# Yes, we CAN! Data-Driven Decision Making with the Climate Action Navigator

*Veit Ulrich, Emily Wilke, Kirsten von Elverfeldt, Maria Martin, Sebastián Block, Ashwin Chandran, Danielle Gatland, Charles Hatfield, Gefei Kong, Satvik Parashar, Fatemeh Rafiei, Moritz Schott, Alexander Zipf*

(Emily Wilke, HeiGIT gGmbH, Schloss-Wolfsbrunnenweg 33, 69118 Heidelberg, emily.wilke@heigit.org)
(Veit Ulrich, HeiGIT gGmbH, Schloss-Wolfsbrunnenweg 33, 69118 Heidelberg, veit.ulrich@heigit.org)
(Assoc. Prof. Dr. Kirsten von Elverfeldt, HeiGIT gGmbH, Schloss-Wolfsbrunnenweg 33, 69118 Heidelberg, kirsten.vonelverfeldt@heigit.org)
(Dr. Maria Martin, HeiGIT gGmbH, Schloss-Wolfsbrunnenweg 33, 69118 Heidelberg, maria.martin@heigit.org)
(Dr. Sebastián Block, HeiGIT gGmbH, Schloss-Wolfsbrunnenweg 33, 69118 Heidelberg, sebastián.block@heigit.org)
(Ashwin Chandran, HeiGIT gGmbH, Schloss-Wolfsbrunnenweg 33, 69118 Heidelberg, ashwin.chandran@heigit.org)
(Danielle Gatland, HeiGIT gGmbH, Schloss-Wolfsbrunnenweg 33, 69118 Heidelberg, danielle.gatland@heigit.org)
(Charles Hatfield, HeiGIT gGmbH, Schloss-Wolfsbrunnenweg 33, 69118 Heidelberg, charles.hatfield@heigit.org)
(Dr. Gefei Kong, HeiGIT gGmbH, Schloss-Wolfsbrunnenweg 33, 69118 Heidelberg, Gefei.kong@heigit.org)
(Satvik Parashar, HeiGIT gGmbH, Schloss-Wolfsbrunnenweg 33, 69118 Heidelberg, satvik.parashar@heigit.org)
(Fatemeh Rafiei, HeiGIT gGmbH, Schloss-Wolfsbrunnenweg 33, 69118 Heidelberg, fatemeh.rafiei@heigit.org)
(Moritz Schott, HeiGIT gGmbH, Schloss-Wolfsbrunnenweg 33, 69118 Heidelberg, moritz.schott@heigit.org)
(Prof. Dr. Alexander Zipf, HeiGIT gGmbH, Schloss-Wolfsbrunnenweg 33, 69118 Heidelberg, alexander.zipf@heigit.org)

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## 1 ABSTRACT

Cities urgently need to reduce greenhouse gas (GHG) emissions to comply with climate targets. To support evidence-based planning, we present the Climate Action Navigator (CAN) (HeiGIT 2026), a co-created, data-driven dashboard designed to analyse urban environments by means of a broad set of spatial assessment tools. While CAN is neither the first nor only dashboard that builds on open data and open source software for monitoring urban climate action, its commitment to transparency, adaptability, usefulness, and usability makes it uniquely suited for NGOs, (small) municipalities, and citizen initiatives. CAN's assessment tools are co-created with municipal partners, researchers and local stakeholders, and integrate heterogeneous datasets to offer a holistic and accessible dashboard to assist in decision-making. This is supported by the high spatial resolution of CAN's tools, which reach down to the neighbourhood and even the street level. With intuitive, interactive maps, the tools empower decision-makers to identify and compare intervention areas, thereby supporting targeted, actionable insights.

The dashboard focuses on two core thematic areas: active mobility and GHG emissions. For mobility, CAN offers assessments related to walkability (hiWalk), bikeability (hiBike), and multimodal accessibility (transportability) globally. For emissions, it provides high-resolution estimates of emissions related to heating, traffic, and land cover change, as well as $CO_2$-budgets for selected cities. Because of data limitations, these tools are currently constrained to Germany. In addition, CAN utilizes deep learning models to detect rooftop solar panels from remote sensing imagery, again currently restricted to Germany.

With its intuitive interface, CAN enables stakeholders to more effectively urge for climate action measures, prioritise interventions, and evaluate policy plans. This contribution presents CAN's co-created assessment tools, with a focus on the tools related to GHG emissions, and illustrates how the dashboard is designed to assist data-driven policy-making and accelerate climate action at the urban scale.

Keywords: Big Data, Active Mobility, Heating Emissions, Traffic Emissions, Dashboard

## 2 INTRODUCTION: THE FUTURE OF CLIMATE ACTION IS URBAN

Urban areas are key drivers of $CO_2$ emissions, being responsible for around 70 % of global $CO_2$ emissions and primary energy consumption. More than half of the global population lives in urban areas, and this is expected to increase to 70 % by 2050 (IPCC 2022). Not surprisingly, urban areas are also highly exposed to climate change, especially informal settlements and slums (Hussainzad & Gou 2024). At the same time, urban areas can be seen as "the future of climate action" (Rossbach & Filho 2025), because they offer multiple leverage points for societal transformation. As centres of innovation, cities and urban areas are "where solutions can move fastest – if supported with the right tools and resources" (Rossbach & Filho 2025). This requires evidence-based decision-making, which is facilitated by data-driven tools.

However, most data-driven tools developed so far to support climate action suffer from a series of limitations that hamper their usefulness to guide decision-making, or are rather resource-intensive. Most tools, e.g.

CityMetrics (World Resources Institute 2026) or the Climate Risk Dashboard (IIASA 2026), only provide data aggregated to administrative areas, are limited to a single topic (e.g., heat stress), are only available for a few cities, or focus on reporting rather than urban planning. ClimateView, for example, helps municipalities track, manage, and advance their climate action efforts (ClimateView 2025). It thereby encourages municipalities to set science-based targets, to monitor progress, and to report on steps taken. However, especially for cities with limited financial and maintenance resources, ClimateView might be too resource-intensive. And whilst ClimateView integrates various data sources for a comprehensive view of climate impact, it does not utilize geospatial data for urban-specific insights. Another example are tools displaying localized greenhouse gas (GHG) emissions such as ClimateTRACE (Climate TRACE 2026), which do not resolve emissions from all important sectors (e.g., housing and road traffic) at sub-city scale. A dashboard integrating tools for different climate action topics with data at high spatial resolution and global coverage does not yet exist.

CAN wants to fill this gap with its commitment to openness, adaptability, usefulness, and usability. It is explicitly developed for NGOs, municipalities, and citizen initiatives. Additionally, its utilisation of open geospatial data can provide highly relevant and actionable insights for urban areas, helping them to prioritise and implement climate actions effectively. And since CAN's assessment tools are co-created with municipal partners, researchers, and local stakeholders, this community involvement helps to leverage local knowledge and engagement, which is a valuable, yet often overlooked resource. Furthermore, the co-creation approach ensures that the dashboard is both useful and usable for those making decisions. Supported by the spatial resolution of the assessment tools that reaches down to the neighbourhood and even the street level, intuitive, interactive maps allow decision-makers to identify and compare intervention areas for targeted climate action. However, as most of the assessment tools are based on OpenStreetMap (OSM) data, the availability and quality of data is an issue in some areas of interest, and will be continuously improved using methods such as data fusion and Deep Learning.

In the following sections, the paper firstly describes CAN's key principles of openness, transparency, global coverage, usefulness, usability, and CAN as a "living product", arguing that these principles define "right tools" for climate action as demanded by Rossbach & Filho (2025). Secondly, we present CAN's current and future array of assessment tools (i.e., hiWalk and hiBike, Heating Emissions and $CO_2$ Budget, LULC Change, and Land Consumption), also reflecting on their respective limitations. Based on this, the next section discusses how CAN supports data-driven decision making, to then conclude that, yes, we can act now.

## 3 THE CLIMATE ACTION NAVIGATOR

### 3.1 Key Principles

Openness. To generate the greatest impact possible and maximize usefulness, the CAN's tools are based on open data, the code is open source, and the dashboard is accessible and free for anyone to use. Despite being free of charge, CAN requires initial user registration for safety reasons and to enable users to access and view their past computation results when returning to the dashboard. Registered users are also able to download data generated with CAN to use in further analyses.

Transparency. The methodology of each tool is documented clearly and limitations and uncertainties are communicated and emphasised. Being open source, expert users can also audit the code to understand exactly how indicators are generated.

Global coverage. Since solutions for climate action are needed everywhere, CAN's assessment tools strive for global coverage, with an emphasis on urban areas. As data availability varies greatly from region to region across the planet, some of the tools are currently only available for Germany. The quality of the global indicators' databases also varies regionally, which can occasionally limit their usefulness. To mitigate this, we leverage globally available datasets such as remote sensing data or OpenStreetMap (OSM) and, if possible, integrate other heterogeneous datasets to increase coverage. To fill remaining data gaps, new methods using e.g. deep learning (DL) are in development.

Usefulness and usability. Assessment tools are created in close collaboration with partners such as NGOs and citizen initiatives, ensuring that the tools will provide added value for them. Usefulness is further supported by the high spatial resolution of the tools down to street level, the visualisation of intuitive and interactive maps, and the option to further analyse results with GIS. These features enable targeted and actionable insights at the micro-scale that assist stakeholders in making decisions.

CAN is a "living product". We, HeiGIT's Climate action team, can and will adapt its interface, data outputs, and both number and functionality of assessment tools based on partner requests and user feedback. It is an adaptive project that evolves in response to technical innovations as well as partner demands and needs.

### 3.2 Assessment Tools

Currently, the dashboard offers assessment tools in mainly two thematic areas: active mobility (with global coverage) and GHG emissions (currently only for Germany). For active mobility, it includes a walkability tool (hiWalk) and a bikeability tool (hiBike). For GHG emissions, CAN features both a heating emissions and a $CO_2$ budget estimation tool. Furthermore, there is a tool on $CO_2$ emission estimation from LULC change as well as one for land consumption. Tools on further thematic areas, e.g. transitability and rooftop solar, will be added over time.

Active mobility. The hiWalk and hiBike assessment tools provide indicators for the safety, comfort, and practicality of walkable and bikeable infrastructure in user-selectable areas of interest at urban scale. Both tools are based on OSM and remote sensing data and provide micro-scale, street-level indicators: A categorisation of walkable or bikeable paths depending on whether the path must be shared with other users (e.g., motorised traffic) (Fig. 1), and indicators on path smoothness and surface types. hiBike includes an additional indicator for dooring risk showing infrastructure that brings cyclists into the danger zone of opening doors from parallel parked vehicles.

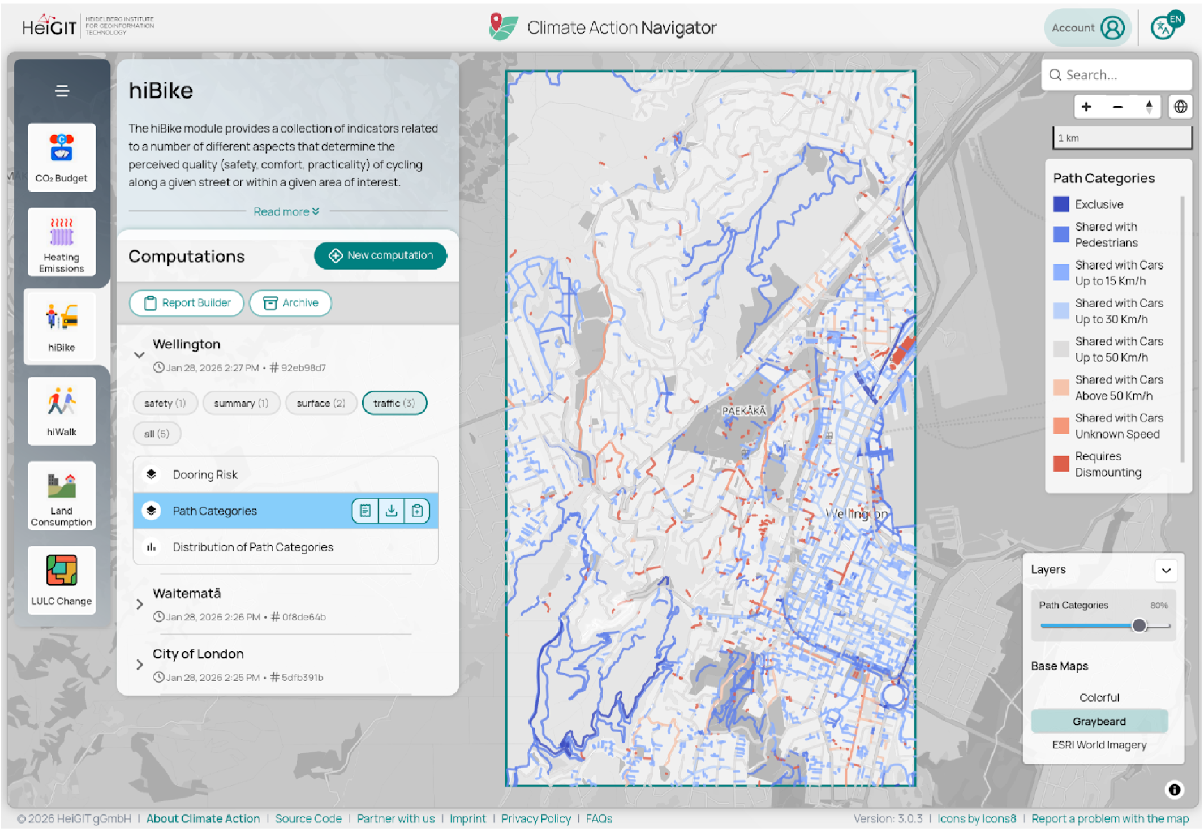


Fig. 1: hiBike Path Categories in a rectangle around downtown Wellington, Aotearoa (New Zealand).

Both tools feature an optional greenness indicator and a detour factor indicator. The former highlights green paths that feature more vegetation; the latter points out those areas where pedestrians or cyclists need to take large detours to reach their destination. While hiWalk and hiBike have global coverage in principle, their reliability varies from region to region due to differences in the quality of underlying OSM data. Another example of data scarcity is the usage street-side parallel parking, as mapped in OSM, as a proxy for dooring risk. We are developing deep learning methods to address these data gaps.

GHG emissions. The heating emissions tool (Kong et al. 2026, subm.) estimates scope 1 emissions from residential heating based on data from the German census of 2022 (Statistisches Bundesamt 2024) using a bottom-up approach. The tool provides maps showing absolute and per capita $CO_2$ emissions at 100 m spatial resolution (Fig. 2), as well as the drivers of those emissions, i.e., building construction year and the corresponding energy consumption rates and building energy carrier, and the associated magnitude of emissions related to heating. The $CO_2$ budget assessment tool uses global carbon budget data (IPCC 2021) and emission data from German cities to calculate the remaining $CO_2$ budget that the selected city can still emit while adhering to shared commitments to limit global warming to 1.5 °C or at least well below 2.0 °C, according to the Paris Agreement (UNFCC 2016). The LULC Change tool uses carbon stock values from bookkeeping models (e.g., Hansis et al. 2015) to estimate the carbon flows caused by changes in land use and land cover. It uses a deep learning model to derive LULC changes from satellite data in a given time period.

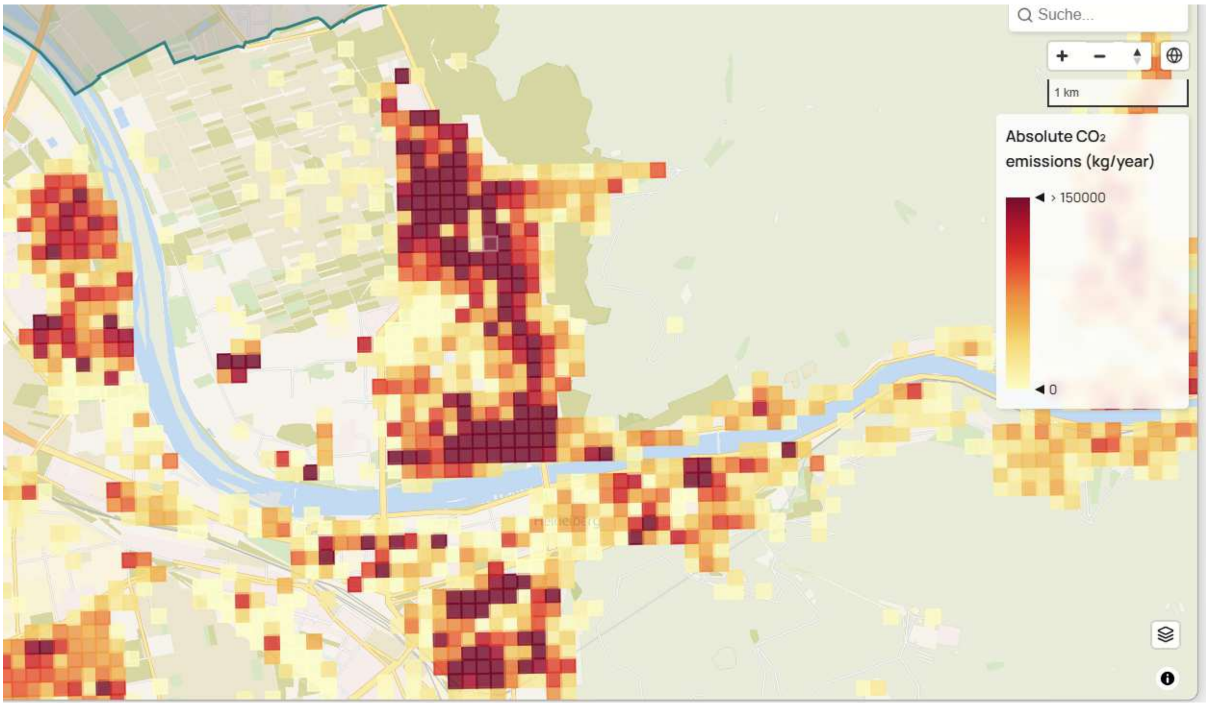


Fig. 2: Absolute $CO_2$ emissions from residential heating in Heidelberg.

Land consumption is assessed based on OSM data. The tool indicates how much land cover has been converted from natural land into built up infrastructure for various land uses in a given area. A tree map displays the percentage of consumed land (broken down into buildings, roads, and parking lots) as well as percentages of agricultural and unconsumed natural land.

Assessment tools under development. Ongoing work on a transitability assessment tool aims at providing indicators for the availability and quality of public transport, such as the number of services that can be reached within a reasonable distance from a given location, as well as stop coverage and frequency, based on publicly available schedules and OSM data. A prototype of a traffic emissions tool estimates street-level annual emissions from road traffic. It extrapolates traffic counts across the road network using road type data from OSM and population data from the Global Human Settlement Layer (Schiavina et al. 2023). It then applies emission factors from the COPERT emission calculator tool (Ntziachristos & Samaras 2024) based on speed limits as well as vehicle and fuel mix to estimate road traffic emissions. The tool will provide maps showing estimated traffic volume as well as $CO_2$, CO, and $NO_x$ emissions for each road segment. A yet unpublished rooftop solar tool analyses aerial imagery to detect rooftop solar panels and display their amount, locations, and spatial distribution in an area of interest. Another assessment tool in early stages of development uses deep learning to monitor subtle land cover changes based on remote sensing data and AlphaEarthembeddings (Brown et al. 2025), to combat land degradation processes with an initial focus on steppe environments in Mongolia.

## 4 EMPOWERING STAKEHOLDERS: DATA-DRIVEN DECISION MAKING WITH THE CLIMATE ACTION NAVIGATOR

CAN's assessment tools are designed to empower stakeholders through a data-driven approach, enabling them to make informed decisions for effective climate action. These tools are created in a partner-driven fashion, in close collaboration with stakeholders such as NGOs or municipal administrations. To this end, HeiGIT's climate action team employs a partner workshop process that allows us to apply design-thinking techniques (Rösch et al. 2023) with the respective partners as equals. This collaborative approach ensures that the indicators are directly applicable in practice and tailored to the specific demands and needs of the partners.

One example of this empowerment is HeiGIT's collaboration with the citizens' initiative Klimanetz located in Heidelberg, Germany, to develop the $CO_2$ budget tool. It displays local GHG emission trends and encourages discussions with the general public, activists, and policy makers based on facts and scientific insights. Furthermore, the tool enables comparisons between Heidelberg's emissions with those of four other German cities, providing valuable context for local climate action efforts. While the tool was initially developed for Heidelberg only, we have included more cities since and plan to expand it further.

During the co-creation process of the tool, a series of idea incubation workshops was held together with Klimanetz, using virtual collaborative workspaces. Within the workshop series, at first initial requirements for the tool were defined, such as the tool's objective and success measures. Next, different user stories were developed to understand the requirements of various user groups, e.g., activists and decision makers. In a third step, the planned tool features were prioritised, so that we were able to develop a demo version. The final workshop was held to review the tool to ensure that the tool is actually usable and useful for Klimanetz and other potential users.

Furthermore, partnerships with scientists have emerged and ensure that CAN's indicators mirror scientific advancements. One notable collaboration is with the environmental physicists at Heidelberg University, where we are developing a $CO_2$ emissions inventory of the Rhine-Neckar region in southwest Germany. They are using CAN's emission data as input for a model to simulate $CO_2$ concentrations in the urban atmosphere at high spatial resolution, and to optimize the placement of $CO_2$ sensors in a monitoring network (Vardag & Maiwald 2024). follows a looser approach with regular meetings, providing valuable input for the development of the emission estimation methodology and tailoring the emission inventory to meet scientific requirements. The heating emissions tool, as well as the traffic emissions tool currently under development, are direct outcomes of this cooperation. Through these tools, CAN effectively translates the latest scientific insights into practical tools, thereby linking scientific knowledge with climate action. This empowers stakeholders by providing them with reliable and actionable data to inform their decision-making process.

Attempting to establish partnerships around the world plays an important role for CAN's continuous development and improvement. However, a bias towards European partners is obvious, such as the WWF Austria, Walkspace.at, Radlobby Austria, or Someware in France, which limits the applicability of our tools outside of Europe. Yet, we are collaborating with the Lagos Urban Development Initiative (LUDI) in Nigeria to develop walkability indicators that address issues in Western African cities. Additionally, we are in the process of establishing further collaborations with stakeholders from countries of the Majority World to expand the reach and the impact of CAN.

## 5 CONCLUSION: YES, WE CAN ACT NOW

In conclusion, CAN serves as an adaptable tool for stakeholders engaged in climate action. With its principles of openness, transparency, global coverage, and co-creation, it provides essential data to support informed decision-making for climate action. The dashboard currently offers assessment tools in the realms of active mobility and GHG emissions, with plans to expand into additional thematic areas in the near future, e.g. transitability and land degradation.

One of the main strengths of CAN is its development through a collaborative and transdisciplinary co-creation process involving experienced partners from relevant fields. This approach ensures that CAN's tools are tailored to meet the specific demands and purposes of its users. However, this strength may be reduced in those areas where open data, e.g., OSM data, is limited. As a living product it allows for continuous adaptation of its interface, data outputs, and assessment tools in response to feedback or changing framework conditions.

The time to act on climate change is now. Delaying effective climate action will only exacerbate the challenges we face and limit our options for mitigation and adaptation. We invite NGOs, citizen initiatives, and other stakeholders to collaborate with us, leverage CAN's tools, and implement effective climate action tools tailored to their specific needs and contexts. While the challenges of climate change are significant, we are committed to working towards the best possible future. CAN aids urban climate action, inspiring stakeholders to take immediate and effective measures, and making it one of the “right tools” for urban climate action. Yes, we can act now.

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