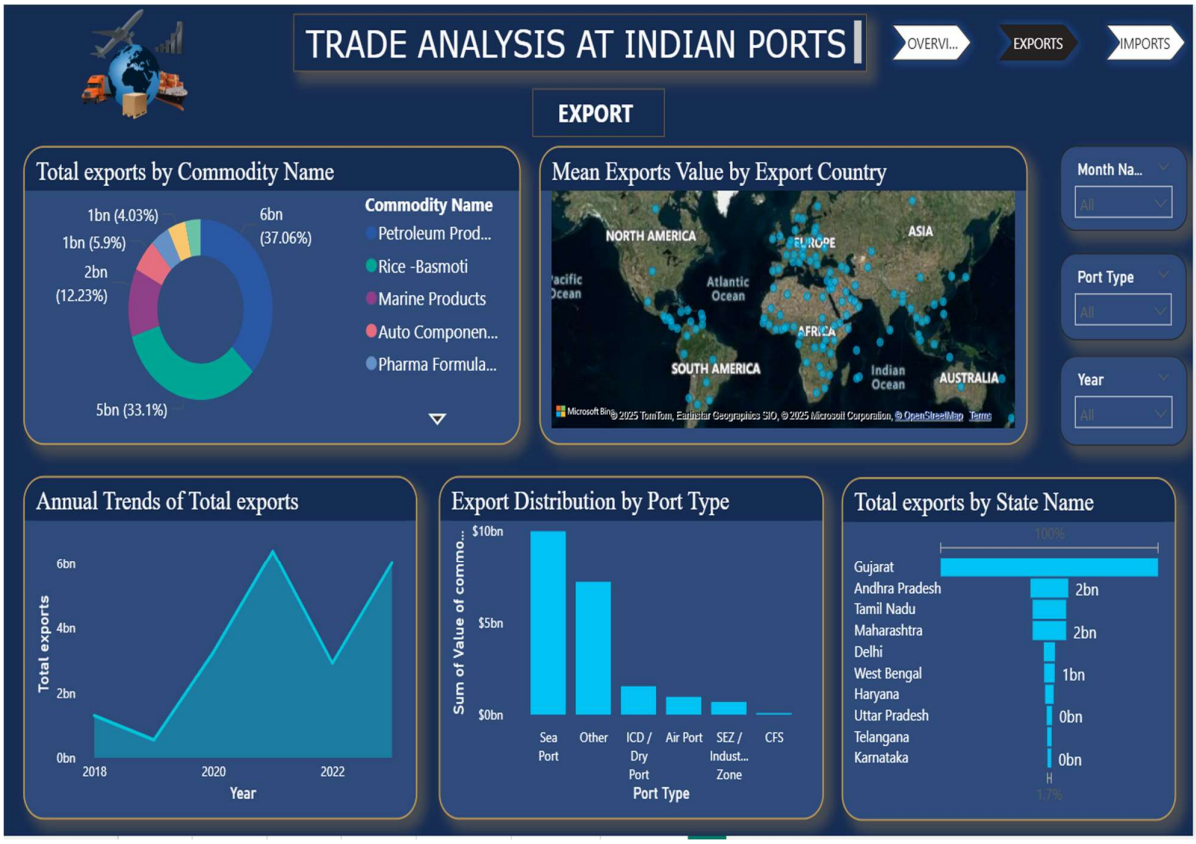
Dashboard:

The dashboard presents a comprehensive analysis of India's trade performance, featuring key indicators such as Total Exports, Total Imports, Trade Balance, Number of Export and Import Countries, and Year-wise and Month-wise Trade Balance (%).

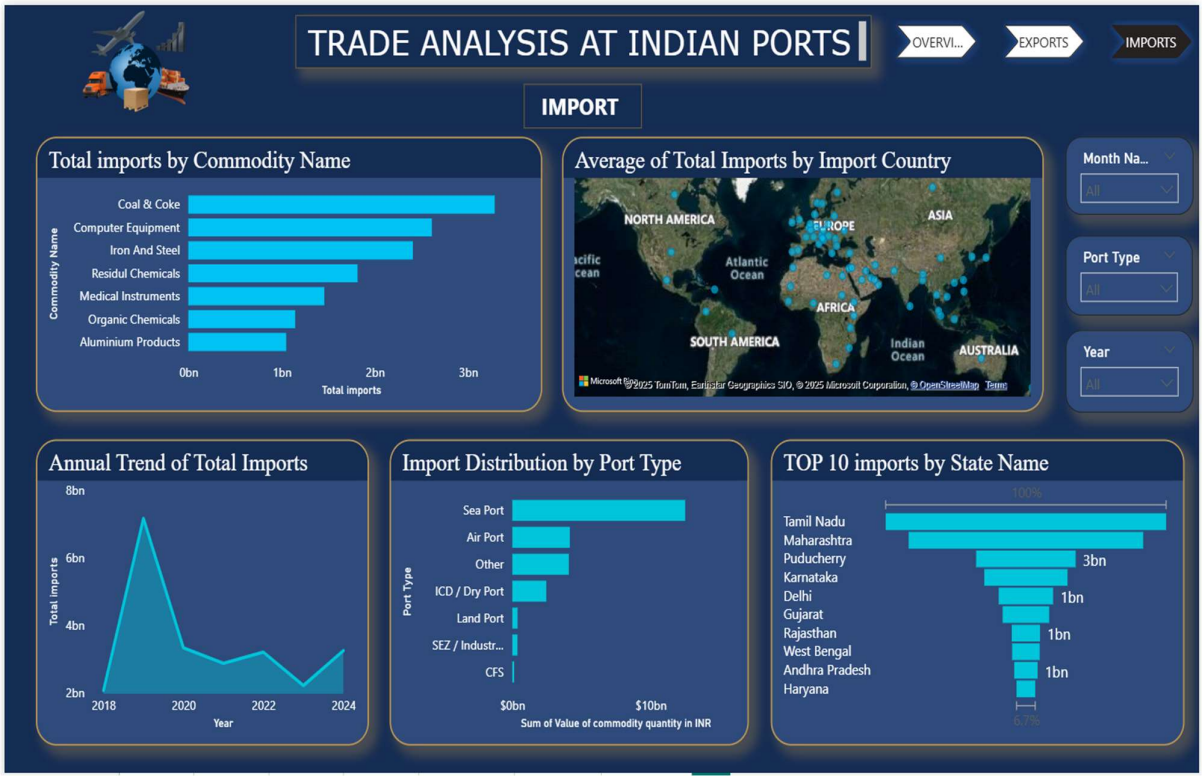
It also includes detailed visuals on Export and Import Distribution by Port, Commodity-wise Trade Values, and Annual Trends of Total Imports and Exports.



(OVER VIEW)



(EXPORTS)



(IMPORTS)

9. Insights & Conclusions

Key Findings

- **Trade Imbalance**

  Total Exports: ₹20bn

  Total Imports: ₹24bn

  Trade Balance: -₹4bn → India's imports exceed exports, indicating a trade deficit.

- **Top Port Type Contribution**

  Sea Ports dominate both exports and imports, followed by Air Ports and ICD/Dry Ports.

  Sea Ports handle over 60–70% of total trade value.

- **Leading Commodities**

  Exports: Petroleum Products (37%), Rice-Basmoti, Marine Products, Auto Components.

  Imports: Coal & Coke, Computer Equipment, Iron & Steel, and Residual Chemicals.

- **Trade Trends Over Time**

Exports: Grew significantly after 2020, peaking in 2021, then slightly declining before recovering in 2023.

Imports: Fluctuated sharply; a peak around 2019–2020 followed by dips and partial recovery in 2024.

- **Monthly Pattern**

  Trade balance remains negative throughout all months.

  June shows the largest trade deficit (-₹133bn).

- **Country Distribution**

  Exports: Australia, Argentina, Brazil, and Austria are top destinations.

  Imports: Vietnam, USA, UAE, and Taiwan are key sources.

Analytical Insights

Descriptive Analysis (What happened?)

- India's **import value consistently surpasses export value**, leading to a sustained trade deficit.
- The **majority of trade** flows through **sea ports**.
- Commodity-wise concentration shows dependency on energy and industrial goods (both import and export).

Diagnostic Analysis (Why did it happen?)

- **Import-heavy sectors** such as energy (Coal, Petroleum) and technology (Computers, Electronics) drive higher import bills.
- **Export growth** is mainly in commodities with limited value addition (Petroleum, Rice, Marine Products), showing dependency on raw/semi-processed goods.
- Seasonal patterns and global demand fluctuations affect monthly balances.

Predictive Analysis (What could happen?)

- If current trends continue, **trade deficit will widen** due to rising industrial imports.
- However, export growth potential exists in **pharma and technology sectors**, which can balance trade in the next 2–3 years.
- **Sea Port dependency** might strain logistics—diversification to ICD/Dry Ports could stabilize trade distribution.

Prescriptive Analysis (What should be done?)

- **Boost export diversification:** Encourage high-value manufacturing exports (electronics, pharmaceuticals, engineering goods).
- **Reduce import dependency:** Strengthen domestic production of energy and machinery.

- **Infrastructure enhancement:** Improve Air and ICD port efficiency to handle higher-value exports faster.
- **Policy focus:** Incentivize export hubs and Free Trade Zones to attract investment and enhance competitiveness.

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10. Conclusions

The analysis reveals that India continues to face a **trade deficit**, with imports exceeding exports mainly due to heavy dependence on **energy and industrial goods**. While sea ports remain the backbone of trade, greater diversification through **ICD and Air Ports** could improve efficiency. Export performance shows strong potential, especially in **pharmaceuticals and technology sectors**, which could help narrow the deficit in the coming years.