Khochma חָכמָה

Subject:	EPSG values
Date:	2023 08 13, last updated 2025 07 27
To:	
From:	Mark Friedman

This memo communicates what EPSG values are and how they are used. EPSG stands for European Petroleum Survey Group. The group itself is defunct, but the system is still used for spatial analysis. These codes allow us to transform one set of X/Y (e.g., longitude/latitude) to another set of X/Y (e.g., Israel Trans Mercator (ITM).

WGS84 (World Geodetic System)

A coordinate system for describing any location on earth using longitude and latitude. Widely used for global positioning systems. It is also known as EPSG 4326

If you need to convert between coordinate systems, the following websites have easy to use converters for manually inputting coordinates. An R code example is provided at the end to see how this can be done programmatically.

- EPSG main page: https://epsg.io/
  Allows you to look up the EPSG code value for an area that has its own system.

- Convert between any two EPSG code values
  https://epsg.io/transform#s_srs=4326&t_srs=6991&x=NaN&y=NaN

- Convert between spatial systems (EPSG, UTM, NAC, W3W, etc.)
  https://coordinates-converter.com/en/decimal/31.245744,34.792518?karte=OpenStreetMap&zoom=7

Additional links:

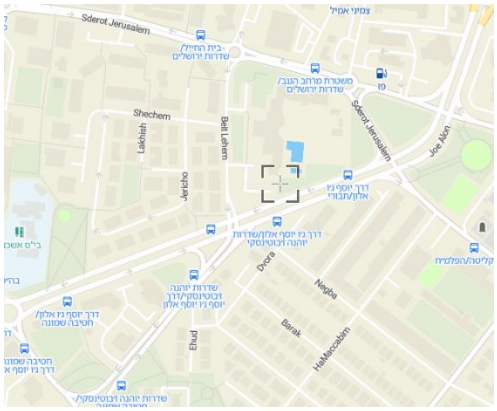
1. Understanding EPSG https://www.earthdatascience.org/courses/use-data-open-source-python/intro-vector-data-python/spatial-data-vector-shapefiles/epsg-proj4-coordinate-reference-system-formats-python/

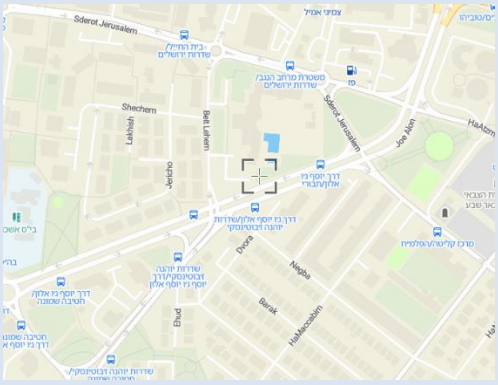
2. Wiki https://en.wikipedia.org/wiki/EPSG_Geodetic_Parameter_Dataset

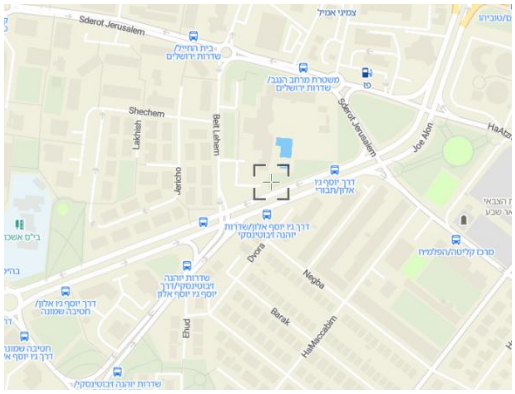
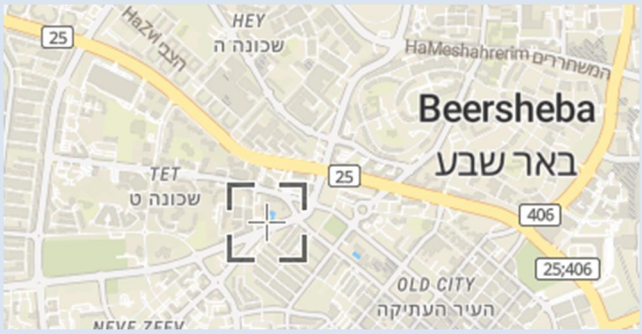
We will walk through converting coordinates received from the Clalit health system.

EPSG value Name and URL	Comment/Example

Clalit Coordinates	These are the types of coordinates we get from Clalit data extracts. They first need to be converted to Palestine 1923 (EPSG 7142) standard.
	
	The data received sometimes have 0 and negative numbers as coordinates. These are invalid values.
	
	`X 129.0222`
	`Y  72.56751`
	
	X and Y are multiplied by 1000 to get the values below
	`X 129022.2  = (129.0222  * 1000)`
	`Y  72567.51 = ( 72.67551 * 1000)`

7142
Palestine 1923
modified TM
https://epsg.io/7142
	`X 129022.18`
	`Y  72567.51`
	
	Center coordinates
	`143344.96, 85938.41`
	
	Projected bounds:
	`69095.65 -126393.26`
	`216562.21  298746.25`
	
	 

2039
Israel 1993 / (ITM)
https://epsg.io/2039
	After converting from Clalit raw values to EPSG 2039
	This is an older Israel standard for geospatial analyses. The difference between EPSG 2039 and the later standard EPSG 6991 is small (5.19 meters) in this example. But some data may be stored as EPSG 2039 and should be therefore be converted to EPSG 6991.
	
	`X 179025.170567438`
	`Y 572564.7091938243`
	
	Center coordinates
	`193476.89, 586022.93`
	
	Projected bounds:
	`119227.55 373692.04`
	`266693.55 798829.62`
	
	 

EPSG value Name and URL	Comment/Example
6991 Israeli Grid 05/12 (ITM) https://epsg.io/6991	**After converting from EPSG 7142 to EPSG 2039** This is the standard for NEHRI geospatial analyses. The difference between 2039 and 6991 is small (5.19 meters), but EPSG is the latest standard for Israel Transverse Mercator and all the public use data files are created with this standard. X 179023.4161635282 Y 572569.5937194888 **Center coordinates** 193346.09, 585940.48 Projected bounds: 119097.33 373609.64 266563.36 798747.07 
4326 World Geodetic System (WGS 84) https://epsg.io/4326	**After converting to EPSG 4326 (WGS 84)** Latitude 34.780° Longitude 31.244° **Center coordinates** 0.0, 0.0 **WGS84 bounds:** -180.0 -90.0 180.0 90.0 

Code example:

```
> library(sf)
> (B7_Clalit <- data.frame(X=129022.2, Y=72567.51))
         X        Y
1 129022.2 72567.51
>
> (B7_EPSG7142 <- st_as_sf(B7_Clalit,coords=c("X","Y"),crs=7142))
Simple feature collection with 1 feature and 0 fields
Geometry type: POINT
Dimension:     XY
Bounding box:  xmin: 129022.2 ymin: 72567.51 xmax: 129022.2 ymax: 72567.51
Projected CRS: Palestine 1923 / Palestine Grid modified
                    geometry
1 POINT (129022.2 72567.51)
>
> (B7_EPSG2039 <- st_transform(B7_EPSG7142, crs=2039))
Simple feature collection with 1 feature and 0 fields
Geometry type: POINT
Dimension:     XY
Bounding box:  xmin: 179025.2 ymin: 572564.7 xmax: 179025.2 ymax: 572564.7
Projected CRS: Israel 1993 / Israeli TM Grid
                    geometry
1 POINT (179025.2 572564.7)
>
> (B7_EPSG6991 <- st_transform(B7_EPSG7142, crs=6991))
Simple feature collection with 1 feature and 0 fields
Geometry type: POINT
Dimension:     XY
Bounding box:  xmin: 179023.4 ymin: 572569.6 xmax: 179023.4 ymax: 572569.6
Projected CRS: Israeli Grid 05/12
                    geometry
1 POINT (179023.4 572569.6)
>
> (B7_EPGS4326 <- st_transform(B7_EPSG7142, crs=4326))
Simple feature collection with 1 feature and 0 fields
Geometry type: POINT
Dimension:     XY
Bounding box:  xmin: 34.78 ymin: 31.244 xmax: 34.78 ymax: 31.244
Geodetic CRS:  WGS 84
               geometry
1 POINT (34.78 31.244)
```