

# The Heatmap Handbook

**HEATMAPS**  
BY HEXOS

# Contents

## **The basics**

- Overview – pg. 4
- Contact information – pg. 4
- License – pg. 4
- Attribution – pg. 4
- Heatmap details – pg. 5
- Downloading – pg. 5

## **About the service**

- Service overview – pg. 7
- Pricing information – pg. 7
- Terms and conditions – pg. 7

## **Images**

- Locating the images – pg. 9
- Understanding the file structure – pg. 9

## **GeoJSON**

- Locating the file – pg. 11
- The variables – pg. 11
- Further uses of the GeoJSON (GitHub) – pg. 13

## **The heatmap data**

Calculation of routes – pg. 15

Combination of walking and public transport times – pg. 15

Understanding the maximum time filter – pg. 16

Understanding the heatmap size / radius – pg.16

Understanding the walking outline – pg.17

# The basics

---

The fundamental restrictions and information about our heatmaps.

# Overview

Hexos has developed an online service that can create heatmaps / travel time maps to visualise public transport and driving commute times travelling towards or from a central point within a given radius. Heatmaps can be generated for any time of day, any day of the week and any location in the United Kingdom. This service is called 'Heatmaps by Hexos'.

# Contact information

If you have any problems with the heatmap you have received or just generally have some questions you can get in touch with us at:

<https://hexos.co.uk/contact.html>

We will aim to get back in touch with you as quickly as possible.

# License

The images and GeoJSON data provided by our service are protected by the following license:

(CC BY 4.0) - <https://creativecommons.org/licenses/by/4.0/>

# Attribution

In order to comply with third party modules used by our service as well as our own license it is vital that the following services/links are referenced whenever you use our product outside of the 'Heatmaps by Hexos' dashboard (online service website).

- HEXOS - <https://hexos.co.uk>
- LEAFLET - <https://leafletjs.com>
- MAP DATA - OPEN STREET MAP © - <https://www.openstreetmap.org>
- MAPBOX © - <https://creativecommons.org/licenses/by-sa/2.0>
- MAPBOX IMAGERY - <https://www.mapbox.com>

Please note, the heatmap images already come with all of this information included/attributed. So please ensure you do not alter these images in any way if you wish to ensure they are compliant with the correct usage of our products.

## Heatmap information

All the heatmap details can be found in one of two ways.

1. Visit the 'Heatmaps by Hexos' dashboard at <https://heatmaps.hexos.co.uk/dashboard> and then find your heatmap in the list and the full details of the heatmap can be found in the Details tab, as well as the Location and the Heatmap ID in the top left and right corners respectively of the heatmap in the list.
2. View the read-me.txt file in the downloaded zip folder where it will give a concise description of the service, external links and all the information about the heatmap you have just downloaded.

## Downloading

You can download the zip folder associated with your heatmap request in one of two ways:

1. Visit the 'Heatmaps by Hexos' dashboard at <https://heatmaps.hexos.co.uk/dashboard> and then find your heatmap in the list and then click the download button.
2. You can find your heatmap ID by consulting the section above. You can then substitute your heatmap ID (replace {YOUR HEATMAP ID}) into the link below and it will directly download your zip folder.

`https://public-transport-heatmap.s3.eu-west-2.amazonaws.com/{YOUR HEATMAP ID}/heatmap.zip`

# About the service

---

A general overview of the service we offer as well as some important external documents.

## **Service overview**

For the most up to date version of our 'Heatmaps by Hexos' overview PDF please visit this link:

<https://hexos.s3.eu-west-2.amazonaws.com/uploads/pth/service-overview.pdf>

## **Pricing information**

For the most up to date version of our pricing information PDF please visit this link:

<https://hexos.s3.eu-west-2.amazonaws.com/uploads/pth/pricing-information.pdf>

You can also view the pricing information as a web version at:

<https://hexos.co.uk/heatmaps-by-hexos.html#pricing>

## **Terms and conditions**

For the most up to date version of our terms and conditions PDF please visit this link:

<https://hexos.s3.eu-west-2.amazonaws.com/uploads/pth/terms-and-conditions.pdf>

You can also view the terms and conditions as a web version at:

<https://hexos.co.uk/terms-and-conditions/heatmaps-by-hexos.html>



# Images

---

Understanding the heatmap images included as part of your download.

# Locating the images

Locating the images should be fairly simple. Go to your downloaded zip folder. At the root of the folder there should be a folder called **images**. Go into it. You should then find 5 sub folders of different images.

# Understanding the file structure

Once in the images folder there should now be 5 sub folders representing the maximum travel time filter of the images inside:

- 1-hour
- 1-hour-30-mins
- 2-hours
- 2-hours-30-mins
- 3-hours

Then once you enter one of these 5 sub folders you will be met by 4 images of 4 different resolutions:

- 512px
- 1024px
- 2048px
- 3072px

Each heatmap image in each subfolder is labelled in the following way to help you locate each image definition:

heatmap-`{IMAGE RESOLUTION}`.png

# GeoJSON

---

Getting to grips with the rich data file in your download folder. We like to think this data file is the beating heart of our heatmaps.

# Locating the file

Locating the GeoJSON should be fairly simple. Go to your downloaded zip folder. At the root of the folder there should be a folder called **geojson**. Go into it. You should then find a file called heatmap.geojson. This is the GeoJSON file for your heatmap.

# The variables

Should you want to use the GeoJSON for something other than what we create there are a large number of variables that we store about each polygon on our heatmaps.

## **The following variables are found in both inbound and outbound public transport heatmaps:**

- Location (location) - The central latitude and longitude of the given discrete journey start location. [Format: {latitude:\*lat\*,longitude:\*long\*}]
- Total Travel Time (totalTravelTime) - The total time taken between departure and the required arrival time. [Format: minutes]
- Moving Travel Time (movingTravelTime) - The total time taken between departure and the actual arrival time. [Format: minutes]
- Distance Travelled (distanceTravelled) - The total distance travelled. Includes walking and public transport. [Format: metres]
- Total Walking Distance (totalWalkingDistance) - The total distance walked during the entire journey. Includes transfers. [Format: metres]
- Initial Walking Distance (initialWalkingDistance) - The distance walked from a location to the first usage of public transport. For example home to a bus stop. [Format: metres]

- Final Walking Distance (finalWalkingDistance) - The distance walked from the final usage of public transport to the centre location. For example from a bus stop to an office. [Format: metres]
- Number Of Transfers (numberOfTransfers) - The total number of public transport transfers made during the journey. [Format: integer]
- Public Transport Services Used (publicTransportServicesUsed) - A list of all the services used and the type of service. For example a bus name and then an indication that it was a bus. [Format: [{ serviceName: '\*serviceName\*', serviceType: '\*serviceType\*' }...]]
- Polygon Coordinates (coordinates) - A list of all the vertices of the polygon that covers the area represented by this discrete journey information. [Format: [[\*long\*,\*lat\*],...]]

**The following variables are only found in inbound public transport and driving heatmaps:**

- Departure Time (departureTime) - The time you must depart by to reach the central point by the given arrival time. [Format: HH:mma]
- Actual Arrival Time (actualArrivalTime) - The actual arrival time of the calculated route as this may be before the requested arrival time. [Format: HH:mma]

**The following variables are only found in outbound public transport and driving heatmaps:**

- Arrival Time (arrivalTime) – The earliest arrival time to arrive somewhere in a given radius from the central point. [Format: HH:mma]
- Actual Arrival Time (actualDepartureTime) - The actual departure time of the calculated route as this may be after the requested departure time. [Format: HH:mma]

**The following variables are found in both inbound and outbound driving heatmaps:**

- Location (location) - The central latitude and longitude of the given discrete journey start location. [Format: {latitude:\*lat\*,longitude:\*long\*}]
- Total Travel Time (totalTravelTime) - The total time taken between departure and the required arrival time. [Format: minutes]
- Moving Travel Time (movingTravelTime) - The total time taken between departure and the actual arrival time. [Format: minutes]
- Distance Travelled (distanceTravelled) - The total distance travelled. Includes walking and public transport. [Format: metres]
- Polygon Coordinates (coordinates) - A list of all the vertices of the polygon that covers the area represented by this discrete journey information. [Format: [[\*long\*,\*lat\*],...]]

## **Further uses of the GeoJSON (GitHub)**

If you wish to use the GeoJSON for something even more colourful than we have, our GitHub repository is a good place start for some code examples:

<https://github.com/hexos-uk>

# The heatmap data

---

Understanding the nitty-gritty about how all our calculations are made, and why we took certain decisions.

# Calculation of routes

Our maps are made up of up to 15,000 discrete journeys between a central point and somewhere in a given radius, all represented by a coloured polygon on the final heatmap.

When you request a heatmap, based on what time of day and day of the week we find a date and time that is either the current day or the next occurrence of the day of week you requested.

With the latitude, longitude of the central point and the polygon we then use data provided by Google Cloud Platform to find the most efficient route between the two points using public transport or driving at the given date and time and heatmap direction and save important variables in the GeoJSON file.

*A note for public transport heatmaps:*

The routes that are calculated will consider walking as an option on the route if it is significantly quicker or it is the only viable option. (This means in some remote areas the heatmap may only show walking – see below).

## Combination of walking and public transport times (public transport heatmaps only)

In order to try and give an accurate and realistic representation of public transport commute times, our maps will also consider walking between locations. For example, walking to the bus stop, walking between services and walking from a final bus stop to a final destination. **Google Cloud Platform considers walking a viable option for a few kilometres.**

Our heatmaps would not work and give you the same level of information if we did not include these considerations. (If we didn't we'd only be able to show transport routes of people who live directly next to bus stops/train stations etc!).

This considered, **if an area has really poor public transport services nearby, the heatmap you are left with could potentially just represent walking times** (as this will have been the only available route). Obviously we wouldn't create a huge map of just walking, but please bear in mind maps can include multiple kilometres of



walking. If you need to clarify this information please consult the interactive map available in the 'Heatmaps by Hexos' dashboard or contact us.

## **Understanding the maximum time filter**

On the interactive maps there is a continuous maximum time filter between 5 minutes and 360 minutes (6 hours).

In the download we provide images with 5 preset maximum time filters.

The maximum time filter simply redraws the colour scale to the new time you have selected. It then removes all polygons (discrete journeys) that take longer than the maximum time and then finally it takes the remaining polygons (discrete journeys) and colours them dependent on their ratio between their total travel time and the maximum journey time.

## **Understanding the heatmap size / radius**

When you request a heatmap for generation, you will have chosen a size with a related radius. There is one single important fact to remember about the heatmap radius:

- The maximum radius is not the confines of all the possible journeys, instead it is the furthest distance we will search from the central point for possible journeys. Therefore there could be possible journeys further away that are not shown on the heatmap as they were outside the maximum radius. How far you wish to search is at your discretion when you select the heatmap size.

# **Understanding the walking outline**

## **(public transport heatmaps only)**

*Please note that the walking outline is only visible on the online interactive map, we have chosen to exclude it from the heatmap images as the area is often very small and can only be viewed when you are able to zoom in (which the interactive map allows).*

Within the black line are routes that only represent walking times.

The reason that walking has been chosen for this route / polygon is because it is significantly more efficient (distance / time) or in remote locations it is the only viable method of transport.

Therefore in very remote locations, it may be that the entire map is encompassed by a black line, this is due to a really poor public transport service in this area. In response to this poor public transport service, walking times have been displayed and calculated for a few kilometres as again, this is the only viable method of transport.

## Overview

'Heatmaps by Hexos' is an online service provided by Hexos to create public transport and driving heatmaps / travel time maps for data visualisation.

## Contact

You can find contact information for Hexos on the following web page.

[hexos.co.uk/contact.html](https://hexos.co.uk/contact.html)

## Find out more

You can find out more about Hexos and 'Heatmaps by Hexos' on the following web page.

[hexos.co.uk](https://hexos.co.uk)

**HEATMAPS**  
BY HEXOS