



How Google's Environmental Insights Explorer (EIE) is supporting Izmir in the identification of low carbon mobility options

TECHNICAL CASE STUDY



SUMMARY

Izmir Metropolitan Municipality has used [Google's EIE Transportation Emissions and Trips data](#) to better understand their transport sector's carbon footprint and the mobility patterns of citizens. EIE is a tool utilising various data sources and modelling capabilities to assist cities in assessing emissions sources, conducting analyses, and formulating strategies for impactful actions. The EIE five-year data from 2018 – 2022 allows the city to have complete information on trips occurring in the city, including private vehicles, buses, bikes, motorcycles, and ferry data. It also identifies low-carbon mobility options that inform the Sustainable Urban Mobility Plan (SUMP) and the Carbon Neutrality Roadmap.

AIMS / OBJECTIVES

1. *Understanding the impact of trips and Transportation Emissions data in the Metropolitan City*
2. *Comparing EIE emissions data with the existing data in the GHG inventories of the city*
3. *Identifying low-carbon mobility options in the city*

OUTCOMES

1. *Identifying how Google EIE Transportation Emissions data can enable the city's GHG emissions inventory*
2. *Comprehensive understanding of all mobility options in Izmir, including ferry data and pedestrian mobility*
3. *Verification of EIE's potential to support the identification of new low-carbon mobility options in the city and inform the new SUMP*

Cover image: Izmir Department of Transport

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INTRODUCTION

Izmir Metropolitan City is the third largest city in Turkey and the largest of the Aegean Region; as a gulf city, it creates substantial passenger and cargo traffic. The Municipality comprises 30 municipal towns and has a population of 4.31 million inhabitants and a territory of 12,007 km². It is an important city regarding industry, agriculture and tourism and a centre of logistics and a commercial hub. Given its position on the western edge of Anatolia, Izmir is a gateway to the sea.

Izmir and ICLEI Europe have been working together on the EIE platform since 2021, analysing the value that this tool can bring to the city. The tool was found useful especially for its Transportation Emissions data calculations and providing insights to understand the city's mobility patterns.

The city is at a stage where they have access to the tool and a deep understanding of the tool's data and methodologies. In addition, the city has been exploring different uses of the tool for their climate action planning processes, emphasising the transport sector.

IZMIR'S CLIMATE STRATEGY AND TRANSPORT DECARBONISATION GOALS

Since 2015, Izmir has been working to define a climate strategy aimed at reducing GHG emissions from their most emission intensive sectors, to foster economic growth and improve their citizens quality of life. In 2020, Izmir developed their Sustainable Energy and Climate Action Plan (SECAP, 2020) in which the city has committed to:

- ★ CO₂ emission reductions of at least 40% (per capita) against a 2018 baseline year by 2030.
- ★ Increase its climate resilience and provide secure access to sustainable and affordable energy in a manner that is integrated with the mitigation and adaptation plans.

Izmir's SECAP is aligned with the development of the Green City Action Plan (GCAP, 2020), which also states the investment plan for climate action for the city over the next decade. In 2022, Izmir was selected as one of the 112 cities at the EU Climate Neutral and Smart Cities Mission, which will allow them to set the path to become carbon neutral by 2050.

Transport is the second largest emitting sector in Izmir, accounting for 23.15% of total emissions, after the industrial sector which accounts for 31.4% of city GHG emissions. Izmir has a detailed Transportation Master Plan (2017/2018) which includes a modal split and transport data supported by analyses for different parts of the metropolitan city. The city is working with the National Government and the Ministry of Transport to develop Izmir's Sustainable Urban Mobility Plan (SUMP).

Izmir aims to foster more diverse modes of low carbon transportation alternatives and to reduce traffic congestion. Some of the measures defined by the city by 2030 are focused mainly in increasing the capacity and efficiency of mass transit, including the rail system network (tram and metro) expansion, developing park and ride systems in transportation hubs and transfer points, and increasing ferry-ride capacity. In addition, the city aims to increase pedestrian infrastructure in central city streets, to expand the cycling infrastructure and to assess the feasibility of scaling-up existing local mobility options.¹



Dreamstime / Wittayayut Seethong

1 Source: Izmir 2021 Report to CDP-ICLEI Track



GOOGLE'S EIE DATA FOR IZMIR METROPOLITAN CITY

When the collaboration between ICLEI Europe and Izmir started, the available data on EIE for the city did not cover the entire Izmir Metropolitan Municipality. The initial boundaries (Figure 1) were adjusted accordingly by Google (see Figure 2) allowing the city to have a comprehensive data source of their mobility patterns and Transportation Emissions data. Currently, EIE is able to provide data for Izmir Metropolitan City from the years 2018 to 2022.

Correcting Izmir's boundaries on EIE showed the importance of understanding the city's geographical and political distribution in order to have the most accurate data possible, especially when analysing trips and Transportation Emissions.

Figure 1: Initial boundaries for Izmir in EIE



Figure 2: Corrected boundaries for Izmir in EIE



TRANSPORTATION EMISSIONS AND MOBILITY DATA ANALYSIS

Having clarified and corrected the boundaries in EIE, an assessment between existing Transportation Emissions and mobility data in EIE and Izmir's GHG emissions inventory data.

From a methodological perspective, it is important to mention that Izmir's emissions are calculated consistently under a top-down approach (fuel sales methods), suggested by the Baseline Emissions Inventory (BEI) Methodology of the EU Covenant of Mayors; Google uses a bottom-up approach, aligned with the GPC Method.

The Climate Change and Clean Energy Directorate is responsible for the emissions inventory, which is carried out with the support of an external firm every two to three years. The process of developing the inventory includes collecting data from national government open data sources and from official institutions such as utility companies and transport authorities. Public transport emissions are calculated based on real fuel consumption data, while private vehicle estimates are based on percentage share, number and types of vehicles registered in the city.

In order to develop the data analysis on EIE and Izmir data, the following premises were defined:

- ★ 2018 as the year for which the data is compared
- ★ Only fuel-based on-road Transportation Emissions can be compared, as rail data (tram, metro, ferry) are emission-free modes in EIE.
- ★ The comparison of Izmir emissions data for on-road transport, has been made against EIE emissions data from full travel activity data.
- ★ All emissions (CO₂, CH₄ and N₂O) were included in the analysis without disaggregation, as the city and EIE report aggregated GHG emissions, measured in tCO₂e.

Having the comparable emissions data from the two sources (EIE and city inventory), the difference between the two was obtained. Table 1 reflects the results of the analysis carried out.

The difference in on-road Transportation Emissions is 2.87%, being higher in EIE than in the city inventory.

Table 1: EIE and city inventory transport emissions data comparison

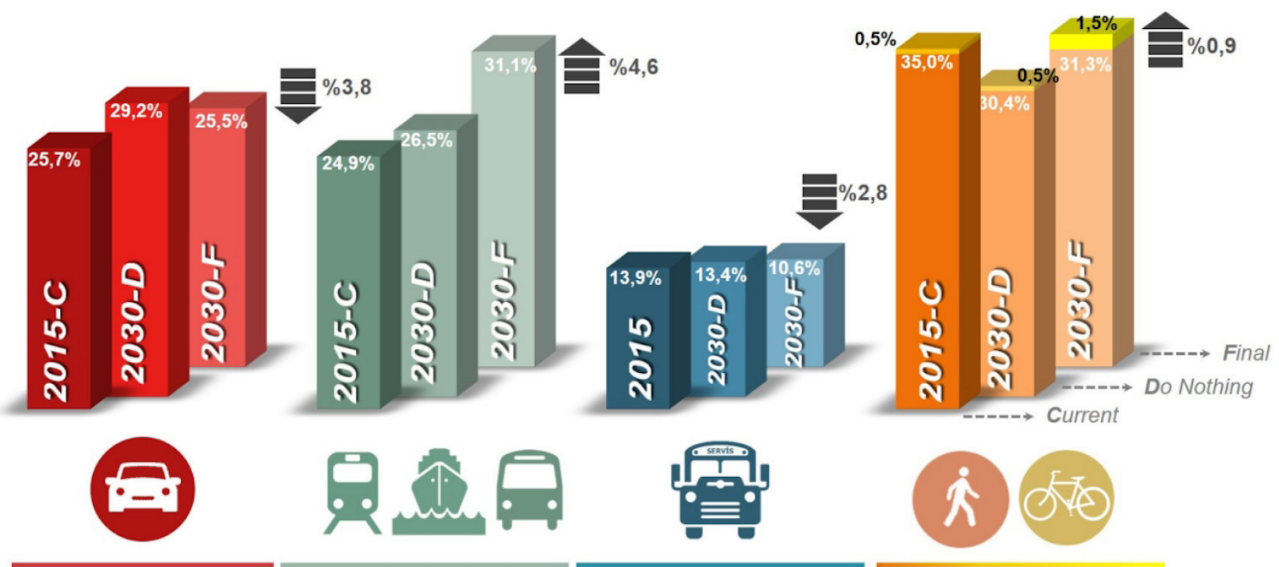
EIE on-road transport emissions (tCO ₂ e) (before boundaries correction)	2,960,000
EIE on-road transport emissions (tCO ₂ e) (after boundaries correction)	5,430,000
Izmir on-road transport emissions (tCO ₂ e) (private transport and bus)	5.278.046
Difference in tCO ₂ e	151,954
Difference (%)	2,87 %

One reason for this difference could be the different methodologies used by Izmir and Google. Yet despite this difference, EIE data is close enough to the data calculated by the city, which provides confidence for further use and exploitation in Izmir.

EIE also provides trip data for different modes of transportation including walking and cycling. In Izmir, the last survey estimating modal share was conducted in 2014, considering a sample of 40,000 households for all trips in 24 hours (2014). In addition, to better understand the modal share, Izmir Metropolitan City carried out field studies in 2015-2016 to update the database and correct deficiencies. All this work was completed by the end of 2017. Based on this analysis, the city identified the need to improve their modal split by 2030 to increase the transport sector's efficiency and sustainability, with focus on reducing private transport trips, increasing active mobility (walking and cycling) and encouraging the use of low-carbon public transport.

The trips data availability in EIE could inform the development of the SUMP in Izmir, as it is able now to provide trips data in all the modes of transport in the city. The Climate and Energy Directorate aims to work with the transport team to develop an integrated climate and transport assessment to identify low-carbon mobility options for the city in the future, which will be included in the new SUMP by 2023.

Figure 3: Izmir entire city trips by model distribution



Source: Izmir Transportation Master Plan, 2017



OUTCOMES AND IMPACT OF THE STUDY

The boundary correction on EIE in Izmir, allowed the city to better understand their emission patterns and trust EIE as a thorough and reliable data source. Izmir now has a full picture of all trips in the city, setting a basis for a ground source of data to better calculate their city transport emissions.

Currently Izmir develops its GHG emissions inventory every 3 to 4 years, and with access to EIE on an annual basis, this process could be optimised in the future. Izmir will update their GHG emissions inventory in the year 2023, using EIE as one of their new sources of data.

The availability of ferry trips data, which before was not available for the city, allows them to have a comprehensive understanding of this type of trip, which are commonly

used for citizen transportation and for moving goods and services between cities in the gulf area.

EIE data has been identified by the city's climate team as a complete data source that could inform the city's updated modal split calculations and be a reference source that could help the city update the new modal share household survey, a basis to develop the city's SUMP. This work will be done together with the city's climate and transport teams.

Having detailed annual emissions data from EIE will allow Izmir to monitor the progress of their transport emissions targets and actions and identify low carbon mobility actions. EIE data can support them as they identify targeted decarbonisation actions in the different modes of transport.



Dreamstime / Ozgur Senegin



Interview with **Caglar Tukul, PhD, Izmir Metropolitan Municipality,**
Directorate of Climate Change and Clean Energy

VALUE TO CITIES

What value did you personally find in Google's EIE Data?

Any type of data that can help make cities more livable is extremely valuable. Although data is provided by users who are obviously citizens of the city, EIE allows us to evaluate transportation from various perspectives. As a result of Google and ICLEI Europe's novel method, it is a collaborative approach in which the majority of citizens contribute. EIE elegantly and effectively analyses massive amounts of data and serves us, a local government, to aid in the development of climate action.

What do you think the value of Google's EIE Data is to your city?

Monitoring city data and rapid data collection through citizen engagement is critical; thus, EIE data and insights are very promising in providing city additional information to assess the current status of the city when well correlated with actual and real measurement data. We are delighted to have EIE data available, and we believe that the tool will provide comprehensive and timely information to cities dealing with climate change.

OPERATIONAL IMPACT

How do you think Google's EIE Data will support your city or local government's operations?

EIE will provide policymakers and decision makers with supporting evidence and insights as they develop and prioritise transportation-related actions. Data is critical in planning, so EIE has the potential to provide valuable insight, particularly during the Izmir SUMP preparation stage. The effectiveness of local governments' efforts toward more sustainable transportation can also be justified using yearly transportation mode-based emission data.

Has Google's EIE Data supported any of your economic and/or post-COVID recovery efforts?

As pandemic effects fade, we now have the opportunity to observe and investigate the consequences and impacts. Because EIE provides five years of Transportation Emissions

data, it is possible to study the impact of transportation during the COVID-19 pandemic. When developing action and sustainability plans such as SUMP, the potential effects of economic crises and pandemics will be considered, and EIE will provide useful insights on time and modal base mobility evaluation.

What have been the estimated time and cost savings of using Google's EIE Data?

As a local government with such a large population and diverse sectors, it is extremely difficult and costly to conduct an annual emission inventory; however, monitoring is critical to determine the effectiveness of the action plans. Furthermore, in the transportation sector, the city emission inventory does not provide information on modal share, which includes the most sustainable modes of transportation such as biking and walking. EIE provides free yearly transportation data based on the modal share to local governments. EIE can collect and analyse billions of lines of data to summarise for city experts using a comprehensive set with great technical capability.

The establishment of such a system will be remarkably costly and time consuming for local governments. ICLEI Europe supports and justifies EIE's scientific foundation, which adds credibility to such approaches.

GLOBAL IMPACT

What do you see will be the impact for all cities?

Cities should and will take into account all available data and insights, whether provided internally or externally, to improve planning and decision making. To understand the developments on all levels holistically, good collaboration and communication among local governments, international city networks and institutions, and tech companies are required. EIE is an excellent example of such a collaboration for bringing cutting-edge technology to cities. It is also important to note that it is an ongoing effort to make it more usable and effective year after year, based on feedback from cities that are quite different and diverse. EIE will excel and provide more reliable and detailed data to cities and communities with the assistance of ICLEI Europe experts.



OUTLOOK

Based on Izmir's work with EIE, other metropolitan cities can learn the importance of exploring different sources of data that can complement city data sources. EIE can provide detailed data of new and local mobility, and Izmir is an example of how the data in EIE can be refined with boundary corrections and how very useful sets of data can be obtained.

As Çağlar TÜKEL, Directorate of Climate Change and Clean Energy from the Izmir Metropolitan Municipality notes, "Cities should and will take into account all available data and insights, whether provided internally or externally, to improve planning and decision making. To understand the developments on all levels holistically, good collaboration and communication among local governments, international city networks and institutions, and tech companies is required. EIE is an excellent example of such a collaboration for bringing cutting-edge technology to cities."

Cities in the Climate Neutral and Smart Cities Mission could build on Izmir's experience using EIE data. Having a dataset spanning 5 years could help Izmir and other cities better understand the temporal evolution of transport emissions, project emissions and identify low carbon mobility options that could support the city in advancing their climate neutrality journey.

Lastly, EIE holds the potential to become part of the data sources to inform and create SUMPs, determine priorities for investment, as well as provide information about other, similar cities, so that benchmarking activities can drive changes.

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