Towards Broad Prosperity

The power of walking, cycling, and e-bikes in accessibility

Discover how data-driven insights help policymakers stimulate active mobility and tangibly improve broad prosperity - from cleaner cities to equal opportunities for everyone. In this whitepaper, we explore the crucial role of walking, cycling, and e-bikes in strengthening broad prosperity. Broad prosperity is not just about economic growth, but also about health, livability, inclusivity, and sustainability. Active mobility contributes in all these areas, especially when we use smart, data-driven analyses to make the accessibility of amenities visible and to substantiate targeted policy choices. Through practical examples, such as the Digital Twin of Argaleo and Dutch Cycling Intelligence, we show how new technologies support policymakers in shaping the mobility transition - from vision to implementation.

Broad Prosperity and Mobility: More Than Economic Growth

The concept of broad prosperity goes beyond just economic growth and income. It also encompasses things like health, living environment, social cohesion, and equal opportunities. Mobility plays a key role in this: it enables people to reach important destinations - from work and school to shops and healthcare - and thus participate fully in society. But mobility is not an end in itself; it is a means to increase well-being. Policy visions such as the *National Environmental Vision (NOVI)* therefore emphasize that we must approach mobility in service of broad prosperity. Concretely, this means choosing sustainable forms of transportation (walking, cycling, public transport) that contribute to a healthy living environment and healthy lifestyle.

Broad prosperity in mobility policy is about carefully weighing different social values: accessibility, safety, health, and living environment. This offers opportunities for policies that on the one hand address *inequality of accessibility* (so that everyone, regardless of income or region, has access to important facilities) and on the other hand reduce the harmful effects of especially car traffic on the environment and safety. In other words, mobility investments should not only accelerate travel, but also contribute to cleaner air, fewer traffic casualties, and a higher quality of life for everyone.

Active mobility improves health, inclusiveness, and livability

Active mobility - such as walking and cycling - is a form of transportation that particularly promotes broad prosperity. When we choose active modes of transportation, we benefit from various advantages:

Health benefits

Daily cycling or walking extends life expectancy and helps prevent diseases of affluence. According to the RIVM, only 44% of the Dutch meet the recommended daily physical activity - active mobility can increase this percentage.

Cleaner living environment

Every trip made by bike or on foot instead of by car reduces the emission of harmful substances such as particulate matter and nitrogen oxides that contribute to health problems and premature death.

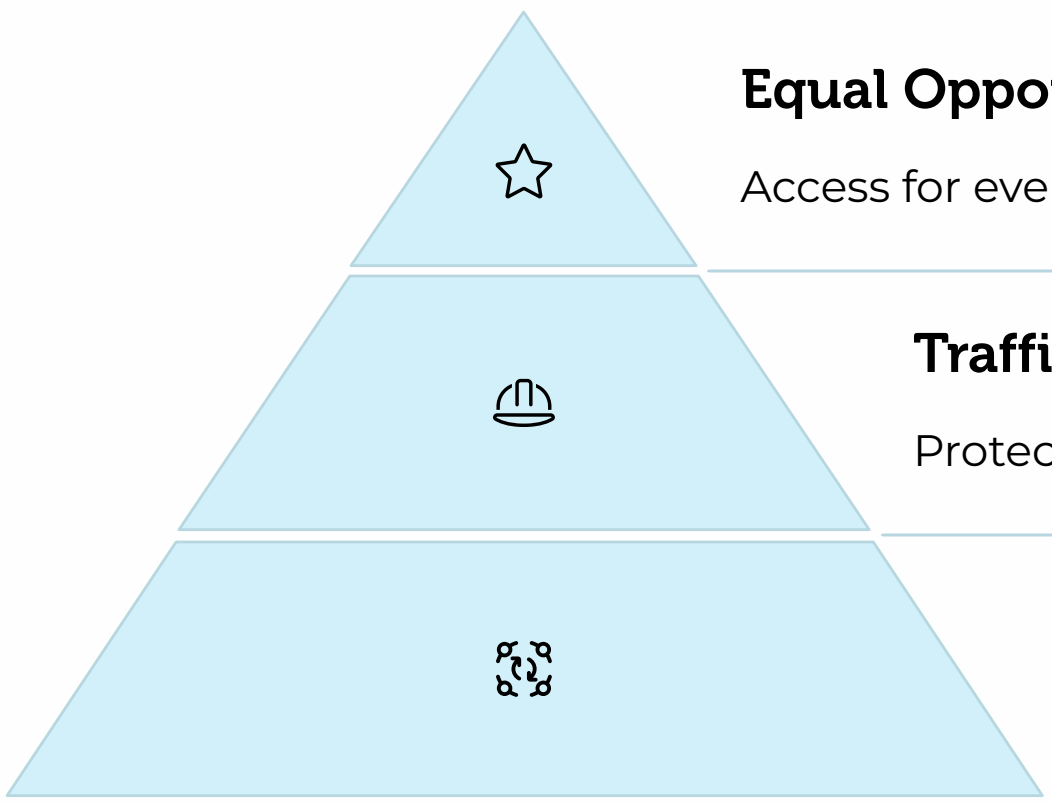
Improved quality of life

More cyclists and pedestrians mean fewer traffic jams, less noise pollution, and more livable streets and neighborhoods. Traffic noise from cars causes stress, while active mobility contributes to quieter and more pleasant living environments.

Inclusivity and Safety through Active Mobility

The inclusive nature of walking and cycling is also crucial. Good bike and pedestrian paths make mobility accessible to virtually all age groups and income classes. Children can safely walk or cycle to school independently; the elderly maintain their freedom of movement in the neighborhood; and people without a car or driver's license (for example, due to financial reasons or because they are too young/old) can still access shops, education, and jobs. A fine-meshed network of walking and cycling routes thus prevents forms of *transport poverty* and increases equal opportunities. Everyone gets more equal chances when essential facilities are within a feasible distance, regardless of whether one has a car. This principle is in line with the *STOMP* principle (Walk, Cycle, Public Transport, Mobility as a Service, Private car) on which more and more cities base their mobility planning - first the pedestrian and cyclist, then public transport and the car.

Finally, active mobility also increases traffic safety in the long run. Infrastructure focused on walking and cycling (wide sidewalks, separate bike paths, safe crossings) makes cities safer for vulnerable road users. Drivers also adapt their behavior in a city designed "at eye level" for the cyclist and pedestrian. This is in line with Vision Zero goals and contributes to both objective and subjective safety (people feel more comfortable on the street when the environment is pedestrian-friendly). In short, investing in walking and cycling is investing in healthier, more inclusive and livable communities - precisely what broad prosperity is all about.



Equal Opportunities

Access for everyone

Traffic Safety

Protection for vulnerable participants

Livable Communities

Pleasant public space

The E-bike as a Game Changer for Distance and Accessibility

In recent years, the e-bike has seen a strong rise and plays an important role in connecting broad prosperity with accessibility. The technical advantages of the electric bicycle offer more comfort and significantly increase the range of cyclists: where half of the people want to cover an average trip on a regular bicycle in just over 10 minutes, this figure is almost 15 minutes with the e-bike. On average, the Dutch consider about *9.5 km* an acceptable distance to cycle with an e-bike for work or education - significantly more than with a regular bicycle. This means that thanks to the technical advantages of the e-bike, many more destinations become accessible without a car. In fact, mobility data shows that 58% of commuter trips are within that 9.5 km range, while about 30% of those are still made by car. There is therefore enormous potential here: if we provide safe, fast cycling routes, e-bikes can replace a significant portion of these car trips, with all the positive consequences (less CO_2, healthier people, less traffic jams).

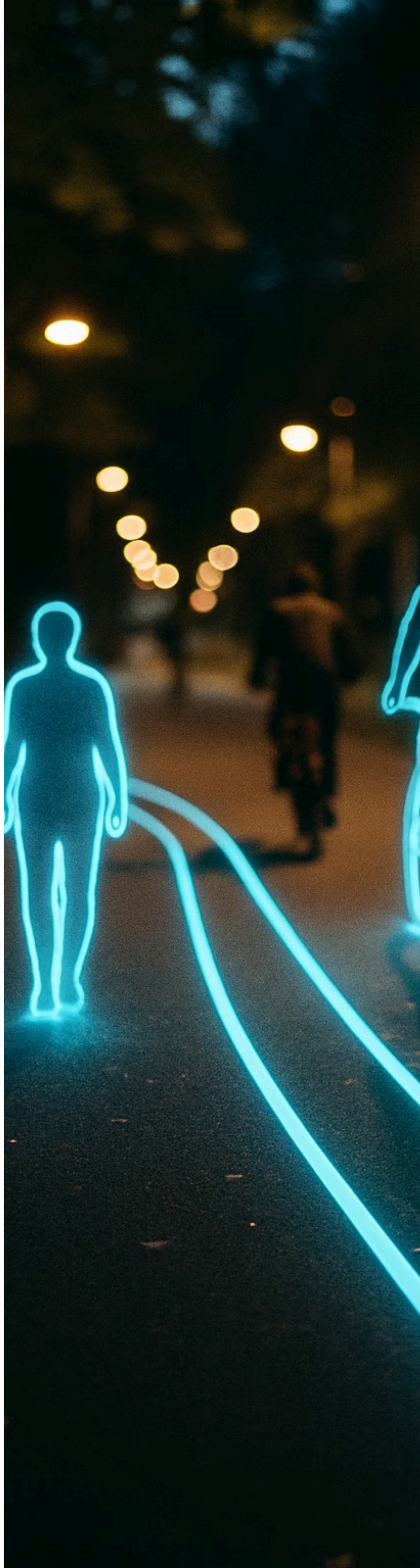
For the elderly and people with limited fitness, the e-bike offers additional benefits in terms of inclusivity. Where a 5-kilometer ride on a regular bicycle would be too far for some, pedal assistance makes it possible for these groups to continue participating. The e-bike, as it were, extends the independent mobility of seniors and increases the freedom of movement of people in suburbs or rural areas, where distances are greater. In this way, the e-bike also connects less densely populated areas with economic core zones in a sustainable way. Governments recognize this potential: in various regions, investments are being made in so-called cycling highways (or fast cycling routes) so that longer regional distances between cities and the surrounding region can also be covered attractively by (electric) bicycle. These investments in high-quality cycling infrastructure are in line with the ambitions for sustainable mobility and help to achieve climate goals, while at the same time keeping accessibility high.

Data-driven insights into the accessibility of pedestrians and cyclists

To be able to make targeted improvements to pedestrian and cycling infrastructure, insight into the current accessibility is essential. This is where the data-driven accessibility analyses of, among others, *Argaleo, Stratopo* and *Dutch Cycling Intelligence (DCI)* come into play. These initiatives convert large amounts of mobility data into useful information for policymakers. Instead of relying on gut feelings or incidental counts, one can now objectively see how accessible different places are on foot, by bicycle or e-bike.

An example of this is the *Digital Twin* technology of Argaleo, applied in collaboration with Dutch Cycling Intelligence. In this digital map environment, various data sources are combined and visualized to map accessibility.

But what exactly does accessibility mean here? Joost de Kruijf (driver of the Knowledge and Innovation Lab Mobility Transition and initiator of the Dutch Cycling Intelligence concept) explains: *"With accessibility, we indicate how easy or difficult it is for us to get from A to B"*. In practice, this is measured based on factors such as distance/travel time, people's willingness to travel and the supply of destinations within reach.



Travel willingness and accessibility analysis

Travel willingness means: how far or long are people willing to walk, cycle or use the e-bike for a particular destination? This varies per person and per type of destination. The data confirm, for example, that people accept a shorter travel time for daily facilities than for work. In other words, almost no one cycles for half an hour to go to a neighborhood supermarket, but going to work or school is common. Until now, insight into travel willingness per motive was limited or usable on averages.

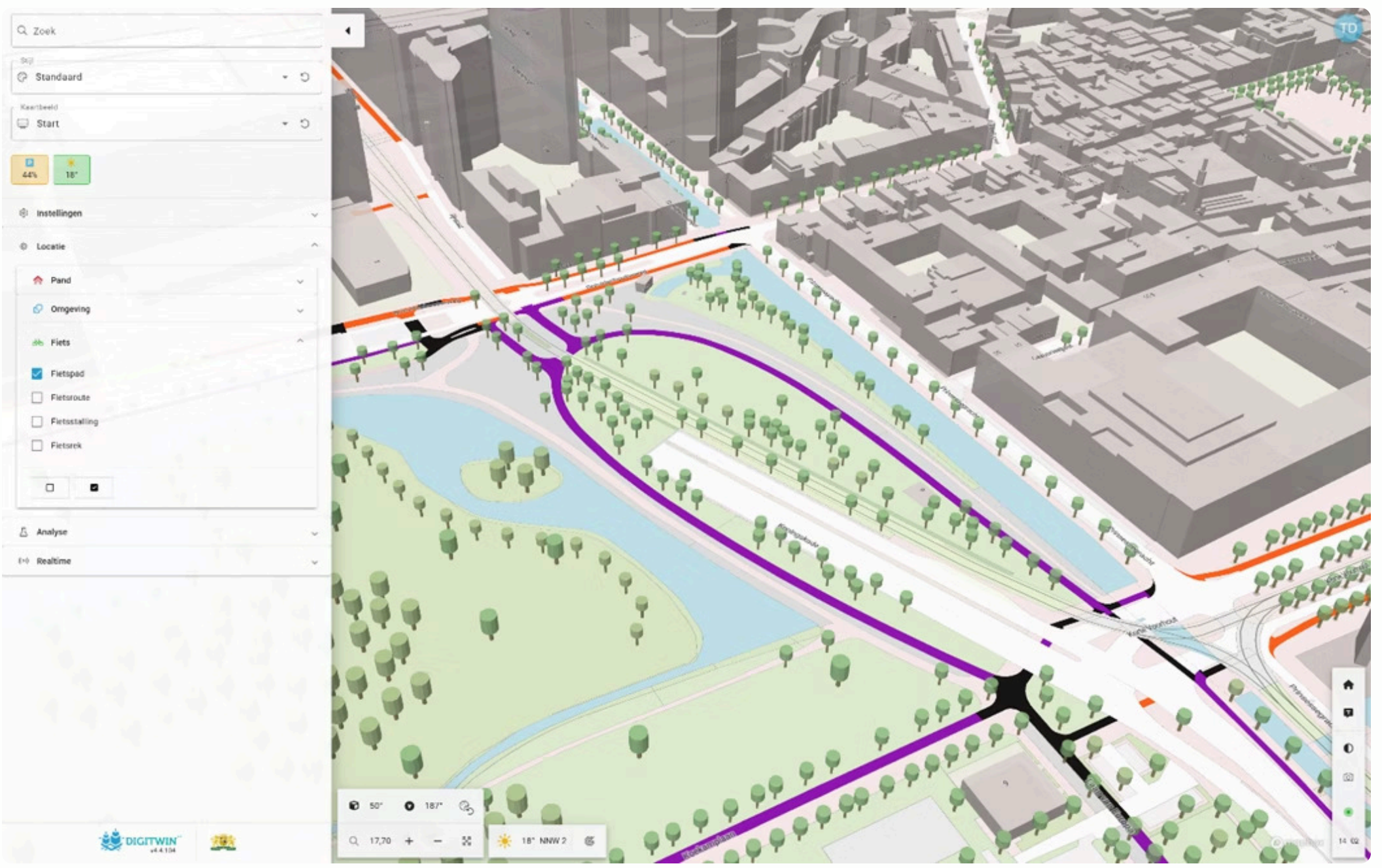
Based on the Onderweg in Nederland (ODiN, CBS 2024) research, so-called travel time decay curves have now been calculated, which have made it clear how long people are willing to use the bicycle and/or e-bike for certain purposes. It can also be made clear, for example, what the difference in travel willingness is between people living in the city or in a more rural area. By working with travel willingness, it can be made clear whether a facility is *actually* accessible to most people.

In addition to travel willingness, the analyses look at the number of facilities within a certain radius or travel time. Think of: how many supermarkets are there within a 10-minute walk? How many jobs are available within a 30-minute bike ride from neighborhood X? How far is it to the nearest general practitioner's post by e-bike? Such questions can be quickly answered thanks to the linking of geo-data with facility registers. The result is a rich picture of the environment of every neighborhood: where are the "white spots" (areas with few facilities nearby) and where is there an abundance?

What do we visualize in the Digital Twin?

The Digital Twin for cycling policy nicely illustrates which data layers are combined. The dashboard provides insight into:

Infrastructure: the exact network of bike paths, plus locations of relevant objects such as traffic lights and speed bumps. Important destinations (stations, schools, business parks) are also visualized on the map. This forms the base map: where can one cycle and where does one need to go?

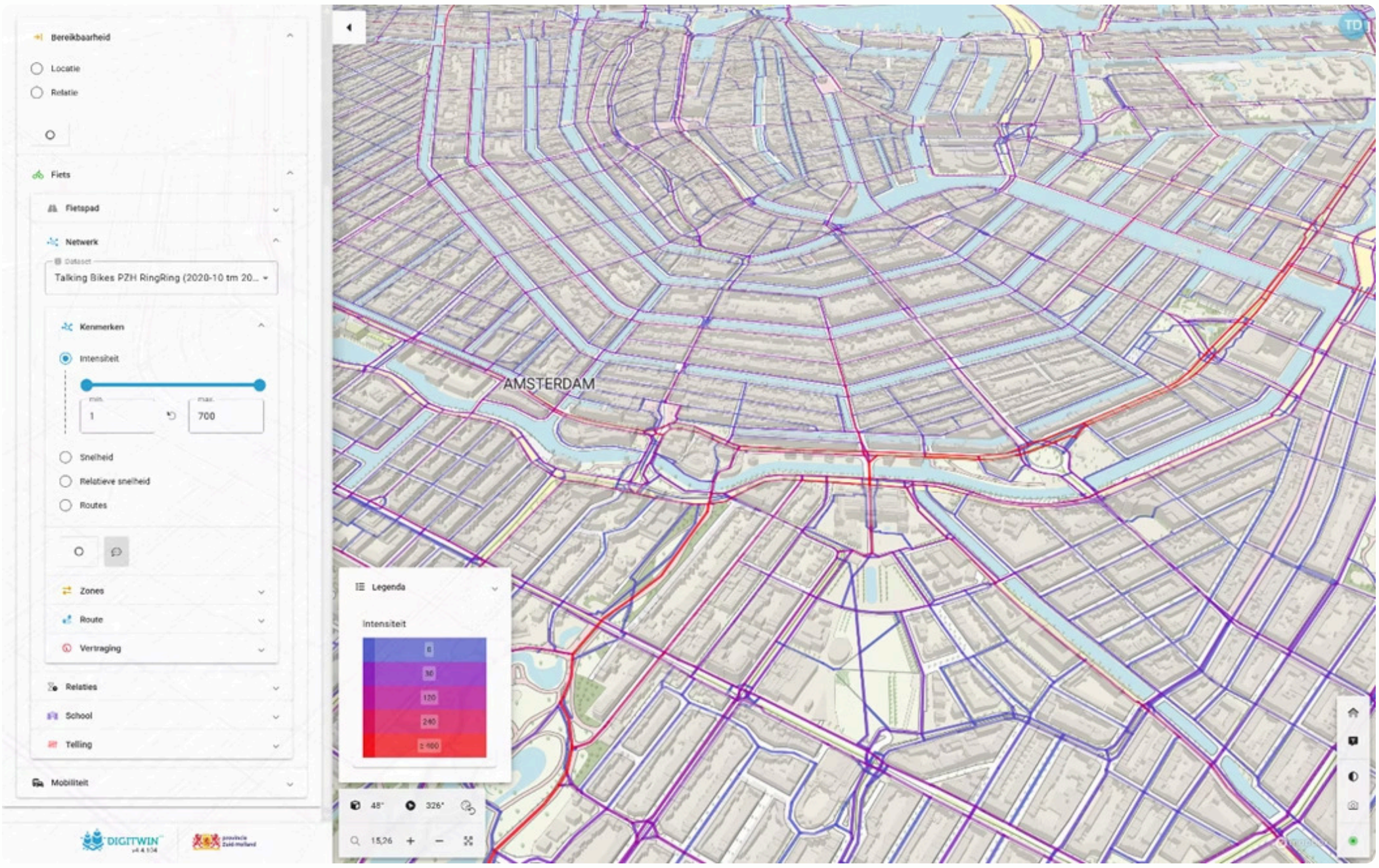


Accessibility Analyses

Accessibility: the bicycle accessibility of important locations, for example how many minutes it takes to cycle from each address to the nearest station or school. This also shows information about the number of facilities within a certain travel time (e.g. how many shops or sports facilities are within a 20-minute bike ride). Demographic data can also be linked: the number of potential users in an area (population, age structure) - so you can see, for example, how many elderly people benefit from a better sidewalk to the shopping center.

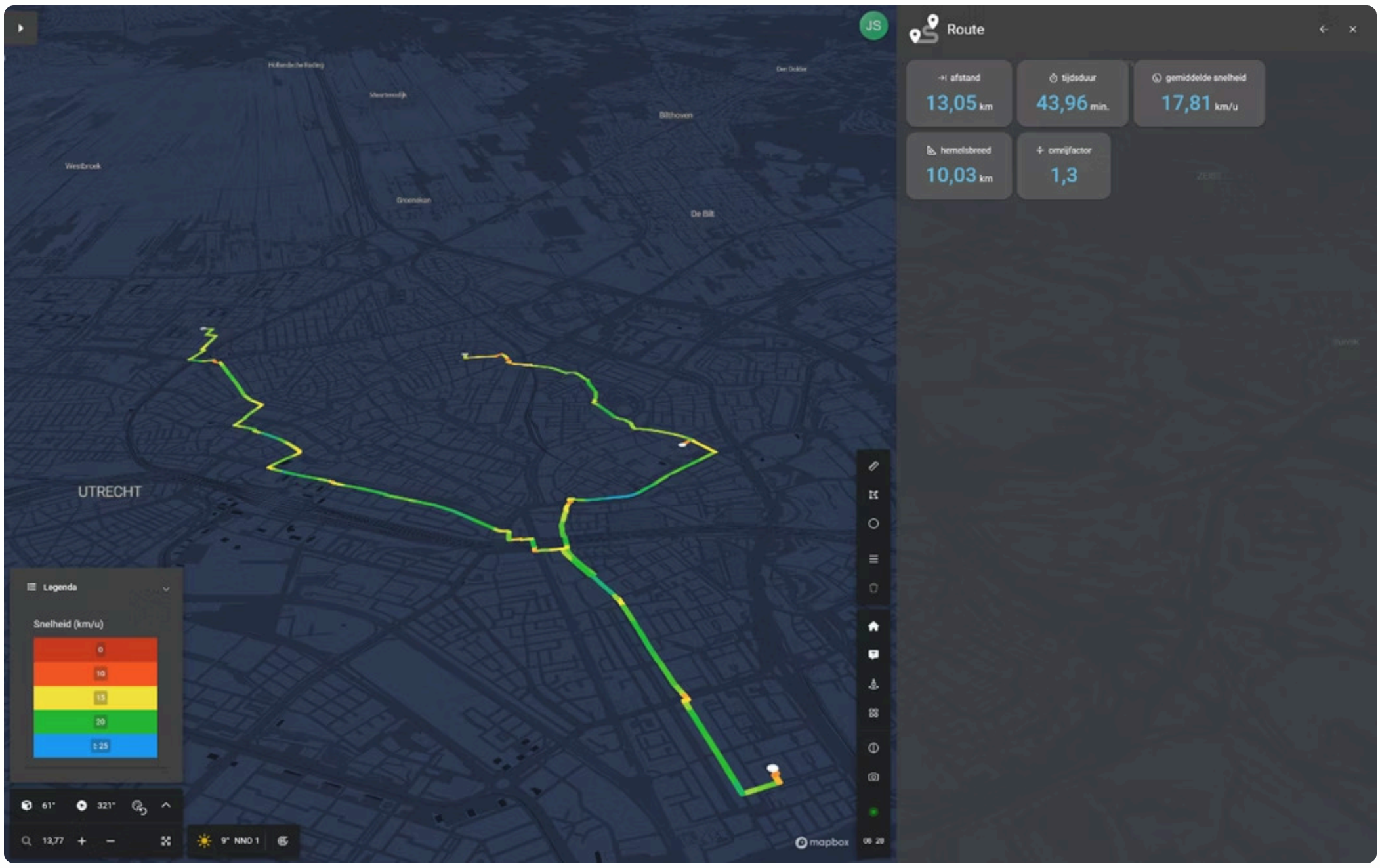
Bicycle Network Usage

Bicycle network usage: insight into the utilization and performance of the network. GPS data from cyclists shows which routes are popular and how fast/slow cyclists are moving in a particular area. This makes it clear where the bottlenecks are: places where there is a lot of delay, detours are chosen, or safety is perceived to be an issue. The DigiTwin, for example, shows the biggest bottlenecks in the bicycle route network per neighborhood.



Travel times and routes

Travel times and routes: an integrated route planner shows the fastest and shortest routes between points. This allows you to test scenarios, e.g. *"What if we build this new bike bridge, how much time will cyclists save from neighborhood A to station B?"*. You can also analyze the *detour factor* (how much detour compared to the shortest route), which provides insight into where routes are suboptimal.

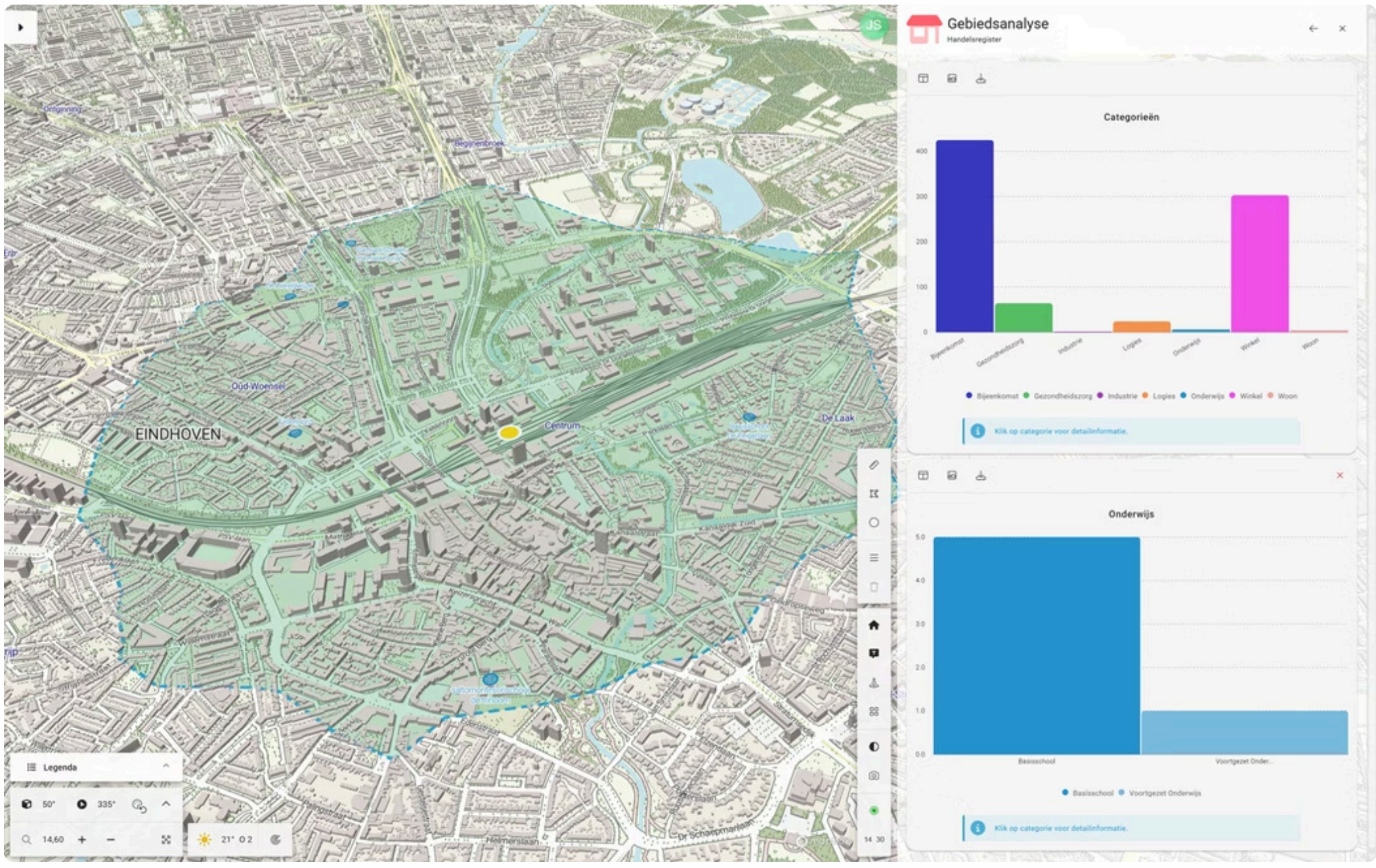


Traffic Data and Trends

Traffic data and trends: if there are bicycle counters or app data available, bicycle numbers and usage trends can also be visualized. This allows you to see, for example, growing e-bike usage on certain routes or the effects of seasons.

Amenities

Amenities: insight into the accessibility of essential amenities such as elementary schools, supermarkets, and general practitioners. The Digital Twin, for example, shows how many elementary schools are within a 15-minute bike ride from each neighborhood, and where there are blind spots where children have a longer commute. By combining this information with demographic data, such as the number of families with young children, municipalities can strategically invest in new schools or better bike connections to improve accessibility.



Area-based presentation of mobility data

All this information is presented on an area-specific basis: one can zoom in to the level of province, municipality, neighborhood or even street. In the digital twin, for example, it is possible to see how well various facilities such as schools or business parks are accessible by bicycle in a particular city. This is based on the actual bicycle speeds and routes that people choose, measured via GPS data, rather than theoretical assumptions. This creates a realistic picture: if many cyclists take a detour to avoid an unpleasant route, the data reflects that.

Variation in behavior is also taken into account. De Kruijf nuances that an accessibility score is never the same for everyone - *"One cyclist is not the other. Where one finds it fine to have to pedal for twenty minutes, that is a bridge too far for another"*. Yet the insights from the data are valuable, precisely because they are combined with other sources and large numbers of users. The strength of this data-driven approach is that it reflects actual behavior and is not purely theoretical. And as more data becomes available (e.g. via smartphone apps, e-bike sensors, etc.), the analyses become even more accurate.

Provincial level

Comparison between regions and identification of regional bottlenecks in the bicycle network

Municipal level

Analysis of accessibility of facilities and work locations within municipal boundaries

Neighborhood level

Detailed information on local accessibility and identification of missing connections

Street level

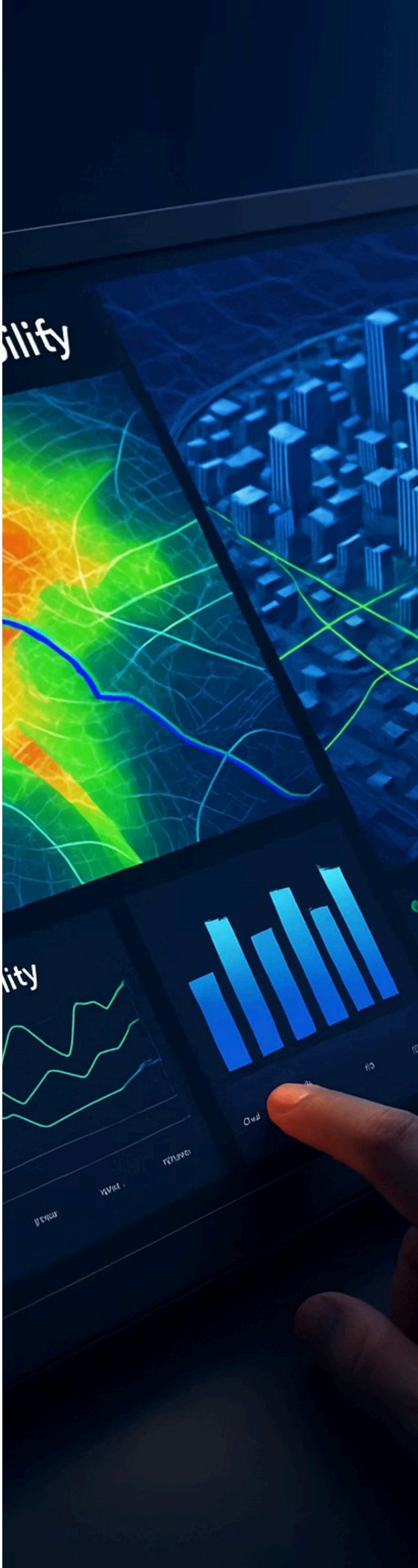
Specific bottlenecks and improvement opportunities for individual routes and intersections

Visualizations support policy and decision-making

An important aspect of data analysis is how the results are presented. Figures and tables alone do not always inspire policymakers, but visualizations do. In the dashboards of Argaleo and DCI, all insights are displayed on intuitive maps, graphs, and 3D visualizations.

The use of such interactive maps - a kind of digital twin of the city - helps policymakers and administrators to really understand the data. A map where you can click and see exactly how many people live within a 10-minute bike ride of a library, or which neighborhoods don't have a supermarket within walking distance, tells a story that a report card never could. Moreover, these visualizations are excellent communication tools for residents and political bodies.

An alderman can show one image in the council chamber and say *"look, this green area shows that 80% of our children can safely bike to school, but see that yellow part on the map - there's a gap in the connection"*. That makes the urgency of a particular project very tangible.



Scenario Analysis for Future Developments

One of the developments in Argaleo's 3D dashboard technology even allows the impact of scenarios to be made visible. Policymakers can virtually turn the knobs: *What happens to accessibility if we add a new residential area here? What if we realize that cycling route?* Such an instrument is enormously valuable in the current time of major spatial challenges. For example: the Netherlands is facing a substantial *housing construction challenge*, but there is a risk that new homes will be built in locations where everyone will subsequently need a car. With the available tools, this can be prevented: planners can pre-test whether a location will be structurally sustainably accessible by public transport and bicycle. If not, timely adjustments can be made (for example, by planning a station in the vicinity, or by building additional bike paths). This link between mobility data and spatial planning is precisely what the NOVI advocates - integrated area development in which housing, work, green spaces and mobility are considered together.

Plan Housing Locations

Identify potential locations for new homes

Analyze Accessibility

Calculate the accessibility of facilities by bike and public transport

Adapt Infrastructure

Add new bike connections where needed

Ensure Sustainable Mobility

Ensure that new residents do not become dependent on cars

From data to action: targeted policies for sustainable accessibility

The insights from the above analyses are not just an academic exercise; they are already being actively used by governments to shape policies and inform decisions. For example, the Province of South Holland wants to position itself as the "best accessible cycling province" in the Netherlands. In collaboration with Argaleo, SmartwayZ.NL, and Breda University, South Holland has developed a digital twin dashboard to support its cycling policy. This dashboard shows the cycling accessibility of business parks, public transportation stops, and schools in the province, and identifies missing links in the cycling network. With this data, the province and municipalities can plan very targeted measures. *"This information helps us to weigh alternative routes and choose the most effective improvements"*, says Ron van Noortwijk, cycling policy advisor at the province. Specifically, if the dashboard shows that route A involves a lot of detours and delays for cyclists heading to a particular employer, while route B can be faster with a small intervention, the province will focus its resources on route B. This makes decision-making on cycling infrastructure much more precise and better informed.

Provincial Cycling Networks and MIRT Consultation

A similar story can be seen in the Province of North Brabant, where data analysis has led to new insights for the cycling network. Rogier Heijltjes, Cycling Program Manager at the province, states: *"With a data-driven approach, we have gained better insight in recent years into the opportunities for improvement and expansion of a high-quality cycling network"*.

This has resulted in an implementation program in which clear priority is given to certain through-cycling or fast cycling routes and missing connections between villages and cities. By quantifying how many cyclists would use a new route (and how many motorists might thereby be persuaded to get out of their cars), Brabant was able to strongly advocate for co-financing in the MIRT consultation with the national government. After all, what is good for accessibility, sustainability and health scores high on broad prosperity - and that is precisely the direction in which the Multi-Year Program for Infrastructure, Spatial Planning and Transport (*MIRT*) is moving. Increasingly, projects are not only assessed on travel time savings for cars, but on their broader societal benefits.

Broad prosperity is gradually becoming embedded in the language of policymakers. Terms such as *equal opportunities*, *livability* and *sustainable mobility* are appearing in mobility visions at all levels. The recent *cycling ambition* of the national government (2022-2025) explicitly focuses on increasing the cycling modal share with a view to climate and inclusion.

Data Analysis

Insight into cycling flows and potential

Realization

Construction of high-quality cycling infrastructure

Implementation Program

Prioritization of routes and connections

MIRT Consultation

Advocating for co-financing

Regional Cooperation and Area-Specific Approach

At the annual Administrative Consultations (BO) MIRT between the national government and the regions, the bicycle has now become a fixed agenda item, resulting in additional funds for regional bicycle routes. Municipalities work together on an area-specific basis in transport regions to address bottlenecks with the support of data. A good example of such an area-specific approach can be seen in the digital twin: an analysis for the city of Breda turned out to be relatively easy to expand to the whole of Brabant, thanks to the scalability of the system. This means that what is learned in one municipality can be quickly scaled up regionally - exactly the "learning community" concept advocated by Argaleo and DCI.

It is important that these data analyses do not remain on the shelf, but actually lead to action. Fortunately, we see that governments are taking this up: multiple municipalities have already drawn up policy plans that explicitly refer to the outcomes of accessibility scans. In various workshops, municipalities have thought together with Breda University of Applied Sciences about the Bicycle Oriented Development (BOD) concept. This way, a municipality can demonstrate: *"Our North neighborhood scores below average in terms of the number of facilities within a 1 km walking distance; we are going to invest in a neighborhood supermarket or better public transport for that neighborhood."* Or: *"The data shows that the east of the city does not have a secondary school within 20 minutes of cycling, we are investigating the addition of a new school or a fast cycling route there."* This type of decision directly affects equal opportunities - the data helps to see which groups or areas are disadvantaged in terms of accessibility and thus in broad prosperity. By making this transparent, policymakers can intervene in a targeted manner.

Another aspect is monitoring progress. Because the digital twins can refresh data in real-time (or very frequently), governments can see whether their measures are having an effect. Is the accessibility score of that neighborhood indeed better after the opening of the new bicycle bridge? Are bicycle flows increasing as planned? After all, broad prosperity is also a long-term vision: continuous monitoring helps to make adjustments and celebrate successes. The visualizations serve as a means of communication here, both internally and towards citizens, to show: *look, we have made this investment and now 20% more people can reach a health center within a quarter of an hour - broad prosperity in action!*

Bicycle and pedestrian infrastructure as an investment in broad prosperity

The above shows that good bicycle and pedestrian infrastructure is not a luxury, but a prerequisite for broad prosperity. The social benefits are diverse: healthier residents, less inequality between those who have a car and those who don't, more attractive public spaces, and contributions to climate goals. Yet in the past, investments were not always viewed in this way. For a long time, the focus was one-sidedly on traditional accessibility (car and public transport travel times). Fortunately, the concept of broad prosperity is gaining more ground in the mobility domain, including in the area of bicycle policy.

Research commissioned by the CROW knowledge platform shows that bicycle investments demonstrably contribute positively to broad prosperity, but their effects are often underexposed in decision-making. As a result, bicycle measures are sometimes undervalued in cost-benefit analyses, and it can happen that priority is given to a new highway over a bicycle path, even though the broad prosperity gain of that bicycle path would actually be greater. To break through this, a *methodology* has been developed that helps to make more explicit how a bicycle intervention (e.g. a new fast bicycle route or bicycle parking facility) contributes to goals such as health, social participation and the environment. Such tools and knowledge exchange (via Tour de Force, CROW Fietsberaad, etc.) fit seamlessly with the data-driven approach: striving to capture the story of the bicycle in figures and maps, so that it gets a full place at the policy table.

It is therefore encouraging that broad prosperity is being mentioned more and more explicitly in mobility policy documents. In the Amsterdam region, for example, a *Broad Prosperity & Mobility* benchmark has been set up to see how municipalities score and learn from each other. It has also been agreed in the *Urbanization Policy* (NOVI areas) that the effects on broad prosperity must be a benchmark in the planning process - and that new neighborhoods must be well accessible by bicycle, on foot and by public transport to be future-proof. Cycling and walking are thus no longer seen as incidental, but as an integral part of the solution.

Health benefits

Regular exercise through active mobility reduces the risk of affluence-related diseases

Social inclusion

Accessible mobility for all ages and income groups

Environmental benefits

Less emissions and noise pollution due to reduced car use

Economic benefits

Lower healthcare costs, less congestion costs and higher labor productivity

Conclusion: From Vision to Implementation

The relationship between broad prosperity and walkability, cycling, and e-bike accessibility is evident and strong. Now it's time to move from vision to implementation.

Broad Prosperity through Active Mobility

While automobile mobility brought us prosperity in the past in the form of economic growth, walking and cycling bring us the broad prosperity of the 21st century: healthier people, happier communities, more equal opportunities, and greener cities.

Data-Driven Decision Making

Data-driven analyses like those developed from the Dutch Cycling Intelligence concept prove their value by translating abstract concepts into concrete information. They show *where* we need to intervene for maximum impact.

The 15-Minute City, Dutch Style

This aligns with the principle of the 15-minute city, but in a Dutch way: village, city, and countryside broadly prosperous through smart, sustainable accessibility. The recent expansion to a 30-minute city underscores the importance of regional accessibility by bike and e-bike.

From Vision to Implementation

By investing in good pedestrian and cycling infrastructure, supported by data-driven insights and attractive visualizations, we can make choices that make our society not only more efficient, but above all healthier, fairer, and happier.

While broad prosperity may be a broad concept - the path to it surprisingly begins with something very basic: the sidewalk and the bike path.

Sources

The insights and quotes used are from public sources and collaborations, including Argaleo, Dutch Cycling Intelligence, Breda University of Applied Sciences, dashboards and articles, policy publications (CROW, PBL, CBS) and practical examples from the provinces of South Holland and North Brabant, to substantiate the link between data, mobility and broad prosperity. This integrated approach shows how the Netherlands is on its way to an even more prosperous and sustainable future with steps and stairs.