



# **Methodology for the distance calculation**

**April 2023**

**Version 1.0**

**Prepared by TCI – IIMB Supply Chain  
Sustainability Lab, IIM Bangalore**

## Distance Calculation Methodology

An important part of the emission calculation is the distance between origin and location. The tool has used the following methodology to calculate the distance between origin and destination points:

### **Air**

The tool uses the open-source database **OurAirports** to populate airports and determine the latitude and longitude of the airport.

The tool uses the Haversine formula to calculate the distance between the origin and destination airports. The Haversine formula is a mathematical equation used to calculate the distance between two points on the surface of a sphere, such as the Earth. It is used to determine the "as the crow flies" or air distance between two points on the Earth's surface. The formula takes into account the latitude and longitude of the two points to calculate the great-circle distance, which is the shortest distance between the two points on the surface of the earth.

### **Water**

#### Domestic

The tool identified the 31 major and minor ports in India that are used for coastal shipping. The distance in nautical miles was calculated for every pair of ports using the online website named ports.com and populated on the tool. The nautical miles were converted to kilometres using the conversion factor of 1.852 kilometres for every nautical mile.

#### International

The user is urged to fetch the distance between the origin and destination ports using the website ports.com and enter it into the tool. The conversion from nautical mile to kilometre happens as per the conversion above.

### **Road**

The distance between the origin and destination is calculated using the Google distance matrix API, with the travel mode being driving. The Google Distance Matrix API is a web service provided by Google that allows developers to obtain distance and travel time data between two or more points. The Google Distance Matrix API uses a matrix algorithm to calculate distances and travel times between origins and destinations.

### **Rail**

The distance between the origin and destination is again calculated using the Google distance matrix API, with the mode being rail. If the user does not enter the exact train station, the application will identify the nearest railway station and calculate the road distance between the origin points and the nearest train station. Similarly, for the destination location. The distance displayed in the tool is the sum of the road distance between the origin point and the nearest rail station, the rail distance



between the origin rail station and the destination rail station, and the road distance between the destination rail station and the destination location.

### **Contact Us**

For any queries or suggestions.

Dr. Aditya Gupta

COO, TCI-IIMB Supply Chain Sustainability Lab

IIM Bangalore

Mail : [Aditya.gupta@iimb.ac.in](mailto:Aditya.gupta@iimb.ac.in)

Ph : 080-26993554