TransitAnalystIsrael Methodology

Rev 1.0

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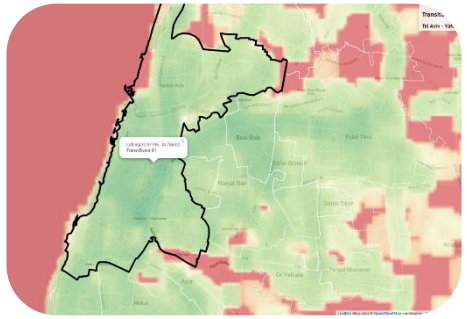
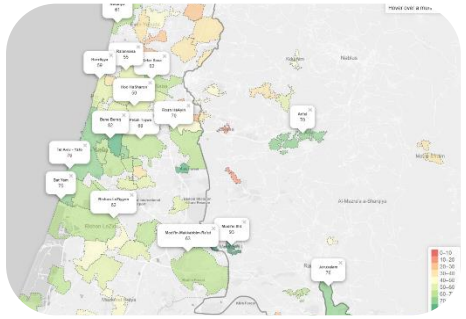
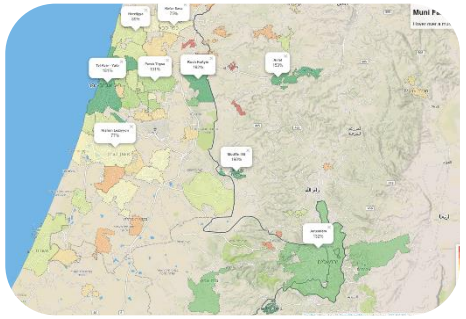
מנתח תחבורה לישראל
כלים קלים לשימוש לתכנון תחבורה בישראל



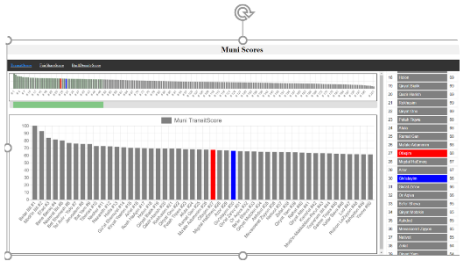
TransitScore Israel – The relative intensity of the transit service in Israel by location.



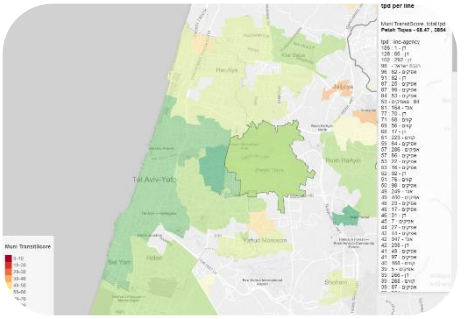
Municipal TransitScore - The relative average intensity of the transit service in cities and towns in Israel.



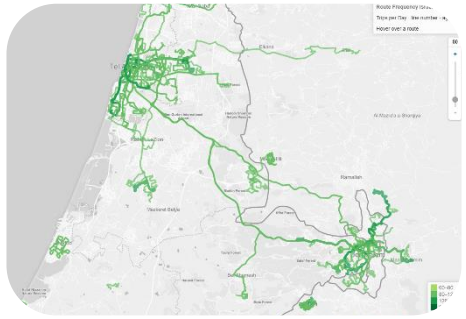
Municipal FairShareScore - The relative investment in transit service in cities and towns in Israel.



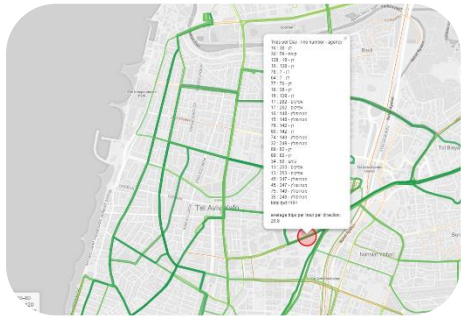
Municipal Transit Ranking – Municipal ranking by TransitScore, FairShareScore and BuiltDensityScore displayed as charts and lists.



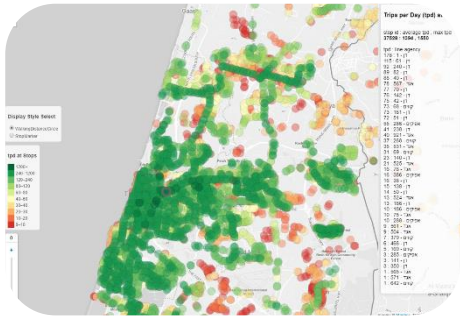
Municipal trips per day (tpd) per line – Display the trips per day for each transit line that serves a selected City or town.



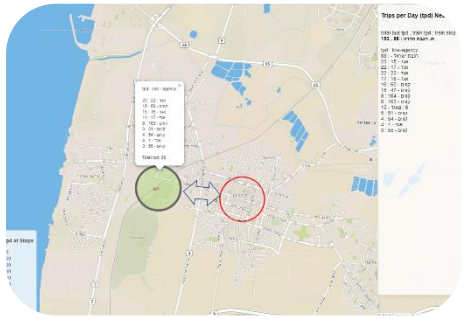
Frequent Service Lines – Show frequent service lines on an interactive map.



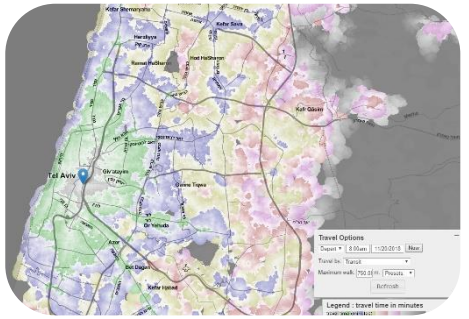
Buses per day on street – Provide a list of all the lines and their service per day on a selected street segment.



Accessible level of service at stops – Displays the level of transit service accessible within walking distance from any location.



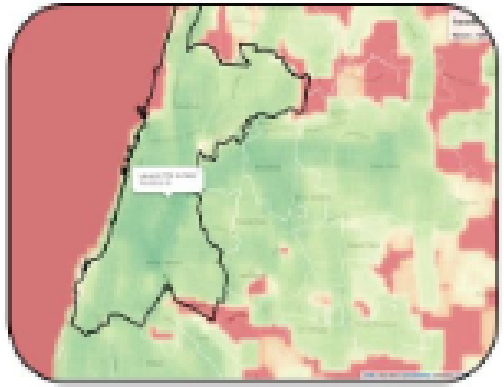
Accessible level of service to and at train stations – Display the level of service on feeder buses near train stations and the level of service of trains at stations.



TransitTimeMap - Accessible area for a given duration of travel from/to a location by transit (or bike or walking).

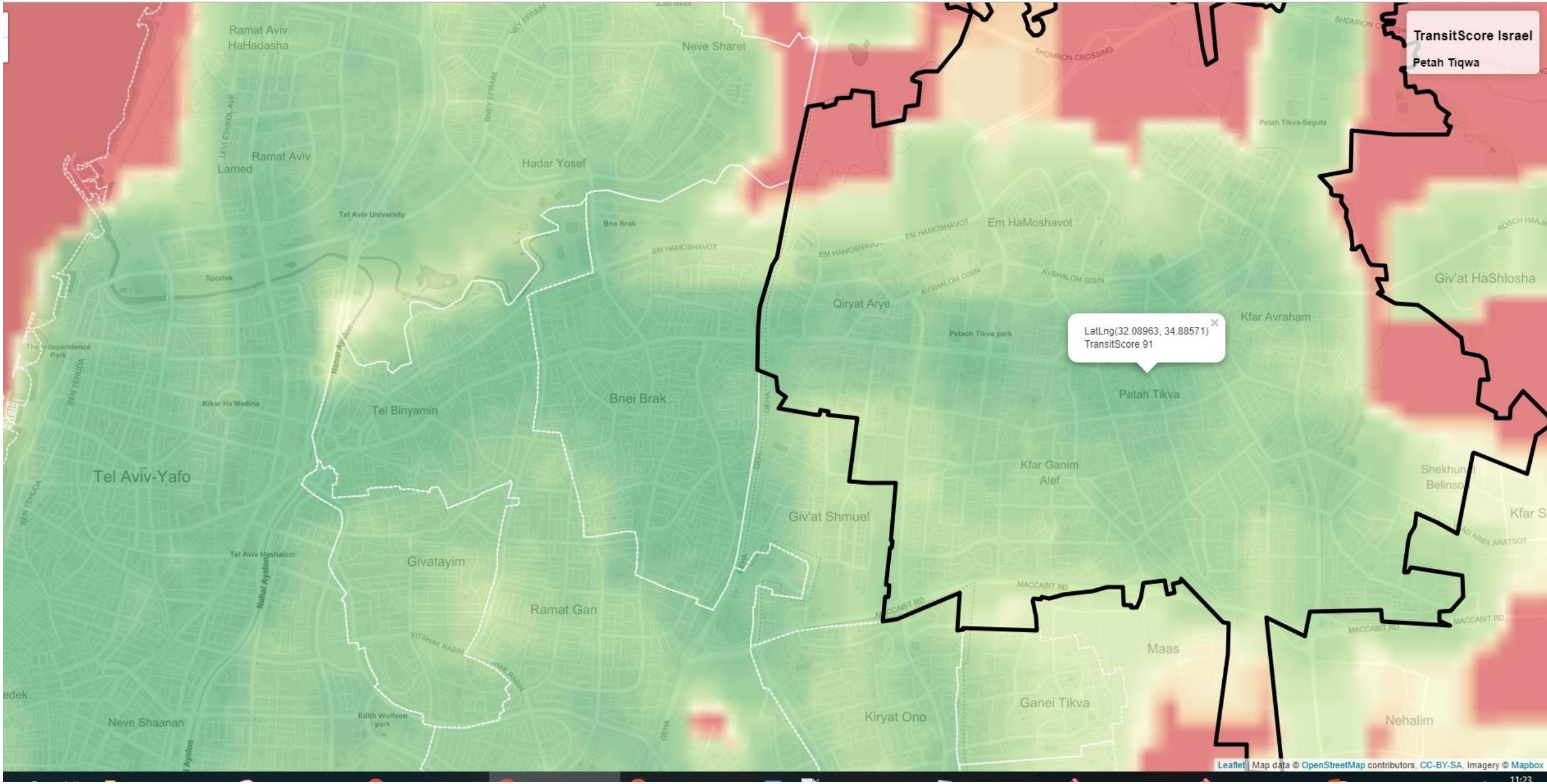
עוצמת תח"צ לפי מיקום

ציון יחסי של שירות התח"צ בישראל לפי מיקום.
הציון מנורמל לערכים בטווח 0-100.
מוצג כמפת חום (ירוק גבוה – אדום נמוך) אינטראקטיבית.
לחצו על המפה כדי לקבל ציון עבור מיקום.
שימושי להשוואת רמת שירות תח"צ בין מיקומים או שכונות בתוך ישובים.



TransitScore Israel – The relative intensity of the transit service in Israel by location.

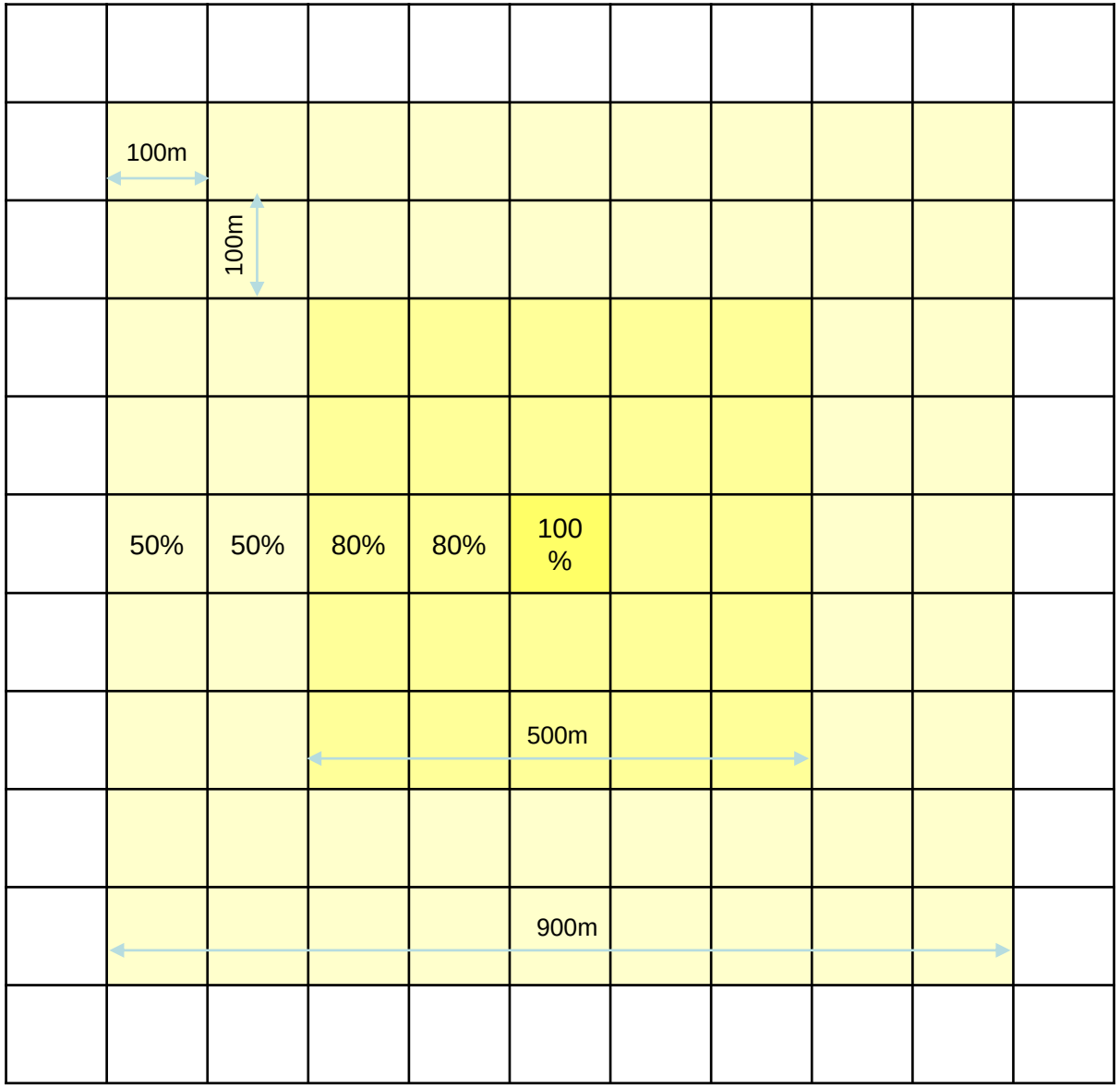
TransitScore Israel



TransitScore Israel Methodology

- TransitScore Map for all of Israel displayed as heat-map on an interactive map
  - A 100mx100m grid is overlaid on the entire area of Israel
  - A Grid Score is computed for each grid element using the GTFS file data (see next slide). To compute the grid score we count the number of opportunities to use transit in and around the grid element during the analysis period of one week. Any time a bus (or train or LRT or BRT) stops and opens the doors - it is a transit opportunity. We give different weight based on the distance of the stop from the grid element. We also give different value, to the different transit types, for each transit opportunity: 1x for bus, 3x for BRT, 5x for LRT, 10x for train.
  - The Transit Score (between 0 and 100) for each grid element is calculated by normalizing the Grid Score
    - Transit Score(i,j) = 100 *log(Grid Score(i,j))/ log(Max Grid Score of IL)
  - The array of TransitScores in grid elements is used by the web tool to lookup and display the transitscore value for a location (lat,lon) that the user clicks on the map.
  - The array of TransitScores in grid elements is also used to create a color image that is displayed on the map in the web tool.
  - As part of the conversion of the array to an image theTransitScore for each grid element is mapped to a color spectrum from red through orange then yellow to green. So that 100 is bright green and 0 is dark red. The color rendering uses a mapping file that can be easily changed. Every 5 points (between 0 and 100) is mapped to a different color.

Calculating the Grid Score in TransitScore



- s_size = 1
  - 100m square grid element
  - weight_s = 1.0
- m_size = 5
  - 500m square around grid element
  - weight_m = 0.8
- l_size = 9
  - 900m square around grid element
  - weight_l = 0.5

- Grid_Score for each grid element =

  1.0 * number of trips that stop in grid element +

  0.8 * number of trips that stop in 500m square around grid element (but not in grid element) +

  0.5 * number of trips that stop in 900m square around grid element (but not in grid element nor in 500m around grid element))

- Count increment per trip at stop:
  - 1x for bus,
  - 3x for BRT,
  - 5x for LRT,
  - 10x for train.

TransitScore Israel Methodology – known issues

- The 100mx100m grid elements are actually 0.000900 deg lat x 0.001050 deg lon grid elements. These elements have an error of +-2% over the entire extent of Israel relative to 100mx100m grid elements.
- The actual accessibility of the grid elements surrounding the one being analyzed and contributing to the score, is not tested.
- The normalized [0-100] TransitScore does not have any meaningful units. It is a relative measure. Since Log is used as part of the normalization – a small reduction in score is a big reduction in service. Other tools – like the tpd at stops or line frequency provide measures with meaningful units.
- The grid element with maximum grid score, gets the normalized score of 100. This score of 100 in one month (instance) is not the same level of service as the 100 in another month. TransitScore is a relative score within one instance and can not be compared between instances.

עוצמת תח"צ בישוב

ציון יחסי של עוצמת שירותי התח"צ בישוב .
הציונים מנורמלים לערכים בטווח 0-100.
מוצג כמפה אינטראקטיבית.
לחצו על הישוב כדי לקבל ניקוד.
שימושי להשוואת רמת שירות תח"צ בין ישובים.

Municipal TransitScore - The relative average intensity of the transit service in cities and towns in Israel.

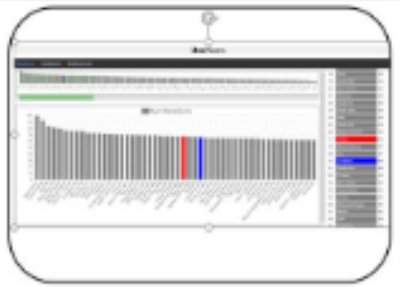
השקעת תח"צ בישוב

ציון יחסי של ההשקעה בשירותי תח"צ בישוב.
הציונים יחסיים להשקעה הלאומית הממוצעת לאדם.
לדוגמא, ציון 100% היא השקעה זהה לממוצע הלאומי, ציון 150% היא השקעה גבוהה ב-50% מהממוצע הארצי וציון 70% היא השקעה נמוכה ב-30% מהממוצע הארצי.
מוצג כמפה אינטראקטיבית.
לחצו על ישוב כדי להציג את הציון.
שימושי עבור השוואת ההשקעה בשירות תח"צ בין ישובים.

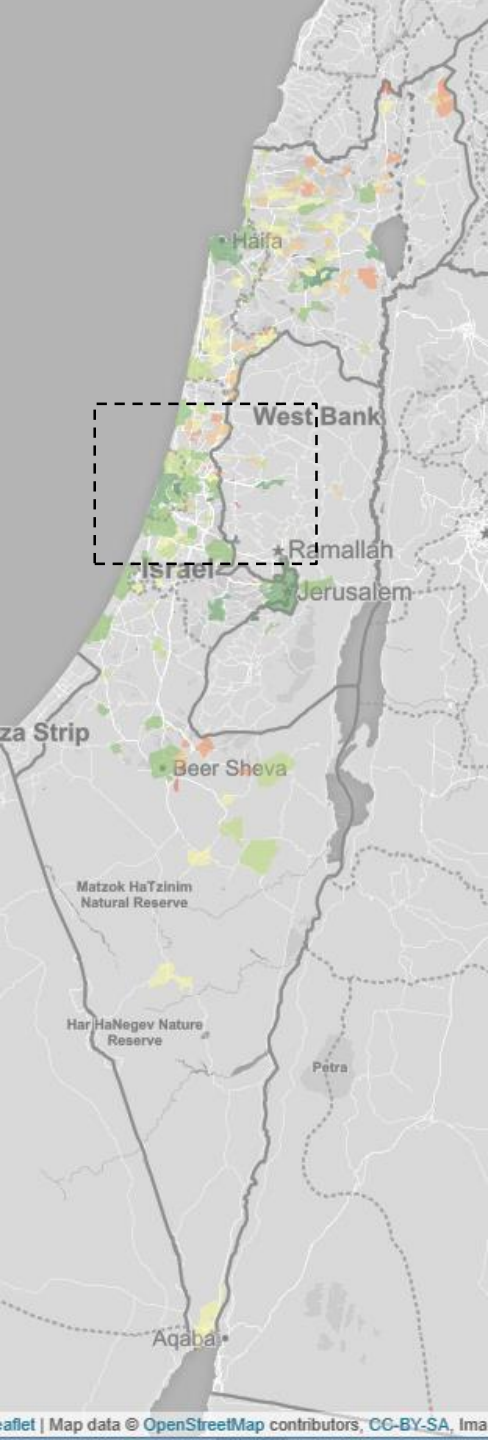
Municipal FairShareScore - The relative investment in transit service in cities and towns in Israel.

דירוג תח"צ בין ישובים

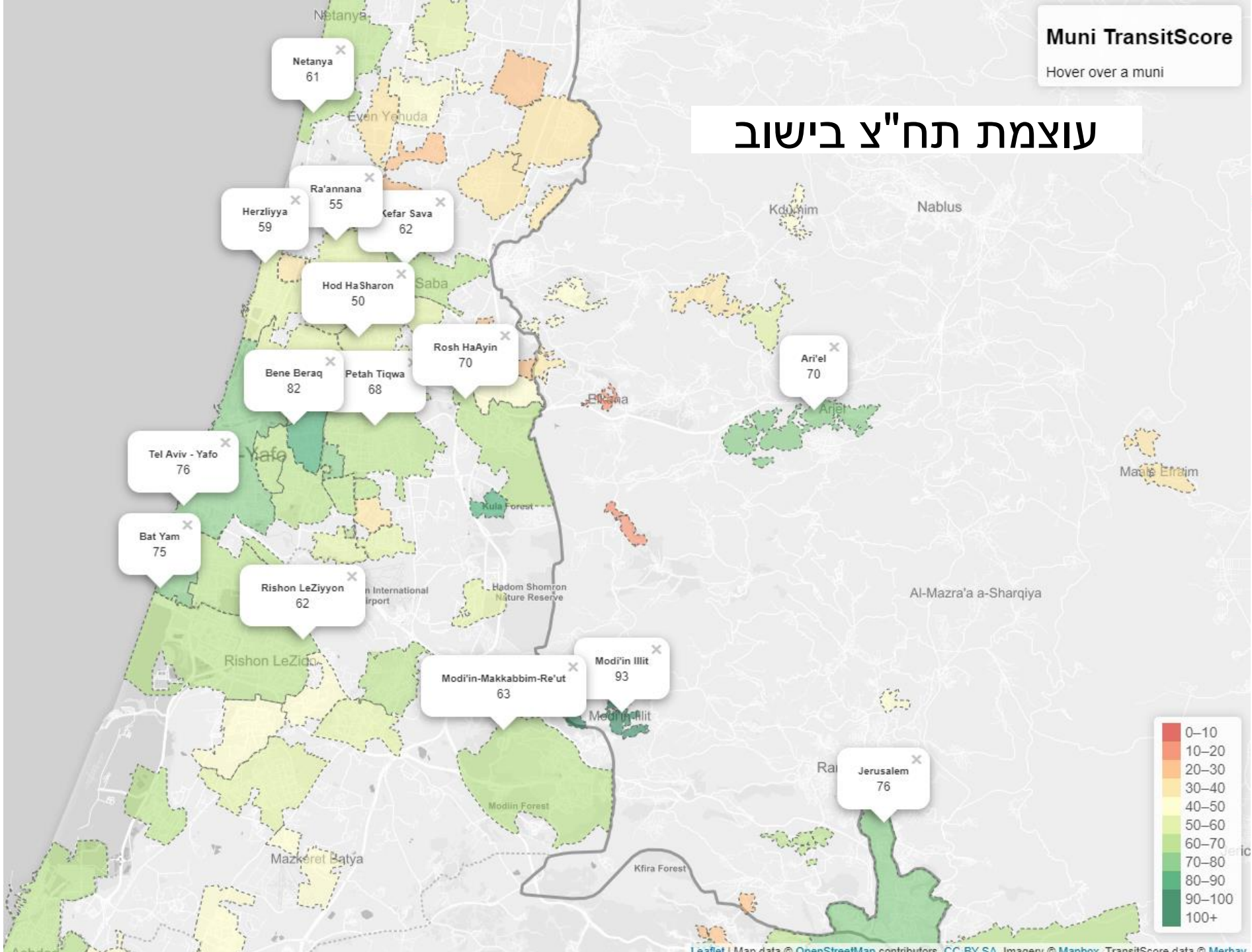
דירוג ישובים לפי עוצמת תח"צ בישוב, לפי השקעת תח"צ בישוב ולפי הצפיפות הבנויה של הישוב.
הדירוגים מוצגים על גבי תרשימים.
חפשו ומיינו את הדירוגים לפי שם הישוב או לפי הציון.
השתמשו בסליידר כדי לעבור בין אזורים שונים של התרשים.
לחצו על שם הישוב או על התרשים כדי להדגיש את הישוב.
שימושי להשוואת הדירוג בין ישובים שונים.



Municipal Transit Ranking – Municipal ranking by TransitScore, FairShareScore and BuiltDensityScore displayed as charts and lists.



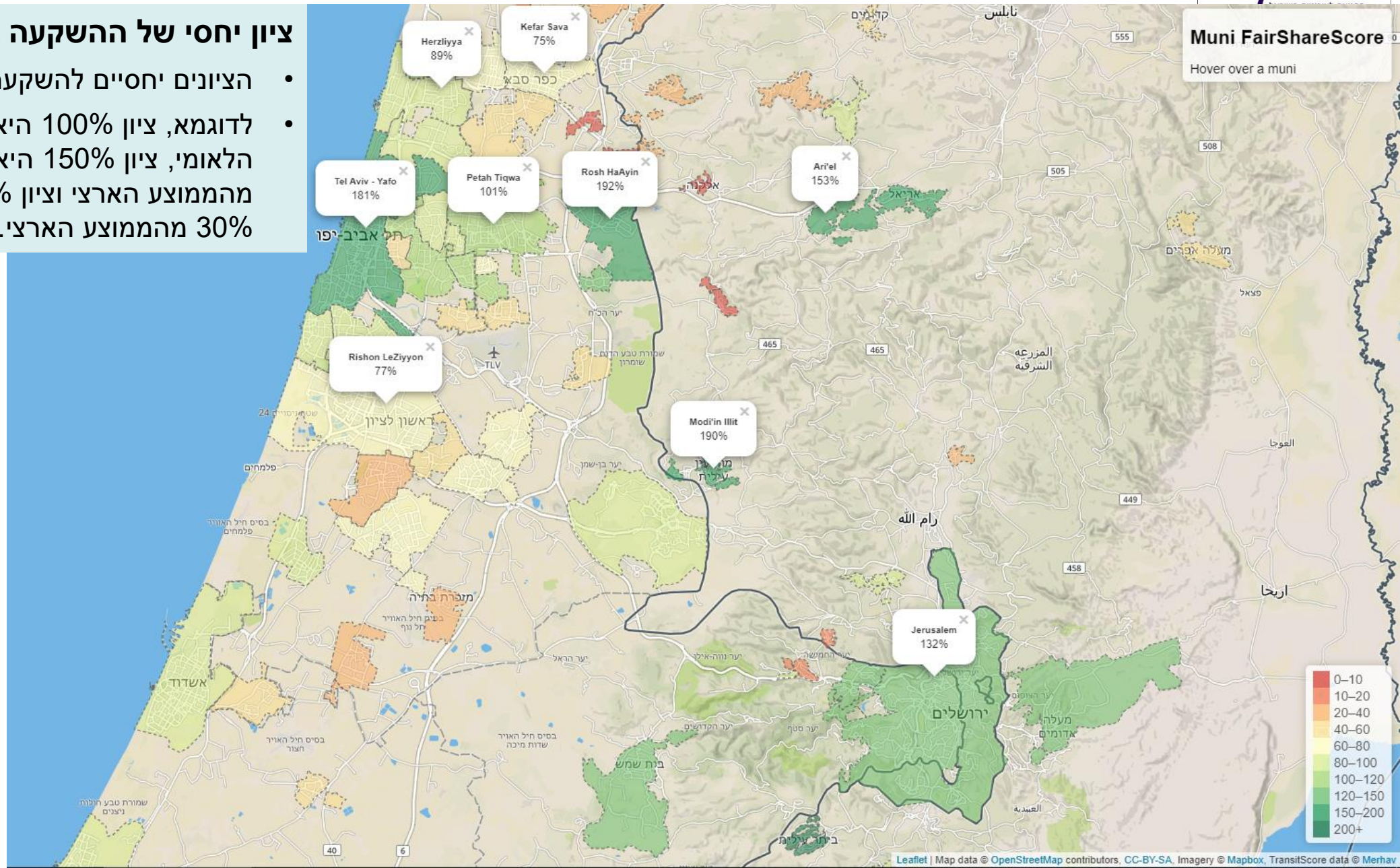
עוצמת תח"צ בישוב



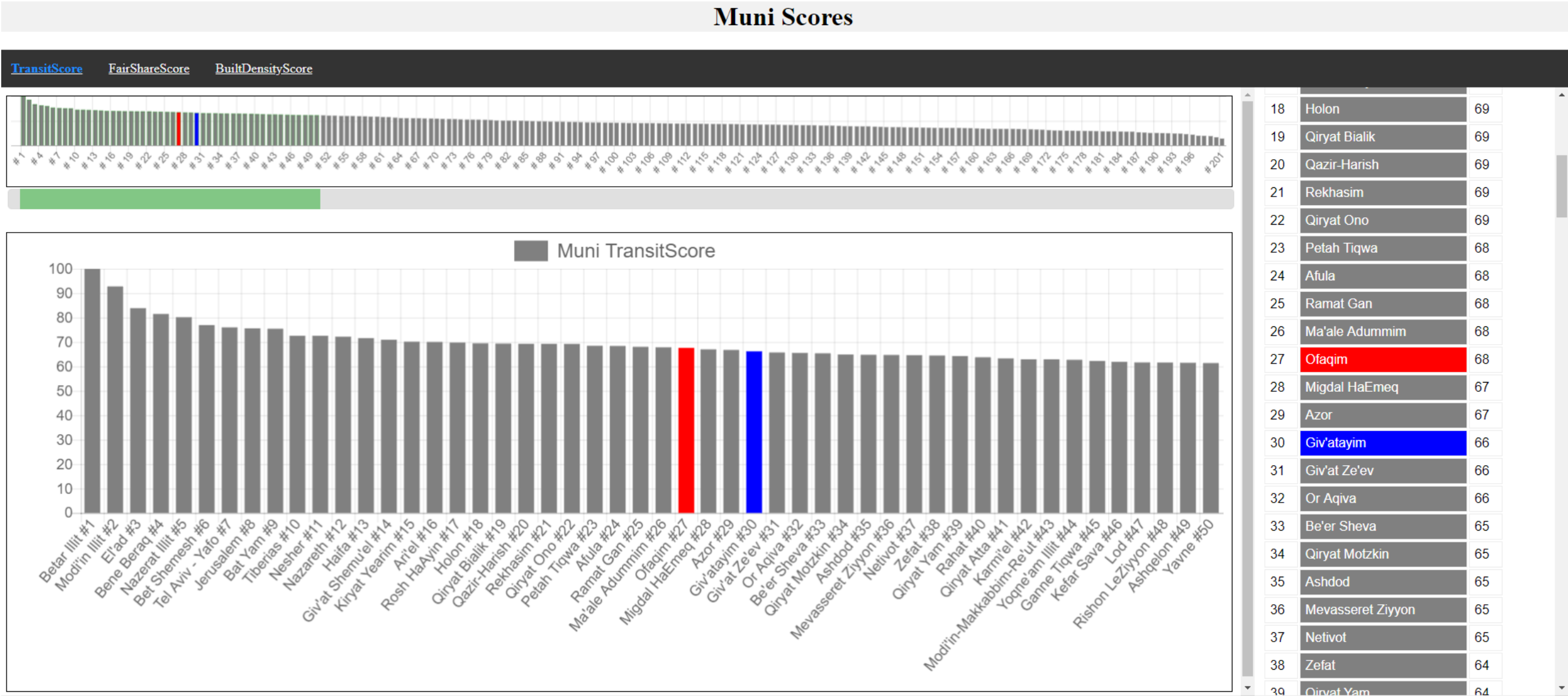
השקעת תח"צ בישוב

ציון יחסי של ההשקעה בשירותי תח"צ בישוב.

- הציונים יחסיים להשקעה הלאומית הממוצעת לאדם.
- לדוגמא, ציון 100% היא השקעה זהה לממוצע הלאומי, ציון 150% היא השקעה גבוהה ב-50% מהממוצע הארצי וציון 70% היא השקעה נמוכה ב-30% מהממוצע הארצי.



דירוג תח"צ בין ישובים

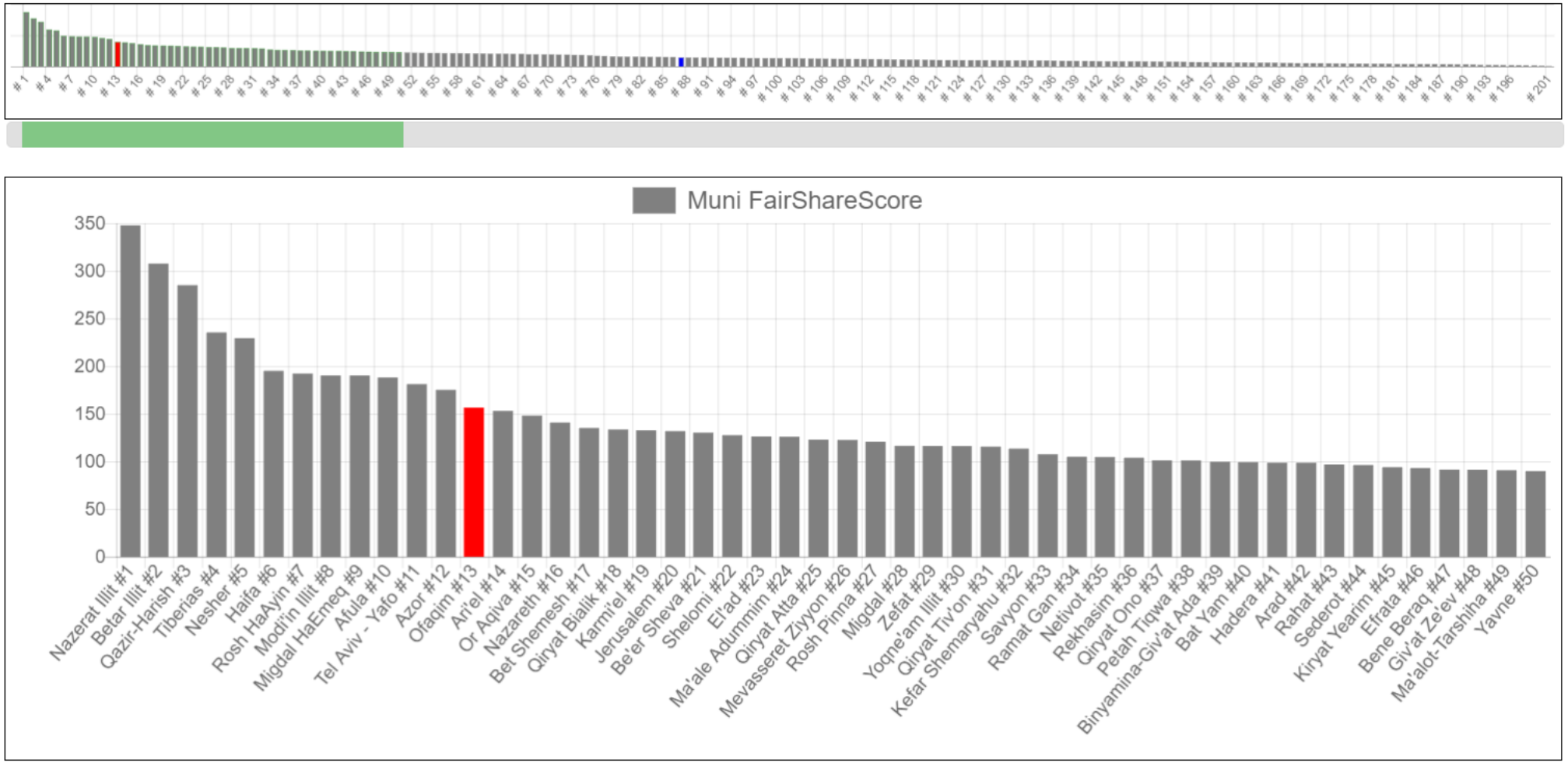


18	Holon	69
19	Qiryat Bialik	69
20	Qazir-Harish	69
21	Rekhasim	69
22	Qiryat Ono	69
23	Petah Tiqwa	68
24	Afula	68
25	Ramat Gan	68
26	Ma'ale Adummim	68
27	Ofaqim	68
28	Migdal HaEmeq	67
29	Azor	67
30	Giv'atayim	66
31	Giv'at Ze'ev	66
32	Or Aqiva	66
33	Be'er Sheva	65
34	Qiryat Motzkin	65
35	Ashdod	65
36	Mevasseret Ziyyon	65
37	Netivot	65
38	Zefat	64
39	Qiryat Yam	64

דירוג תח"צ בין ישובים

Muni Scores

TransitScore | FairShareScore | BuiltDensityScore



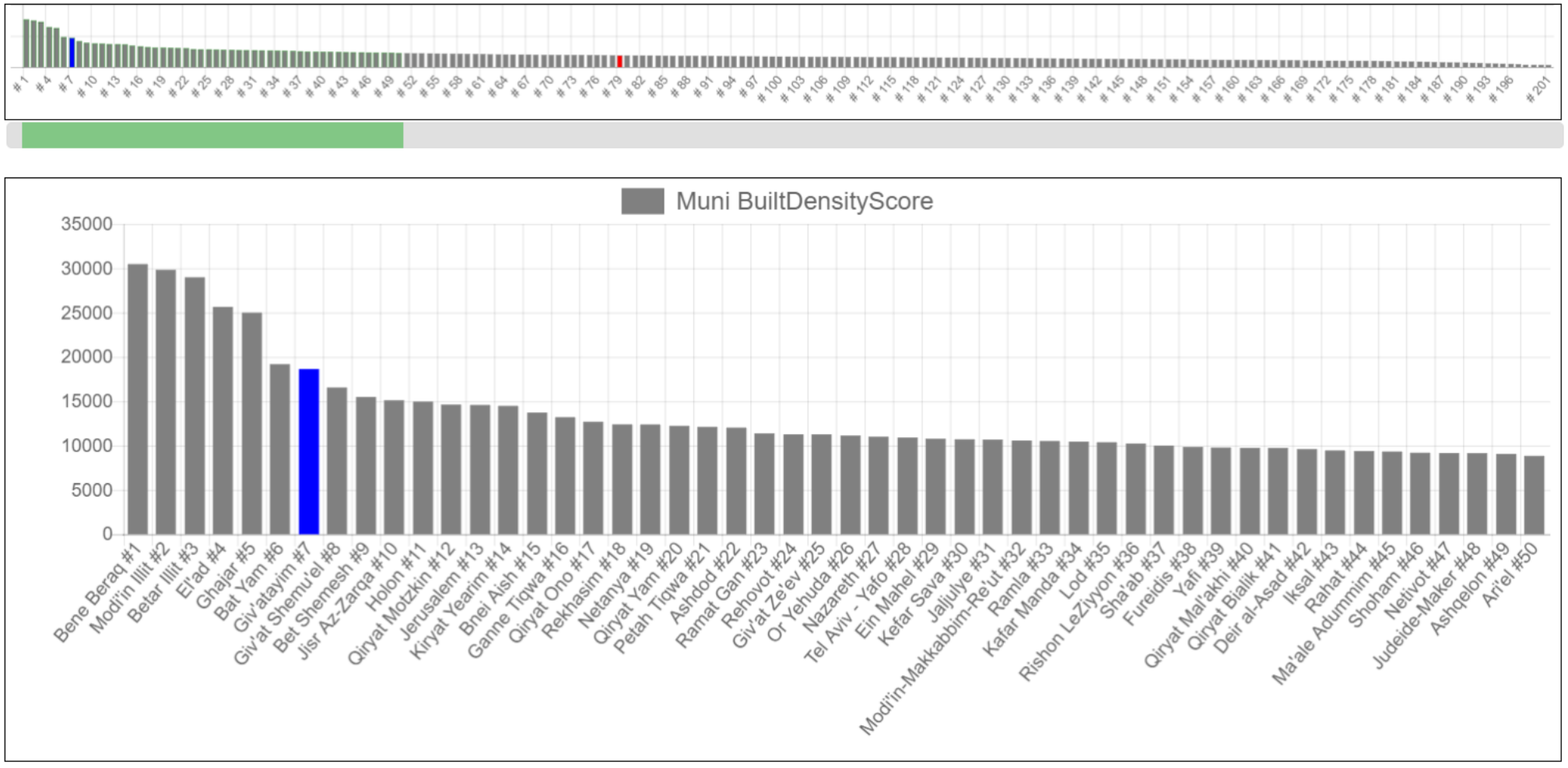
Search

	Muni Name	FairShareScore
1	Nazerat Illit	348%
2	Betar Illit	308%
3	Qazir-Harish	285%
4	Tiberias	235%
5	Nesher	229%
6	Haifa	195%
7	Rosh HaAyin	192%
9	Migdal HaEmeq	190%
8	Modi'in Illit	190%
10	Afula	188%
11	Tel Aviv - Yafo	181%
12	Azor	175%
13	Ofaqim	156%
14	Ari'el	153%
15	Or Aqiva	148%
16	Nazareth	141%
17	Bet Shemesh	135%
19	Karmi'el	133%
18	Qiryat Bialik	133%

דירוג תח"צ בין ישובים

Muni Scores

TransitScore FairShareScore BuiltDensityScore



Search

	Muni Name	Built Density
1	Bene Beraq	30484
2	Modi'in Illit	29821
3	Betar Illit	28989
4	El'ad	25642
5	Ghajar	25000
6	Bat Yam	19182
7	Giv'atayim	18631
8	Giv'at Shemu'el	16558
9	Bet Shemesh	15487
10	Jisr Az-Zarqa	15106
11	Holon	14965
12	Qiryat Motzkin	14624
13	Jerusalem	14590
14	Kiryat Yearim	14483
15	Bnei Aish	13725
16	Ganne Tiqwa	13206
17	Qiryat Ono	12697
18	Rekhasim	12391
19	Netanya	12385

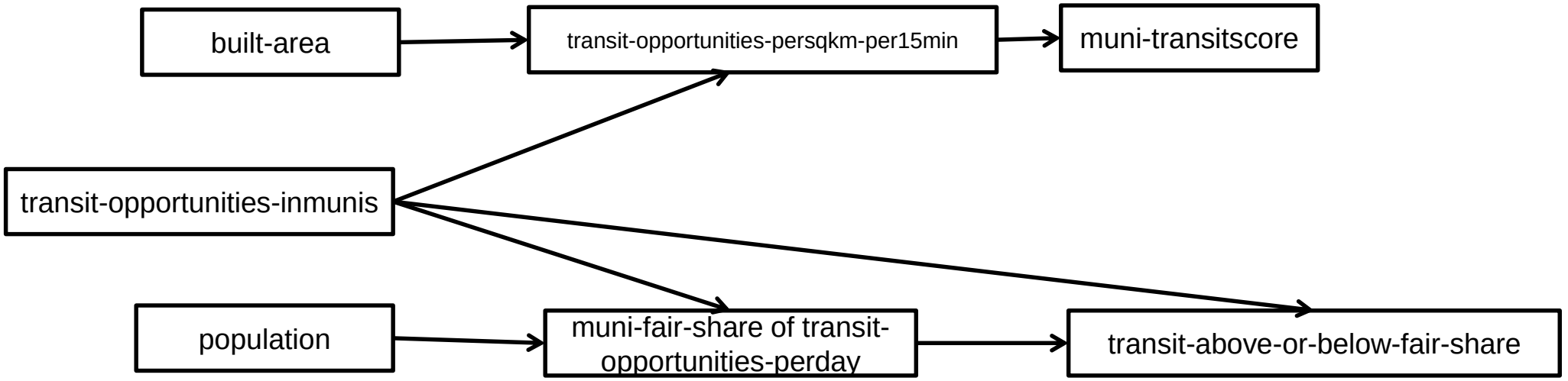
Muni TransitScore, Muni FairShareScore and Muni Rank Methodology

- Municipal TransitScore, Municipal FairShareScore and the Municipal Ranking tool all use the same data and share the same processing flow. They are therefore discussed together.
- The municipalities that we analyze are the 201 cities and towns (‘moatzot mekomyot”) in Israel.
- First we compute the average tpd (trips per day) at each stop (trips per week / 6). When computing tpd we give different value, to the different transit types, for each transit trip at a stop: 1x for bus, 3x for BRT, 5x for LRT, 10x for train.
- We then collect the set of stops in each muni. We do this by geo-filtering the GTFS stop locations by the muni boarder polygons (each muni boarder polygon is a muli-polygon, to be exact).
- Once we have a set of stops per muni, we sum the average tpd for all the stops in each muni to get the transit opd (opportunities per day) for each muni.
- The opd per muni is divided by the muni built area (from the Israeli CBS – “lamas”) to get the muni transitscore – after log and normalization. (see next slide)
- To compute the fairsharescore we first divide the total opd for all munis by the total population for all munis. This is the fair (as in equal) share of transit opportunities per person in Isarel.
- We now multiply the fairshare per person by the muni population (from the Israeli CBS – “lamas”) to get the muni fairshare of transit opportunities per day.
- To get the muni fairsharescore we divide the muni opd by the muni fairshare opd. (see next slide)
- So that a muni with fairsharescore of 100% has transit opportunities per person like the national average. A muni with a fairsharescore of 150% has transit opportunities per person that are 50% higher than the national average. A muni with a fairsharescore of 70% has transit opportunities per person that are 30% lower than the national average.

Muni TransitScore, Muni FairShareScore and Muni Rank

- muni-transitscore = 100*LOG10(transit-opportunities-persqkm-per15min)/LOG10(MAX (all transit-opportunities-persqkm-per15min))
- transit-opportunities-persqkm-per15min = 15*transit-opportunities-inmuni /(built-area *12*16*60)

- transit-above-or-below-fair-share = muni-transit-opportunities-perday / muni-fair-share of transit-opportunities-perday
- muni-fair-share of transit-opportunities-perday = muni-population * total transit-opportunities-perday / total population

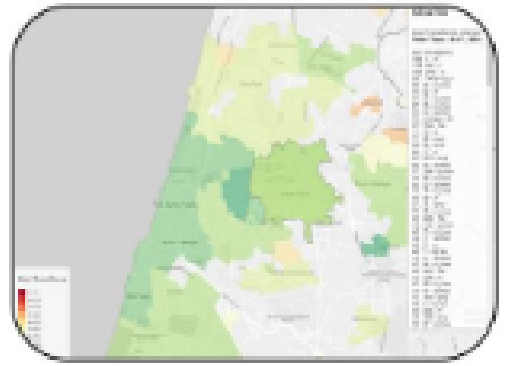


Muni TransitScore, Muni FairShareScore and Muni Rank Methodology – known issues

- The stops per muni are based on simple geo-filtering by the muni polygons. In some cases, this does not represent well all the stops that serve a muni. E.g. in cases where a road is the boarder between two munis, it is not uncommon that the muni boarders run through the middle of the road, such that the stops on one side are in a muni but the stops on the other side are not… This can be improved by adding a buffer of say 200 meters to all muni polygons before doing the geo-filtering. Another option is to manually edit the mapping of stops to munis.
- The “lamas” does not update the built area per muni often enough. Therefore the current processing uses muni built area data from 2013. This situation biases the muni transitscore to be higher than it should be for munis that increased their built area significantly since 2013. This can be improved by updating the built area by processing recent satellite data or by processing recent OSM (Open Street Map) data.

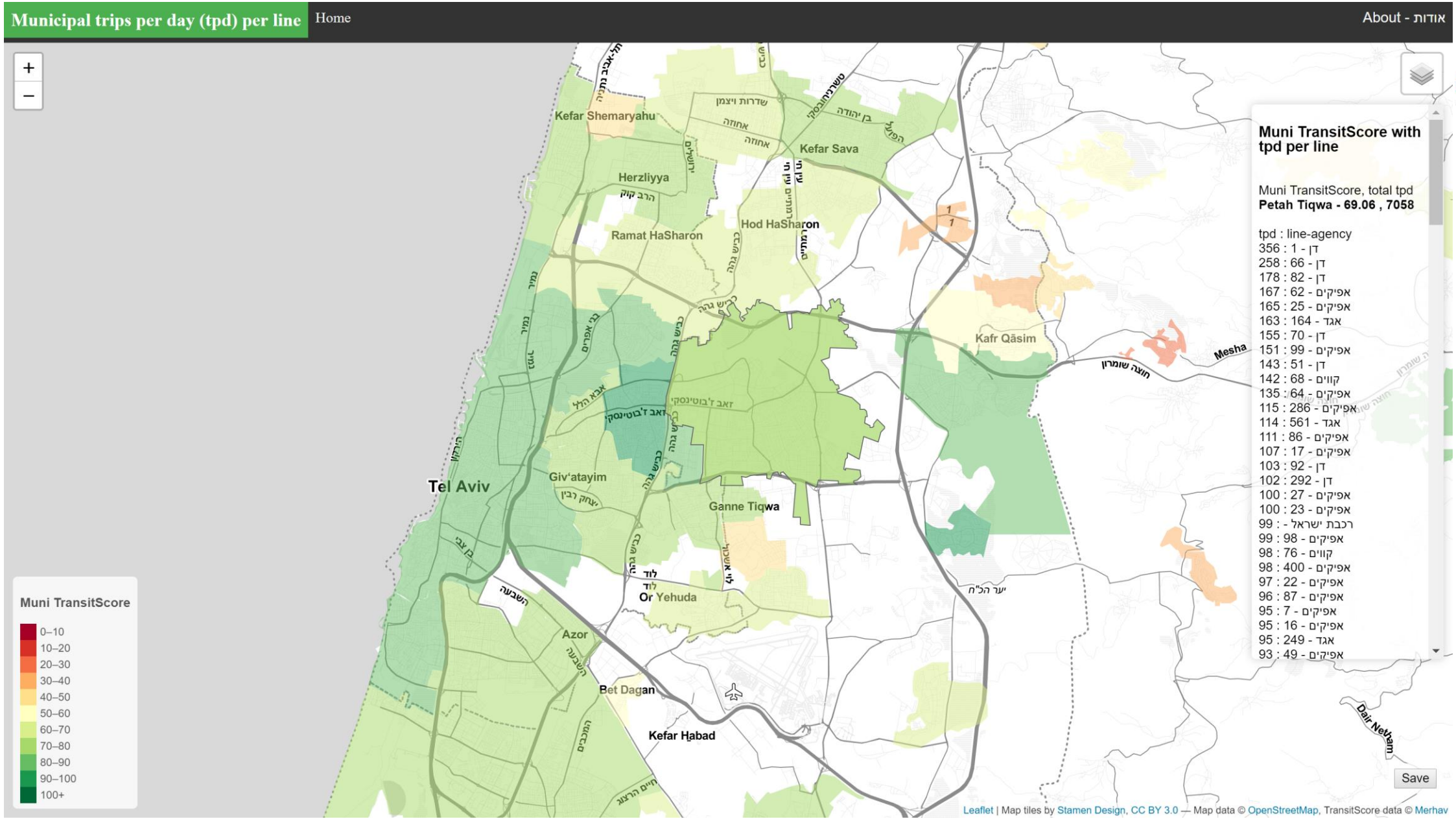
נסיעות תח"צ ליום בישוב

הצגת סך הנסיעות היומיות של כל הקווים המשרתים את הישוב הנבחר.
מוצג כמפה אינטראקטיבית.
לחצו על הישוב כדי לקבל רשימה של קווים ממוינים לפי סך הנסיעות היומי.
שימושי לניתוח מפורט של שירותי התח"צ בישוב וכבסיס להצעות לשיפור ברמת השירות.



Municipal trips per day (tpd) per line – Display the trips per day for each transit line that serves a selected City or town.

Muni trips per day (tpd) per Line



Muni trips per day (tpd) per Line Methodology

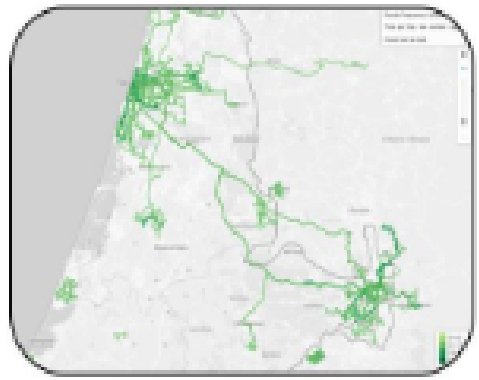
- The municipalities that we analyze are the 201 cities and towns (‘moatzot mekomyot”) in Israel.
- A “line” in this tool is based on the agency_id and the route_short_name. Although agency and route_short_name are not unique within Israel, the assumption is that within a muni they are unique. Note that based on this definition the output tpd per line is for both directions of the line.
- We first collect the set of stops in each muni. We do this by geo-filtering the GTFS stop locations by the muni boarder polygons (each muni boarder polygon is a muli-polygon, to be exact).
- For each stop in muni we collect the set of trips.
- We then merge the set of trips per stop into one set of trips per muni (eliminating overlap).
- We then for each trip in muni we count the number of trips in the week that the trip is scheduled to run. We count in different buckets per Line – one set of buckets is based on the days of the week (giving us tpd for each day of the week per line), a second is based on the hours in a day (giving us tph for each hour per line summed over the week).
- For the web tool, we output for display per muni the tpd per line on the day that the total tpd for all lines is max.

Muni trips per day (tpd) per Line
Methodology – known issues

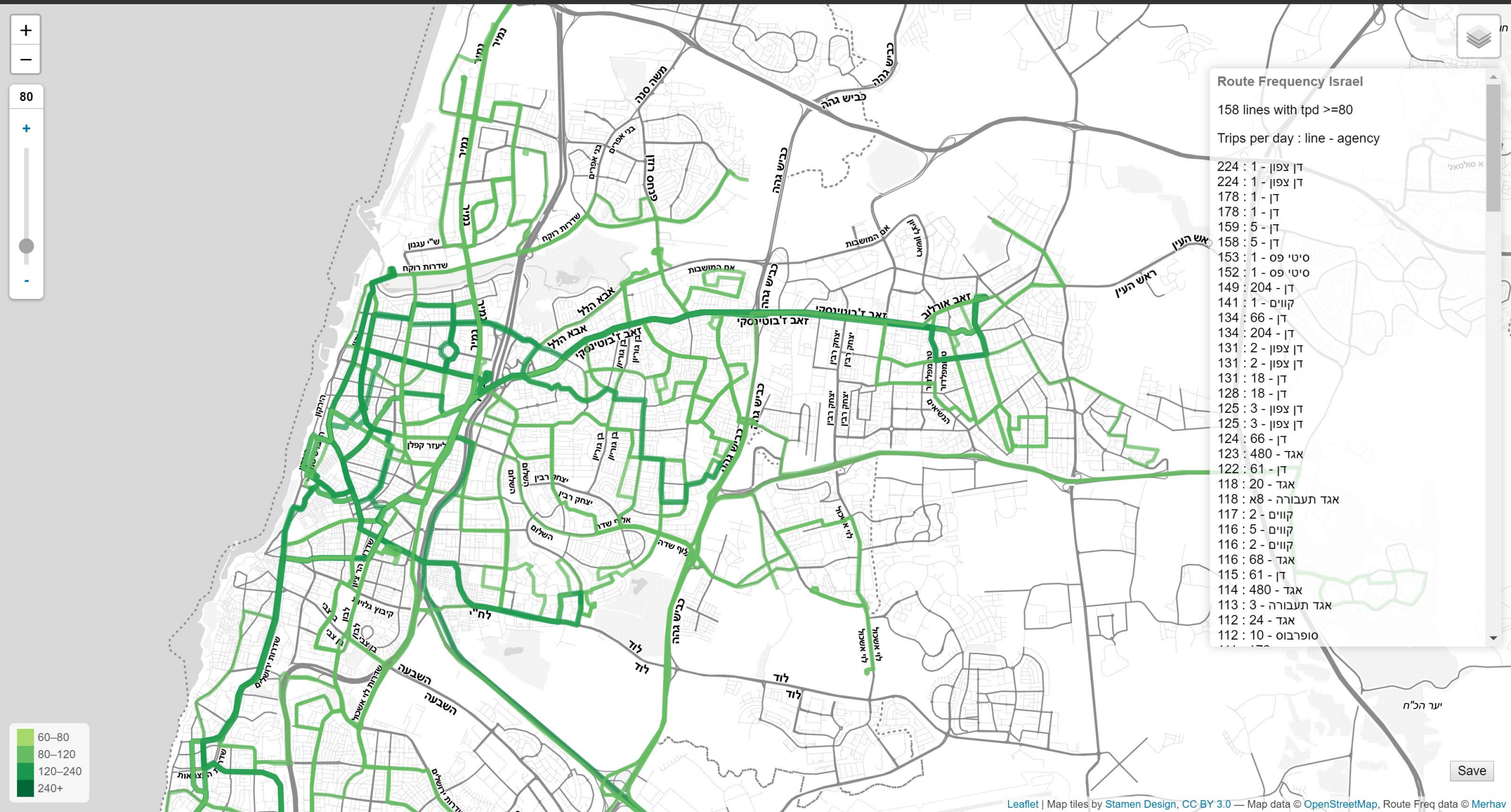
- The stops per muni are based on simple geo-filtering by the muni polygons. In some cases, this does not represent well all the stops that serve a muni. E.g. in cases where a road is the boarder between two munis, it is not uncommon that the muni boarders run through the middle of the road, such that the stops on one side are in a muni but the stops on the other side are not… This can be improved by adding a buffer of say 200 meters to all muni polygons before doing the geo-filtering. Another option is to manually edit the mapping of stops to munis.
- A “line” in this tool is based on the agency_id and the route_short_name. Although agency and route_short_name are not unique within Israel, the assumption is that within a muni they are unique. Note that based on this definition the output tpd per line is for both directions of the line. This can be improved by using the direction and route_desc fields to count seperatly the trips per line in each direction.

קווי תח"צ תדירים

קווי שירות תדירים מוצגים על גבי מפה אינטראקטיבית.
השתמשו בסליידר כדי להגדיר את רמת השירות לפי מספר נסיעות ביום (מ 60+ ועד 240+) לכל קו.
לחצו על המפה בכדי להציג רשימה של קווים תדירים במקום, ממוינים לפי תדירות.
שימושי לניתוח וזיהוי שכונות וישובים המקבלים שירות תדיר או שירות חסר.



Frequent Service Lines – Show frequent service lines on an interactive map.


Route Frequency Israel
158 lines with tpd >=80
Trips per day : line - agency
224 : 1 - דן צפון
224 : 1 - דן צפון
178 : 1 - דן
178 : 1 - דן
159 : 5 - דן
158 : 5 - דן
153 : 1 - סיטי פס
152 : 1 - סיטי פס
149 : 204 - דן
141 : 1 - קווים
134 : 66 - דן
134 : 204 - דן
131 : 2 - דן צפון
131 : 2 - דן צפון
131 : 18 - דן
128 : 18 - דן
125 : 3 - דן צפון
125 : 3 - דן צפון
124 : 66 - דן
123 : 480 - אגד
122 : 61 - דן
118 : 20 - אגד
118 : 8א - אגד תעבורה
117 : 2 - קווים
116 : 5 - קווים
116 : 2 - קווים
116 : 68 - אגד
115 : 61 - דן
114 : 480 - אגד
113 : 3 - אגד תעבורה
112 : 24 - אגד
112 : 10 - סופרבוס
80
60–80
80–120
120–240
240+
Save
Leaflet | Map tiles by Stamen Design, CC BY 3.0 — Map data © OpenStreetMap, Route Freq data © Merhav

Frequent service Lines Methodology

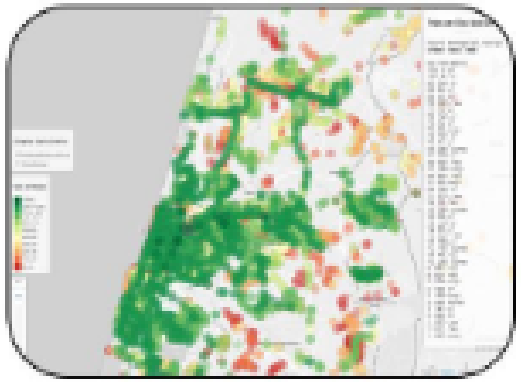
- We refer to “Lines” in a way similar to how a transit user in Israel views lines.
  - Lines are the name (a number in Israel) of a transit service along the same (or similar) sequence of stops and along the same (or very similar) path.
  - Usually (if not a circular line) a Line will have two directions along similar (but opposite) paths. Both directions will use the same name (number).
  - Line names (numbers) in Israel are not unique. E.g. there are more than 16 bi-directional lines with the name “1”. Even with the agency name, line names are not unique – E.g. “Kavim” has five different Line “1”s in different cities.
- Unfortunatly this concept of “Lines” does not exist in GTFS.
- GTFS has:
  - route_short_name this is the closest thing to a Line name (number)
  - agency_id and agency_name this is the service operator (“mafeila”)
  - Each trip has a direction_id and a route_id and a service_id and a shape_id of the path
  - The route_id provides access to the route_short_name, the agency_id, and the route_desc
  - The service_id provides access to the schedule of what days of the week the trip runs
- Using agency_id, route_short_name, direction_id and route_desc we can uniquely identify a “Line”
- First we collect a set of trip_ids for each route_id.
- Then we use the set of trip_ids per route_id to count the trips per day (tpd) for each service day in the week being processed.
- Then we merge the route_ids into lines using agency_id, route_short_name, direction_id and route_desc to identify route_ids that belong to the same line. When merging route_ids we sum the tpds for each day from the route_ids being merged.
- We output a file for display with the max tpd and the average tpd (tpw / 6) for the week per line. we also attach the shape of the path to the line. We use agency and route_short_name to identify the line.

Frequent service Lines Methodology – known issues

- Since a “Line” includes multiple route_ids and multiple trips, it is associated with multiple shapes (variants of the same line). Therefore, the question of what shape to output for display comes up. The current methodology selects the shape that is used for the highest number of trips. this is a good choice as it best represents the line. However, in some cases this can be misleading. E.g. when analyzing a specific area that only a minority variant of a line covers, you will not see the line shape in that area. In such cases, using the tpd at stops tool can clarify exactly what tpd of the line use what stops in what location. This can be improved by merging all shapes of the variants into one multi-shape to use in the display.
- Because we use the agency and route_short_name to identify the line in the output file, the same line appears twice, ones per direction. However, the direction is not displayed.

נגישות לשרותי תח"צ תדירים

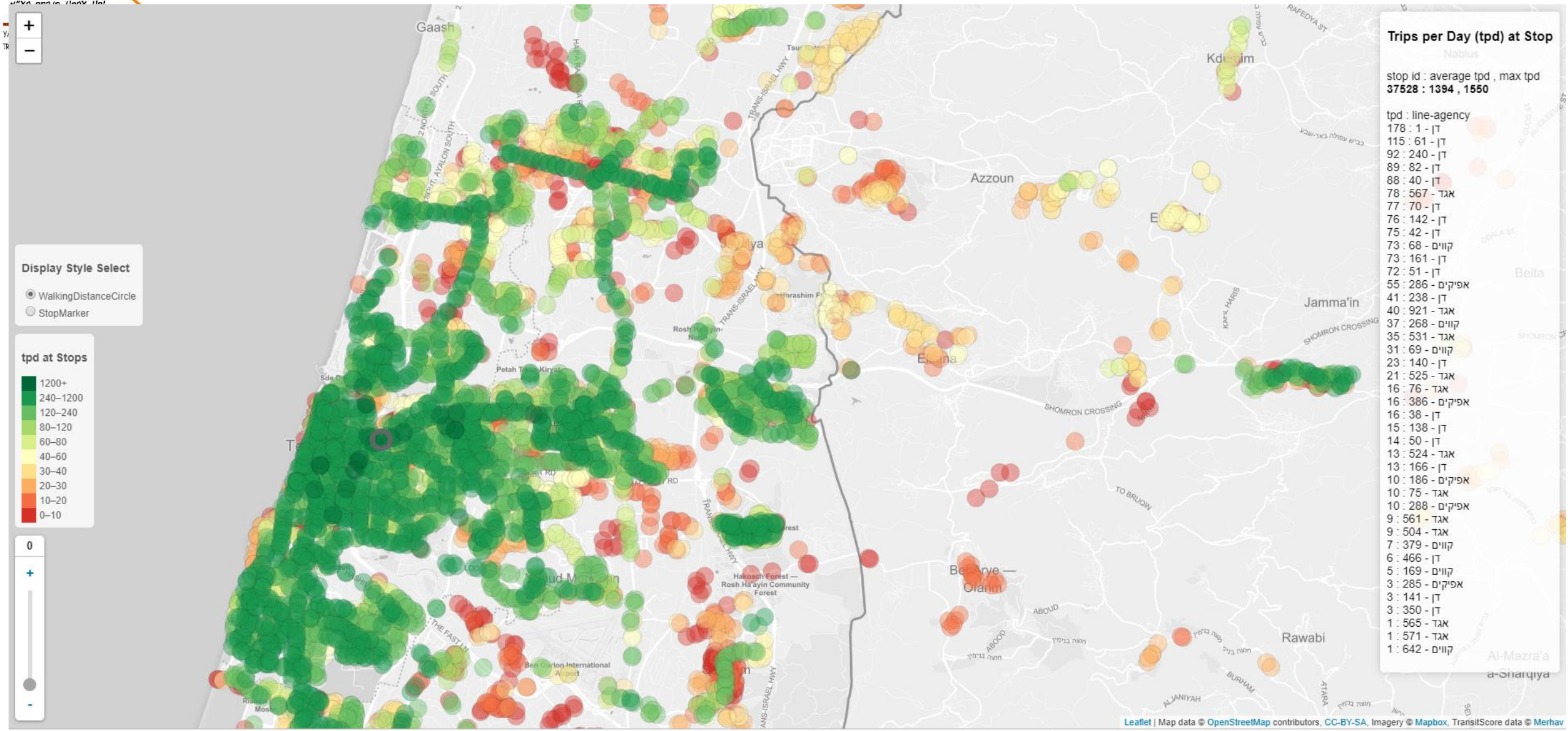
תדירות שירותי תח"צ בתחנות הנמצאת במרחק הליכה.
מציג את סך הנסיעות ביום בכל תחנה.
לחצו על תחנה כדי לקבל פירוט של כל הקווים באותה תחנה ממוינים לפי תדירות.
שימושי לניתוח באילו אזורים בישוב יש גישה לשירות תדיר והיכן צריך לשפר.



Accessible level of service at stops – Displays the level of transit service accessible within walking distance from any location.

נגישות לשרותי תח"צ תדירים

תדירות שירותי תח"צ בתחנות הנמצאת במרחק הליכה.



Trips Per Day (tpd) at Stops per Line Methodology

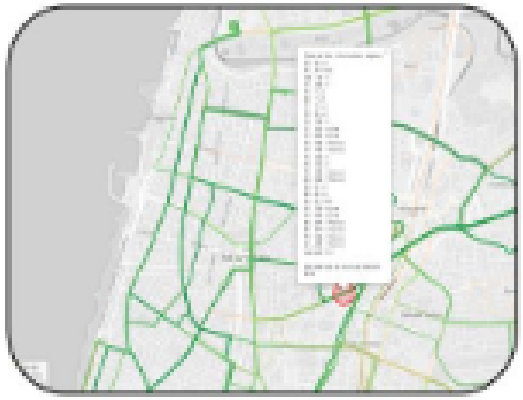
- A Line in this tool is defined by agency and route_short_name. This is enough to identify a line uniquely at any specific stop, even if the same line number is used somewhere else in Israel.
- Count the number of trips per day per line at all stops in a GTFS file over the selected week of the service period. Include breakdown of tpd per line (agency_id, route_short_name) at each stop.
- We start by collecting a set of trip_ids for each stop.
- We then count the number of trips in the week that the trip is scheduled to run. We count in buckets per stop – buckets are based on the days of the week (giving us tpd for each day of the week per stop with a breakdown of tpd per line).
- We output for display per stop the total tpd from the day of the week that it is highest and the breakdown by lines for that day. We also output per stop the average tpd for the week (tpw/6).

Trips Per Day (tpd) at Stops per Line Methodology – known issues

- At stops where a bus stops in both directions, the tpd will reflect the total count. This can be misleading as in other stops the same line will show a tpd that is about half – the tpd in one direction. This situation happens rarely and when it does it is typically (but not always) at the stop that is both the end and the beginning of the line.
- Note also that some lines have loops so that the bus stops at a stop more than once during a trip in one direction. Again the tool will count all the times that the bus stops at a stop.

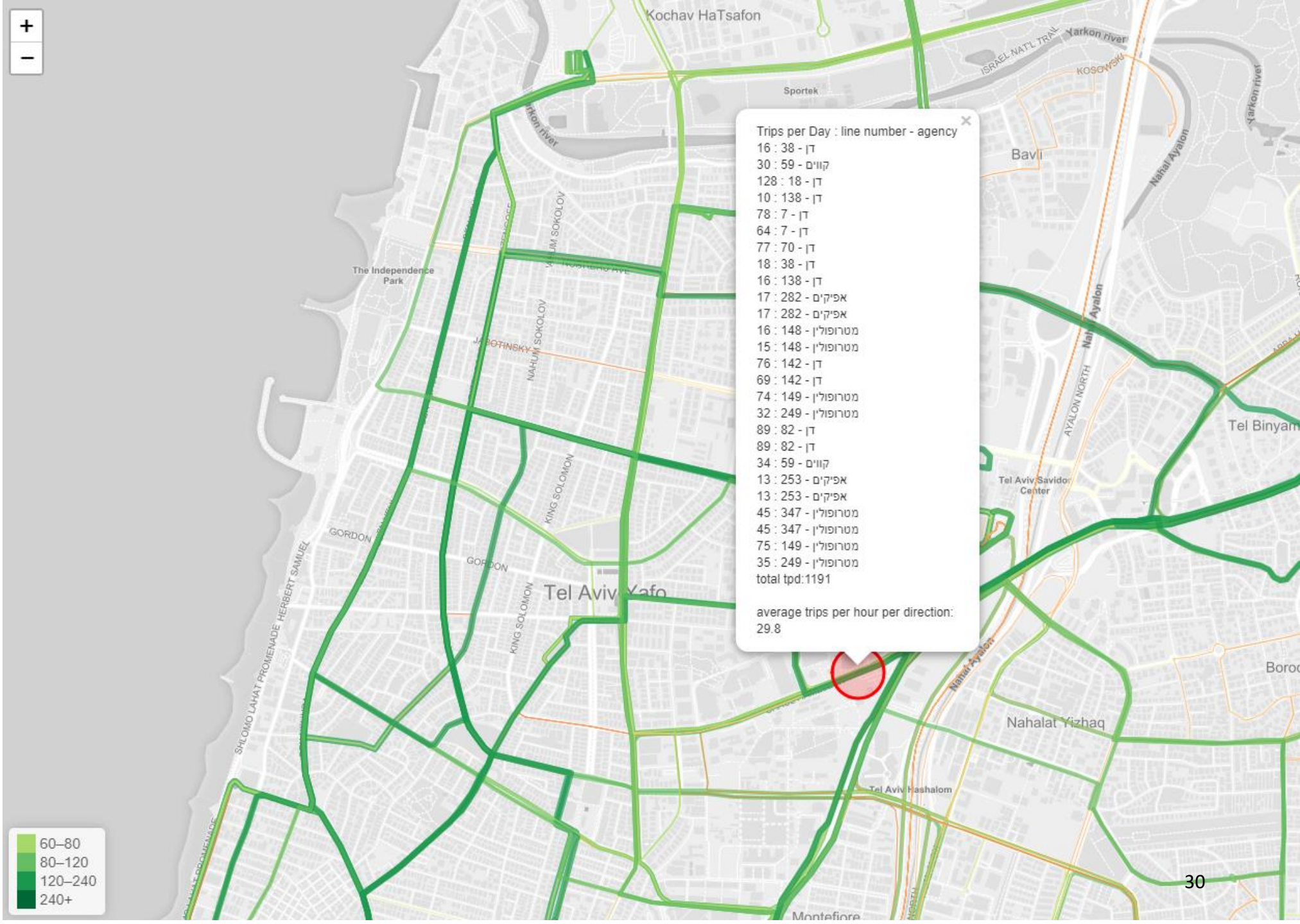
תדירות יומית ברחוב נבחר

רשימה של כל קווי השירות והתדירות שלהם בקטע רחוב נבחר על גבי מפה.
הרשימה ממוינת לפי תדירות וכוללת את סך הנסיעות שעוברות דרך קטע הרחוב ביום.
שימושי לניתוח היתרון הפוטנציאלי של נתיב תחבורה ציבורית בקטע הדרך.



Buses per day on street – Provide a list of all the lines and their service per day on a selected street segment.

תדירות יומית בתחב"צ



Lines on street Methodology

- The GTFS files of all Israel are split into 4 regions to reduce the size of the produced files. Each region includes all lines that have any stop within the region. So lines extending into other regions are included. E.g. a line from Tel Aviv to Jerusalem is included in both the Jerusalem region as well as in the Tel Aviv region.
- Then each region is processed with the same code as is used for the high frequency lines tool. The only difference is that in this tool 10+ trips per day per direction is enough to qualify for output, vs. 60+ in the high frequency tool.
- The tpd (trips per day) displayed includes all trips that cross through the red circle that marks the selected street location.
- The display includes all lines that pass on the selected street location, even if they do not have a stop on that street.
- The tpd is listed separately for each direction of a line that passes the selected location.

Lines on street
Methodology – known issues

- Only lines with a tpd of 10+ per direction are shown, so the total is understated.
- The estimate of peak hour frequency on street per direction is based on taking the total tpd dividing by two (to get per direction) and dividing by 10. So, overall frequency at peak per direction = total tpd on street in both directions / 20.
- If the selected location (the red circle) on a road has train tracks passing trough (like on Ayalon) or on highway “1”, then note that the tpd of the train is included in the display.

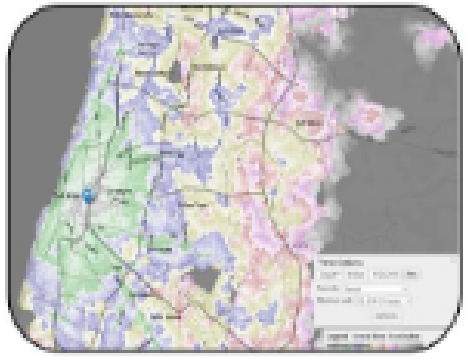
מפת ניידות

הצגה של האזורים הנגישים בטווח זמן נבחר של נסיעה בתחבורה ציבורית, רכיבה על אופניים או הליכה מ/אל מיקום נבחר.

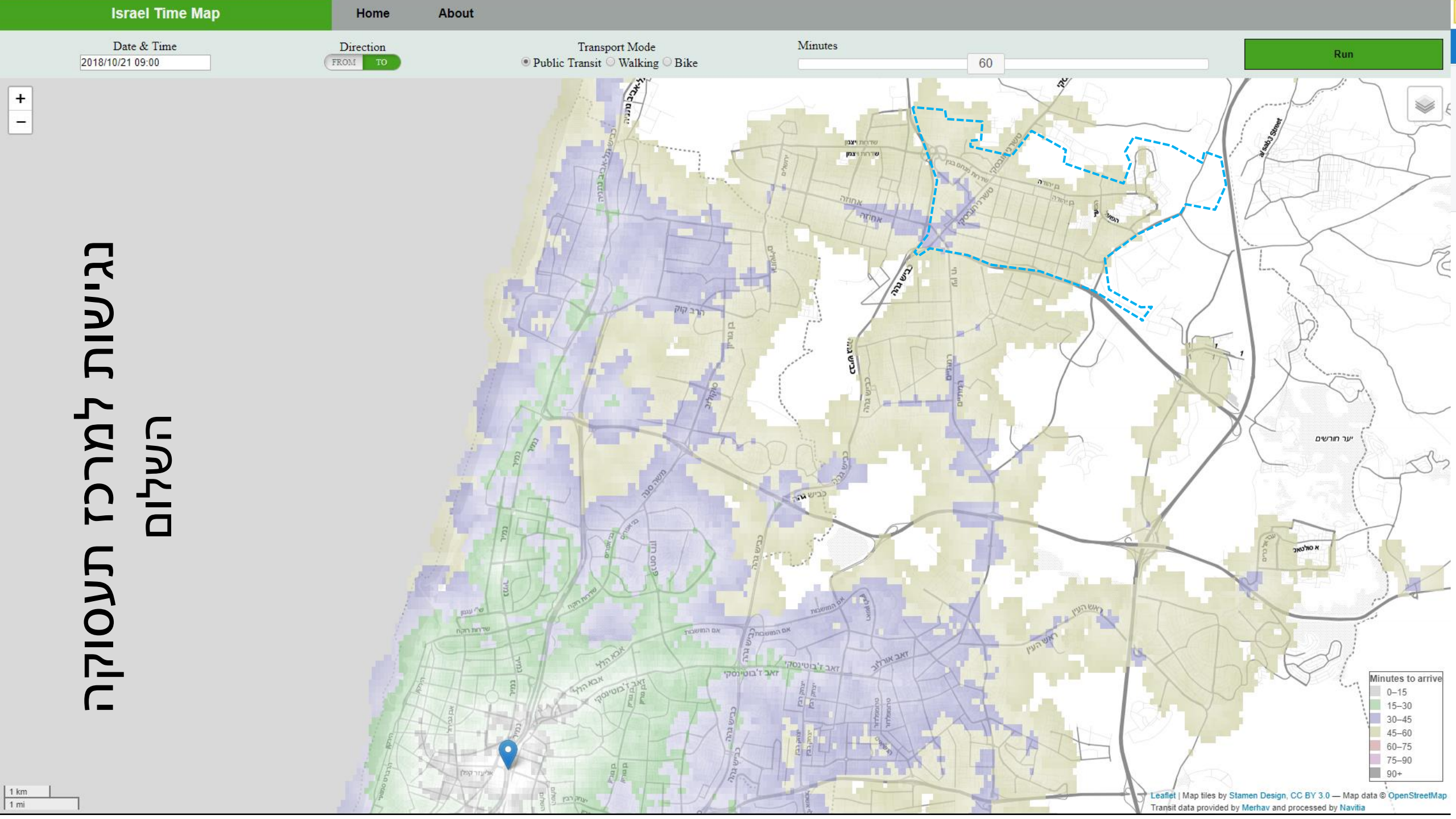
מוצג על גבי מפת חום אינטרקטיבית עם צבעים לחיווי טווחי זמן שונים (15, 30, 45 דקות וכיו"ב).

שימושי לניתוח נגישות ממקום נבחר למקומות עבודה, מסודות חינוך, שירותי בריאות, תחנות רכבת, שירותים עירוניים ועוד.

כמו כן, שימושי להשוואת רמת הנגישות להזדמנויות של שכונות שונות בישוב.



TransitTimeMap - Accessible area for a given duration of travel from/to a location by transit (or bike or walking).


Israel Time Map
Home
About
Date & Time
2018/10/21 09:00
Direction
FROM
TO
Transport Mode
Public Transit
Walking
Bike
Minutes
60
Run
נגישות לתחבורה ציבורית
Minutes to arrive
0–15
15–30
30–45
45–60
60–75
75–90
90+
1 km
1 mi
Leaflet | Map tiles by Stamen Design, CC BY 3.0 — Map data © OpenStreetMap
Transit data provided by Merhav and processed by Navitia

Transit Time Map Methodology

- The Transit Time Map (TTM) tool is based on navitia. For details, see - https://github.com/CanalTP/navitia/wiki
- The navitia server gets time map requests from the client web tool and responds with time maps.
- The requests specify; the location for analysis, the direction, the datetime, and the mode (transit, bike or walk).
- The time map response provides the travel time per location (as an array).
- The array is displayed in different colors for each increment of 15min.
- Clicking on the map provides the travel time for that location.
- A modified trip planning algorithm is used to compute the travel time to/from the analysis location, from/to all other locations.
- Open Street Map (OSM) is used as the underlying connectivity information and GTFS is used for the transit information.

Transit Time Map
Methodology – known issues

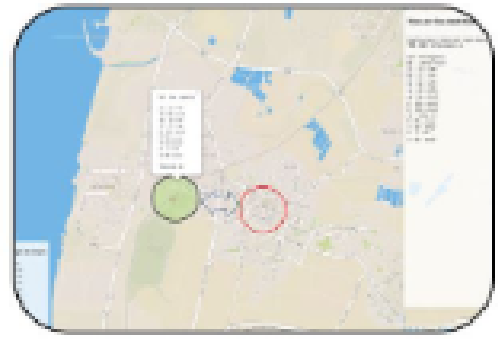
- The array response is always 500x500 elements. Therefore, for better resolution, use smaller cutoff times.
- The bike mode is implemented using the walk algorithm but at a higher speed. Bike paths or lack thereof do not impact the result.
- GTFS in Israel does not take peak hour congestion into account when providing travel times between stops. Therefore, transit travel times at peak are understated. A good way to use the TTM is to analyze and compare the relative time to different locations.

רמת נגישות בתח"צ לתחנות רכבת

רמת השירות של אוטובוסים מזינים לתחנות רכבת ורמת שירות הרכבות בתחנות הרכבת עצמן. מציג את רמת שירות התח"צ בנקודת עניין נבחרת, וכן את השירות בין נקודה זו לתחנת רכבת נבחרת.

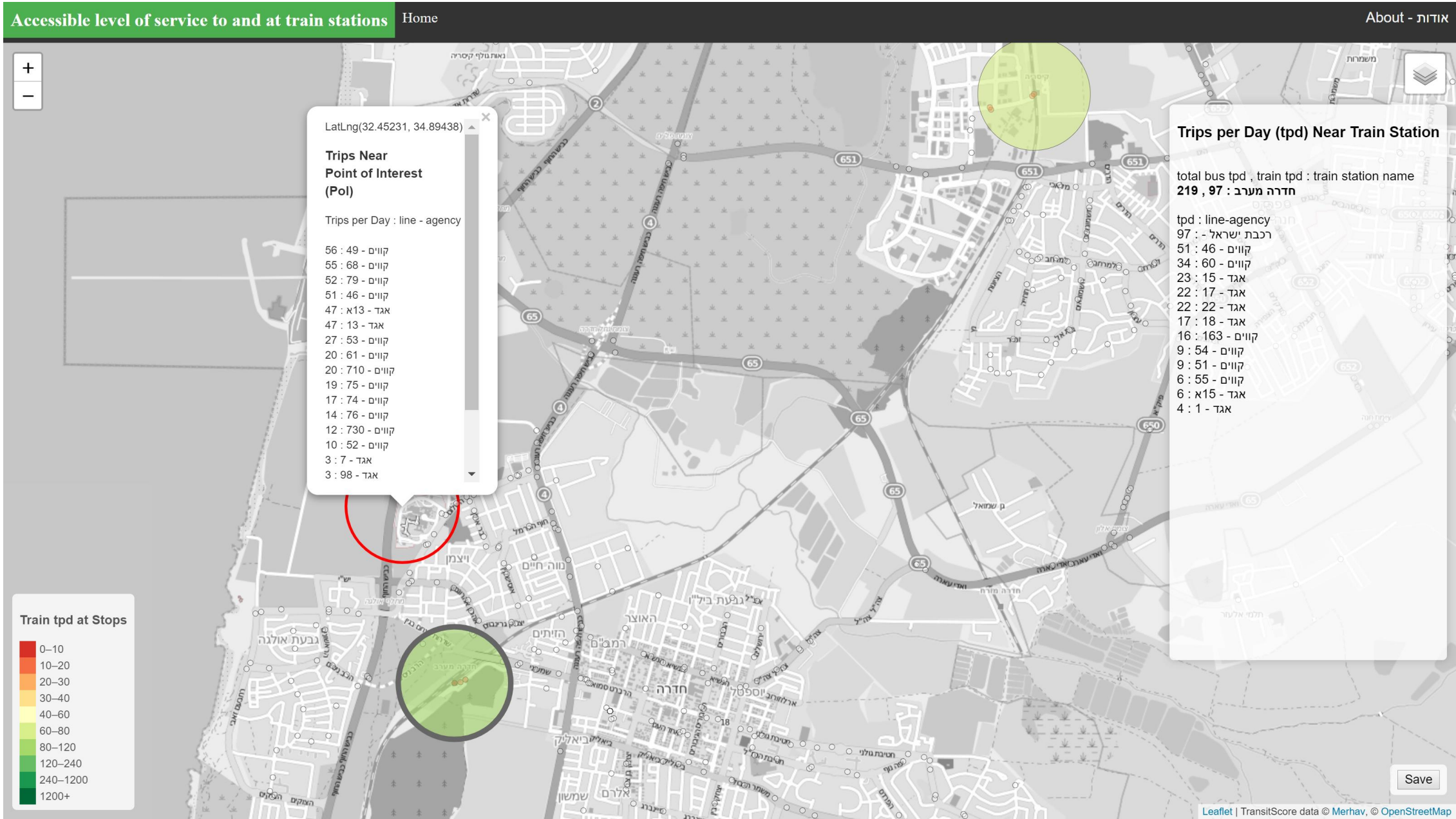
שימושי לניתוח האיזון הנדרש בין רמת השירות של קווי אוטובוסים מזינים לרכבת ותדירות השירות של הרכבת בתחנה.

שימושי גם לניתוח הנגישות באוטובוס לתחנות רכבת משכונות ומקומות אחרים בעלי עניין כמו מרכזי עבודה, בתי חולים, אוניברסיטאות ועוד.



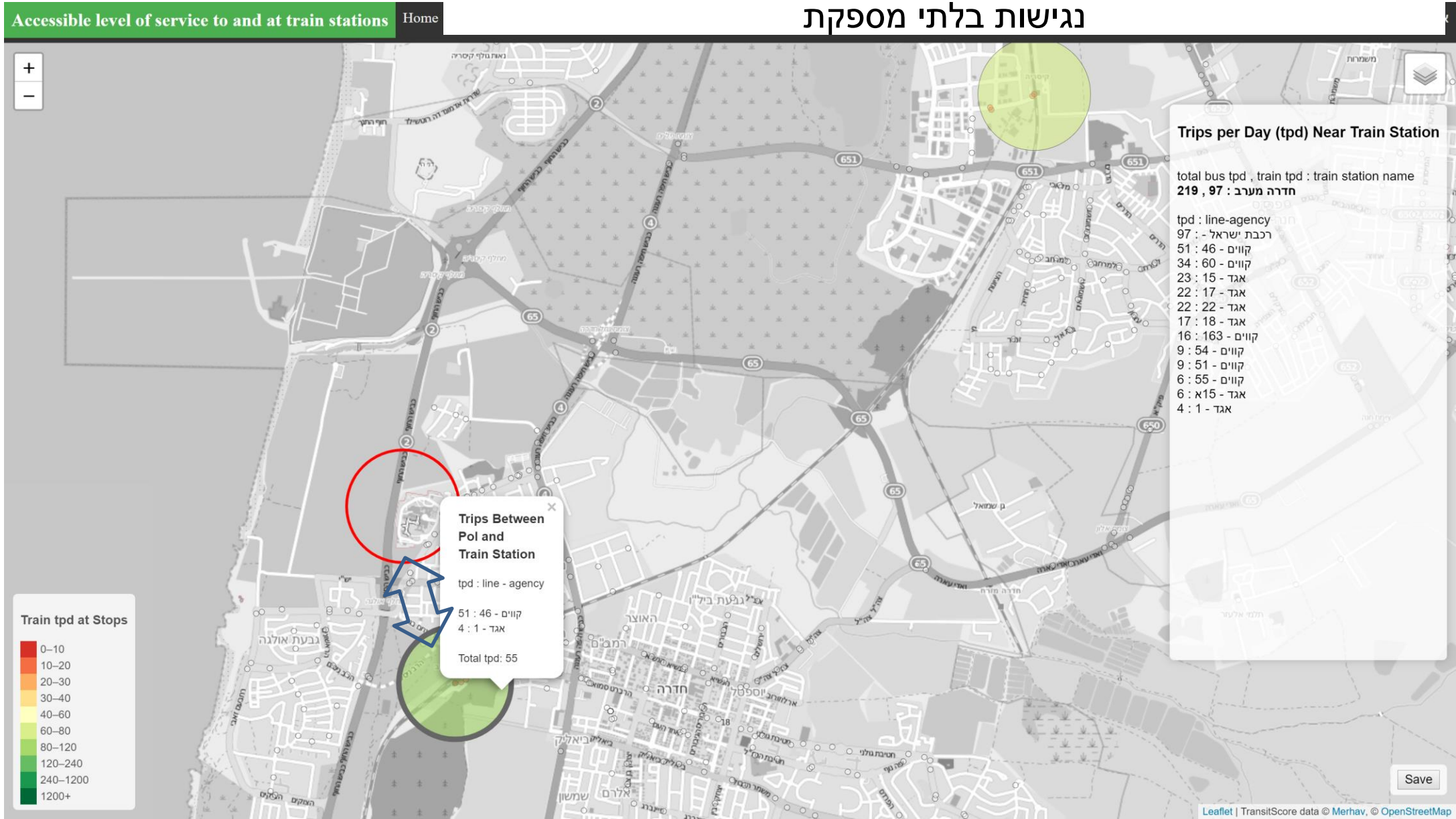
Accessible level of service to and at train stations – Display the level of service on feeder buses near train stations and the level of service of trains at stations.

219 אוטובוסים ביום פוגשים 97 רכבות בתחנת הרכבת בחדרה.
455 אוטובוסים ביום משרתים את בית החולים.



רק 55 אוטובוסים ביום, המשרתים את בית החולים, פוגשים 97 רכבות בתחנת הרכבת בחדרה

נגישות בלתי מספקת



Trips per Day (tpd) at, to and from Train Station Methodology

- We start by creating a list of all the train stops and their location by finding the stops that agency “Israeli Rail” stops at.
- We use the list of train stop (station) locations to create a list of all transit stops (usually bus stops) that are near (default is < 500m as the crow flies) each of the train stops.
- Not all bus stops that are less than 500m (as the crow flies) from a train station are actually useful as a connection to the train station. Therefore the list of stops near train stations needs to be edited. The list can be edited manually using a map tool that was specifically developed for this purpose. If not, an automatic script removes a list of stops based on a reference set of pre and post edit lists that were created by manual editing using data from October 2018.
- For each stop near a train station we collect the set of trips that use this stop.
- We then merge the set of trips per stop near a train station into one set of trips near the train station (eliminating overlap).
- We then for each trip near the train station we count the number of trips in the week that the trip is scheduled to run. We count in different buckets per Line – one set of buckets is based on the days of the week (giving us tpd for each day of the week per line), a second is based on the hours in a day (giving us tph for each hour per line summed over the week).
- For the web tool, we output for display per train station the tpd per line on the day that the total tpd for all lines is max. We also output the total tpd of trains at the station and the total tpd of buses (actually this is all transit that is not train – so BRT and LRT in addition to Bus) near the station. The tpd values are for both directions.
- We also output for the web tool a list of all the transit stops with tpd per line. This enables the display of the tpd per line in a circle around a point of interest (poi) selected by the user.
- The list of all the transit stops with tpd per line also enables the display of the tpd per line that are common to the poi and the selected train station.

Trips per Day (tpd) at, to and from Train Station Methodology – known issues

- The tpd values near the train station are for both directions. This assums there is at least one stop in each direction near the train station. If not then the tpd is for one direction. In any case the tpd reflects correctly the number of trips per line at the stops near the train station.
- The tpd per line at all the stops in the poi are merged so that the max tpd per line at any stop in the poi is displayed. This is different from the way the tpd per line is counted near the train station. The reson for the difference is that it allows the user to select the poi at will, whereas the location of train stations are known ahead of time so more extensive offline analysis is possible.
- The tpd displayed per line between the train station and the poi uses the tpd value near the train station. Even when we know that the train station and poi have a line in common we do not know that all trips of the common line get to the poi. We still choose to display the tpd value near the train station as our best estimate of the connection to the poi. The connection may be therefore overstated.