TomTom O/D Analysis
User Guide

Move Support: MoveSupport@tomtom.com

Table of Contents

Introduction

Location-based services have become ubiquitous in recent years and are used by multiple industry segments and businesses. Because of this phenomenon, it is essential to understand the typical behaviors of travelers in all kinds of driving. TomTom O/D Analysis is a product for origin and destination analysis based on probe data.

The pattern information of everyday trips is in high demand from diverse business sectors, including:

- Smart City and Mobility programs,
- Geomarketing,
- Location-based advertising (LBA),
- Retail shop location,
- Urban planning of infrastructure development.

Product Description

TomTom O/D Analysis provides trip investigation based on a high volume of location data. TomTom gathers real-time Floating Car Data (FCD) by combining measurements of existing infrastructure with signals from anonymous TomTom (connected) GPS devices, connected cars, and anonymous GPS-equipped mobile phones. TomTom also archives this data to create a historical traffic database. This is the main source of the TomTom O/D Analysis.

Image 1: TomTom Floating Car Data (FCD) source mix.

Trip Definition

Our algorithms analyze the probe traces coming from each device. The analysis recognizes the pattern of a regular trip within any area. Probe traces are sequences of probe points that come from the same device. These sequences define the concept of a trip. The trips come from completely anonymized data and guarantee a highly secure content level. This protects individual devices from being associated with specific drivers. The origins and destinations are always associated with polygons (cities, districts, neighborhoods, postal codes, and so on) and as such, cannot be linked to a specific residence or businesses.

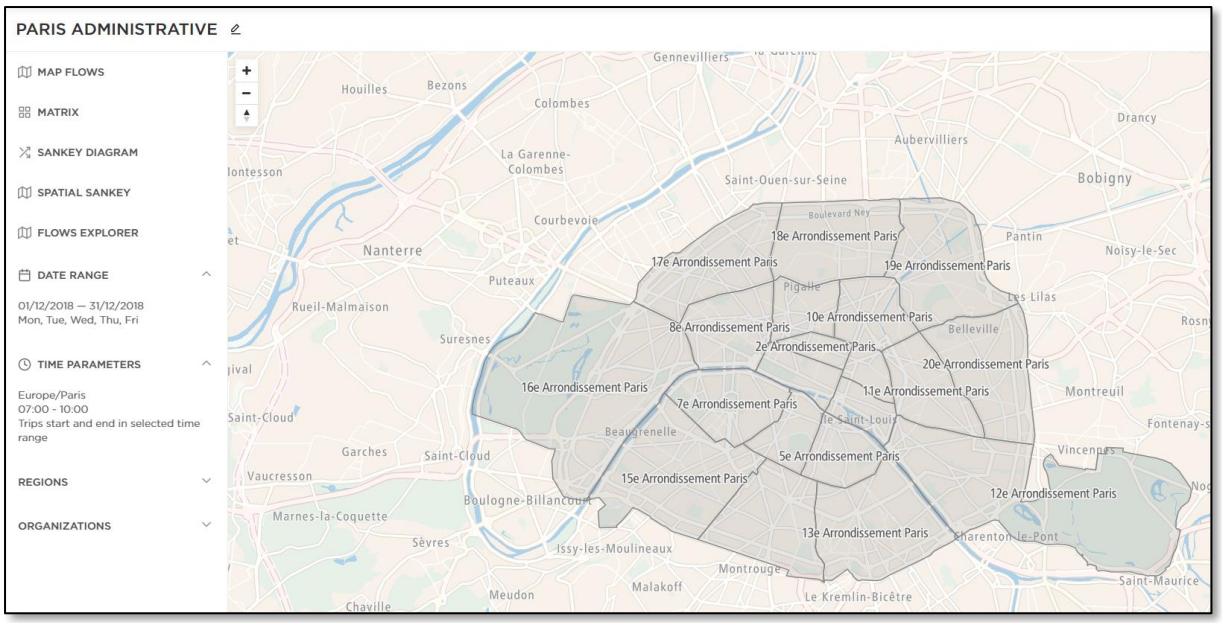


Image 2: Example of polygon definition in Paris, France.

Based on the area/polygon definition, TomTom O/D Analysis defines the origins and destinations based on the trip start point and end point, according to each FCD provider's typical behavior. For example, mobile and automotive data are interpreted differently. For our use, a trip is a sequence of probe points that originate from the same anonymous device ID. We call this a "probe trace". We define a trip by every probe trace, with its start point and end point. The primary output of any origin-destination product is based on the specific dynamics of these trips, such as where and when it was initiated and concluded.

Analysis Creation Process

The entire analysis creation process consists of four steps:

1. Defining the regions of the analysis
2. Defining the date ranges
3. Defining the time periods
4. Choosing the name of the analysis and additional parameters

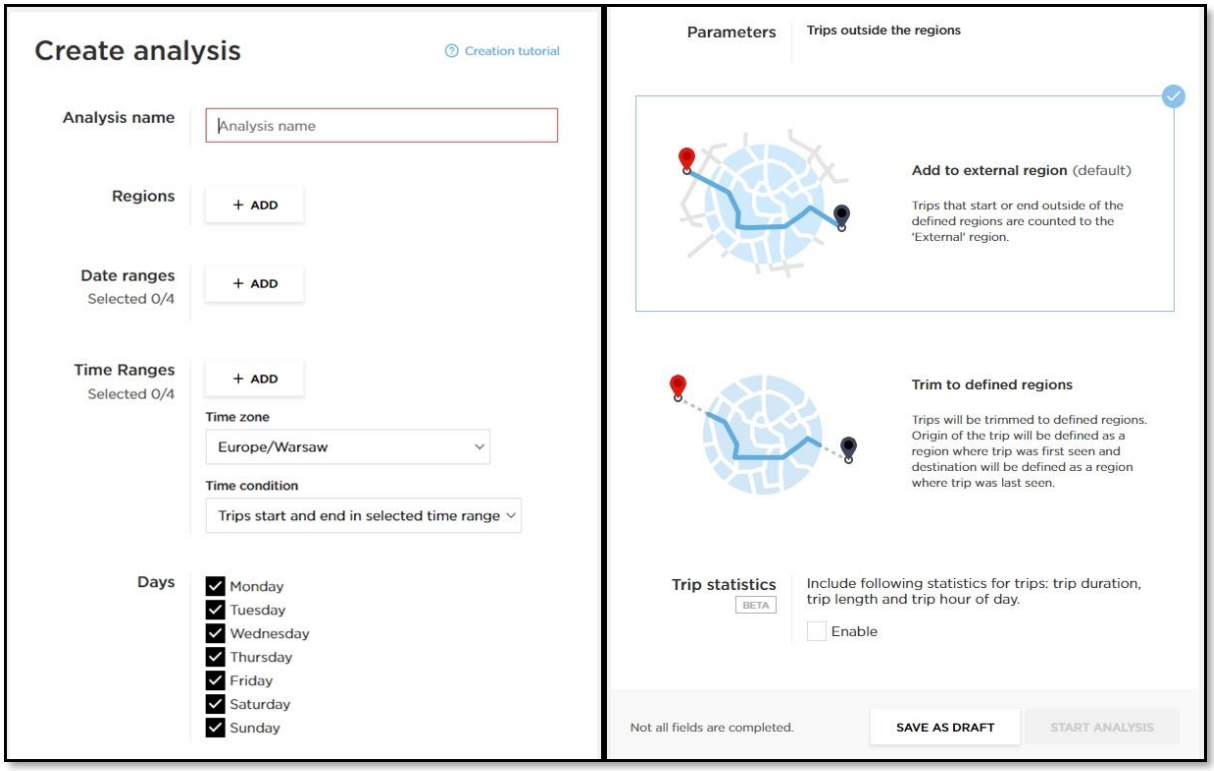


Image 3: Analysis creation section with all the report settings.

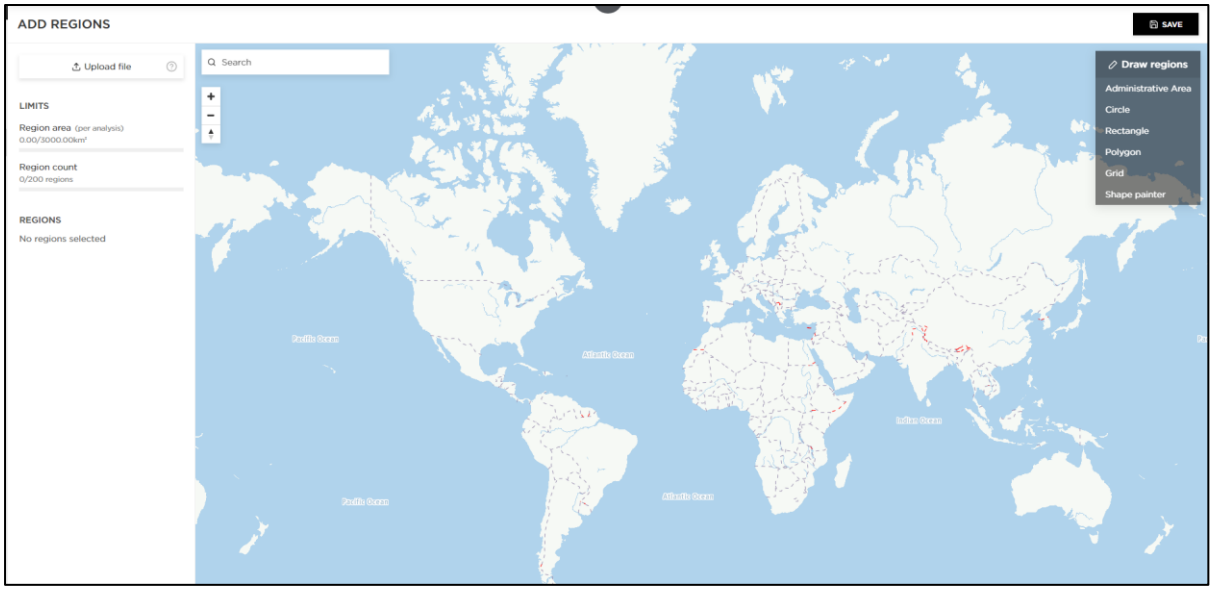


Image 4: TomTom map where the analysis area can be defined and visualized.

Area Definition

There are two main methods of defining regions of your analysis:

1. Upload file option. This feature allows you to import regions using one of the supported file formats:

- .GeoJSON
- .TopoJSON
- .SHP (all files should be provided in a single zip archive)
- .KML
- .KMZ

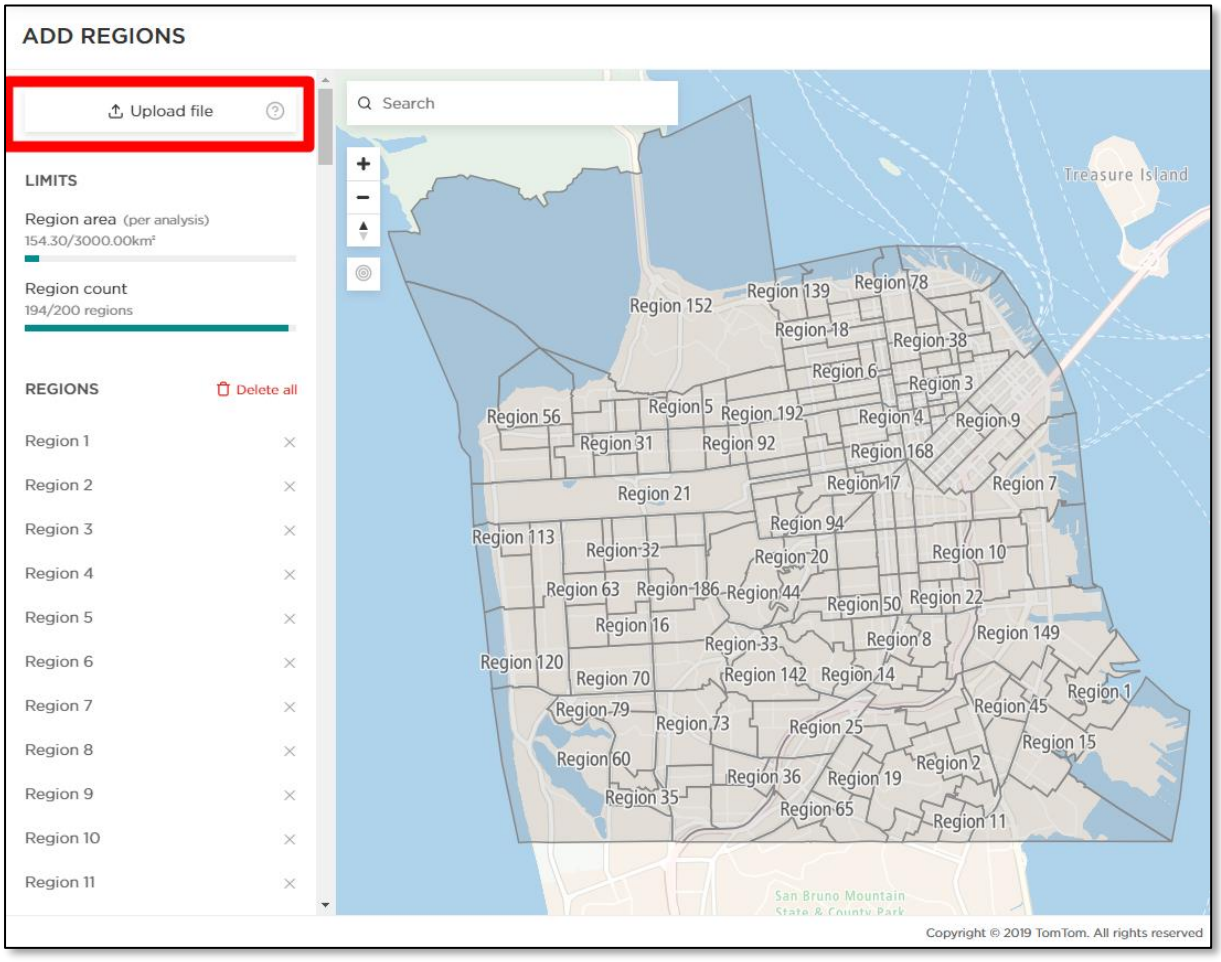


Image 5: Results of importing a shapefile file containing San Francisco regions.

2. The second method is using the **Draw regions** option, which uses the following tools:

- Administrative Area: this tool allows you to select the administrative areas (e.g. neighborhoods, districts, or cities) available in the TomTom map.
- Circle: this tool allows you to draw circular areas by selecting the center and then increasing the radius.
- Rectangle: this tool allows you to draw rectangular areas.
- Polygon: this tool allows you to draw polygonal areas.
- Grid: this tool allows you to create a grid of connected squared or hexagonal areas with a customizable cell side length from 0.50km to 10km.
- Shape painter: this tool allows you to draw custom shapes that will be converted into areas.

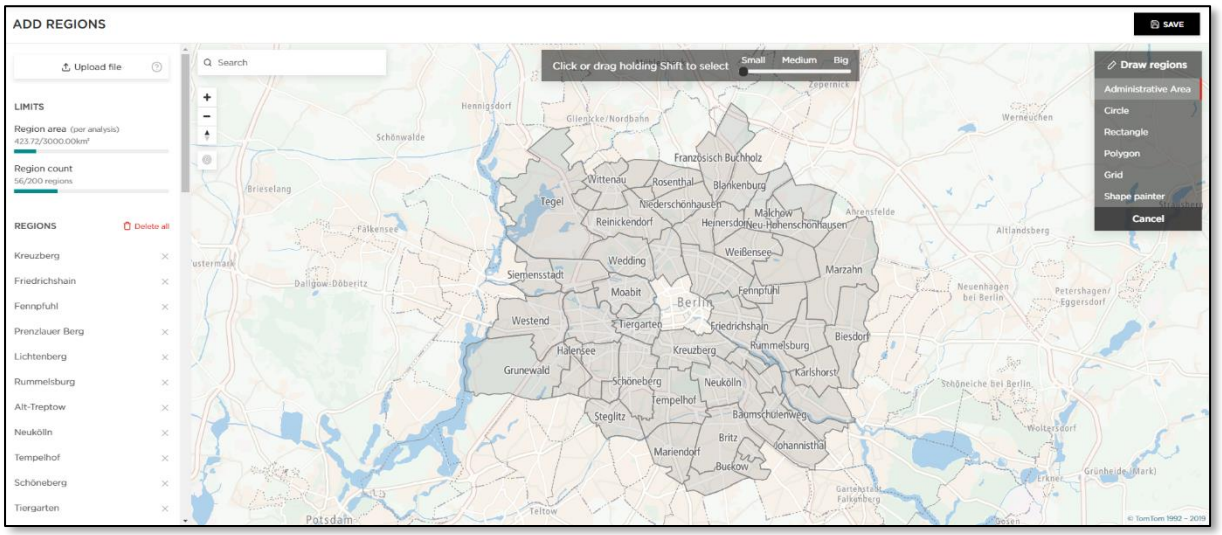


Image 6: Administrative Area selection.

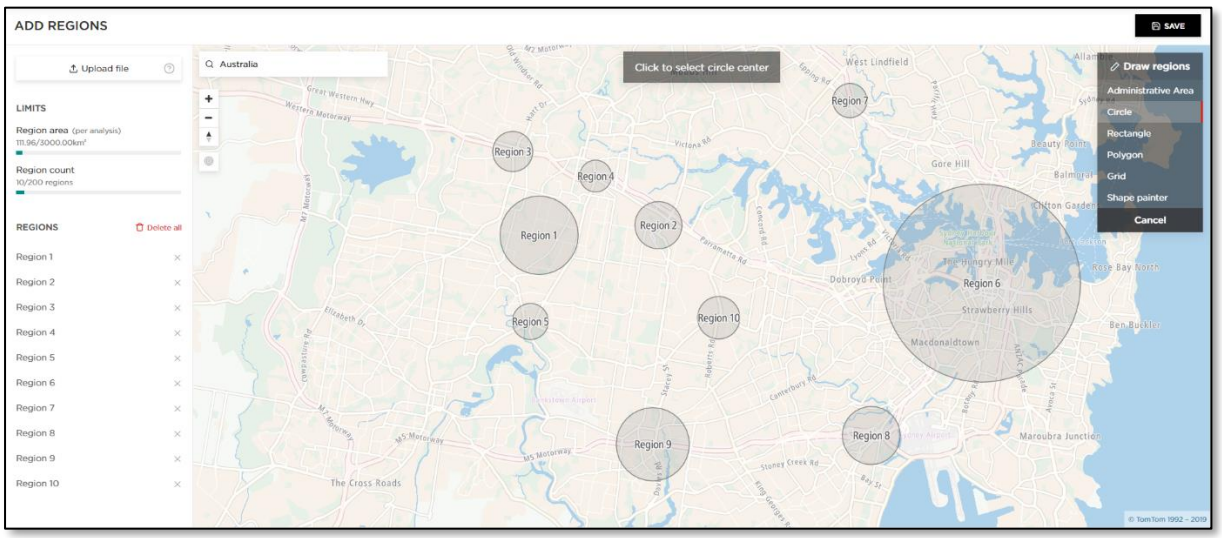


Image 7: Circle drawing tool.

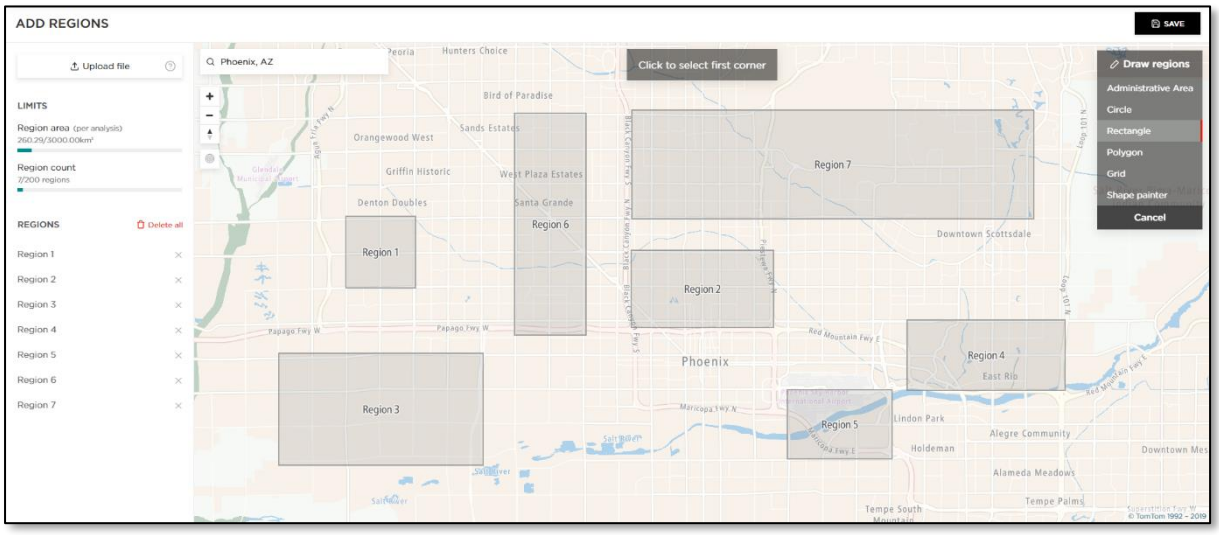


Image 8: Rectangle drawing tool.

Image 9: Polygon drawing tool.

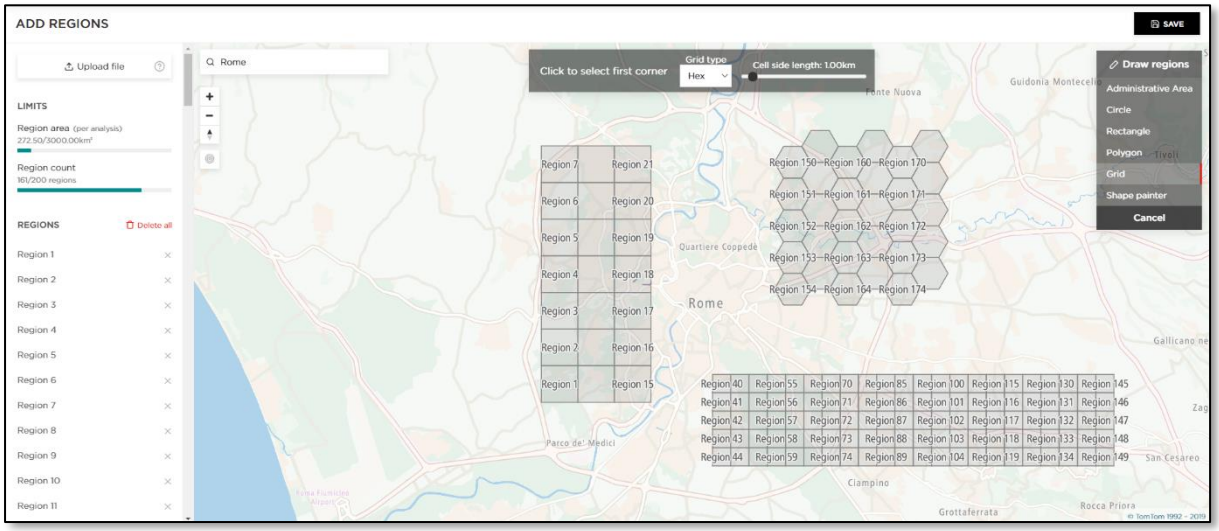


Image 10: Grid drawing tool.

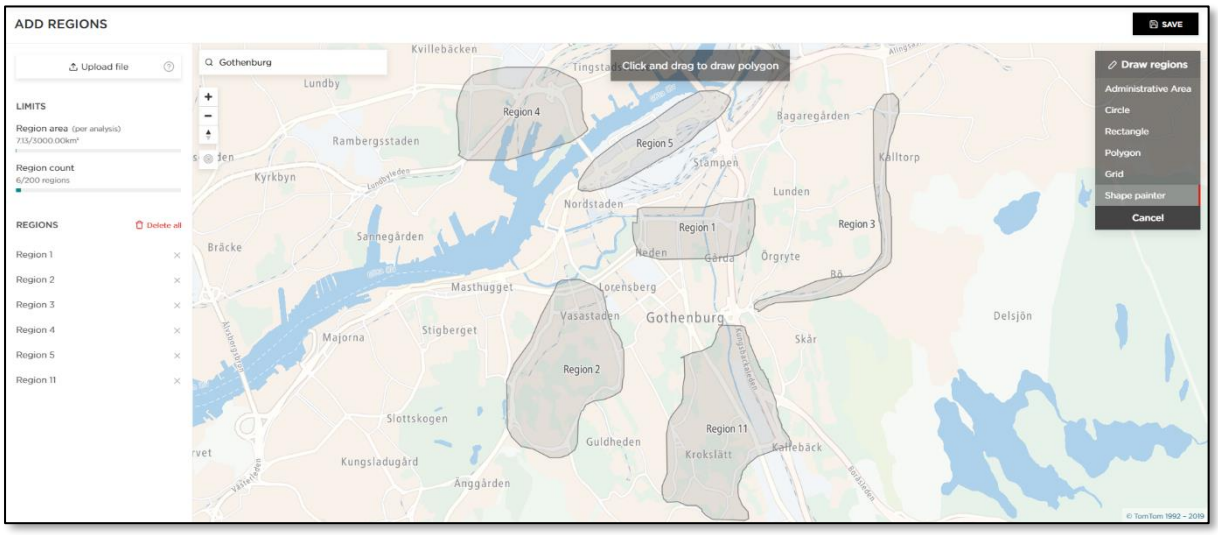


Image 11: Shape painter drawing tool.

In addition to the individual methods described previously, you can combine these region types. For example, the user can import pre-defined shapefiles or geoJSON files and draw custom shapes.

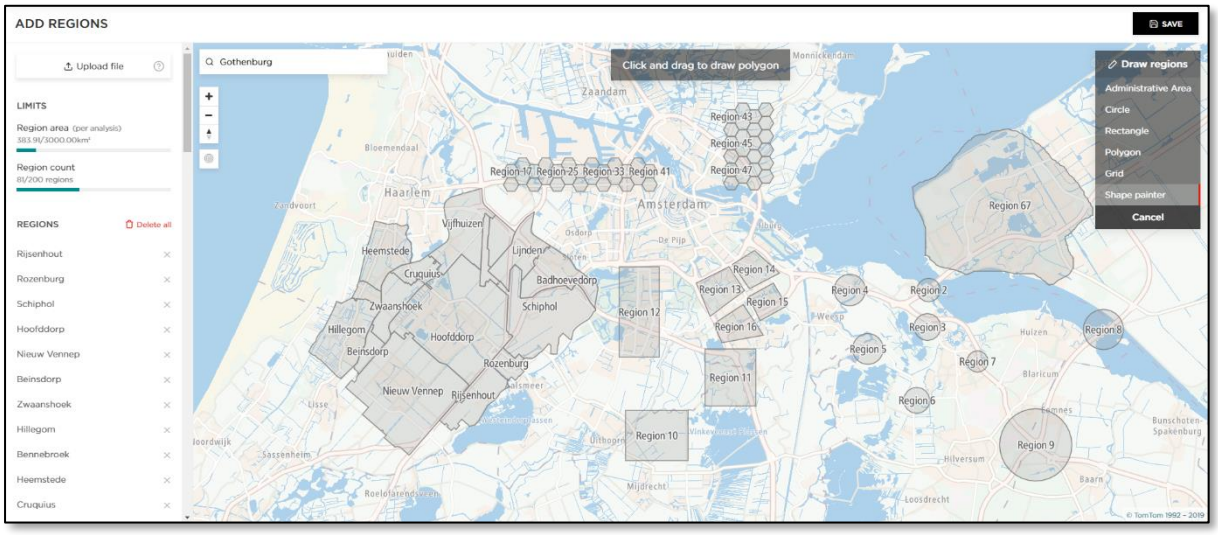


Image 12: All the drawing tools combined and used in the same report.

The total region area (per analysis) is a maximum of 3000 km² while the maximum number of regions (per analysis) is 200.

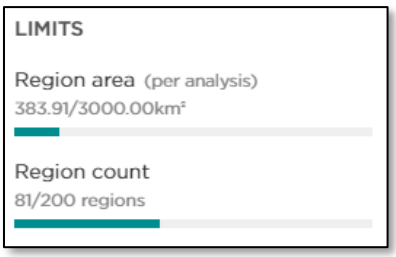


Image 13: O/D Analysis limits for a single report.

Date & Time Ranges

There are three information types while defining the date range and time period:

1. Date range: where you select a calendar range where 28 days is the minimum and 2 years is maximum. The whole date range of your selection will be used in the analysis calculations. It is possible to select up to 4 date ranges in one analysis.

2. Time range: where you can select a specific time window that will be used in the analysis calculations. The minimum time frame is 3 hours while the maximum is 24 hours. It is possible to select up to four time ranges in one analysis. The time range menu also allows you to select time zone and a time condition which means that trips can either start & end in a specific time range or start only.

3. Days of the week: where you can select specific days of the week that will be considered in the analysis calculations. It is required to select at least 1 day of the week.

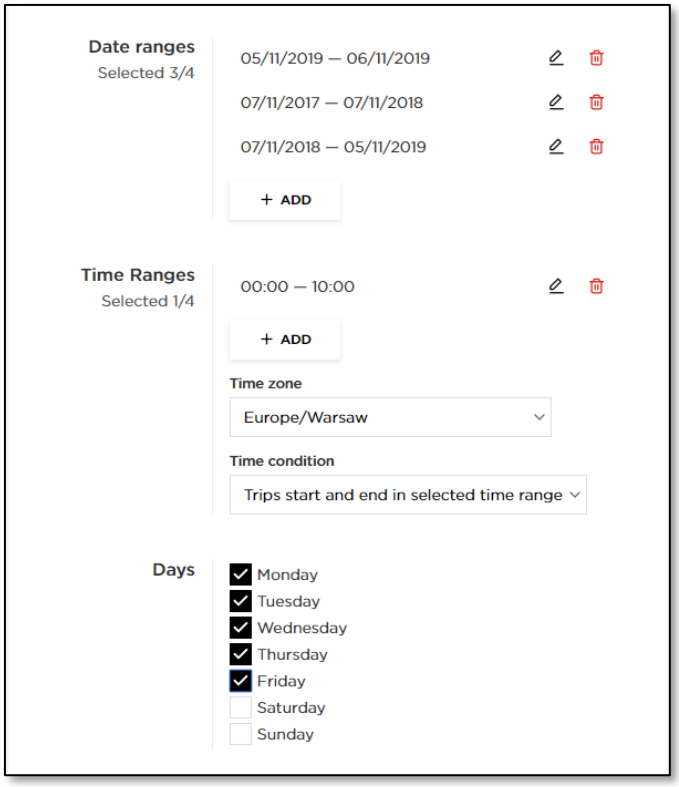
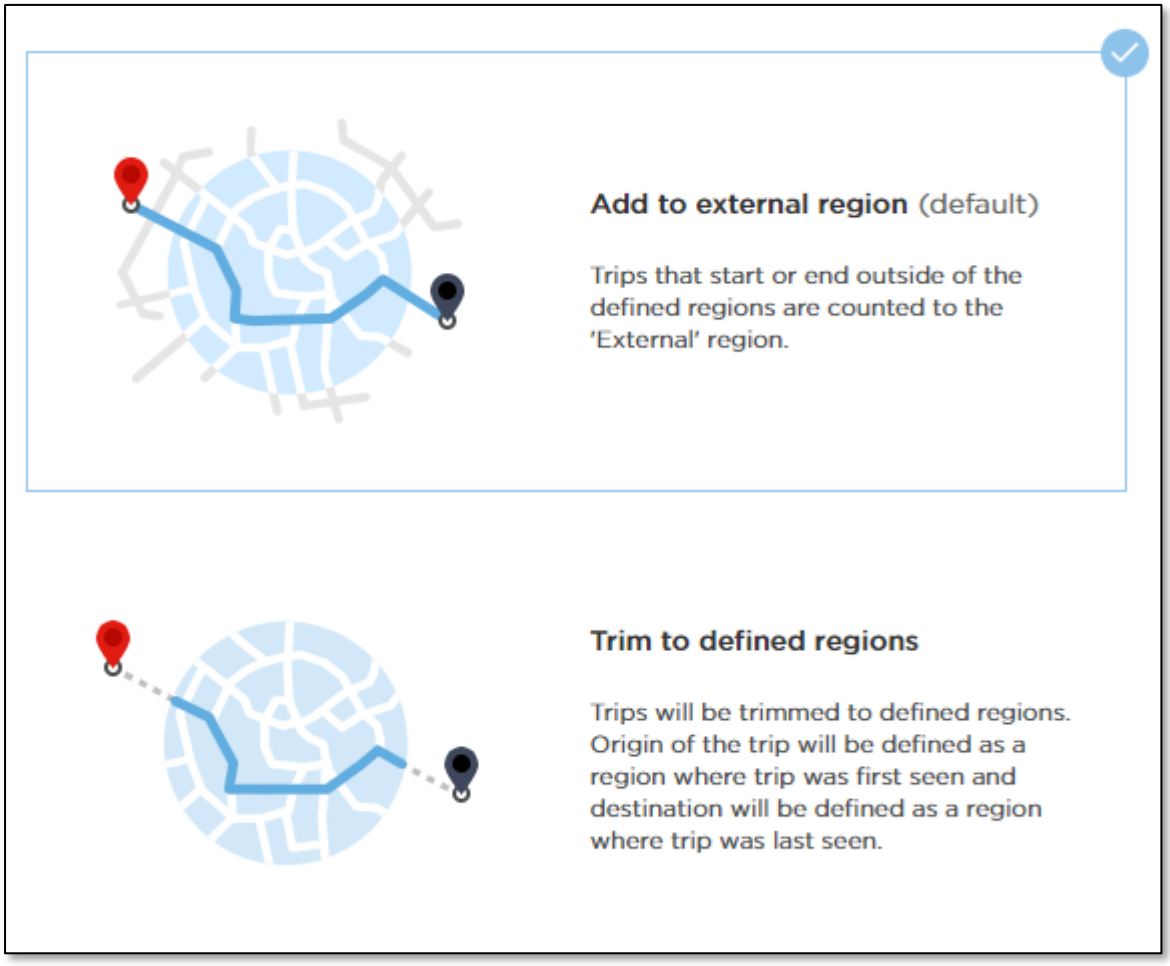


Image 14: Date range, time range and days selection menu.

Note! Synchronizing and saving all the new data we use in our tool takes up to 7 days, therefore, it is not recommended to use the last 7 days in the analysis date range to make sure the results contain complete source of data.

Additional Parameters

While creating an analysis, you can choose one of the two following parameters:

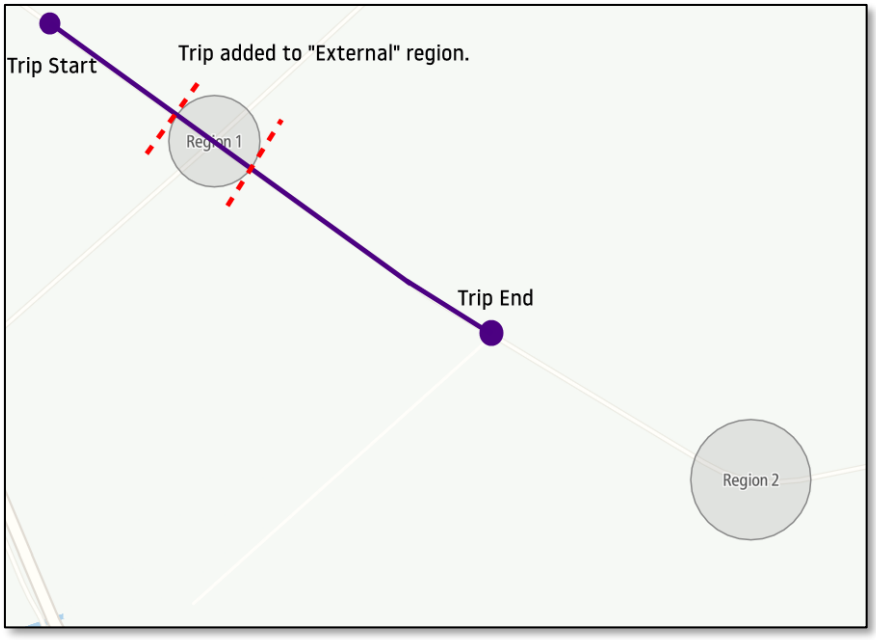


The first one, "**Add to external region**", is a default setting. It means that all the trips which had a starting or ending point outside of your defined region will not be added into your results but will be added as a separate "**External**" hypothetical region instead.

The second one, "**Trim to defined regions**", will add the aforementioned trips (the ones which started or ended outside of your regions) to your results, so the trips will be counted to your regions instead of a separate "**External**" one.

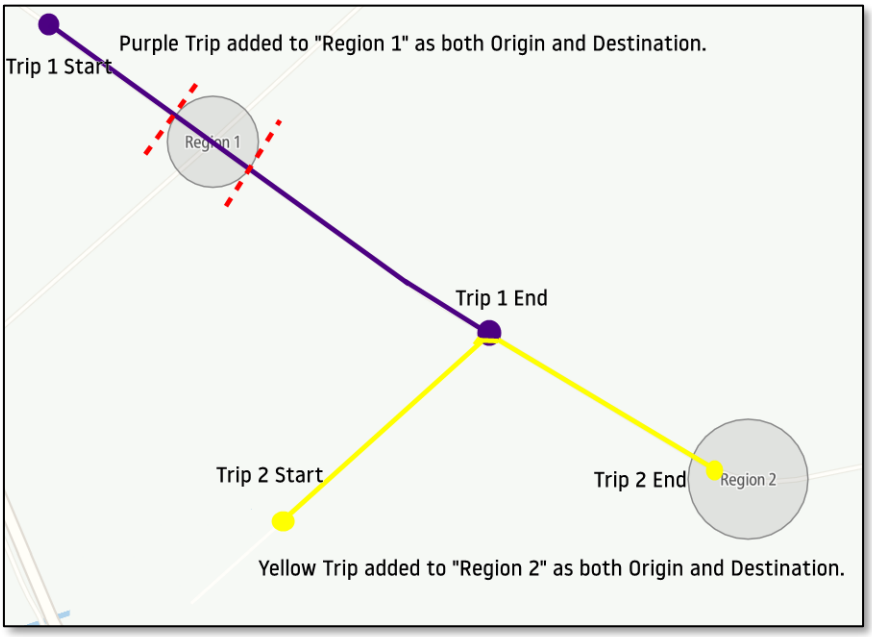
To visualize how this works, let's break it down based on the screenshots below.

1. Add to external region.



The trip that started or ended outside **Region 1** will be added to a separate "**External**" region in the analysis results.

2. Trim to defined regions.



The trips that started or ended outside region will be added to this "**Region 1**" instead of creating a separate "**External**" one.

My Reports

This section is the main view of the TomTom O/D Analysis application. It contains a list of all your available reports, their statuses, their creation date and the duration it took to calculate them.

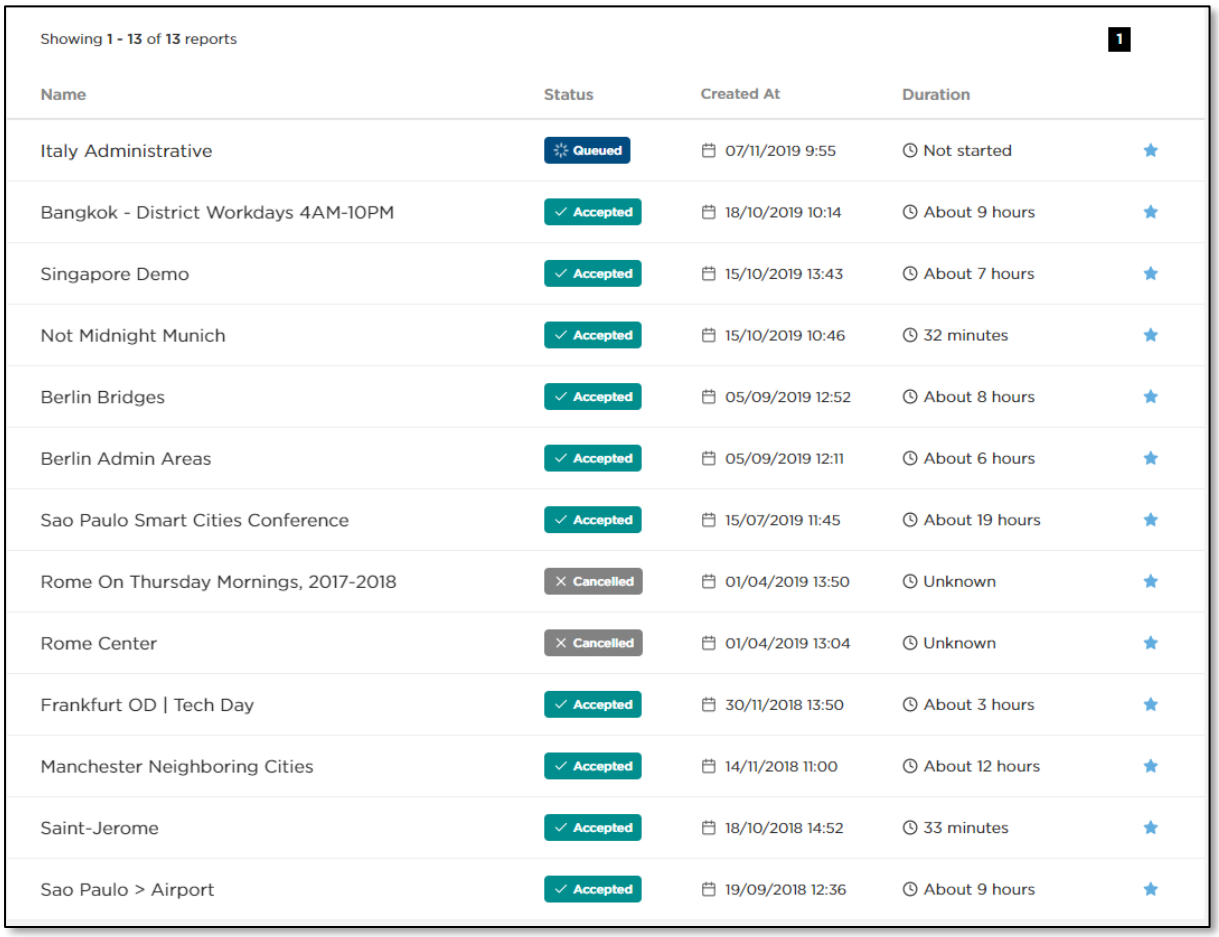


Image 15: A list of all the analyses in "**My Reports**" section.

It is also possible to search the reports by name, mark them as favorites and view in a separate "**Favorites**" tab or even clone them to make a new analysis based on the settings of the one you are cloning.

Image 16: **My Reports** search bar and **Favorites** selector.

In order to clone a report or mark it as a favorite, you need to hover your pointer over a report and use the buttons which will appear on the right.

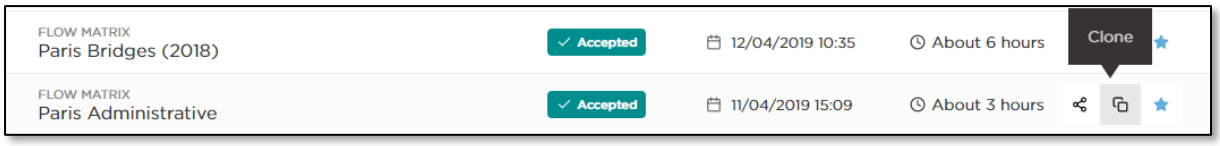
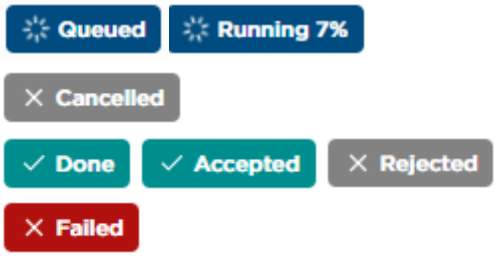


Image 17: **Clone, Favorite** & **Share** buttons for a specific analysis.

NOTE! If the analysis is queued or running, an additional "**Cancel**" button will appear which allows you to abort the calculation of the analysis.

Below you can see about all the statuses available in "**My Reports**" section, which are further explained in the next section of the user guide:



It is also possible to share your analysis results by creating a shareable link.

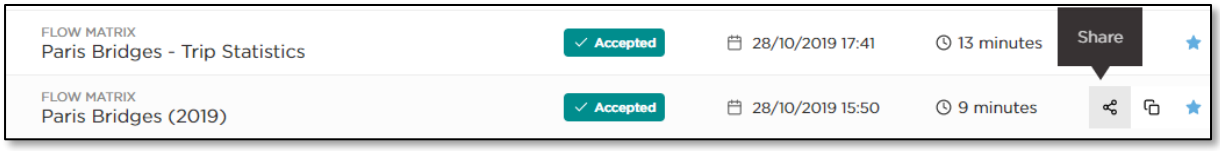
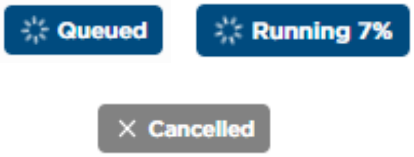


Image 18: Generating a shareable link to share the analysis results.

NOTE! Using the "DELETE" button will expire the link and the results will not be accessible anymore.

Analysis In Progress

After running the analysis, the status of it will be "**Queued**" or "**Running**". At this point, you are able to cancel the analysis from the "**My Reports**" section, which will change its status to "**Cancelled**".



While the analysis is calculating, you are able to see how many trips have been already counted.

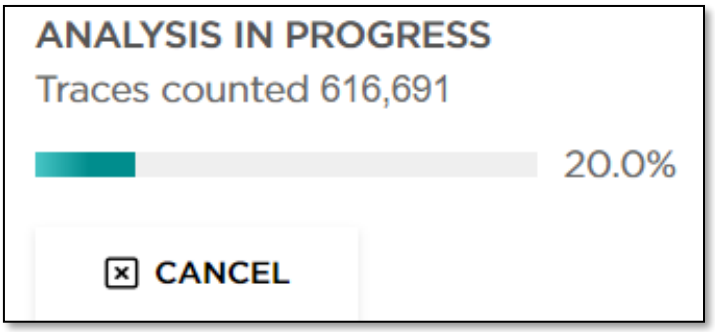
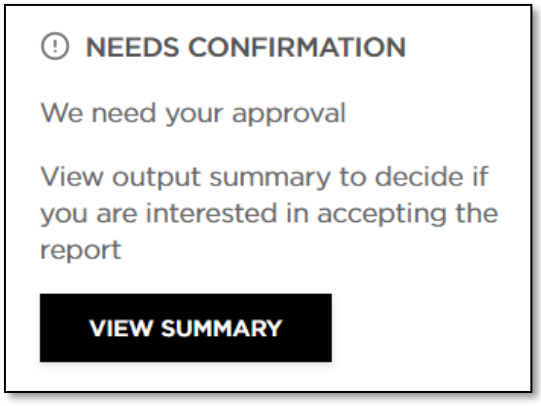


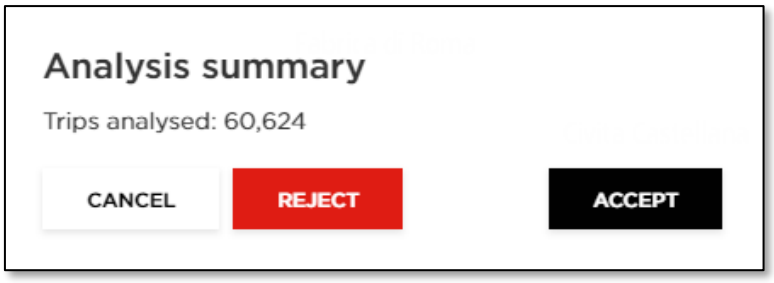
Image 19: Traces counter showing calculations in real time.

As soon as the analysis is processed the status will change to "Done".

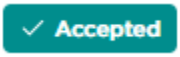
When you open the report, you will see the following acceptance window:



You can **Accept** the analysis if the number of trips satisfies you. In case the number of trips is low, and you don't want to be charged for the results you can **Reject** it.



As soon as the analysis is accepted the status will changed to "Accepted".



In case you will reject the analysis, it will change to the following status:

In rare cases, the analysis may fail while being processed. The outcome is the "**Failed"** status which indicates that it was not calculated properly. You will not be charged for such analysis; therefore, we advise running it again. Should the issue occur more than once, do not hesitate to contact us at MoveSupport@tomtom.com and we will investigate it further.

Analysis Results

If the analysis was calculated properly and accepted on the user's end, opening it from your "My Reports" list will load a results page.

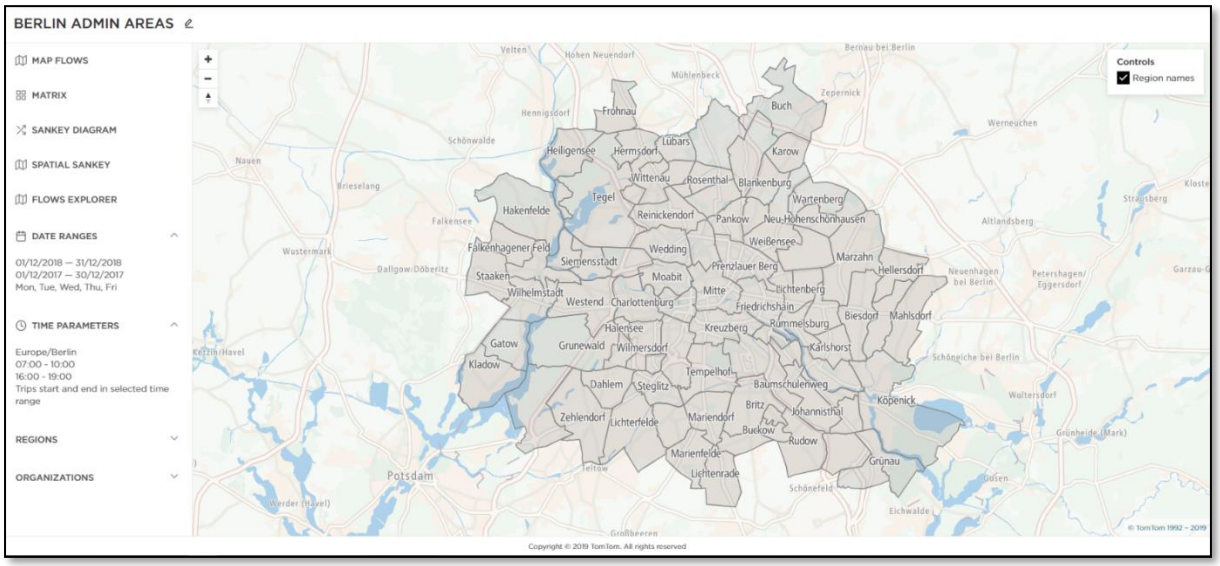


Image 20: Analysis results page.

TomTom O/D Analysis offers 5 different methods you can use to review the results:

1. Map Flows

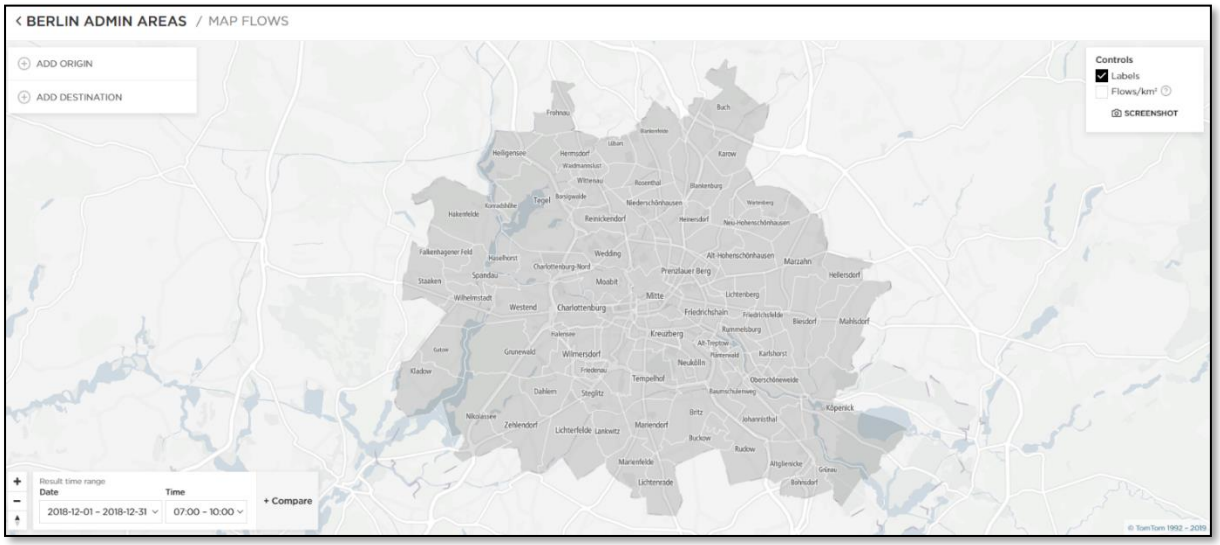
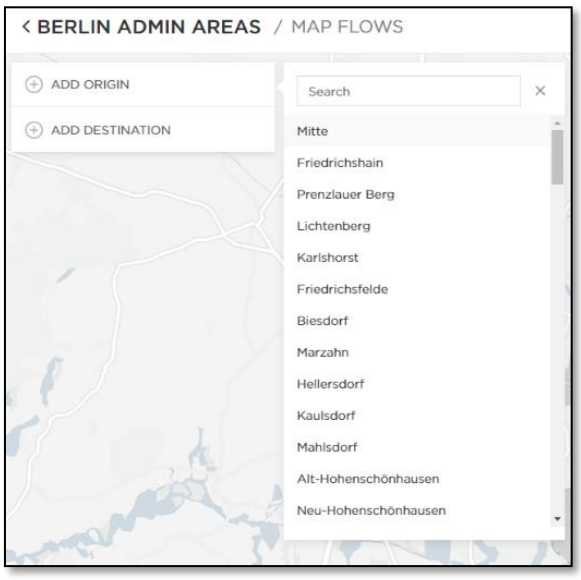


Image 21: Map Flows section with an interactive map of predefined regions.

This is interactive report view which allows you to preview various of different scenarios.

There are two ways you can mark given region either as origin or destination:

- using menu on the left side (ADD ORIGIN/ADD DESTINATION);



- by clicking on given region and then selecting option;

The example on the screenshot below shows the result for one region selected as **Origin** (highlighted in grey). All other regions, in this case, became **Destination** and show the distribution of trips in:

- percentage ratio - shown on the map;
- flows ratio - which is shown on the left side;

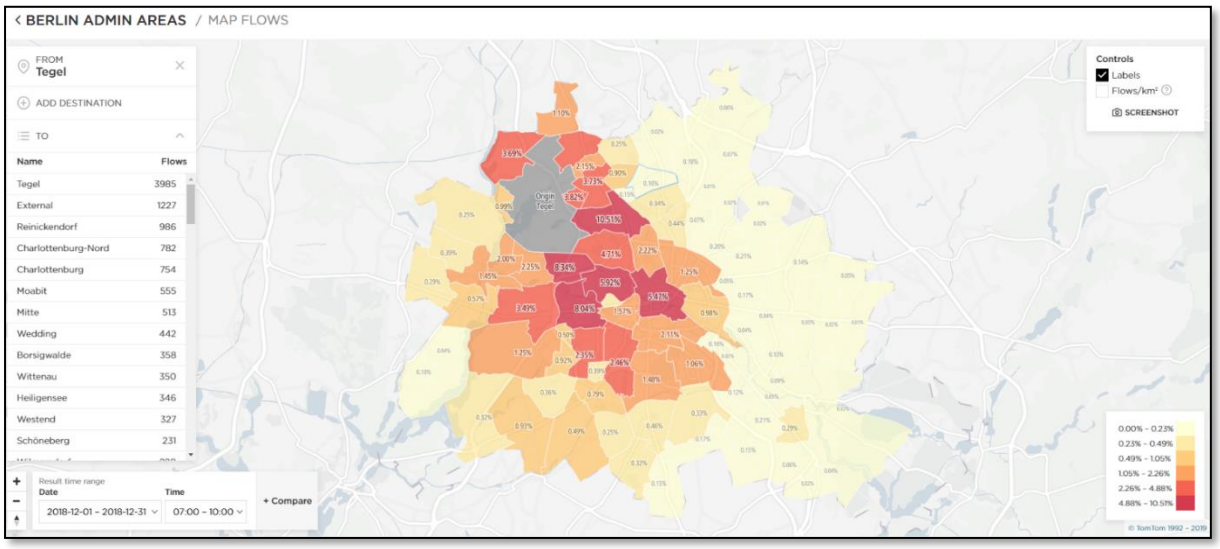


Image 22: Map Flows results with only one region marked as "**Origin**".

These results contain additional information when you check **Flows/km²** option in the upper right corner. This option takes into consideration the size of the regions and compares it to the number of all the trips.

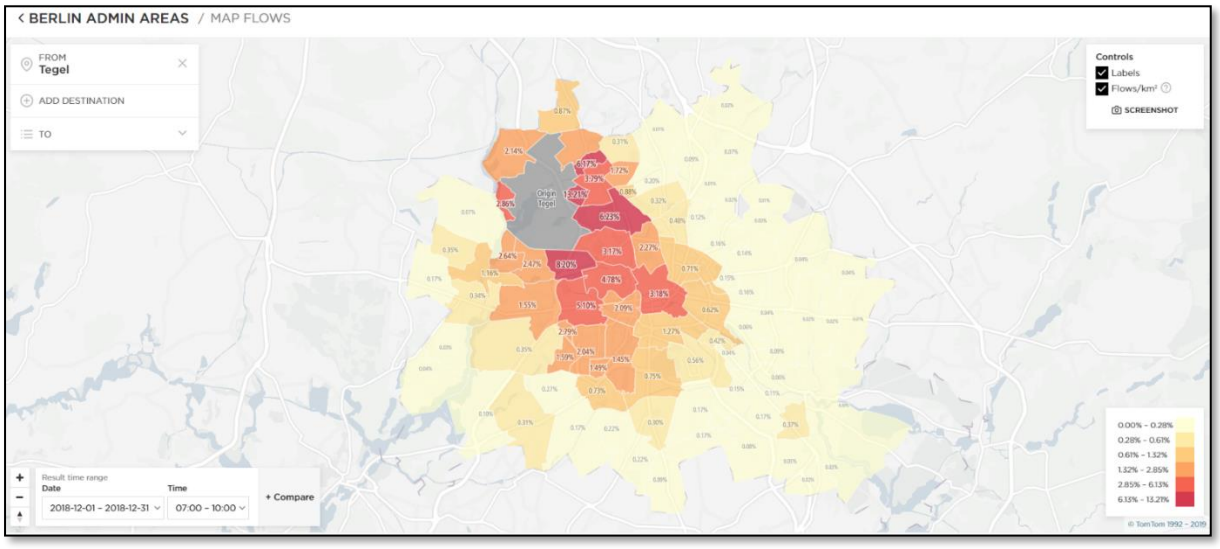


Image 23: Map Flows results with **Flows/km²** option enabled.

Another option to view the Map Flow results is to:

- select one region as **Origin** (highlighted in grey);
- select the other one as **Destination** (highlighted in grey);

All the other regions with the data available will be treated as **Via** automatically.

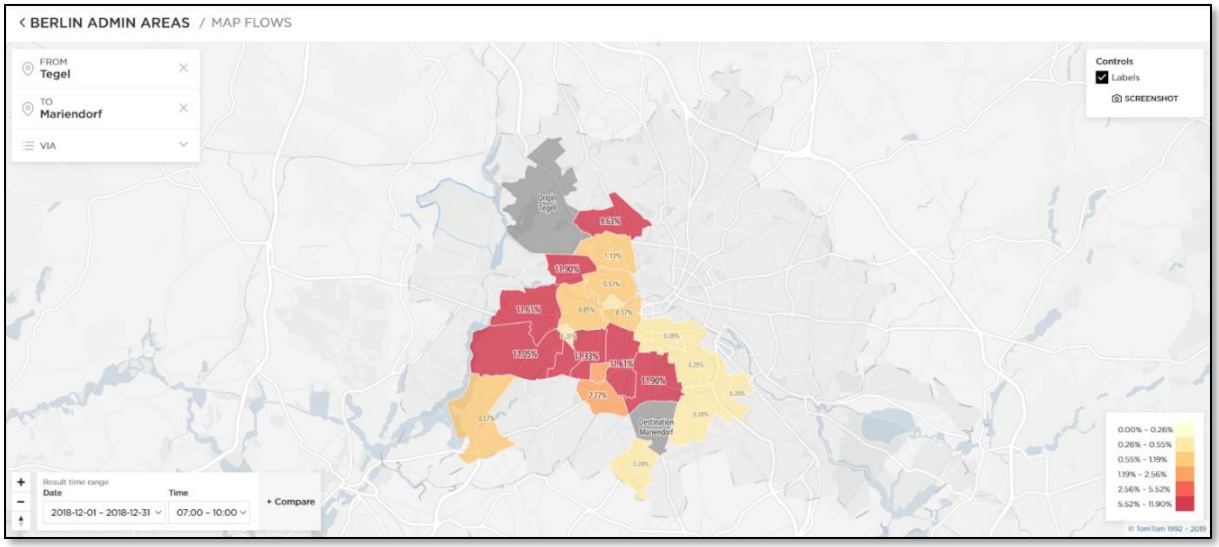
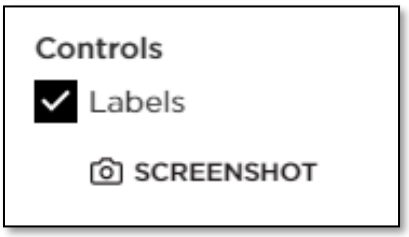


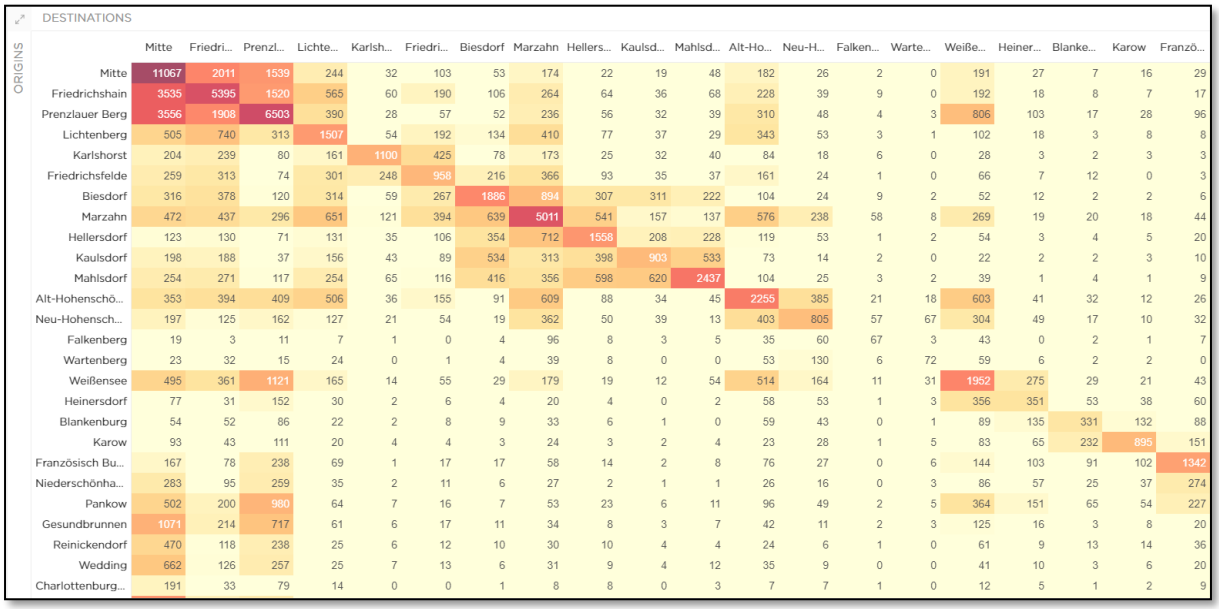
Image 24: Map Flows results with one region marked as "**Origin**" and the other as "**Destination**".

NOTE! There is a possibility to make a screenshot of the analysis available in the upper right corner.



2. Matrix

This option shows you all the connections between different regions in form of a table.



DESTINATIONS / ORIGINS

	Mitte	Friedri...	Prenzl...	Lichte...	Karlsh...	Friedri...	Biesdorf	Marzahn	Hellers...	Kaulsd...	Mahlsd...	Alt-Ho...	Neu-H...	Falken...	Warte...	Weiße...	Heiner...	Blanke...	Karow	Franzö...
Mitte	11067	2011	1539	244	32	103	53	174	22	19	48	182	26	2	0	191	27	7	16	29
Friedrichshain	3535	5395	1520	565	60	190	106	264	64	36	68	228	39	9	0	192	18	8	7	17
Prenzlauer Berg	3556	1908	6503	390	28	57	52	236	56	32	39	310	48	4	3	806	103	17	28	96
Lichtenberg	505	740	313	1507	54	192	134	410	77	37	29	343	53	3	1	102	18	3	8	8
Karlshorst	204	239	80	161	1100	425	78	173	25	32	40	84	18	6	0	28	3	2	3	3
Friedrichsfelde	259	313	74	301	248	958	216	366	93	35	37	161	24	1	0	66	7	12	0	3
Biesdorf	316	378	120	314	59	267	1886	894	307	311	222	104	24	9	2	52	12	2	2	6
Marzahn	472	437	296	651	121	394	639	5011	541	157	137	576	238	58	8	269	19	20	18	44
Hellersdorf	123	130	71	131	35	106	354	712	1558	208	228	119	53	1	2	54	3	4	5	20
Kaulsdorf	198	188	37	156	43	89	534	313	398	903	533	73	14	2	0	22	2	2	3	10
Mahlsdorf	254	271	117	254	65	116	416	356	598	620	2437	104	25	3	2	39	1	4	1	9
Alt-Hohenschö...	353	394	409	506	36	155	91	609	88	34	45	2255	385	21	18	603	41	32	12	26
Neu-Hohensch...	197	125	162	127	21	54	19	362	50	39	13	403	805	57	67	304	49	17	10	32
Falkenberg	19	3	11	7	1	0	4	96	8	3	5	35	60	67	3	43	0	2	1	7
Wartenberg	23	32	15	24	0	1	4	39	8	0	0	53	130	6	72	59	6	2	2	0
Weißensee	495	361	1121	165	14	55	29	179	19	12	54	514	164	11	31	1952	275	29	21	43
Heinersdorf	77	31	152	30	2	6	4	20	4	0	2	58	53	1	3	356	351	53	38	60
Blankenburg	54	52	86	22	2	8	9	33	6	1	0	59	43	0	1	89	135	331	132	88
Karow	93	43	111	20	4	4	3	24	3	2	4	23	28	1	5	83	65	232	895	151
Französisch Bu...	167	78	238	69	1	17	17	58	14	2	8	76	27	0	6	144	103	91	102	1342
Niederschönha...	283	95	259	35	2	11	6	27	2	1	1	26	16	0	3	86	57	25	37	274
Pankow	502	200	980	64	7	16	7	53	23	6	11	96	49	2	5	364	151	65	54	227
Gesundbrunnen	1071	214	717	61	6	17	11	34	8	3	7	42	11	2	3	125	16	3	8	20
Reinickendorf	470	118	238	25	6	12	10	30	10	4	4	24	6	1	0	61	9	13	14	36
Wedding	662	126	257	25	7	13	6	31	9	4	12	35	9	0	0	41	10	3	6	20
Charlottenburg...	191	33	79	14	0	0	1	8	8	0	3	7	7	1	0	12	5	1	2	9

Image 25: Colored Matrix showing all the relations between regions in form of raw data.

You can select what regions you would like to see in the report.

The additional 'region' which is not checked by default is **External**. Checking this 'region' shows you the number of trips coming from outside the selected regions.

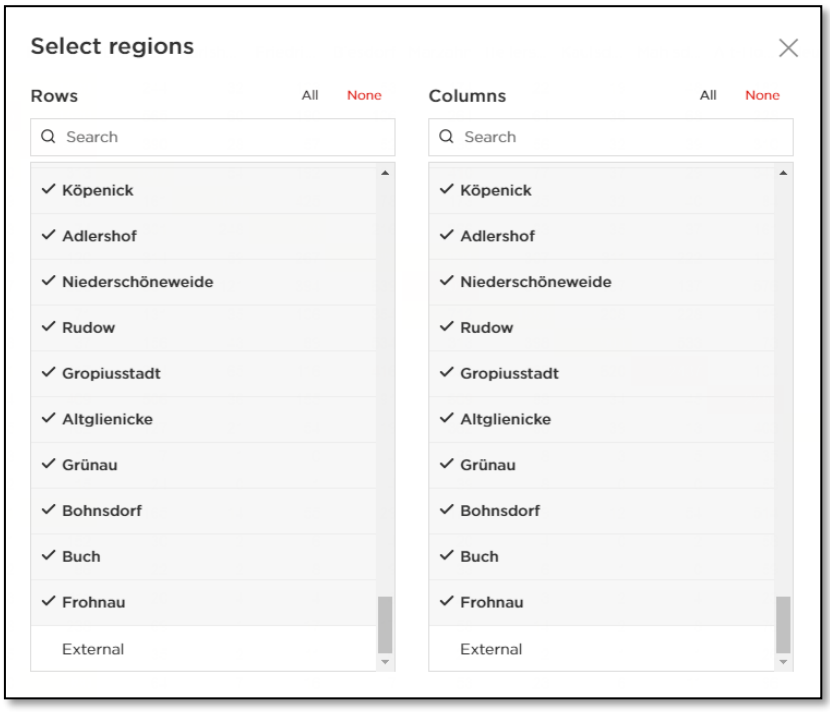
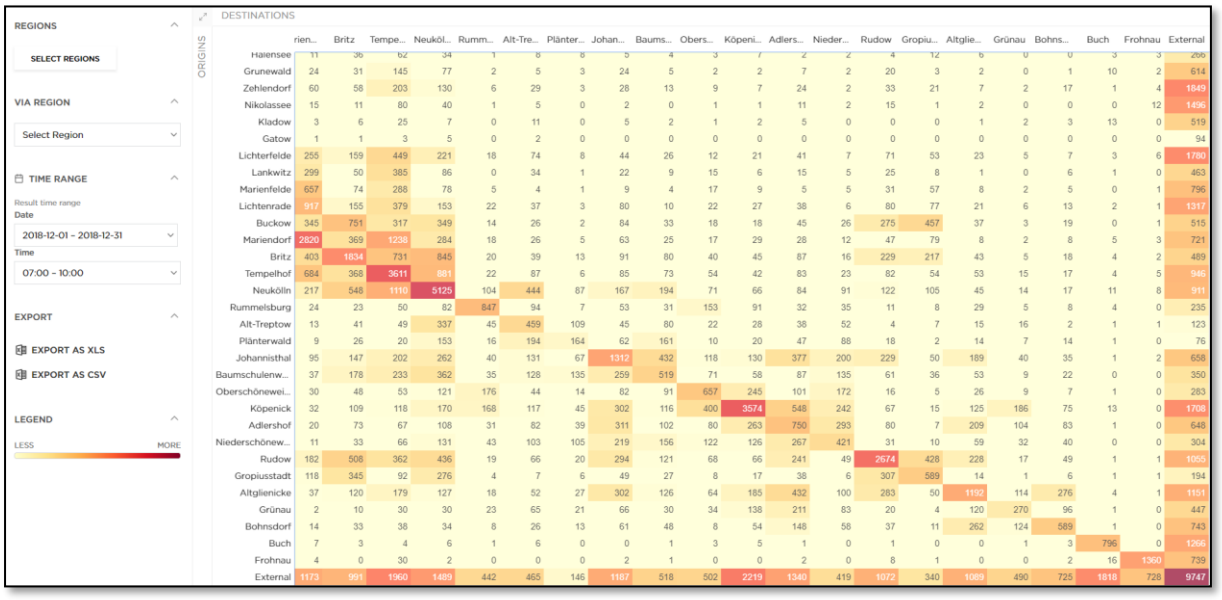
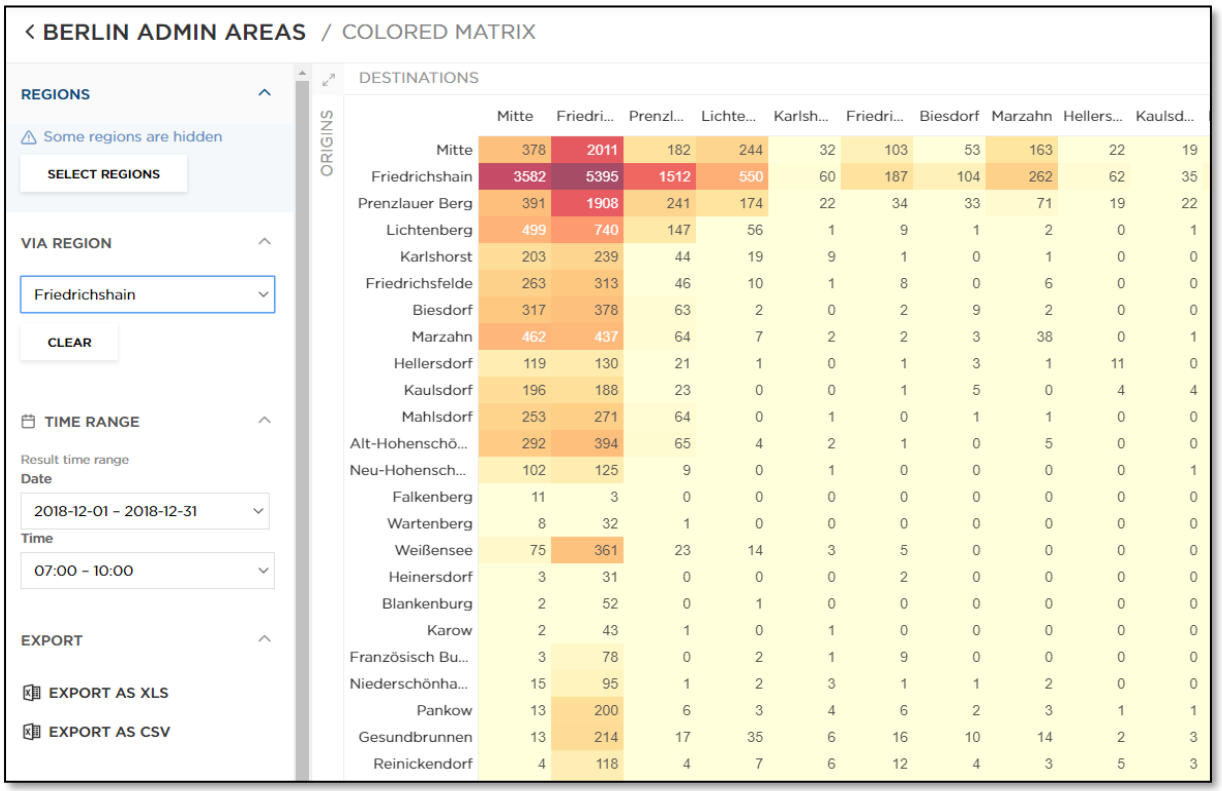


Image 26: Selecting regions for the Colored Matrix results section to display.

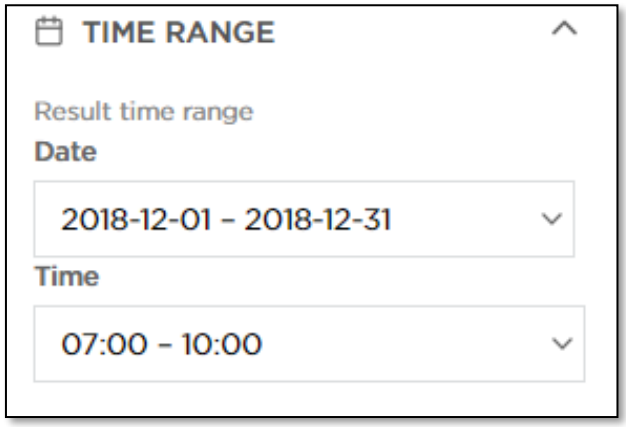
Below you can see a Colored Matrix report results when the **External** region is checked.



Another option available in the **Matrix** view is to select the **Via** regions, which means you will see the number of connections between different regions which travelled through the region selected as **Via**.



The time and the date ranges can be changed on the left side:



The **Matrix** results can be downloaded in two file formats:

3. Sankey Diagram

This option shows you the number of connections between different regions in form of lines.

Image 27: **Sankey Diagram** representation of the analysis results.

By default, the results show you only 4 regions with the highest number of trips measured. In order to add additional regions, you can use the Search window on the left side.

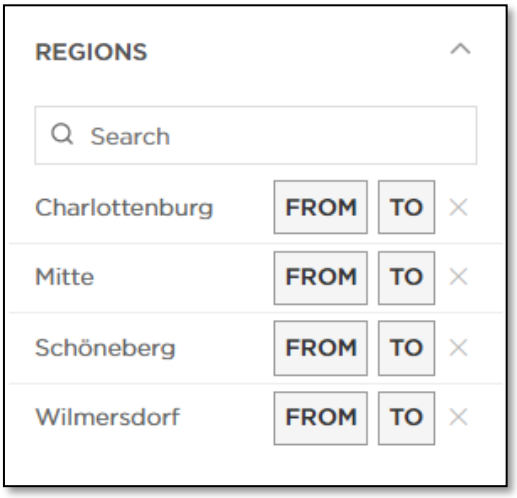
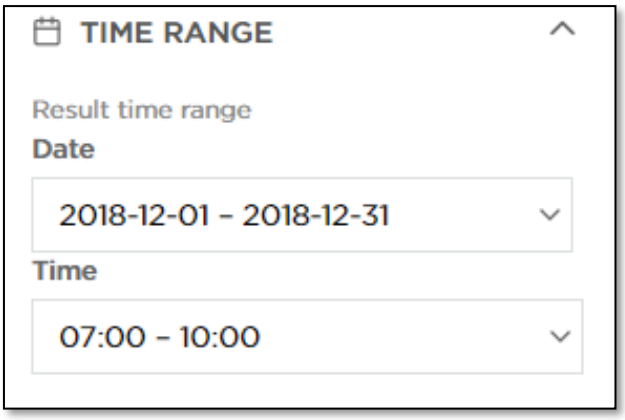
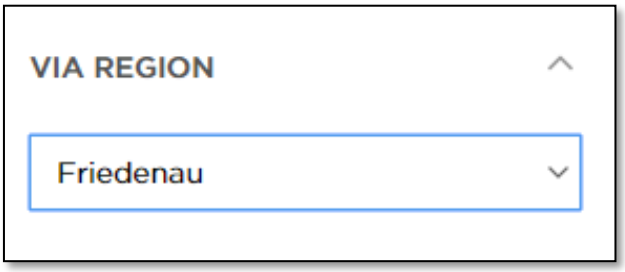


Image 28: The possibility of adding more regions into **Sankey Diagram** results page.

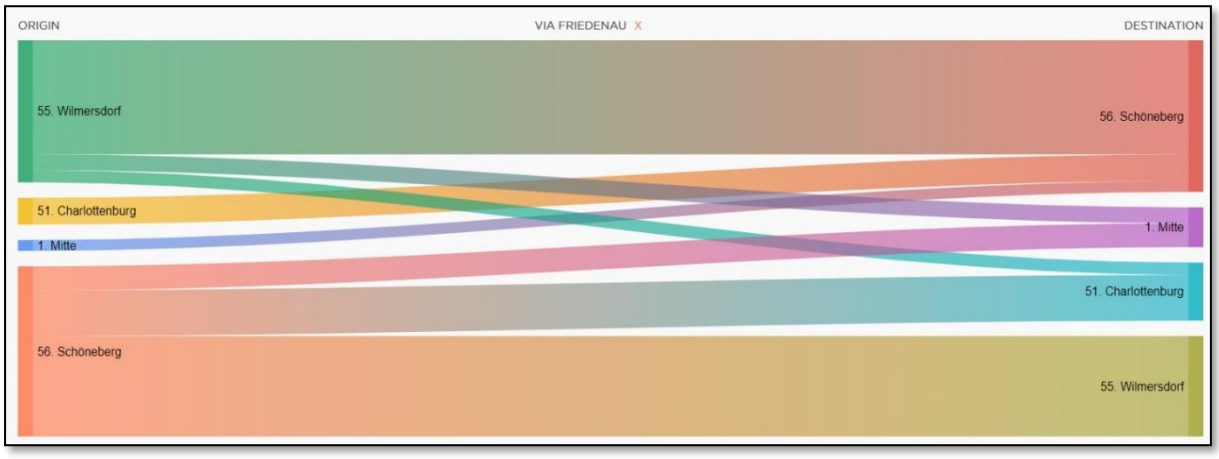
The time and the date ranges can be changed on the left side:



There is also a possibility to select **Via** regions, so you will see the number of connections between different regions which travelled through the region selected as **Via**.



The example is shown on the screenshot below:

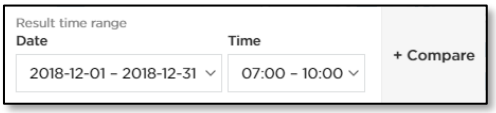


4. Spatial Sankey

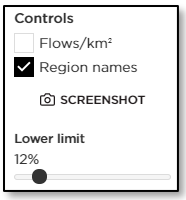
The Spatial Sankey view allows you to display the results in a Spatial Sankey. This visualization type is particularly useful if you have a lot of regions. This view makes it much easier to recognize dense flows between regions.

Image 29: Analysis results in form of a **Spatial Sankey** showing the relations between regions as lines.

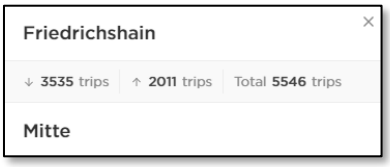
The date and the time ranges can be changed in the bottom left corner of the map.



In case the analysis has many different regions and it is harder to view the results on the map, we recommend lowering its limit. That way the results will be clearer, and you will only see the relations with more significant data.



While viewing the results in **Spatial Sankey** you can click on a specific line connecting two different regions and see the trips statistics.



5. Flows Explorer

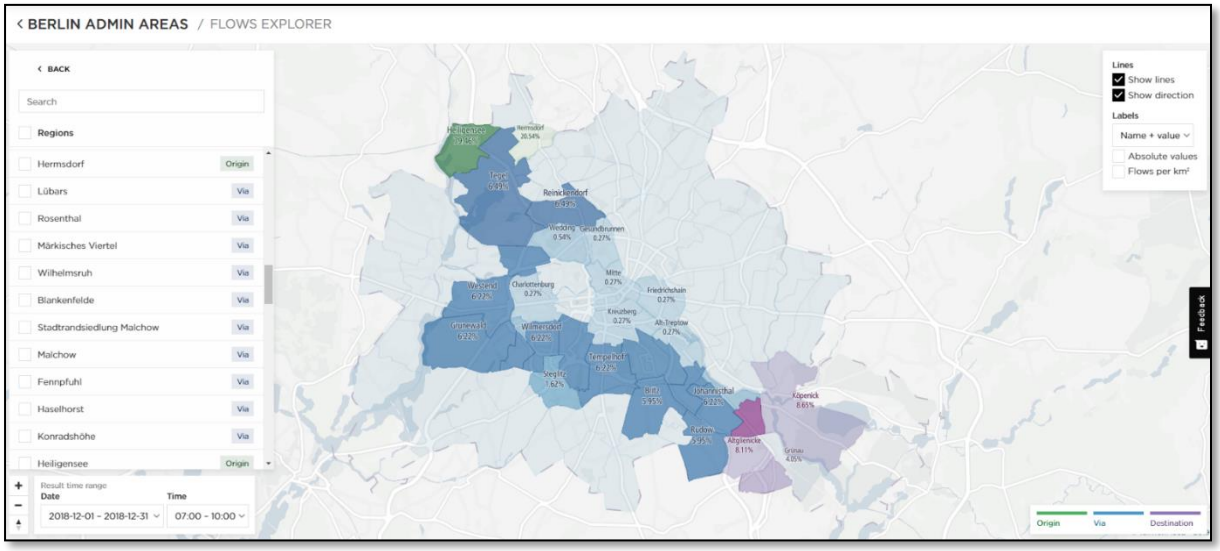


Image 30: Analysis results displayed on an interactive map of **Flows Explorer**.

This is an interactive report view that allows you to select more than one **Origin**, **Via** and **Destination** comparing to the **Map Flow**.

If you click on the region selected as **Via**, you will see the start and the end regions, which travelled through this one and their percentage ratio.

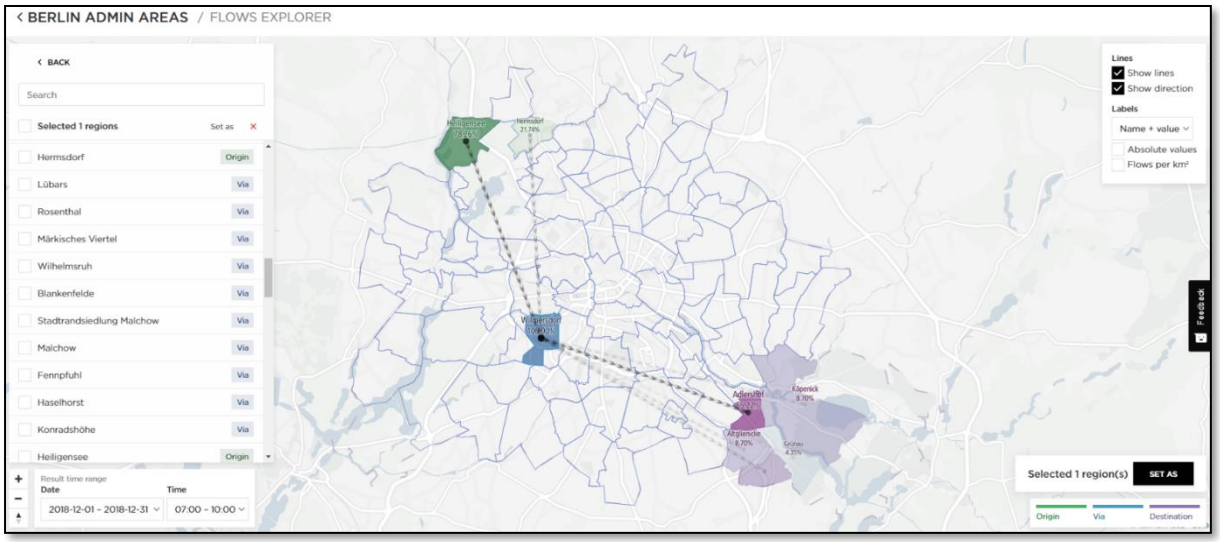
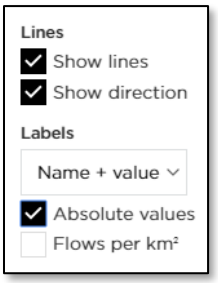


Image 31: An example combination of multiple regions types in **Flows Explorer**.

In case you would like to see the number of probes instead of the percentages, you can check "**Absolute values**".



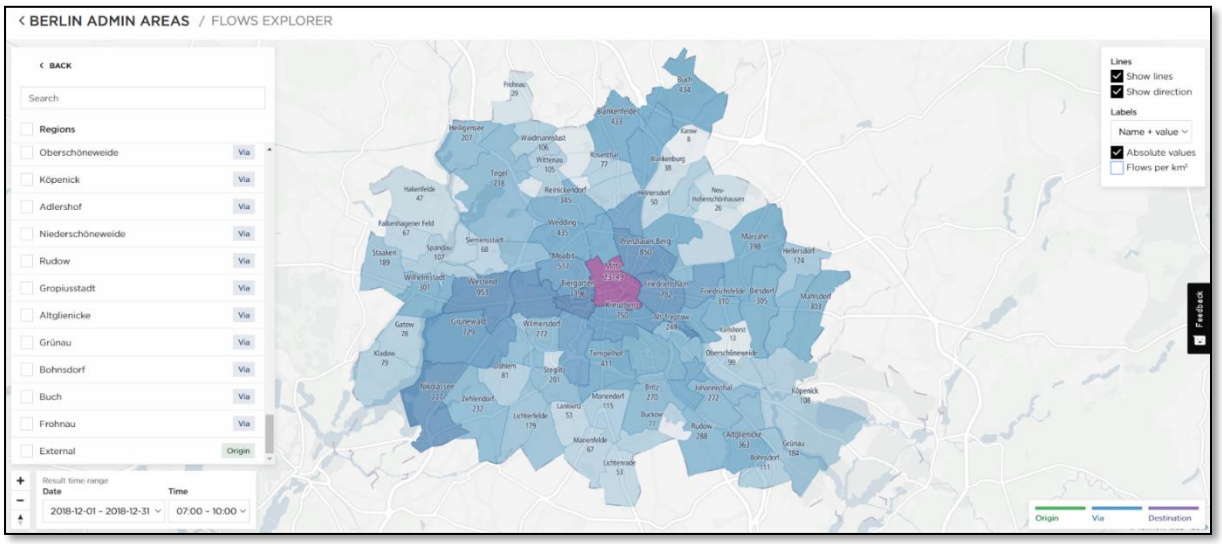
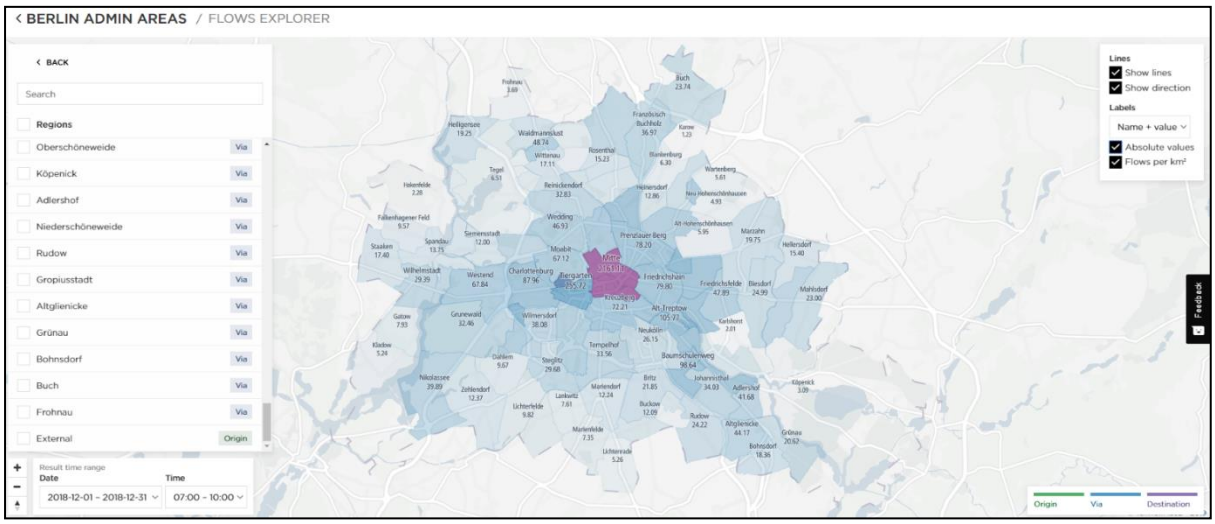
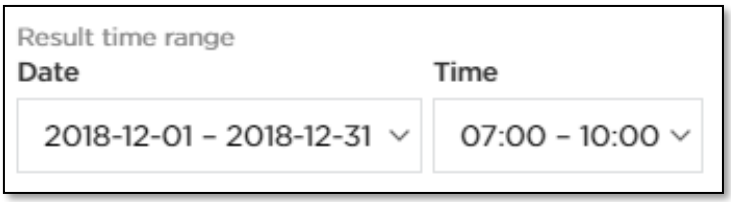


Image 32: Results displayed in form of **Absolute values** instead of percentages.

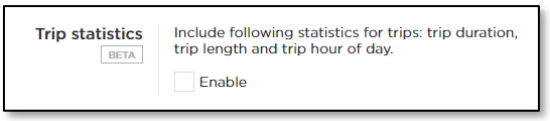
Just like **Map Flows**, this view also allows you to check the **Flows per km²** values in the upper right corner:



The date and the time ranges can be changed in the bottom left corner of the map.



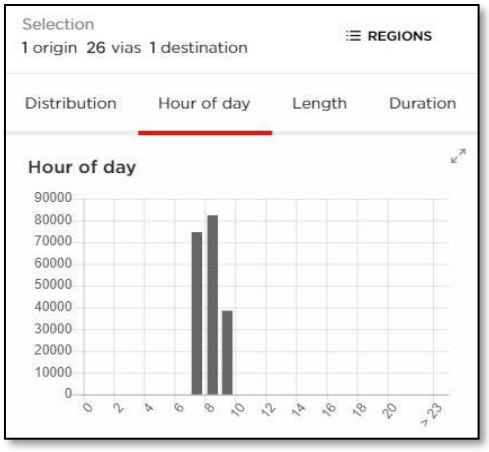
In case you selected the additional **Trip statistics** option while creating the report, you will be able to view these results in the **Flows Explorer** section.



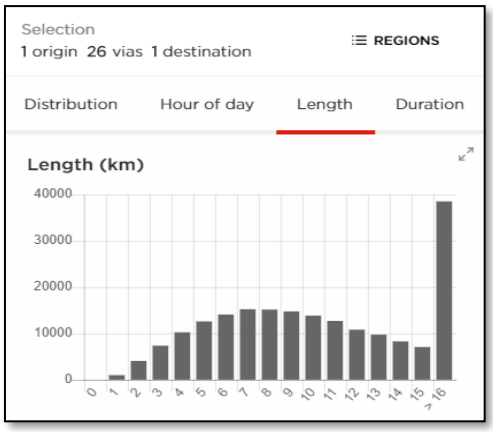
This parameter enables you to see not only trip count but also histograms of:

- Distribution – shows the number of vehicles travelled in a specific direction.

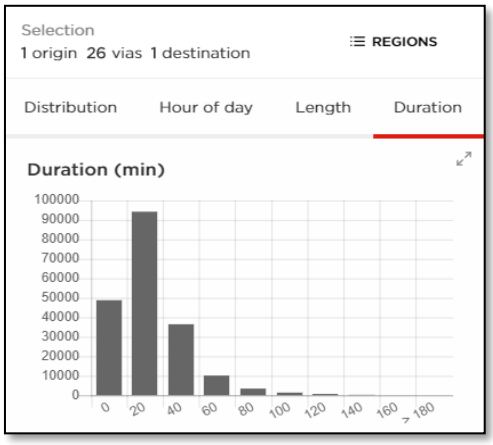
- Hour of day – shows the number of vehicles that started the trip at the specific hour.



- Length – shows the number of vehicles that travelled the specific distance.



- Duration – shows the number of vehicle trips that lasted for a specific time.



Use Cases & How To Read The Results

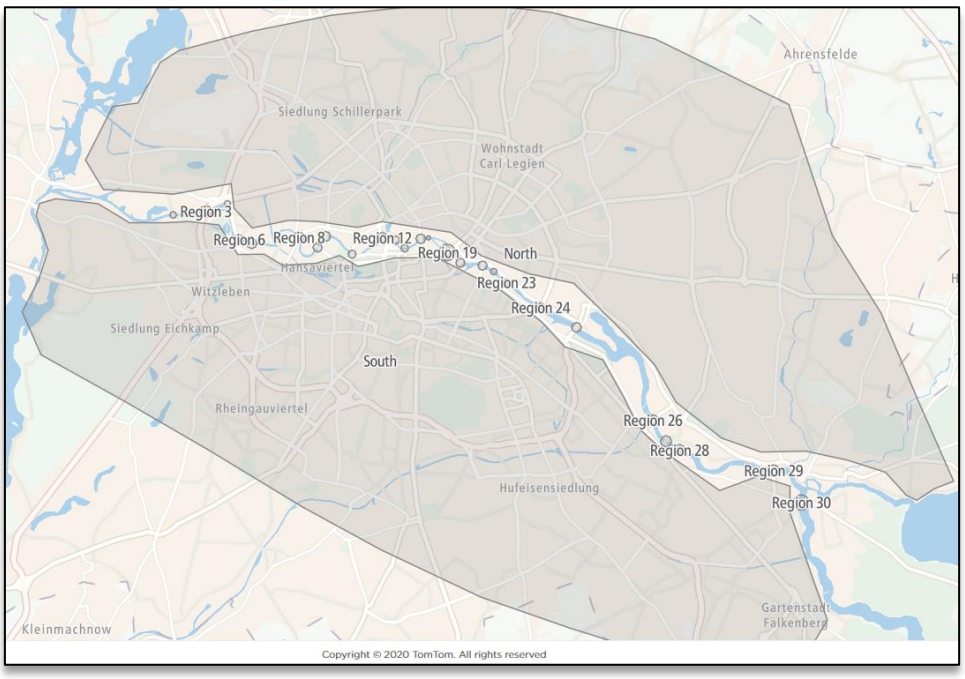
Origin-Destination Analysis tool allows analysing the trip patterns in multiple ways. That creates the opportunity for diversity in results which may vary based on the customer needs.

Because you are free to draw your regions in whatever way you wish, it is possible to create different scenarios.

Use Case 1

Let's say an advertisement company wants to see which bridge was used the most while crossing the river in Berlin to know where to place their billboards while advertising some social events to increase their marketing reach. Or maybe the city council wants to modernize bridges but wants to analyse the network to pick the least used bridges first to prevent heavy traffic interference.

It is very simple to receive such results in Origin-Destination Analysis. Below you can see that it is possible to create one big region around the **north side of the city**, one big region around the **south side of the city** and multiple small regions on **each bridge between them**.



Once you have such an analysis calculated, you can go straight to the results. In the "**Map Flows**" section, which was explained on **Page 17**, you can mark the upper regions as the **Origin** and the bottom regions as the **Destination**.

Just by following these two simple steps, you will be able to see the whole trip distribution between these zones.

Now you can zoom in to the bridge you are interested in, for example – the one marked as **Region 20**. You can see that it is the most travelled bridge among all the nearby bridges, with **13.99%** of all the trips from the **north side of the city** to the **south side of the city** going through it.

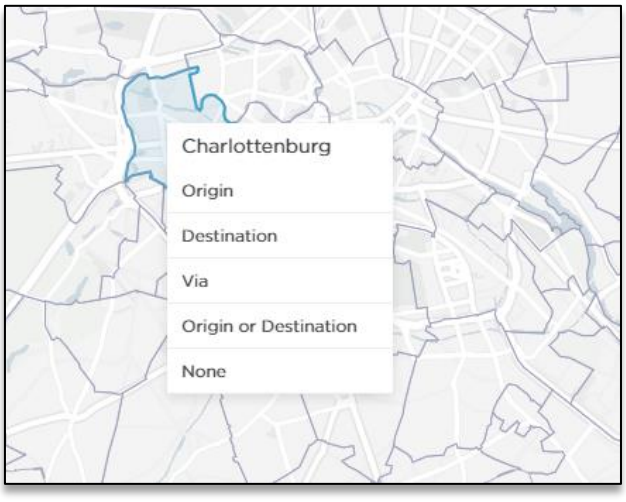
Use Case 2

Instead of drawing the regions on your own, the O/D Analysis tool allows you to select already predefined administrative areas by clicking them on the map in the region creation section.

That way it is incredibly easy to analyze the trip patterns between different admin areas of a specific location.

Once you have your administrative areas selected and the analysis calculated, you can go straight to the results and customize the region relations you are interested in.

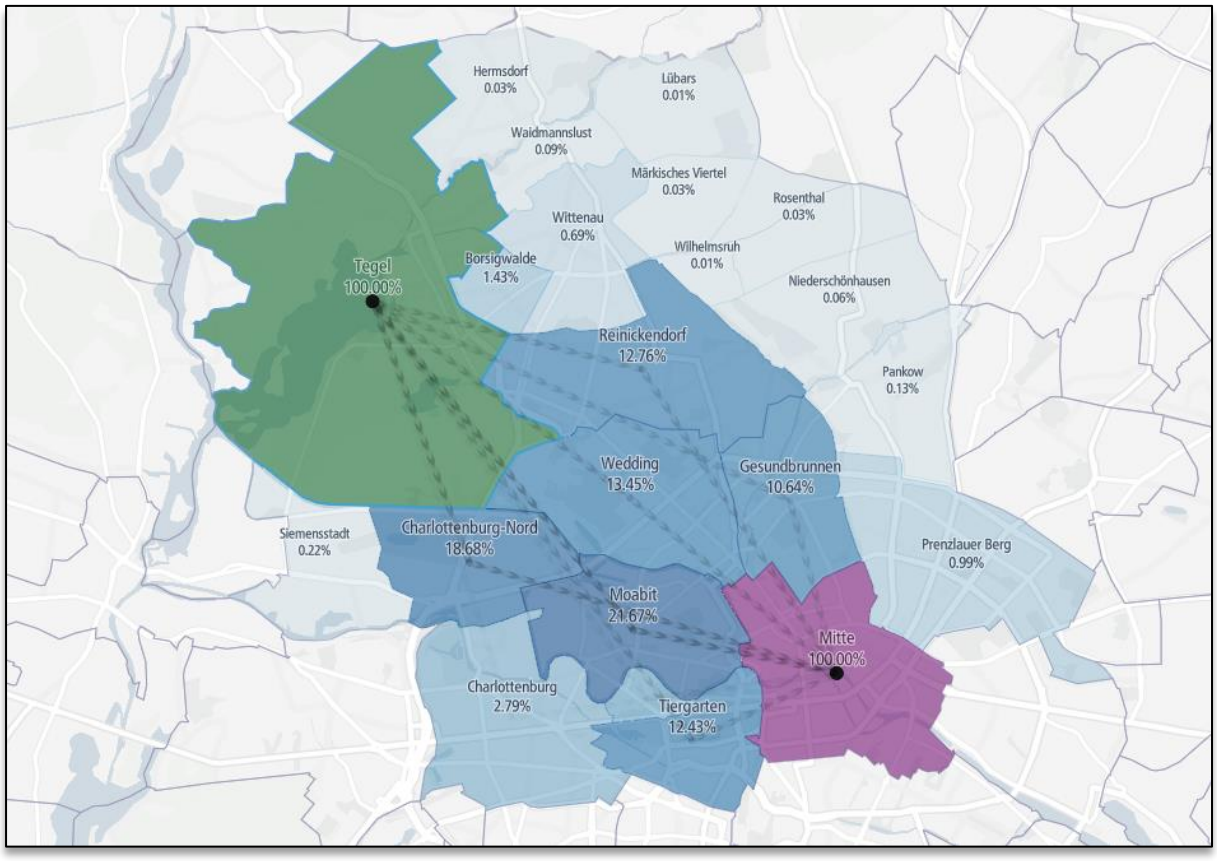
Useful way of reviewing the relations between multiple regions is to use the **Flows Explorer** section. It allows you to mark any region as **Origin**, **Destination, Via,** or both **Origin or Destination** so you can customize the flows in any way possible.



As an example scenario - the city council wants to reduce vehicle congestion and pollution by opening new public bus transport routes from **Tegel** administrative area to **Mitte**, the city center.

To plan the routes, they need to know which admin areas are the most traversed ones on the route from A to B. It is simple to see that outcome in O/D Analysis. All you need to do is to mark the **Tegel** region as either the **Origin** or **Destination,** then mark the **Mitte** region as either the **Origin** or **Destination** and finally mark all the regions between them as **Via.**

The results would help to see the trip patterns between these zones:



Additional Options

After opening the analysis from "**My Reports"** list, users are able to view the results in form of 5 different methods, just as it was explained above, but there is also information about the analysis **Date Range** and **Time Parameters.**

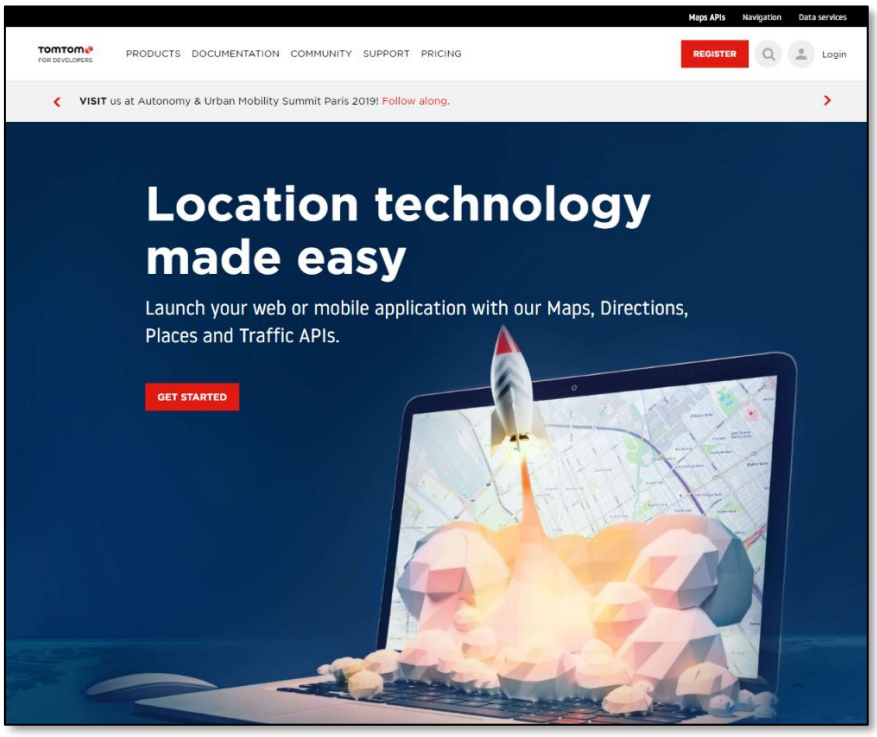
The regions of a processed analysis can be downloaded in GeoJson format if you click **Regions**. That way it will be possible to reuse them again while creating a new report. It is also possible to **RENAME** regions even when the analysis is processed.

Image 33: Option to rename and download regions.

Delivery

API Delivery – Developer Portal

To request API access, please visit https://developer.tomtom.com/.



Web App Delivery – TomTom Move

To request web app access, please visit https://move.tomtom.com/login.