

# Data Journey:

## Permanent Bicycle Counters

The City of Frankfurt and the Federal State of Hessen installed [10 permanent bicycle counters](#) beneath the streets to measure bike traffic at those selected locations. They cooperated with the company „Eco Counter“, which sells the model „[ZELT](#)“ used in Frankfurt.

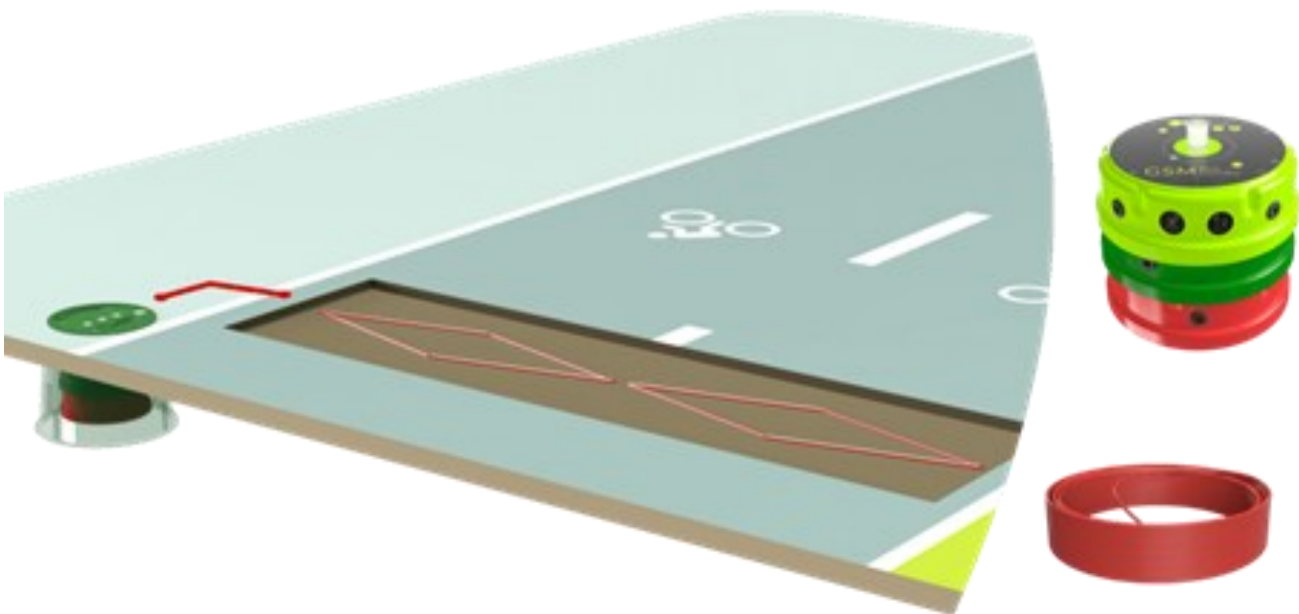
Finished counter installation in an asphalted street →



Counter installation in a non-asphalted street ↓



Once installed, the counter runs up to two years, 24/7. It measures both directions with the induction loops placed under the street surface.



When an object passes the loops, the counter on the streetside automatically identifies it.



# Inside the Bicycle Counter

To identify if a passing object is a bike, the counter uses an algorithmic system called „**SIRIUS**“. It differentiates the physical input by 13 criteria, which help to decode the bicycles' electro-magnetic "fingerprint". This allows for different types of bikes with different frames to be detected.

The counter hence is a measurement device (the induction loop) with a built-in algorithm that processes the input into a dataset, which can then be transmitted wirelessly.

The screenshot displays the SIRIUS 4.3.0 software interface. The top menu bar includes options like 'File', 'Edit', 'View', 'Tools', 'Project', 'Compound', 'Report', 'Summaries', 'DBMS', 'Export', 'Console', 'All', 'Database', 'Jobs', 'Log', 'Settings', 'WebService', 'Bug Report', and 'About'. The main window is divided into several sections. On the left, there is a sidebar with a list of compounds and their properties. The central area shows search results for 'Lactoferrin' and 'Kasoprolol 2-thamerside (1-2)-thamerside'. Each result includes a chemical structure, a score, and a weight. The top result is 'Lactoferrin' with a score of 76.52% and a weight of 4.184. Below it is 'Kasoprolol 2-thamerside (1-2)-thamerside' with a score of 73.91% and a weight of 4.184. The bottom result is 'Isothiazolone' with a score of 71.54% and a weight of 4.888. The interface also features a 'Substructures' section with a grid of colored squares and a 'Databases' section with various search filters.

The screenshot displays the SIRIUS 4.3.0 software interface, showing a detailed view of a chemical structure and its classification. The top menu bar is the same as in the previous screenshot. The main window is divided into several sections. On the left, there is a sidebar with a list of compounds and their properties. The central area shows a detailed view of a chemical structure, 'Lactoferrin', with a score of 76.52% and a weight of 4.184. Below the structure, there is a 'Substructures' section with a grid of colored squares and a 'Databases' section with various search filters. The bottom section shows a table of alternative classes and their associated scores and weights. The table has columns for 'Index', 'Name', 'Parent Probability', 'Description', 'ID', and 'Parent'. The table lists various chemical classes such as 'Organic compounds', 'Organic compounds containing a benzene ring', 'Organic compounds containing a heterocyclic ring', etc. The table is sorted by 'Parent Probability' in descending order.

Index	Name	Parent Probability	Description	ID	Parent
4	Organic compounds	100.00%	Compounds containing a ring with least one cat...	CHEMONT_000002	Organic compounds
4030	Organic compounds	100.00%	Organic compounds containing an aromatic ring...	CHEMONT_000003	Organoheterocyclic compounds
4042	Hydrocarbon derivatives	100.00%	Derivatives of hydrocarbons obtained by substit...	CHEMONT_000004	Organic compounds
4045	Organic oxygen compounds	100.00%	Organic compounds that contain one or more o...	CHEMONT_000005	Organic compounds
3270	Organocyclic compounds	100.00%	Organic compounds containing a bond between...	CHEMONT_000006	Organic oxygen compounds
111	Carbohydrates and carbohydrates congeners	100.00%	Monosaccharides, disaccharides, oligosacchar...	CHEMONT_000007	Organocyclic compounds
3117	Carbohydrates	100.00%	Compounds containing a pyran ring, which is a...	CHEMONT_000008	Organic compounds
2013	Phenylpropanoids and polyketides	100.00%	Organic compounds that are synthesized thro...	CHEMONT_000009	Organic compounds
3124	Diester compounds	100.00%	Carboxylic acid esters in which a single group...	CHEMONT_000010	Carbohydrates and carbohydrate congeners
3366	Secondary amides	100.00%	Compounds containing a secondary amide func...	CHEMONT_000011	Alcohols and polyols
1220	Alcohols and polyols	100.00%	Organic compounds in which at least one hydro...	CHEMONT_000012	Organocyclic compounds
3930	Organic oxides	100.00%	Organic compounds containing an oxide group...	CHEMONT_000013	Organic oxygen compounds
66	Organic compounds	100.00%	Compounds that contain at least carbon atom...	CHEMONT_000014	Organic oxygen compounds
4824	Organic oxides	100.00%	Compounds containing an oxygen atom, which is...	CHEMONT_000015	Chemistry articles
130	Organic compounds	100.00%	Compounds containing a pyran ring, which is a...	CHEMONT_000016	Organoheterocyclic compounds
123	Isothiazolone	100.00%	Organic compounds containing a heterocyclic r...	CHEMONT_000017	Organoheterocyclic compounds
254	Organic acids and derivatives	100.00%	Compounds containing a pyran ring, which is...	CHEMONT_000018	Organic compounds
3053	3-Aminoalcohols	100.00%	Organic amine compounds that have a hydroxyl...	CHEMONT_000019	Biopyrroles
2206	O-glycosyl compounds	100.00%	Cyclic in which a sugar group is bonded to...	CHEMONT_000020	Glycosyl compounds
134	Phenols	100.00%	Compounds containing a phenol moiety, which i...	CHEMONT_000021	Benzenoids
3276	Resonance and tautomeric structures	100.00%	Isomeric compounds containing one ring, whic...	CHEMONT_000022	Benzenoids
4236	Heterocyclic compounds	100.00%	Compounds containing at least one hetero atom...	CHEMONT_000023	Organic compounds
3695	Amines	100.00%	Compounds having the structure R2N(R)2, R...	CHEMONT_000024	Organoheterocyclic compounds
3882	Nitrogenous oxides	100.00%	Organic compounds containing a nitrogen ox...	CHEMONT_000025	Organic oxides and derivatives
418	Organic acids and derivatives	100.00%	Compounds containing a pyran ring, which is...	CHEMONT_000026	Pyrroles
3580	Favored glycosides	100.00%	Compounds containing a carbonyl group, which...	CHEMONT_000027	Favored glycosides
2270	Alcohols	100.00%	Organic compounds containing more than one...	CHEMONT_000028	Alcohols and polyols
2811	Oximes	100.00%	Compounds containing an oxime functional group...	CHEMONT_000029	Organic amine compounds
3111	Resonance and tautomeric structures	100.00%	Compounds containing a benzene ring, whic...	CHEMONT_000030	Biopyrroles
144	Isoprenoids	100.00%	Compounds containing a branched chain, whic...	CHEMONT_000031	Isoprenoids
4630	1-Hydroxy-2-alkoxyethanes	100.00%	Phenols that are substituted at the hydroxyl...	CHEMONT_000032	Phenols
334	Phenols	100.00%	Phenol secondary metabolites that contain the...	CHEMONT_000033	Phenylpropanoids and polyketides
4120	Phenylpropanoids	100.00%	Compounds containing one carbonyl group, whic...	CHEMONT_000034	Carbohydrates and carbohydrate congeners



# Dashboard

The company Eco Counter also provides an analysis tool called „[Eco-Visio](#)“ for their counters. In Frankfurt, it is used to visualize the bike data in a [public dashboard](#), which is updated by the counters daily.

This is the company's promotional video for the tool:



This is how the dashboard looks like:



<https://www.youtube.com/watch?v=ssEmpMWZjRs&t=5s>





# Traffic model

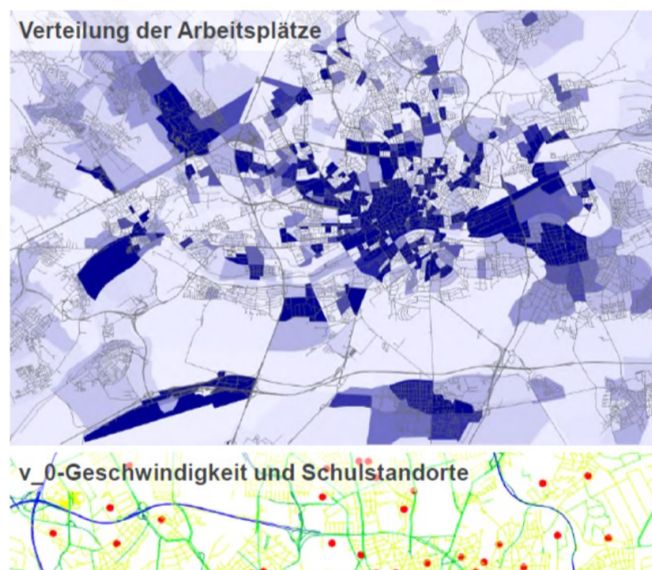
The city's traffic department also uses the counted bicycle data as one of the variables in their newly developed traffic model. The model's engineers provided us with a content list of their so-called „Data Hub“. Many of the other data points that make up the hub (and subsequently inform the traffic model) are structural / static in nature (for example commuting statistics of Frankfurt in 2019). Counting data is used, the engineers say, to regularly „re-calibrate“ the model with updated information.



## Nicht nur Beantwortung verkehrsplanerischer Fragestellungen – auch allgemeiner Datenhub

Verwendete Eingangsdaten (Auswahl) für 2019, 2024, 2040:

- Flächennutzungsdaten: Aktis-Datensatz, Flächennutzungsplan
- Strukturdaten: städtische und Landesstatistiken zu Einwohnern, Alter, Berufstätigkeit, Arbeitsplätze, Fahrzeugverfügbarkeit etc.
- Pendlerdaten: Pendlerstatistik der Bundesagentur für Arbeit
- Verkehrsverhaltensdaten: SrV, MiD,
- Netzdaten mit diversen Eigenschaften: Vtnet-/IGLZ-Mikronetz, HERE-Netz von Ortskundigen korrigiert und verbessert, Regionales Radnetz (IVM), SVA-Radroutennetz, Höhendaten aus Geländemodell, OSM
- Daten des ruhenden Verkehrs (inkl. Auslastung), Anzahl Parkraumbewirtschaftung
- ÖV-Daten: Fahrpläne sowie Fernbus; Fahrzeugpreisdaten



## Datenhub II

Verwendete Eingangsdaten (Auswahl) für 2019, 2024, 2040:

- Radverkehrsdaten: Erhebung zur Radnutzung in Ffm durch SVA
- Versorgungsdaten: täglicher und nicht-täglicher Bedarf, Ärzte, Krankenhäuser, Ämter
- Bildungsdaten: Kindergärten, Schulen, (private) Hochschulen, Universitäten
- Freizeit: Gastronomie, Kultur, Sport, Grünflächen, Besuche
- Tourismus- /Besucherdaten: Hotelbetten (FFM/ Umland), Anteile geschäftlich/Privat, Messe und Stadiondaten Besucherzahlen
- **Zähl- und Zählstellen-Daten: aus Dauerzählstellen, Schleifendaten und Einzelzählungen, 30 Radverkehrszählungen im Rahmen des Projektes durchgeführt, Zähl- und Zählstellen-Daten von traffiq und RMV-Verbunderhebung, Bundes GV-Modell**
- POIs umfangreich aus allen o. g. Bereichen

