Mobility Design

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Mobility Design

Shaping Future Mobility

Volume 1: Practice
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Mobility Design: Shaping Future Mobility

↳ Kai Vöckler
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Mobility means the need—but also the ability—to accomplish physical movement in space.[01] To overcome space, to become mobile while at the same time determining the form mobility takes, is a fundamental need: mobility can be defined as individually achievable spatial movement. Accordingly, the term mobility refers to a qualitative experience, in contradistinction to the terms traffic/transport, which refer to a quantitative performance, to the conveying of people or goods from point A to point B (the overcoming of geographical distance). A primary focus of mobility design is the shaping of the mobility experience—how can transport infrastructure, including the means of transport, buildings, objects, and analog or virtual information, be configured in order to ensure a positive user experience? The quality of the interaction between users and the transport system is central to the acceptance of new forms of mobility. The following attempts to demonstrate the extraordinary importance of this set of design tasks in relation to climate change and the resultant need to developing an environmentally friendly mobility system.

The purpose of this introduction is first, to briefly outline the development of transport technologies up to the model of fossil-fueled individual automotive transport, still dominant worldwide today. We hope to show that this transport model results in enormous burdens on both mankind and the environment, and that climate change demands a reorientation. Decisive here, we argue, is not the means of transport itself, but rather the quality of movement. Enhanced quality becomes possible through new forms of networked, integrated, intermodal mobility. The development of an innovative, environmentally friendly, networked mobility system, however, is not solely a political, organizational, and planning task, but instead represents special challenges for the disciplines of architecture and design. This point is illustrated in this publication by more than sixty projects that are exemplary by virtue of their design qualities. There are already many groundbreaking, creative concepts and projects that illustrate how a climate-friendly mobility system can be configured. These are presented here, in the first volume of a publication series on mobility design. The focus is on design practice, on the interplay between architecture and the shaping of user-oriented spaces, processes, objects, and information.

Technologies for overcoming space In order to realize mobility, i.e., individualized movement, mankind has long sought for resources designed to improve the concrete possibilities of personal locomotion. With the domestication of riding and draft animals such as horses, donkeys, oxen, or camels, an organic symbiosis between human and animal augmented human muscle power. From the use of simple sleds for dragging loads to the invention of the wagon wheel, technical innovation led to the optimization of available options for overcoming space. Also important was the construction of rafts and boats. However, these were still dependent on muscle power and unpredictable natural forces such as water currents and wind power. Only the invention of the internal combustion engine, initially as a steam engine, facilitated greater independence from natural influences. With the development of railroads and steamships, worldwide networking was not only intensified but also synchronized using a uniform time scale.[02] It was the regularity and hence predictability of space utilization made possible by the new technologies that opened up new forms of space exploitation.[03] This access to global space via networked transport technology was portrayed vividly in Jules Verne's novel *Around the World in Eighty Days*, published in 1873, a narrative which retains its fascination even today—as numerous film versions testify. The sole reason for the journey was a bet among English gentlemen over whether a trip around the globe could be made in just eighty days. A feat that had only become conceivable through the opening of the Suez Canal, shortly before the novel appeared, and because the

01 The term mobility also encompasses intellectual and social mobility, which are, however, not addressed here.
02 Rammler 2014, pp. 19–38
03 Cf. Huber 2010

transcontinental railway in the United States had been completed. But necessary for the journey to become a reality was an indispensable tool: *Bradshaw's Continental Railway Steam Transit and General Guide*—a timetable containing all of the information necessary to travel planning, to which Phileas Fogg had recourse. Verne's novel rendered the introduction of universal time tangible (let us recall that the bet was ultimately won only because the travelers journeyed eastward, gaining an entire day crossing the international dateline). But the timetable was more than a mere auxiliary device: it was also a manifestation of the individualized spatiotemporal access to the world as a whole that had now become feasible.

Although the railway optimized the possibility of overcoming space, it nonetheless remained a means of mass transit. The loss of individual locomotion, formerly associated with the horse and carriage, was immediately decried. Drawbacks included the need to subordinate oneself to the regimentation of the timetable and the dependency of travel routes on the railway tracks, but also the distasteful experience of transportation as part of a larger mass. Better-off passengers deplored the minimal distinction gained through »first-class« status.[04] Only the invention of the internal combustion engine as Otto and diesel engines succeeded in linking the advantages of the horse-drawn carriage with the new railway, first through a motor that was independent of the muscle power of the horse, and moreover far more efficient, and secondly through the flexible usability of the new vehicle, as with a carriage. At first, it remained an open question which propulsion technology would prevail in individual vehicles, whether steam, electricity, or oil. Often omitted from the success story of the automobile is the fact that with the electric motor, a drive technology was available at the end of the 19th century that had already been used successfully in high-speed trains and streetcars and was technically far simpler. As early as 1899, Belgian racing car driver and engineer Camille Jenatzy drove a self-constructed electric automobile, *La Jamais Contente* (Eng.: The Never-contented), establishing a record of more than 105 kilometers per hour. It would take the automobile industry more than a century to rediscover this technology.[05] The storage battery and correspondingly limited range emerged as downsides to the electric engine—but even more so the price: in 1914, the »Detroit Electric« cost nearly ten times the price of a »Model-T Ford« with its combustion engine. In the United States, the leading nation in the mass fabrication of affordable autos in the early-twentieth century, meanwhile, focused lobbying by the oil industry in collaboration with manufacturers of automobiles (which used combustion engines) worked to establish motorized, oil-based transport. Between 1927 and 1955, in altogether forty-five US-American major cities, front companies purchased electrified streetcar companies and shut them down. Residents had no alternative but to purchase oil-based private automobiles.[06]

In architecture and urban planning as well, Modernism perceived individual auto mobility as progress and developed corresponding urban models in which automobile traffic could develop unhindered—despite the fact that in most countries in the nineteen-twenties, only a fraction of the population had access to this mode of transport. In his texts *Urbanisme*, architect Le Corbusier proclaimed an urban planning model that strictly segregated the functions of dwelling, industry, commercial activity, and recreational spaces from one another, as well as from transport systems.[07] He illustrated his concept in urban visions, among them the »Plan Voisin« of 1925 (named, characteristically, after a manufacturer of automobiles and aircraft): the old city center of Paris would be demolished and replaced by six-story, loosely positioned towers, around which individual transport could flow unhindered on broad boulevards. In 1932, at the 4th Congress of CIAM, the International Congress of Modern Architecture, an association of architects who regarded themselves as the avant-garde of a new, progressive urban development (at that time an exclusively male group), adopted the »Athens Charter,« which prescribed the segregation of functions and the dominance of mass motorized individual transport—with far-reaching consequences for urban planning during the postwar era, when their vision became a reality: now, cities became »car-friendly,« meaning: built around the automobile.[08] But this also required the necessary infrastructure: the automobile is inseparable from the street. Before the desired individual mass mobility could be achieved, the preconditions for it had to be created. That the putative individual freedom of movement was at the same time designed as mass mobilization was a conceptual contradiction that remained unnoticed at the time—only with increasing traffic density through the ongoing automobilization of the population after World War II and the size and prolongation of traffic congestion did this paradox become apparent. Symptomatically, road construction was pushed aggressively at a time when car owners were in the minority, and no one could possibly speak of necessity. Governments assumed key roles here.

This becomes especially clear with reference to Germany, one of the industrialized nations that remained somewhat backward after World War I when it came to automotive development: during the nineteen-twenties, Opel had just succeeded in bringing a plagiarized version of the French »Citroën 5 HP,« the so-called »Laubfrosch« (tree frog), onto the market as a »car for everyone.« The other small German autos, such as the der »Hanomag 2/10PS« (the »Army Bread«) or the »BMW Dixi« were objects of ridicule.[09] It is well-known that Adolf Hitler provided the decisive impetus for the development of a small, affordable car. In 1938, the town of Wolfsburg was established as the headquarters of VW, and the development of an inexpensive »Volkswagen« (Peoples' Car) was propagandized—as we know, it was only after the collapse of the Nazi regime that the car became available in significant numbers. The key investment of the National Socialist state was actually the construction of the Autobahn system, which was designed to stimulate the economy in conjunction with the promotion of automobile sales. The development of the German highway network was regarded as an undertaking that would weld together the »national community« into a unity—a myth that is still effective today, and one with great potential for simulating a sense of identity. It also compensated for feelings of inferiority in relation to the US, with its flood of automobiles (during the nineteen-thirties, more than 20% of the American population already owned cars), while it was deliberately overlooked that other European countries such as Italy had already constructed a highway network. But the German Autobahns did not remain empty solely due to wartime conditions: the proportion of automobile owners in the population as a whole was simply too small, even less than 1%. The significance of the highway system for military logistics became clear only in the course of the war. The example of Germany shows how state-directed infrastructural measures and the accompanying governmental systems of order and regulation gave rise to a developmental logic that facilitated the expansion and implementation of specific forms of mobility. During the nineteen-thirties, Germany had an excellent, well-developed rail network, which has, however, dwindled meanwhile to half its former size—also a consequence of transport policies oriented toward individual mass mobilization that were perpetuated without interruption after the end of World War II.[10]

04 Sachs 1990, pp. 110–116
05 In 1874, Jules Verne predicted the inception of hydrogen propulsion (using a fuel cell that obtained electrical current from hydrogen): »I believe that water […] decomposed […] by electricity […] will one day be employed as fuel, that hydrogen and oxygen which constitute it, used singly or together, will furnish an inexhaustible source of heat and light, of an intensity of which coal is not capable. […] Water will be the coal of the future.« Verne 2019, p. 288
06 Urry 2013, pp. 77–78
07 Cf. Le Corbusier 2015
08 Cf. Reichow 1959
09 Sachs 1990, pp. 57–58
10 Cf. Hruza 2020

Automobility: dreamlike velocity—slow-moving traffic But all of this alone fails to explain the success of automobilization. Alongside governmental measures in the area of traffic infrastructure and their accompanying financial, legal, and institutional safeguarding (coinciding with the disadvantaging or even repression of the competition, i.e. rail and streetcar travel), it also requires a subjective anchoring, an identification with the »mobility machines«—representative among them, of course, the automobile. The network consisting of supporting infrastructure, automotive transport, and regulative regional planning produces a subject-defining affectivity, an emotionally grounded self-affirmation that is based on the experience of overcoming space and is transferred to the auto as an object. It is the sensation of the self-determined and unrestricted overcoming of space, of allowing time to evaporate: the desire for velocity. Staged on the street, and through the automobile, is the utopia of an unlimited overcoming of space, through which the space-time relationship is accelerated—in a symbiosis of human and machine that endows the individual's powers with the necessary impetus.[11] There is no goal, just pure delight in speed for itself, in the negation of distances and divisions—a peculiar kind of spatial experience.[12] In his novel *On the Road*, written in 1955, Jack Kerouac captures this boundless energy: the trip from New York to California, and, after a Coca Cola, back again, across thousands of kilometers: »In no time at all we were back on the main highway and that night I saw the entire state of Nebraska unroll before my eyes. A hundred and ten miles an hour straight through, an arrow road, sleeping towns, no traffic, and the Union Pacific streamliner falling behind us in the moonlight. I wasn't frightened at all that night; it was perfectly legitimate to go 110 and talk and have all the Nebraska towns—Ogallala, Gothenburg, Kearney, Grand Island, Columbus—unreel with dreamlike rapidity as we roared ahead and talked (…).«[13] A drive that was as meaningless as crossing the street. A drive to nowhere: driving itself is the goal—the annihilation, the disappearance of space which, however, does not stand in contrast to the dimension of its emergence. When driving, space is generated continuously, and its passing by becomes a source of pleasure: the real space is transcended in an ecstatic spatial experience. The automotive conditions of velocity and movement have generated a space that negates the physical resistance of geographical space and seems to be without ground contact. This was immediately understood in the arts, as seen in the emergence of independent genres such as the »road novel« in literature and the »road movie« in film, which sublimate this experience artistically (it was, after all, a mobility experience that is rarely encountered in daily life). Popular films testify to this: in Monte Hellman's *Two-Lane Blacktop* of 1971, where a souped-up 1955 Chevrolet races across the US with a Pontiac GTO (whose driver is referred to in the film tellingly only as »GTO«).[14] It was followed in 1974 by *Gone in 60 Seconds*, whose star is a yellow 1973 Ford Mustang Mach 1. A film that has become imprinted in collective memory for its 40-minute car chase, in whose course more than one hundred autos are destroyed—on the canvas, it became possible to live out automobile-dependent masculine fantasies of omnipotence without inhibition.[15] In 1975, more sensitive souls preferred taking a drive with Rüdiger Vogler and Hanns Zischler in Wim Wenders' *Im Lauf der Zeit* (Kings of the Road) in a converted moving van in the »Zonenrandgebiete« (German-German border region) along the German-German boundary line. A road movie that rather illustrates the shaken character of German inwardness: at the start of the film, emblematically, Hanns Zischler attempts to commit suicide by plunging his VW Beetle into the Elbe.[16] People with a simpler mind preferred action comedies like *The Cannonball Run* with the unforgettable Burt Reynolds indulging in dubious stunts and crashes (one of which ends in a swimming pool).[17] This list of »car flicks« could be prolonged endlessly, and there is no end in sight. Then there are computer games such as »GTA—Grand Theft Auto,« whose sale of 300 million copies testifies to the undiminished delight in car chases. All of them make one thing quite clear: the question of how we move and with which vehicle is hardly incidental, instead it is part of practices of subjectification that are attached to emotionally-charged objects such as the automobile.

These are deeply embedded in everyday culture; combined here are lifestyles, consumer preferences, and modes of behavior that make possible individual self-experience and self-affirmation via the automobile. In the selected films, they are artistically exaggerated and coded in pop culture: as the automotive promise of unrestricted freedom of movement.

The automobile stands for the promise of individual autonomy, for the freedom of motorized travel—which however dissolves in the everyday reality of the anonymous mass of slow-moving traffic. The more people partake in individual automobility, the less they are able to live out this imagined freedom of movement—the mobility paradox. In large German cities, the average travel speed of a passenger car is reduced year by year, and on main roads, it is meanwhile lower than 20 kilometers per hour; it is now overtaken by bicyclists who swerve past, ostentatiously displaying their superior maneuverability.[18] This proves that the passenger car is not the only mode of transport that allows us to live out the sensation of freedom. What is, however, completely ignored is the fact that the putative freedom of individual automobility is dependent on a network of streets and parking spaces, fuel depots and service stations, traffic lights and lighting systems, on a complex supply network, without which automotive mobility would be virtually inconceivable (shame to him who thinks of *Mad Max*).[19] This putative autonomy is dependent upon an overarching infrastructure whose allocation and organization is part of public governmental service provision. Infrastructurally and institutionally, individual automobility is embedded in space, and it is here that the conversion of the all-dominant traffic model based on individual motorization must begin. Why is this necessary? Because of the climate crisis and resource shortages, but also because the substantial negative burdens on humans and the environment imposed by continuously increasing traffic heightens the urgency of arriving at fresh solutions for a sustainable mobility that respects both mankind and the environment.

The challenge of climate change—traffic/transport as the problem child Why take action on climate? Outlined once again in brief: the Earth is protected by a gaseous envelope, the atmosphere, which prevents heat from escaping into outer space. An important component of this atmosphere is formed by the greenhouse gases, which absorb heat energy. The proportion of greenhouse gases, in particular carbon dioxide (CO_2) is increasing continuously through the escalating use of fossil-based energy sources in industry, transport, and in households, as well as by environmentally harmful land-use and agriculture. The consequence is steadily increasing temperatures, with predictably catastrophic outcomes: rising sea levels, increasing droughts and spreading deserts, flooding, extreme weather events.[20] From a scientific perspective, there is no doubt about this development, nor is it attributable to natural climate fluctuations. Instead, it is well-documented that over the past two hundred years, and beginning with industrialization in the late-eighteenth century, the concentration of greenhouse gases in the atmosphere has increased, dramatically intensifying the greenhouse effect—with impacts that are tangible already today.[21] Which is why in 2015, through the Paris Climate Accord, 196 countries committed themselves to defining and implementing national climate protection goals

11 Cf. Dant 2004
12 Vöckler 2014, pp. 120–124
13 Kerouac 1968, p. 218
14 *Two-Lane Blacktop*, USA 1971, directed by Monte Hellman
15 *Gone in 60 Seconds*, USA 1974, directed by H. B. Halicki
16 *Kings of the Road*, BRD 1975, directed by Wim Wenders
17 *The Cannonball Run*, USA 1981, directed by Hal Needham
18 BVL.digital and HERE Technologies 2019
19 *Mad Max*, AUS 1979, directed by George Miller
20 BMU 2014
21 Deutsches Klima-Konsortium et al. 2020

designed to limit the warming of the Earth to less than two degrees centigrade, thereby at least mitigating this disastrous development. Among them was the Federal Republic of Germany, which set the goal of reducing national greenhouse gas emissions by 40% by 2020, and by 55% by 2030 in relation to 1990. Germany has met its climate protection target for 2020—but only as a result of the Covid-19 pandemic. If we take a closer look at the numbers, it becomes clear that Germany has a problem child: the transport sector. Over the past twenty years, this sector has contributed virtually nothing to reducing greenhouse gases—unlike every other sector.[22] But globally, too, the climate goal of keeping global warming below two degrees centigrade has been thwarted by traffic/transport. Even in an optimistic scenario, the strongly growing requirement for mobility, and the CO_2 emissions associated with it, in particular road and air traffic, means that the sector will make no significant reduction to CO_2 emissions as compared with current levels. Currently, the contribution of transport/traffic to global greenhouse gases is 14% and is expected to rise; here in particular, effective measures are therefore indispensable.[23] An index of the urgency of rethinking mobility is the number of private automobiles, which continues to rise worldwide: in 2015, this figure already amounted to around 947 million.[24]

Germany—car country Considering Germany, it immediately becomes clear that allegedly self-determined mobility via the private automobile is the main cause of the problem. Traffic volume in passenger traffic (the distance traveled multiplied by the number of people transported, calculated as passenger kilometers) increased between 1991 and 2019 by nearly 34%. Individual motorized transport occupied the dominant position. Its share of total passenger movement was approximately 75%.[25] One fifth of the total CO_2 emissions are attributable to traffic/transport. Fully 90% of that amount is associated with road traffic (cars and trucks). Unlike other sectors, CO_2 emissions caused by traffic/transport have seen virtually no decrease since 1990. Although innovations in propulsion and exhaust technology have been able to significantly reduce emissions, the relief has been neutralized by increased traffic intensity.[26] Exacerbating the situation are substantial increases in engine performance and vehicle weight, accompanied by a corresponding increase in fuel consumption. In short: traffic flows are increasing, as is the stress on people and the environment. Millions of people are on the road every day, many of them alone in private autos. This practice is associated with substantial psychological and physical strains on humans and the environment (stress, air pollution, noise, land consumption, contamination). Urban centers in particular are heavily burdened by the traffic volume: atmospheric and noise pollution are damaging to human health. Moreover, the climate crisis demands a fundamental reconceptualization of mobility behavior: as the case of Germany demonstrates, technical improvements alone are incapable of alleviating stresses on the environment and climate.

This applies to e-mobility as well. As long as electric autos are fueled with power from fossil energy, the switch to a different drive technology is irrelevant—only when the power is derived from renewable energy does the electric auto become environmentally friendly. Cautious optimism is warranted: the share of renewable energy in Germany's power mix is rising, and hence the climate footprint of the electric car is improving. But if we take into account production and disposal, service life and road performance, do electric autos really offer ecological advantages in comparison with vehicles using internal combustion engines? While the question is unresolved, it does appear that a switch to e-mobility is worthwhile in the long term. It is often forgotten that not just CO_2 emissions burden the environment, but particulate matter as well, a major source of which is road traffic. Particulate matter enters the atmosphere, not just through engines, but to a large extent through tire abrasion and braking—and this is the case with all vehicles types, including electric ones. With regard to noise pollution as well, electric vehicles offer little relief: for a vehicle with an internal combustion engine, the engine noise is dominant up to circa 25 kilometers per hour. At higher speeds, however, tire-roadway noise becomes predominate. Although electric cars are significantly quieter at very low speeds, they are as loud as conventional cars at high speeds.[27] However, the real problem lies elsewhere: it is the sheer mass of private vehicles, most transporting single passengers: German households own 43 million cars, and the number rises annually.[28] Whether they run on non-fossil or fossil energy, the result is virtually the same when we consider the gigantic utilization of land involved—land consumption through street traffic increases ceaselessly by a daily average of 17 hectares.[29] It is estimated that circa 50% of this is surfaced. And the greater part of this advancing environmental destruction caused by the need to provide infrastructure for continuously growing traffic streams is street traffic, which is dominated by individual automobility.

There are more and more autos—which are barely used and take up too much space A comprehensive study on mobility in Germany presented in 2017 highlighted the dominance of motorized individual transport, anchored in the privately owned automobile: in Germany, there are 527 automobiles owned by private households per thousand residents. And the number is growing: over the past two decades, the number of privately owned cars in Germany has risen continuously by circa 500,000 annually, and is for the most part attributable to the growing number of second and third cars in households. Nor is there any indication that the trend is weakening.[30] On an average day, a good 40% of private cars remain unused. The average operating time per vehicle per day is only 46 minutes, only 3% of the total duration of a day. Put differently: the private auto is more a stationary object than a moving vehicle: it remains parked for an average of 23 hours and 14 minutes daily—with over 20 of those hours outside the owner's front door.[31] Of the 30 kilometers covered on an average day, there is rarely more than a single passenger in the car (the average is 1.46 per vehicle).[32] Troubling here is not simply the astonishing inefficiency of this means of transport from a macrosocial perspective, but also the negative consequences of a form of mobility that is bound to the private automobile—we can hardly speak of an equality of the various means of transport. As a matter of course, the automobile is still accorded first priority when it comes to space and passage.

The inequitable utilization of (mostly public) land by the private auto in comparison to other means of transport is particularly flagrant in metropolises. An evaluation of stationary traffic in the Austrian city of Graz showed that bicycle parking spaces require 2%, public transport vehicles 3%, and stationary pedestrian traffic (street cafés, park benches, etc.) a similar 3%, while 92% of parking areas in public space were used by private autos. On average, each private auto requires 12 square meters of surface area. Moreover, as mobility researcher Stephan Rammler remarks so trenchantly, »Grass no longer grows there.«[33] Cities are well-acquainted with the consequences: sidewalks blocked by parked cars, circling automobiles searching endlessly for parking spaces. And these numbers are only the statistics for stationary traffic—the demands on space in city centers by individual transport modes is even more unequal when the street space required for moving traffic is taken into account. By a wide margin, private auto traffic uses the largest amount of surface area, pedestrian and cycle traffic the least. A private auto occupied by 1.4 people (on average) and traveling at 30 kilometers per hour requires 65.5 square meters, and at 50 kilometers per hour, a full 140 square meters—a streetcar with a utilization rate of

22 UBA 2020a
23 ITF 2017
24 Statista 2021
25 UBA 2021
26 UBA 2020a
27 UBA 2013
28 MiD 2017; Kuhnimhof and Liedtke 2019
29 UBA 2017
30 Kuhnimhof and Liedtke 2019
31 MiD 2017
32 Deutscher Bundestag, *Parlamentsnachrichten* 2018
33 Rammler 2017, p. 60

20% and traveling 30 kilometers per hour, in contrast, requires only 5.5 square meters, and traveling at 50 kilometers per hour, just 9 square meters.[34] Particularly noteworthy in this context is the fact that in German metropolises, the proportion of car-free households is 42%.[35] Put differently: with their cars, the other 58% of metropolitan households block off scarce public space for their neighbors (NB: we are talking about a method of transport that remains unused 97% of the time). A disproportionate demand on public space, which is moreover still virtually cost-free, or, more precisely: is used at the expense of car-free households, and diminishes the quality of life in cities to a considerable extent: it is completely taken for granted that children can no longer play on streets and must instead be restricted to security enclosures such as fenced playgrounds; sidewalks are blocked; cyclists can count themselves lucky if a minimum strip is designated as a cycle route, and they need not fight for their right to use the street; and everyone uncomplainingly endures noise and automobile emissions. Things cannot possibly continue like this. A central question is: how can we reduce traffic burdens without restricting mobility? How can we reclaim public, shared space in the process? How is quality of life to be restored?

Designing a new, environmentally friendly, networked mobility The restoration of quality of life, along with the reduction of environmental burdens, requires the reorganization of the now dominant automobile-based model of traffic/transport. Automobile-centered mobility is not a quasi-natural given and can be designed both politically and socially. But what is the alternative?[36] The continuing development of digital information systems has made innovative, smart, sustainable forms of mobility feasible. In the future, we will be able without difficulty to configure and use various modes of transport depending on our individual needs (networked, multimodal mobility), and without reliance on a private automobile. The technical preconditions already exist: mobile Internet via smart phones and tablets, which will be expanded in the future through additional forms of digitalized communication (keywords: smart devices / augmented reality). In the future, a flowing and reliable transition from one form of mobility to another, the use of diverse modes of transport on a single route, will be done intuitively and flexibly depending on individual requirements (intermodal mobility). This will simplify the use of both public and shared modes of transport (sharing offerings).

The new mobility is a powerful promise; required in order to redeem it, however, is the continuing expansion of both digital and traffic/transport infrastructures and the digital bundling of all mobility options in order to facilitate an unrestricted »flow« through the mobility system. Climate-friendly mobility does not mean traveling less, but in different and more intelligent ways.[37] Required here are not so much flying taxis and fully autonomous cars, but instead a functioning market, regulated by the public authorities, whose backbone—alongside rail-based long-distance, regional, and local transport—is the public local transport system, supplemented by on-demand services using autonomous/partially autonomous vehicles (small buses) and sharing options, operated with non-fossil energy.[38] A system that, in particular, encourages foot and bicycle traffic for local mobility. Taken together, all of this means a mobility system which can be used intermodally, and which is characterized by flexibility and adaptability to user requirements—even the absence of a private auto.

But changes of individual behavior alone are insufficient: the dominant automobile is supported by physical-material infrastructural elements, and in its socio-spatial organization by regulative and instrumental framework conditions that have interfered to date with the fundamental transformation of the auto-centered mobility system.[39] This means that the transition to an environmentally friendly mobility system is a macrosocial challenge that must be addressed politically. This also requires a social consensus that regards these measures as reasonable, but also as »functional« in relation to the everyday reality of the individual: they must be not just feasible, but must also correspond to the needs and desires of real people. This is where mobility design comes into play: it must mediate between the (environmentally friendly, multimodal) mobility system and the user. It must optimize access, influence experience positively, and facilitate identification. Individual adoption and evaluation are decisive factors for acceptance, which must be conceptualized as a specific function in relation to the reorganization of the mobility system. Moreover, acceptance is not achievable solely via communication about a new form of mobility, but primarily through the design of the physically experienced mobility system (together with its digital extensions) that is geared to human needs—a positive experience of mobility must emerge through actual use. This is not simply »nice to have,« but is instead a basic precondition for success.

From a macrosocial perspective, it is also evident that the CO_2 footprint—the environmental burden that results from individual behavior—is a question of milieu: the higher the household income, the greater the environmental contamination.[40] And for those with lower household incomes, who are largely dependent on public transport, and who may own one car but rarely two, a private automobile also ensures social participation—given the current condition of Germany's public transport, organizing the daily routine without a private automobile—including shift work, childcare arrangements, and daily errands—is a genuine challenge. Given its flexibility, moreover, a private auto allows owners a dwindling remnant of autonomy and serves as an emblem of one's ability to »keep up.« Beyond a straightforward means of transport, a tool for getting from A to B, an automobile represents the promise of self-determination and freedom, and it demonstrates social status. Moreover, automobile design conveys symbolic meanings that are associated by owners with specific values and desires that transcend the vehicle's practical purpose (transport and overcoming of distance).[41] In purchasing decisions, the required engine performance, fuel consumption, and other technical factors play a secondary role—a car must satisfy the demands of everyday life and run smoothly. However, functional aspects alone hardly account for the allure of the automobile (which takes nothing away from the engineering achievements involved). The automobile is more than that: an owner identifies with it and uses it to convey self-image. This leads to purchase prices that most car owners can only afford by taking out a loan. Automobile design and marketing provide purchasing incentives and stimulate a desire for ownership. From the earliest days of automobile production, well-known designers (virtually all of them men) endowed the symbolic and emotional needs of their (mostly male) customers with concrete form. In the US, for example, Raymond Loewy (»ugliness does not sell«) developed streamlined design, thereby giving the desire for speed a creative expression.[42] Or European designers of the postwar era, for example Ferdinand Alexander Porsche, who in the 1960s developed the Porsche design that has been continued to this day (and designed the legendary »Nine Eleven,« the Porsche 911, in 1963). Then there is Giorgio Giugiaro, author of the distinctive designs of the first VW Golf (1974) and the Fiat Panda (1980), or the Italian design studio Pininfarina, which shaped the designs of numerous vehicles for firms such as Alfa Romeo, Ferrari, Jaguar, Lancia, and Maserati. They made dreams come true, and the desire for self-realization or self-affirmation was cast into material form. The symbolic exaltation brought about by the design cannot be valued highly enough: in 1955, when the »Citroën DS« with its extraordinary design (along with its technical innovations, such as the hydropneumatic suspension, which seemingly made it

34 Randelhoff 2014
35 MiD 2017
36 Explored in detail in Eckart and Vöckler 2018, pp. 158–167
37 Cf. Canzler and Knie 2016
38 Cf. Mager 2017
39 Cf. Urry 2007
40 UBA 2020b
41 Cf. Geuenich 2020
42 Raymond Loewy, *Never Leave Well Enough Alone*, Baltimore 2002

float) was presented at the Paris Auto Salon, it provoked a surge of enthusiasm. In 1957, the French philosopher and author Roland Barthes wrote a famous essay that equates the »DS« (pronounced like the French word »Déesse,« Goddess) with the Gothic cathedrals—the latter a material expression of the love of God; the »DS« an expression of the love of velocity.[43] The automobile industry was aware of the impact of design and built up large internal design departments with support from psychologists, sociologists, as well as trend and market research firms. The design strategies of international automobile concerns tailored their models precisely to the desires and needs of customers: symbolic and emotional factors are decisive for purchasing decisions.

What is true for the automobile is true for all of the objects of utility that surround us: through them, we not only gain access to our world in practical terms, but aesthetically as well, all of it influenced and structured by design.[44] With and through them, we communicate with one another (and with ourselves as a society). And the impacts and significance of this communication—which takes place with and through the things we use and experience in everyday life, whether buildings, modes of transport, or utilitarian objects—are shaped by architecture and design.[45] These are the things that are familiar, taken for granted, everyday culture. All the more reason that an alternative, environmentally friendly, networked mobility system must not simply function smoothly (which also presupposes good planning and organization), but must also provide a positive mobility experience, and above all »speak« to people as a product, must express regard for them (in its design, its functioning, its »feel«), and moreover must emphasize outwardly that we are taking part in a progressive, appealing form of mobility.[46] It is the design that communicates values and conveys the meaning of the mobility system.[47] As explained above, mobility systems exist as material infrastructures and modes of transport, cultural notions and symbolic languages, social practices and the forms of subjectification associated with them.[48] In this framework, design makes understanding possible, conveys meaning, and generates identity (the »Offenbach model«).[49] Acceptance of and identification with a new, environmentally friendly, networked mobility system is inconceivable in the absence of high-quality design. If the new mobility is to become established, design plays an essential role, along the digital interface with the virtual information and communication space that accompanies us, but above all during the entire mobility process—formulated, once again, from the perspective of the user: How do I orientate myself? Is it straightforward and comprehensible? Does it inspire confidence, is it fun, am I motivated? How does it feel to be mobile together with others? How much proximity do I want, and how much distance? How do I experience the spaces through which I move, what do they tell me—am I valued? The task, then, is to shape and organize a highly complex process.

Mobility design Mobility design is oriented not toward the individual mode of transport, but instead toward the mobility needs of users. Mobility design shapes the interactions of users with the mobility system, which are constituted by time- and space-based user processes, by the physical configuration and organization of spaces and objects, by the digital interface, by the logic of information transfer, and by the underlying technical-infrastructural systems. This presupposes that mobility design is oriented systematically, and that it requires the bundling together of diverse mobility-related forms of expertise. Mobility design must hence be seen as an interdisciplinary task.[50] Design is the integrative element: through making design decisions, it mediates between humans and the mobility system and influences user experience.

Mobility design follows the guiding principle of a mobility system that is oriented toward user needs, is socially equitable, and is environmentally friendly. It considers mobility as a whole, as manifested in the need and the capacity to move through space. As an essential component of social participation, the implementation of mobility systems must ensure accessibility for as many segments of the population as possible. It is here, at the interface between human users and the mobility system, that mobility design makes a contribution. The design of mobility systems opens up new dimensions for the sustainable shaping of processes of social transformation. The design of new, sustainable, and networked mobility can be subdivided into two separate but interrelated areas of activity:

↳ First, there is the interdisciplinary, comprehensive design of the mobility system with consideration given to its organizational-institutional logic and political framework conditions, as well as to ecological, economic, and social aspects. Coming together here are various disciplinary approaches—from political and social sciences, urban and traffic planning, all the way to engineering disciplines, who work together with the design disciplines to develop a new understanding of the shaping and organization of mobility systems.
↳ Second, the design of the interaction between user and mobility system. Central here are the specialist competencies of design and architecture, which design spaces, objects, and information in a way that provides access, improves experience, and communicates meaning and quality (and hence displays respect and recognition for the user).

We believe that high-quality design is indispensable if people are to renounce the individual use of private autos. The transferral of personal feelings of freedom, status, value, and security currently associated with an object (the automobile) onto movement (mobility) means that this new form of individual locomotion must offer an experience that is persuasive, sustainable, and perceived positive. The technical and organizational determinants of automobile locomotion are by no means fixed for all eternity; they are alterable provided their functions—the guarantee of spatial and temporal autonomy, flexibility, and privacy—are preserved.[51] In short: as long as the »flow« is preserved. The task of mobility design is precisely to make this possible: to pave the way for an ecologically sustainable and socially equitable mobility by giving shape to a climate-friendly, networked, intermodal mobility. The good news: the work has already begun. The present publication showcases more than 60 outstanding examples of the design of mobility spaces, buildings, transport systems, objects of use, and information providers which, in their entirety, convey a forward-looking picture of innovative, climate-friendly mobility while testifying to the enormous importance of high-quality design.

43 »I think that cars today are almost the exact equivalent of the great Gothic cathedrals; I mean the supreme creation of an era, conceived with passion by unknown artists, and consumed an image if not in usage by a whole population which appropriates them as a purely magical object.« Barthes 1972, p. 169.
44 Cf. Gros 1983; Feige 2018
45 For the design-theoretical substantiation of the theory of product language, developed during the 1970s at the HfG Offenbach, cf. Schwer and Völckler 2021
46 Cf. Eckart 2021
47 Cf. Völckler 2021
48 Cf. Urry 2004
49 The »Offenbach model of human-centered mobility design« will be discussed in detail by the authors of the present volume on design research *Mobility Design: Shaping Future Mobility*, vol. 2, *Research*, eds. Peter Eckart, Martin Knöll, Martin Lanzendorf, Kai Völckler).
50 This is the topic of the research cluster »Infrastructure-Design-Society« that is part of the »LandesOffensive zur Entwicklung Wissenschaftlich-ökonomischer Exzellenz« (LOEWE), supported by the German Federal State of Hessen in 2018–2021, headed by the Hochschule für Gestaltung Offenbach (design), and with the Frankfurt University of Applied Sciences (traffic planning), the Johann-Wolfgang-Goethe-Universität Frankfurt (social scientific mobility research), and the Technische Universität Darmstadt (media and communications technology | architecture) as project partners. www.project-mo.de
51 Cf. Rammler 2003

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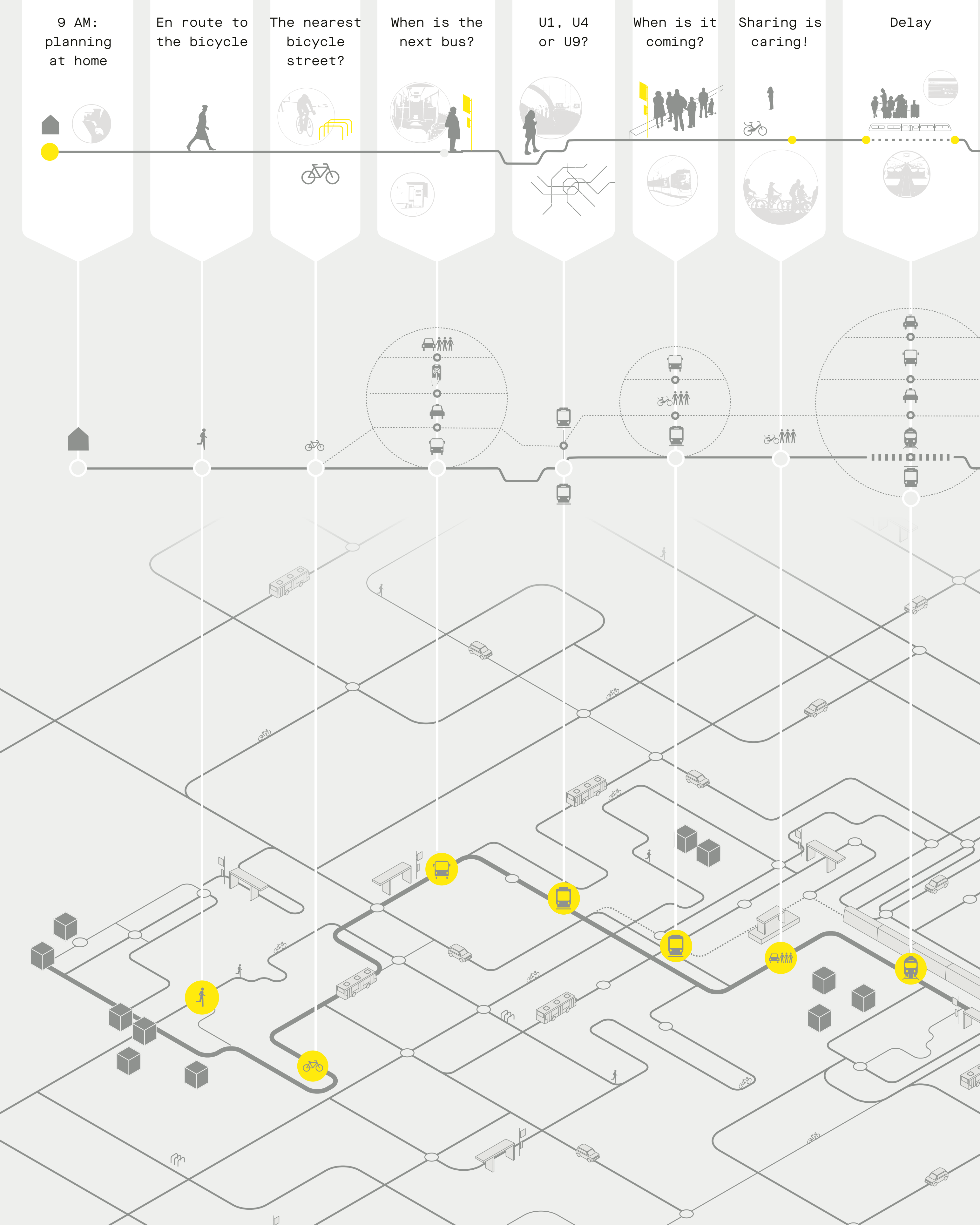
Designing Intermodal Mobility

The focus of mobility design is the space of action used by mobile users—beginning with the planning of individual mobility and extending to its practical implementation. Playing a decisive role in intermodal, environmentally friendly mobility, involving the use of a variety of mobility options along a given route—including, and not least of all, travel on foot—is *seamless mobility*. This means that from the very beginning, users need to have a clear understanding of the options offered by an intermodal mobility system: only this allows users to become properly oriented, to make good decisions, and to proceed toward their destinations with as few disturbances and complications as possible. Accessibility and the intelligibility of the mobility system are preconditions for uncomplicated mobility. But there is more: vitally important for physical movement through the mobility system are not just interfaces with digitally supported information systems, but in particular the touch points of the mobility system. This must be understood literally: among the essential prerequisites for the functioning of the system is the serviceability of objects, for example bicycle storage units, ticket vending machines, and the means of transport themselves, as well as the accessibility (absence of obstructions) of the spaces of mobility. Equally important is the experiential aspect: is the user's need for safety, privacy, and sociality adequately satisfied? Do the overall amenity and experiential qualities results in a sense of well-being? Does the mobility system, in all of its aspects, convey respect for me as a user? Do I perceive myself as participating in a shared, public mobility system that is viable for the future? The quality of user interaction with the mobility system is central to the acceptance of new forms of mobility and represents a genuine design task, for it mediates between user and system, striving to provide a positive experience via design decisions. The diagram below provides an overview of a prototypical multipart journey and exemplifies the way in which the user-oriented design of the spaces and processes, of objects and information, ensures the serviceability of the interfaces and touch points of the mobility system.


9 AM: planning at home
En route to the bicycle
The nearest bicycle street?
When is the next bus?
U1, U4 or U9?
When is it coming?
Sharing is caring!
Delay

Tuk-tuk
At work
Is there a shuttle service nearby?
Car sharing
Taxi
City train
Autonomous driving
6 PM: back home

Connective Mobility

Peter Eckart &
Kai Vöckler

Connective mobility refers to the interconnection of different transport systems through moving individuals. The connectivity of the system only comes about through mobile use: that is, intermodal mobility. It is crucial to understand intermodal mobility as a dynamic process through which networking is enacted in the first place. Mobility design is concerned with the interaction of users with a mobility system. Design shapes the access to the system. It creates recognizability, enables orientation, and ensures functionality and accessibility, making the mobility system as easy to use as possible for everyone, regardless of age, capabilities, or status. And not least, the value and significance of this form of mobility is communicated through the design.

In this section of the book, the shaping of the physical aspects of intermodal mobility systems is introduced. The digital expansion of mobility systems will be discussed in more detail in the section titled »Augmented Mobility.« With mobile access to the internet via smartphones and tablets (and via other technical interfaces in future), a substantial improvement in the planning and implementation of intermodal mobility has been achieved for users. This has opened the way to a revolution in mobility technology, based on the two principles of »networking« and »sharing.« Through the connection of digitally supported communication platforms with collaboratively shared and thus more efficiently utilized transport modes, environmentally friendly and intelligent mobility will be possible. However, smartphones (and other technical information and communication tools) do not transport people. For this, a transportation infrastructure is necessary to provide for physical mobility. As already mentioned in the introduction, this transportation infrastructure consists of pedestrian and cycle paths (see section: »Active Mobility«), and of public transport (bus, train), supplemented by different sharing services, from ride-sharing to jointly used vehicles. In addition, there are semi-autonomous (and soon fully autonomous) vehicles that are utilized as public vehicles on demand and as required. Test projects for this have already begun (see section: »Visionary Mobility«). However, from the perspective of users, all of these mobility services should be understood as an interconnected system that can flexibly adapt to mobility choices. In an intermodal mobility system, users interact with a highly complex system of different services that are physically embedded in space—such as mobile transport modes, along with essential and supportive stationary spaces and objects, which provide the relevant information in analog form. Accordingly, the section titled »Connective Mobility« is also organized under the subheadings of mobility hubs, information and wayfinding systems, climate-friendly transport modes, and architectural and urban design projects that cleverly integrate environmentally friendly mobility into planning and design.

The development of a well-functioning intermodal mobility system is not only a question of a political will to shape things, or of comprehensive organization and planning. Rather (as mentioned above), it is essentially a task for mobility design. Only through the design will users be made aware of the significance and value of this new, progressive mobility—in fact immediately during usage. For this reason, its design requires a systematic approach that considers all components of the mobility system at once: from bike stands, to transport vehicles, to station halls. Each of these individual elements facilitates user access to the entire mobility system: through the essential characteristics of comprehensibility and usability, its significance, and the emotional and symbolic impact of the designed mobility spaces. This fundamental problem for future mobility design, namely, taking a systematic approach to an intermodal mobility system, will be illustrated through the selected examples included here. The choice of projects include here was not only based on outstanding design quality, but also on how functional usability, emotional impact, or symbolic meaning were conveyed through design—as will be explained in the accompanying project texts. This book does not aim to offer a comprehensive overview, nor to provide assessments. Rather, the selection was based on insight gained from systematic observation, often of a special solution or a precisely worked-out detail. Therefore, it is also the reader's job to make the overarching connections, and at the same time to see and appreciate good design quality in the individual cases.

Here are a few introductory thoughts and examples. In order to enable access for all users, a mobility system must first be designed so that it is recognizable as a cohesive whole. This is a well-known fact that it was already necessary to achieve this during the development of the public inner-city transport systems with their interlinking of buses, streetcars, express trains and subways. A decisive factor for achieving this is the information and wayfinding system that provides the necessary orientation information, while symbolically expressing the meaning of the system as one of the most important elements of everyday urban life. In this context, good design is crucial, yet as is often overlooked, it is also important to sustainability. A pertinent example: in the nineteen-thirties, the draftsman Harry Beck created a map for the London Underground network that was no longer oriented according to geographic features. Instead, his new map represented the connections between stations and lines so that users would be clearly provided with the necessary information to orient themselves within the system. That is, he reconceived the map from the user's perspective. Today, his work remains a landmark design for underground maps, which has been refined in countless variants and further developed in digitally based dynamic versions. However, architecture and design do not only support the usability of the various elements (such as maps, ticket machines, benches, transport modes, train stations); they also influence user experience by responding to their need for spatial and experiential quality. An interesting example is how the train acted as the most important element of mobility development in the nineteenth century. Train station buildings of the time were designed to reflect their new social significance. They took on great importance as the critical starting, ending, and connecting points of a journey—both symbolically, as new »city gates,« and practically as functional complexes. The main train station buildings in the big cities adapted the architectural vocabulary of medieval cathedrals, an immediately recognizable symbolism for contemporaries. This was also expressed through the spatial configuration. The impressive train station halls, with their great height and width, symbolized the meaning of this transportation structure through their powerful spatial effects. This is still perceptible today. A good example is the Zurich train station hall, which fortunately was freed of all the later provisional additions in the late nineteen-eighties, following a citizens' initiative.

History can inform the design of a new, environmentally friendly intermodal mobility system, as demonstrated by the example of Pennsylvania Station in New York City. Along with Grand Central Station Terminal, it is one of the most important train stations in the metropolis, where up to 650,000 commuters arrive and depart every day. This is also thought to have been one of the most beautiful train stations in the US (in 1934, poet Langston Hughes dedicated a moving poem to it). In 1963, it was destroyed and literally forced underground to make way for the new Madison Square Garden. Consequently, the station became the symbol for a kind of transport planning that had completely lost touch with the needs of users, who from then on literally felt »like rats in a maze.« Many proposals were made before it was finally possible to give some of the deserved meaning back to this place. An adjacent 1912 post office building of the same era by the architects McKim, Mead & White (who also designed Penn Station) was redesigned as the entry hall and dedicated in 2021. The architects in charge of the redesign, SOM (Skidmore, Owings, & Merrill), created an imposing glass roof structure that emphasizes the expansiveness of the space and its lighting effects, resulting in an impressive experience. Here, a symbolic quality was recovered, which is immediately perceptible to users. To repeat this, it is a matter of how the mobility system »speaks« to me, how it imparts meaning—here through the entry and reception hall. That is the real task of the design disciplines, to bring this symbolism into everyday experience as well. This is already evident in the detail. Take the famous bullseye logo of the London Tube, which from the beginning accompanied the development of the oldest underground train system in the world, and eventually gained pop culture status in the nineteen-sixties. This logo has even been put on T-shirts. It continues to stand for the system as a whole, and with its high-quality materiality (signs are still porcelain enamel), it symbolizes what it stands for at every station of the underground network: the London Tube.

More such examples can be easily found. Most importantly, it is the people themselves who recognize whether they are being treated like »transportation cases,« or if they are being shown genuine respect in the designing of their everyday world, in this case transportation spaces. A new, collaborative, and intermodal mobility, based on the principle of sharing the use of transport modes and spaces with others, must develop a design vocabulary that reflects the needs and desires of users. And this design vocabulary must address everyone; it must be an expression of a communal mobility system for all of society. The design of public metro systems in the twentieth century demonstrates how they have become a central element of urban, and indeed national identity. Who could imagine Paris without its Métro? Just how deeply anchored the meaning of this public system is in the collective consciousness is revealed by the arts. Think for example of Raymond Queneau's novel *Zazie dans le metro* (Zazie in the metro), which was filmed by Louis Malle immediately after it was published (and which led to the naming of a Paris Métro station after Queneau). And if you look at New York City, it is not only the skyscraper silhouette of Manhattan, but also the New York City Subway information system designed by Unimark/Massimo Vignelli in 1970, which stands for the city itself and has embedded itself in the collective consciousness. Even a Stalin-era propaganda project such as the Moscow Metro, which was begun in the nineteen-thirties, still impresses us today with its luxurious stations designed to be like »palaces of the people:« nothing was too good or too costly. The sumptuous fittings recall the design vocabulary of feudalism, transformed to become the setting for a Communist utopia (which Bertolt Brecht celebrated in a 1935 poem as »The takeover of the great Metro by the Moscow working class«). Countless poems, novels, and theater pieces have been written and even films have been made about the Moscow Metro. Even if little has remained of the utopian vision, these underground stations are still today a part of Moscow's identity. Just how deeply this symbolism has shaped the consciousness of the residents is evident at the Revolution Square Metro Station, where thousands of Muscovites stroke the bronze statue of the Red Guard with his guard dog as a good luck charm every day as they pass it. As the Belarussian writer Viktor Martinowitsch fittingly wrote in his 2017 novel, *Revolution*: »A couple of stations, change, everything as in a dream. The Moscow Metro is like a dream that the tired big city dreams. And all of the people with their fates, their lives, and their burdens only appear as a fleeting dream narrative to this Moloch, until he rolls on his side and falls into an even deeper sleep. When you arrive underground, you don't need to think anymore, you can just shut your eyes, flow through his arteries, and let yourself dream of him.«

Mobility design is not just the »beautification« of technical transport systems, of structures and objects of use. Rather, it ensures usability, aids understanding, creates meaning, and thus persuades the people who use it to accept it. That is much more than just market-driven »differentiation,« that is, the target-group-specific design of means of transport, as is common in automotive design. Public mobility services in particular must appeal collectively to all people, symbolically expressing their importance to society as a whole. Developing a formulation for this is the job of future mobility design, as the projects introduced here clearly demonstrate.

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↳**p. 79 top, 82 bottom** netzwerkarchitekten; **p. 79 bottom** Fotodesign Häsler (photo); **pp. 80, 81, 82 top** Jörg Hempel (photos)
↳**pp. 84, 85** Gustavo Penna Arquiteto & Associados, Jomar Braganca (photos)
↳**p. 87** Courtesy of unit-design, Hongik University (Seoul); **pp. 88–90** Courtesy of unit-design, author unknown (photos)
↳**pp. 92, 93 top** BURRI public elements AG (photos); **p. 93 bottom** Kai Flender (Freier Architekt)
↳**pp. 95 (detail), 96** Cobe and Gottlieb Paludan Architects, Rasmus Hjortshøj—COAST (photos); **p. 98** Cobe and Gottlieb Paludan Architects
↳**p. 100** Ector Hoogstad Architecten; **pp. 101–103** Ector Hoogstad Architecten, Petra Appelhof (photos)
↳**pp. 105–108** unit-design and netzwerkarchitekten
↳**p. 109** Eibe Sönnecken (photos); **p. 110** Deutsche Bahn AG, Julie Wieland (graphic, content updated by HfG in consultation with Deutschen Bahn, as of: 05/2021); **p. 111 top** Deutsche Bahn AG, Dominic Dupont (photo); **p. 111 bottom** Deutsch Bahn AG, Oliver Lang (photo)
↳**pp. 112, 113 top** Metroselskabet I/S (network plan and photo); **p. 113 bottom** Metroselskabet I/S, Søren Hytting (photo)
↳**p. 115** KHR Architecture, Ole Meyer (photo); **p. 116** KHR Architecture
↳**pp. 117, 118, 119 bottom** Arup, Rasmus Hjortshøj—COAST Studio (photos); **p. 119 top** Arup
↳**p. 120** Cobe and Arup; **pp. 121–123** Cobe and Arup, Rasmus Hjortshøj—COAST (photos)
↳**pp. 125, 126 top** RCP, Leonard de Serres (photos); **p. 126 bottom** DB/VG Bild-Kunst, Bonn 2021
↳**pp. 128, 129** Inga Masche (photos)
↳**p. 131** robertharding/Alamy Stock Photo; **pp. 132 top, 133** Javier Larrea/agefotostock/agefotostock, **p. 132 bottom** https://www.metrodemedellin.gov.co/viaje-con-nosotros/mapas [accessed on 16 June 2021]
↳**pp. 135–137** Irizar e-mobility
↳**pp. 139, 140** Kazuyo Sejima & Associates (photos)
↳**pp. 141–143** ioki GmbH; **pp. 144, 145 bottom** VHH, Wolfgang Köhler (photo); **p. 145 top** DB AG, Faruk Hosseini (photo)
↳**p. 147** Press images Smovengo, Vankemmel-Thibaut (photos), https://www.smovengo.fr/medias/ [accessed on 29 March 2021]; **p. 148** photo: Station Vélib' Métropole Gare RER—Vincennes (FR94) – 2020-10-04 – 3; author: Chabe01; license: CC BY-SA 4.0, https://creativecommons.org/licenses/by-sa/4.0/deed.en; source: https://commons.wikimedia.org/w/index.php?curid=94750370
↳**pp. 150, 151** Swiftmile Inc.
↳**pp. 153–155** Press images Citroën Deutschland
↳**pp. 157, 160 bottom, 161 top** Ajuntament de Barcelona; **p. 158** Leku Studio, Del Rio Bani (photo); **p. 159** Agencia de Ecología Urbana de Barcelona; **p. 160 top** https://ajuntament.barcelona.cat/superilles/en/superilla/eixample; **p. 161 bottom** photo: Carril bici central del passeig de Sant Joan, que forma part de la xarxa d'itineraris segurs per a vianants, amb ciclistes de totes les edats pedalant. Als laterals de la calçada, gent passejant; author: Desconegut—Goroka (Empresa); license: CC BY-NC-ND 4.0, https://creativecommons.org/licenses/by-nc-nd/4.0/; source: https://www.barcelona.cat/imatges/ca/search/18928/carril-bici-central-del-passeig-de-sa/
↳**p. 163** Wien 3420 aspern Development AG; **p. 164** Wien 3420 aspern Development AG, Daniel Hawelka (photos)
↳**pp. 166, 167, 168 top** BIG—Bjarke Ingels Group, Jens Lindhe (photos); **p. 168 bottom** BIG—Bjarke Ingels Group, Iwan Baan (photo); **p. 169** BIG—Bjarke Ingels Group
↳**p. 171** BIG—Bjarke Ingels Group, Jakob Bosserup (photo); **p. 172** BIG—Bjarke Ingels Group, Ulrik Jantzen (photos), **p. 173 top** BIG—Bjarke Ingels Group, Iwan Baan (photo); **pp. 173 bottom, 174** BIG—Bjarke Ingels Group
↳**pp. 176, 177, 178 top** Michael Egloff(photos); **p. 178 bottom** Martin Stollenwerk (photo); **p. 179** Müller Sigrist Architekten

WalkNYC: Standardized Wayfinding System

Exploring New York City is exciting. However, it's not only difficult for tourists to find their way around the city, even residents can quickly lose their bearings. To make getting around easier for everyone, and to encourage people to walk, cycle, and use public transport, the »WalkNYC« program was introduced.

Since 2013, this wayfinding system has provided residents and visitors with an internationally significant service that has already received numerous awards. The system, which consists of information kiosks on streets, at bus stops, subway stations, cycle rental stations, and ferry docks, helps pedestrians and cyclists to quickly orientate themselves by providing them with important information about available transport modes and links at their location.

This project was initiated at the behest of former mayor Michael Bloomberg and Janette Sadik-Khan, the Commissioner of the New York City Department of Transportation (NYC DOT). Following a public call for bids, in 2011 the PentaCityGroup was commissioned to develop the system. This group is supported by an interdisciplinary team with diverse areas of specialization: with City ID as the lead designers, the graphic designers of Pentagram, the industrial designers of Billings Jackson Design, the engineers and urban planners of the RBA group, and T-Kartor as the developers for the geoinformation system database.

The collaboration between the NYC DOT and the PentaCityGroup began with workshops aimed at precisely defining the goals of the project. The NYC DOT wanted to introduce a universal system that would be applicable to a wide variety of locations and situations, could be used by everyone, and would robustly support a cross-modal transit experience: the transfer between different transport modes was to be made as simple as possible. Facilitating car-free travel and promoting more sustainable forms of mobility are consistent with New York City's policy agenda. They took into account the overall travel experience of users, including their sense of well-being and their perception of the urban environment. The wayfinding system was to be integrated within the DNA of the city in order to build trust and allow people to quickly become familiar with it. Ultimately, the workshops concluded, WalkNYC should connect people with the entire city by inviting them to explore New York.

Following the first workshops, a design team swiftly began a series of tests and user analyses as a means of understanding how people orient themselves and move through the city. This research informed the overall design process. To this end, the team interviewed local people on location about their knowledge of the immediate vicinity and asked them to map it out.

In order to develop the visual identity of WalkNYC, in the preliminary phase the team took stock of the most common graphic signs in the city and how these were perceived. Based upon this research, the decision was made to use the signage designs of the New York City subway system. Bob Noorda and Massimo Vignelli of Unimark International designed this signage in 1970, which has since become iconic. Since the already familiar signage was used as the basis for the new system, users would only have to learn a few new symbols, with the added benefit that WalkNYC immediately gained the status of an official project. Existing subway signage provided the basis for the typography, layout, and colors, such as white writing on a dark background. The typeface used in subway signage was adapted: the new »Helvetica DOT« appropriated the existing style and expanded on it. In addition, new symbols were created for the most well-known buildings. Elements of the city inspired the limited color range: the yellow walk signals, green parks and cycle paths, white-striped crosswalks, and the gray streets and sidewalks. It was essential that the clear visual vocabulary stand out from the cluttered streetscape.

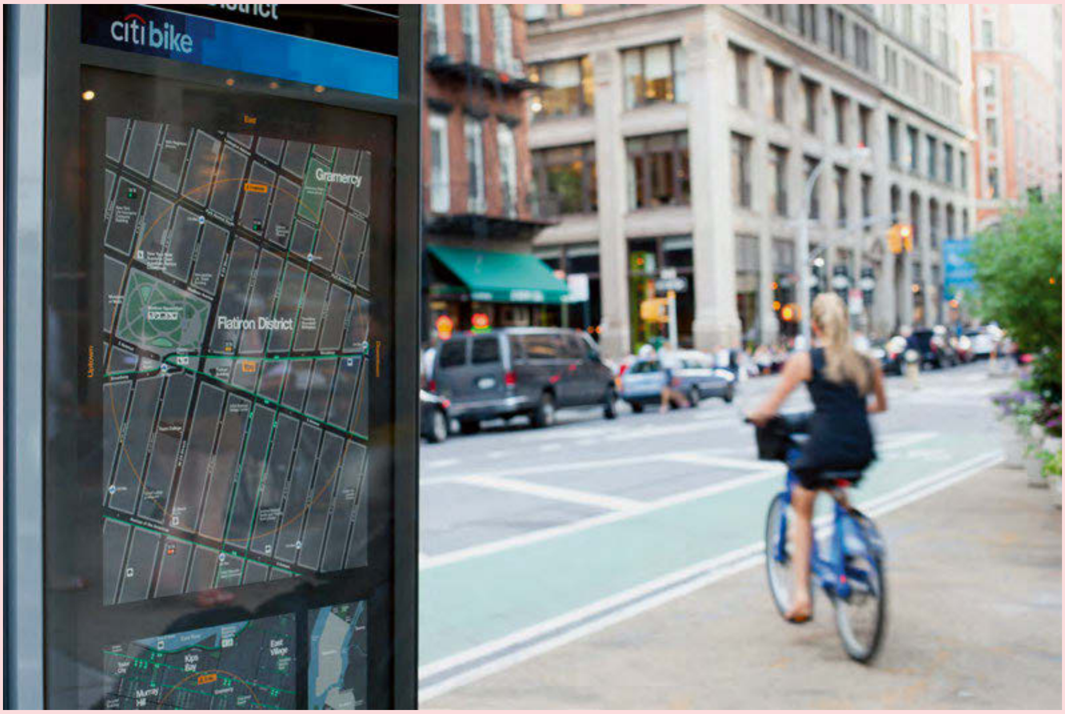
Another aspect that is special about WalkNYC is the use of head-up rather than north-oriented mapping. On each panel the map is oriented so that it corresponds to the viewing-direction of the person looking at it. In fact, a survey showed that 84% of those questioned preferred the head-up mapping over the traditional north-up or grid north formats. The head-up map focuses on the user's location within the immediate vicinity, while another map shows it in the larger context. This visual language was conceived so that it could be utilized in different media.

Different formats were intensively tested in order to ensure that the WalkNYC information panels would be placed in highly visible locations along pedestrian routes and in areas near subway stations and other transport hubs, in heavily frequented pedestrian zones and popular destinations. Information panels were to be slender, modern, and unobtrusive, and at the same time resistant to vandalism and weathering. For the protective covering, the team specified an assemblage of steel and glass—materials that also dominate the buildings of New York City. An entire family of products was developed that could be used in a wide variety of situations. The WalkNYC wayfinding system is a key component in the New York City Street Design Manual—an important resource for the further enhancement of the streetscape and infrastructure of the city. WalkNYC pedestrian signs are installed citywide on sidewalks and in plazas.

Location New York City, USA Introduction 2013–ongoing Client New York City Department of Transportation (DOT) Design PentaCityGroup - Design consortium of City ID (lead design, wayfinding specialist), Pentagram (graphic design), Billings Jackson Design (industrial design), RBA Group (engineering and urban planning), T-Kartor (GIS database development) In collaboration with Monotype (typography), Future Systems (fabrication)

Bus service totem with integrated real-time information

Times Square
Theaters
W 42 Street
Theaters
5 Times Square Ernst and Young
New York Times Building
Graduate School of Journalism, City University of New York
Nederlander Theater
Parsons the New School for Design
W 41 Street
W 40 Street
7 Avenue
Broadway
Times Sq 42 St
Bush Tower
Metlife
6 Avenue
42 St Bryant Park
5 Av
Bryant Park
Fountain Terrace
Upper Terrace
New York Public Library
5 Avenue Terrace
Fortitude: Library lion
Patience: Library lion
5 Avenue
Port Authority Bus Terminal
11 minute walk
Fashion Walk of Fame
Fashion Center Information Kiosk
The New Community College at City University of New York
American Standard Building
Mid-Manhattan Library
W 39 Street
5 minutes
Lord & Taylor
Hell's Kitchen
9 minute walk
W 38 Street
Fashion District
6 minutes
W 37 Street
Midtown
The Haier Building
W 36 Street
Avenue of the Americas
W 35 Street
Herald Square
Macy's
West
Hudson Yards
13 minute walk
Manhattan Waterfront Greenway
22 minute walk
7 minute walk
W 34 Street
You
34 St-Penn Stn
34 St-Herald Sq
Empire State Building
W 33 Street
Madison Square Garden
Penn Station Amtrak, LIRR, NJT, PATH
New York Hotel Pennsylvania
Manhattan Mall
Greeley Square Park
33 Street PATH
W 32 Street
Fordham University
Central Park Loop
Central Park
Time Warner Center
Steinway Hall
Carnegie Hall
Midtown
MoMA
Bloomingdale's
Hell's Kitchen
Manhattan Waterfront Greenway
Radio City
Rockefeller Center
St. Patrick's Cathedral
Turtle Bay
15 min.
Times Square
Grand Central Terminal
Chrysler Building
Port Authority
Bryant
W 57 Street
W 42 Street



Information panel at a Citi Bike rental station

The WalkNYC Product Scope

Detail of an information panel. User research showed that 84% of users prefer head-up mapping as opposed to the usual north-up format.

The steel and glass construction
echoes the architecture
of New York City.

Canal Street & Mott Street
Chinatown
West
Canal St N Q R J Z 6
Tribeca
Civic Center
Brooklyn Bridge
Little Italy
Tribeca
Soho
Civic Center
Little Italy
Chinatown
Downtown
Uptown
You
Battery Park City
West Village
Tribeca
Soho
Civic Center
Financial District
Chinatown
Little Italy
Noho
East Village
Lower East Side
WalkNYC
FEI YANG TRAVEL

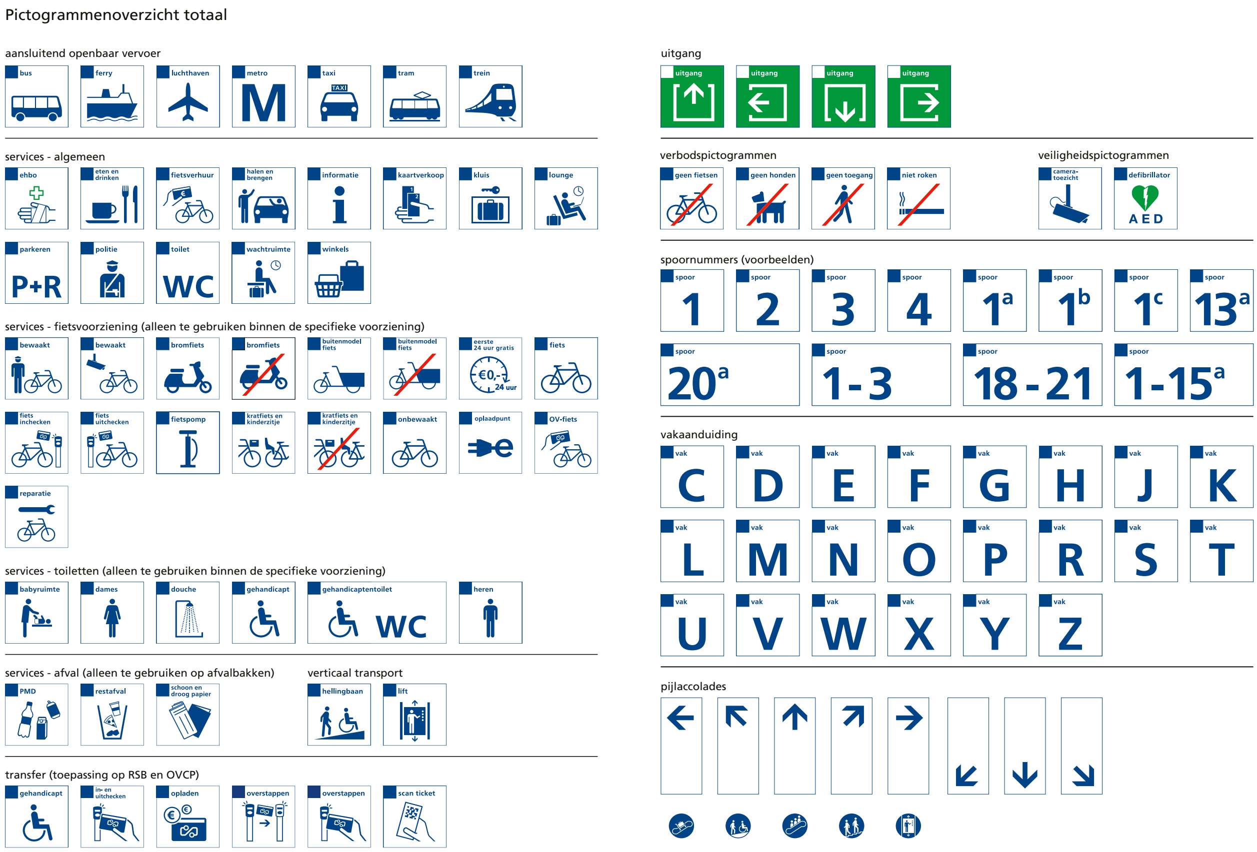
Standard Information System Dutch Railways

Rail travel is among the most pleasant modes of travel – in any case, when you can sit down and watch the landscape pass by. Yet, changing trains and arriving late at the station can often raise stress levels. In the Netherlands, whoever wants to change trains while carrying suitcases, or find the way to the metro, can rely upon a clear wayfinding system that has been used since 1999.

In connection with a restructuring of the Dutch railways in 1998, the train stations and the outdated nineteen-sixties signage were to be modernized. The infrastructure firm ProRail commissioned the Mijksenaar Office of Amsterdam, a specialist in wayfinding systems, to design a contemporary, comprehensive transportation information system. What was desired was a coherent and consistent system for all train stations, which could be used in the train station environment, in the reception and waiting areas, on platforms, and in concourses. This would inspire confidence and make rail travel a more pleasant experience. The designers developed a modular series of twenty-six signage types in total, with standardized sizes and layouts, which could be applied regardless of the complexity of a train station. The system draws on neutral icons not associated with the operating companies, together with the International Union of Railways (UIC) pictograms, which are legible to all regardless of language and cultural background. At the same time, Mijksenaar created a legend so that their system would not be confused with that of another international train company. All signs and track numbers are set within a white block, which increases the contrast and thus legibility. One innovation is the small lettering within the pictogram fields, which helps inexperienced and older travelers find their way. One distinct arrow per sign simplifies directional guidance. In addition, only travel-related information, such as the name of exits, means of transport or service facilities, are specified as text on the signs.

Mijksenaar has succeeded in simplifying orientation at all of the current 397 Dutch train stations. One example is the main train station in Arnheim, completed in 2015, where Mijksenaar advised the architecture firm UNStudio on the wayfinding system. The result is an integrated wayfinding system that supports intuitive navigation, thereby taking into account lines of sight, pedestrian ways, and areas for various service facilities.

Location the Netherlands Introduction 1999–ongoing Client Pro Rail Design Mijksenaar (design agency for wayfinding systems) In collaboration with NS, NS Stations, national and local governments, engineering firms



A selection of pictograms—further development of the existing UIC pictograms

Wayfinding system at Utrecht Central Train Station, showing directions to the platforms

Main hall of Arnhem Central Train Station
with the central information point

Wayfinding system for Amsterdam Central
Train Station showing directions to connecting
metro and ferry lines

Fukuoka City Subway, Nanakuma Line

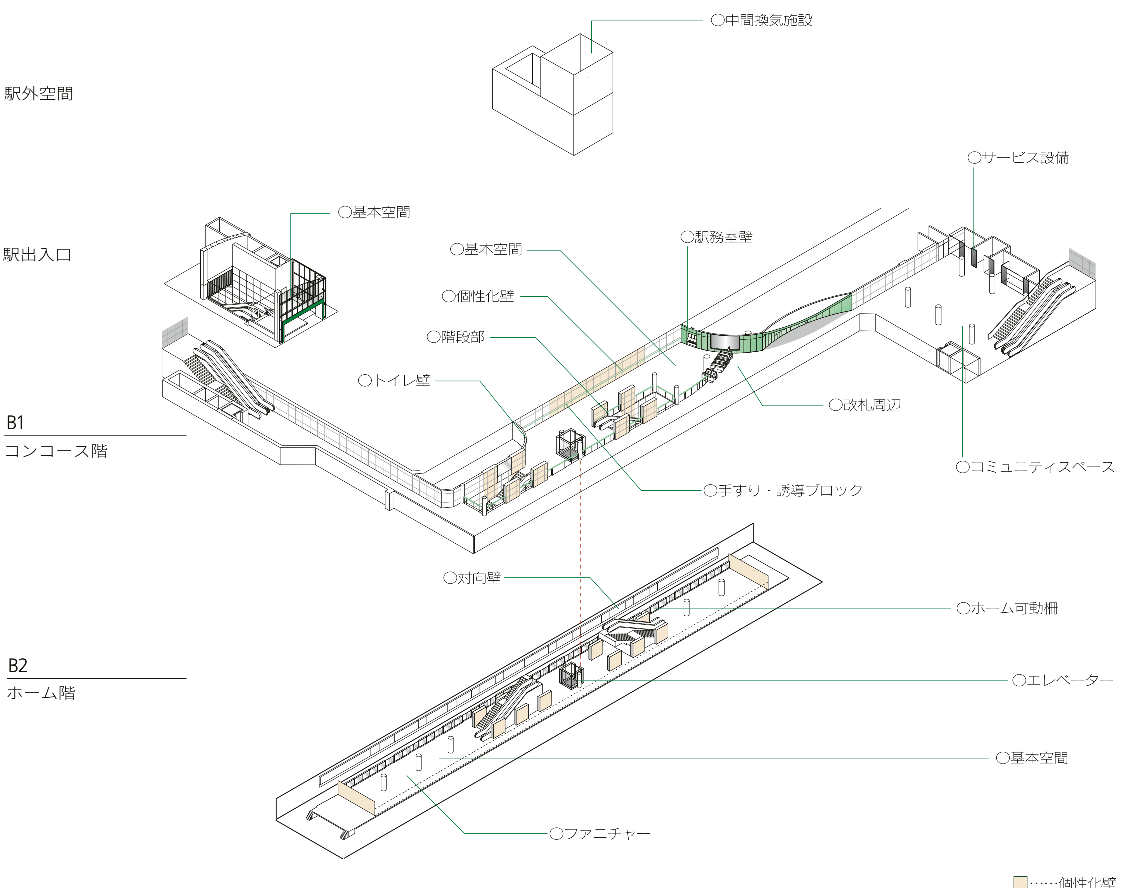
Due to the significant increase in the number of elderly people in Japanese society, barrier-free design has become a major priority. Since the beginning of this century, multiple laws have been passed to promote inclusive design in public areas, such as the »Barrier-Free Transportation Law« (2000) or the »Barrier-Free Act« (2006). Since 2005, this policy had been expanded to universal design in order to serve multi-faceted user needs.

When the Nanakuma subway line opened in the city of Fukuoka (population: 1.6 mill.) in western Japan in 2005, it became a prime example of this development. The office of GA-Tap created a universal design for this line, which connects the inner city with the southwestern districts. This design is characterized by ease of intuitive use and orientation in the 16 stations and specially designed cars. Planning and construction lasted ten years. In the preliminary phase, an interdisciplinary team of architects together with product and graphic designers set up focus groups of people with all kinds of issues to deal with—older people, pregnant women, people with impairments, and those who carry heavy loads, whom they interviewed and observed. They concluded that the Nanakuma Line should principally be comfortable, intuitive, and easily accessible, not only for locals but also for visitors from abroad. The following preferences expressed by the focus groups were responded to with practical solutions: bright stations with daylight, open and spacious areas, easy to use facilities, and clearly legible information. Navigation in the stations was organized around clear sight lines and popular shortcuts. Large glazing areas in the entry and exit areas allow light to pour into the stations. For people with sensory impairment, there are tactile maps and acoustic signals in station entrances, lobbies, and platforms. Navigation is facilitated through guiding strips and RFID technology to provide contactless, automatic orientation. Ticket machines are dimensioned so that people standing or sitting, tall or short, can use them. Every station has its own color, its own wall material, and a symbol, such as an animal, a plant, or an everyday object. The Nankuma Line in Fukuoka is one of the first systems in the world utilizing this kind of integrative, universal subway system design, the result of a close collaboration between users and experts.

Location Fukuoka, Japan Completion 2005 Client Fukuoka City Transportation Bureau, Fukuoka City, Fukuoka Prefecture Design Toshimitsu Sadamura, GA-Tap (design and user research) In collaboration with Japan Sign Design Association

Track number, train station plan, and a neighborhood plan at Tenjin-Minami subway station. The information panels are positioned midway between the eye level of seated and standing passengers.

Tactile maps for people with visual impairments are found at station entrances, in lobbies, and on the platforms.



Conceptual plan of a subway station

Subway map: each station has its own color, its own wall material, and a unique symbol, that children and non-Japanese can easily identify.

Subway cars that are equipped for wheelchair users stop at the elevator.

Papercast®

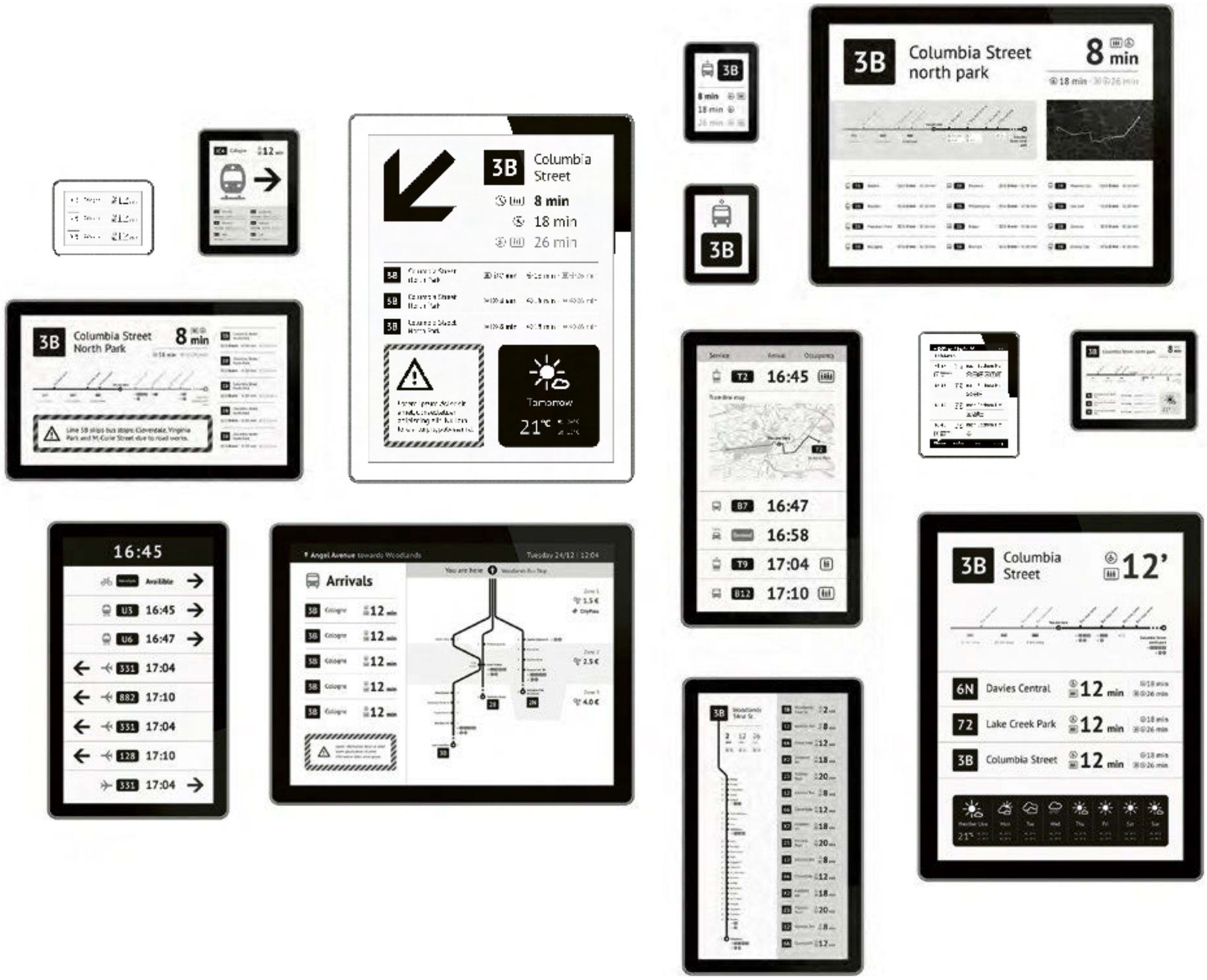
At many bus stops you just find route timetables printed on paper; only by using your own Smartphone you can access travel information in real time. Dynamic digital travel information at each location can improve the travel experience and promote the use of public transport. In addition, such systems provide universal access to real-time travel information for users such as older people without Smartphones.

However, digital travel information requires an electrical and/or internet connection at the stops. Papercast® fills this market gap—with a solar-powered, e-paper passenger information system. Following extensive tests carried out in 2016, this autonomous, adaptive, and interconnected system has been introduced around the world by this British-based firm. It is now utilized in more than forty countries, by companies including FlixBus, Transport for London (TFL), Berliner Verkehrsbetriebe (BVG), Gruppos Torinese Trasporti (GTT), and CITY BUS.

Designed for outdoor use, the universal applicability of Papercast® sells the system: even in direct sunshine, complex real-time information is still highly legible, thanks to the e-paper technology. Powered by only a single solar panel, the system provides all relevant functions using very little electricity. The module is operated via mobile communication using a cloud-based system, which works with open data bases such as GTFS and SIRI. Connection options as well as service, security, and environmental information can be accessed using an intuitive, clearly designed graphic interface. And it is truly for everyone: for example, visually impaired people can press a button to hear information. Passengers have the feeling that they are in control; satisfaction is improved.

Papercast® can be integrated into many contexts. Every information module may be appropriately adjusted according to screen size, direction, and type of interaction. Many layouts and design functions are available to companies. Physical integration is especially easy, even wireless: Papercast® can be readily installed in a few hours on any kind of street furniture and can be powered by a single solar panel around the clock.

Headquarters United Kingdom Utilized in 40+ countries worldwide Product introduction 2016 Design Papercast (manufacturer) In collaboration with E Ink (e-paper technology), Matic Leban (graphic design), Jedco Product Design (initial product design)



An intuitive and universal system for presenting complex realtime and fixed travel information, that compensate for the lack of color

Rendering of a Papercast® 23-inch display with solar panel


Streatham Hill
TELFORD AVENUE
137
DUE
1
Waterloo
4
Liverpool St
7

Just press a button if you want the information read out to you.

E-paper displays provide incomparable visibility both day and night.

Clearview Typeface

With the Clearview typeface, Meeker & Associates, together with font designer James Montalbano of Terminal Design, succeeded in making road signs in the US more legible, in particular for older people, while demonstrably improving road safety.

Originally, this studio specializing in environmental design was commissioned in the early nineteen-nineties to develop highway signage that would promote tourism. During the preliminary work phase, the team recognized that existing road signs left limited space for additional information. They questioned the use of uppercase letters and investigated why lowercase letters appeared to lose their shape when viewed from greater distances. Their observations inspired the creation of a new, more legible typeface system to replace the FHWA Series typeface (also called Highway Gothic) used by the Federal Highway Administration (FHWA) since 1961. As opposed to increasing the size of the letters by 20% as suggested by the research, which wasn't possible anyway due to lack of space, the design team considered another effect: the so-called halation. At night, older people perceive the typeface used up to now as being blurry, due to their greater sensitivity to high brightness contrasts on the reflecting signs.

The new typeface maintained the FHWA standard stroke width, but the spaces inside the problematic lowercase letters, such as a, e, or s, were widened, and in general, the size of the small letters was increased. This reduced overlaps and avoided the visual merging of letters. In addition to legibility, tests had to determine whether the new typography prevented blooming. A new, more aesthetic system based on a proportional layout also unifies the design of different applications across the nation.

Provisional approval in 2004 was preceded by extensive studies, some of which are still ongoing today. The Clearview typeface has the potential to save lives, as shown in a study by Western Michigan University: they compared accident data before and after the installation of Clearview signage and yellow fluorescent exit signs. On improved road sections, there were 14% fewer fatalities. The number of serious accidents at night fell even more sharply. However, it has not yet been possible to require the use of this typeface across the USA.

Location USA, as well utilized in: Canada, Indonesia, the Philippines, Israel, Sri Lanka Introduction USA: 2004 (interim approval), 2018 (renewed approval) Client FHWA—Federal Highway Administration Design Meeker & Associates (project management, environmental design), Terminal Design (typography) In collaboration with various independent university transportation research centers, including The Pennsylvania Transportation Institute (Pennsylvania State University) Support The 3M Company Note the typeface and related research reports are presented in detail on www.clearviewhwy.com

Complete ClearviewHWY® typeface system: Six weights of each font in positive contrast (dark on light) and in negative contrast (light on dark), with alternate version Clearview 5-WR with reduced letter spacing

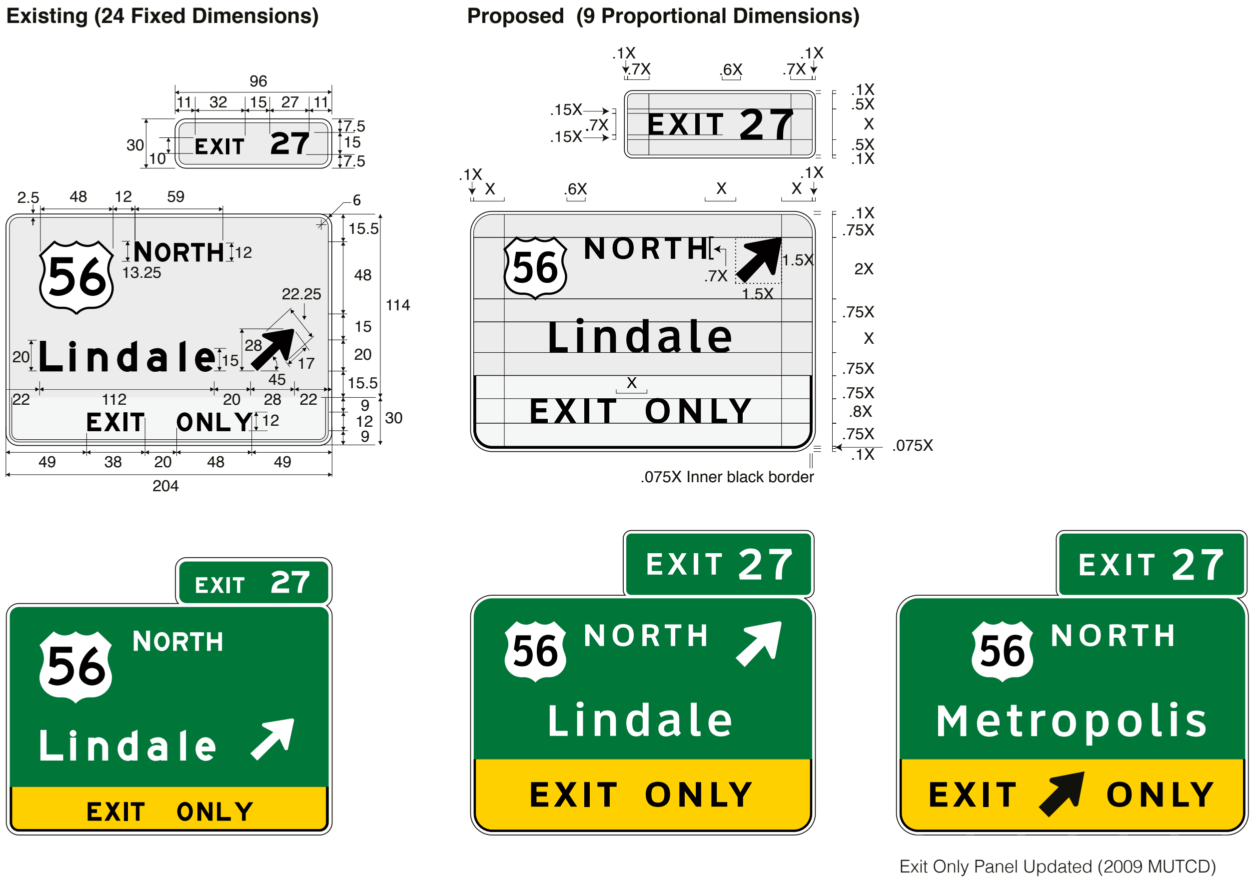
Clearview Type System in Positive and Negative Contrast

ClearviewHwy 1-W	Bergaults	0123456789	⅕ ¼ ⅓ ½ ⅗ ⅔ ¾
ClearviewHwy 1-B	Bergaults	0123456789	⅕ ¼ ⅓ ½ ⅗ ⅔ ¾
ClearviewHwy 2-W	Bergaults	0123456789	⅕ ¼ ⅓ ½ ⅗ ⅔ ¾
ClearviewHwy 2-B	Bergaults	0123456789	⅕ ¼ ⅓ ½ ⅗ ⅔ ¾
ClearviewHwy 3-W	Bergaults	0123456789	⅕ ¼ ⅓ ½ ⅗ ⅔ ¾
ClearviewHwy 3-B	Bergaults	0123456789	⅕ ¼ ⅓ ½ ⅗ ⅔ ¾
ClearviewHwy 4-W	Bergaults	0123456789	⅕ ¼ ⅓ ½ ⅗ ⅔ ¾
ClearviewHwy 4-B	Bergaults	0123456789	⅕ ¼ ⅓ ½ ⅗ ⅔ ¾
ClearviewHwy 5-W	Bergaults	0123456789	⅕ ¼ ⅓ ½ ⅗ ⅔ ¾
ClearviewHwy 5-B	Bergaults	0123456789	⅕ ¼ ⅓ ½ ⅗ ⅔ ¾
ClearviewHwy 6-W	Bergaults	0123456789	⅕ ¼ ⅓ ½ ⅗ ⅔ ¾
ClearviewHwy 6-B	Bergaults	0123456789	⅕ ¼ ⅓ ½ ⅗ ⅔ ¾
ClearviewHwy 5-W-R	Bergautls	0123456789	⅕ ¼ ⅓ ½ ⅗ ⅔ ¾

Bergaults—In 2002, the optimized Clearview typeface was presented to the Federal Highway Administration in comparison with the FHWA standard. The outcome was persuasive as the design team shared the development process with the government.


EXIT 67
412
Hellertown
Bethlehem
2 MILES
E
78
64
.6


EXIT 67
412
Hellertown
Bethlehem
1 MILE
E
78
65
.6



Proportion-based layout system for freeway signs: instead of 24 fixed dimensions, the proportional system works uniformly with 9 measures.

Comparison of freeway sign application: top: »before,«; bottom: »after,« with the Clearview 5-W typeface for destination names.

Wayfinding for Cycle Highways

In the Netherlands a nationwide network of cycle highways was established to make it easier for commuters to give up their cars. Safety and good directional guidance are the most attractive qualities of these cycle highways. Most significantly, the increasing number of e-bikes creates new challenges, since the additional power makes many bikers faster, allowing them to reach speeds of up to 45 kilometers per hour. The usual cycle route signage, designed for a speed of up to 15 kilometers per hour, is not clearly legible at higher speeds.

Within the framework of the EU funded program CHIPS (Cycle Highway Innovations for smarter people), the concept of a new wayfinding system for cycle highways has been developed as part of a research project at the Breda University of Applied Sciences. Two designs for the wayfinding system were conceived of initially, following a concept by the Mijksenaar Office for Information Design. Based on VR tests carried out by Breda University, the Snel (Fast) Concept was further refined, then implemented on an 18-kilometer-long test track constructed specifically for this purpose, and finally evaluated through observation and user surveys.

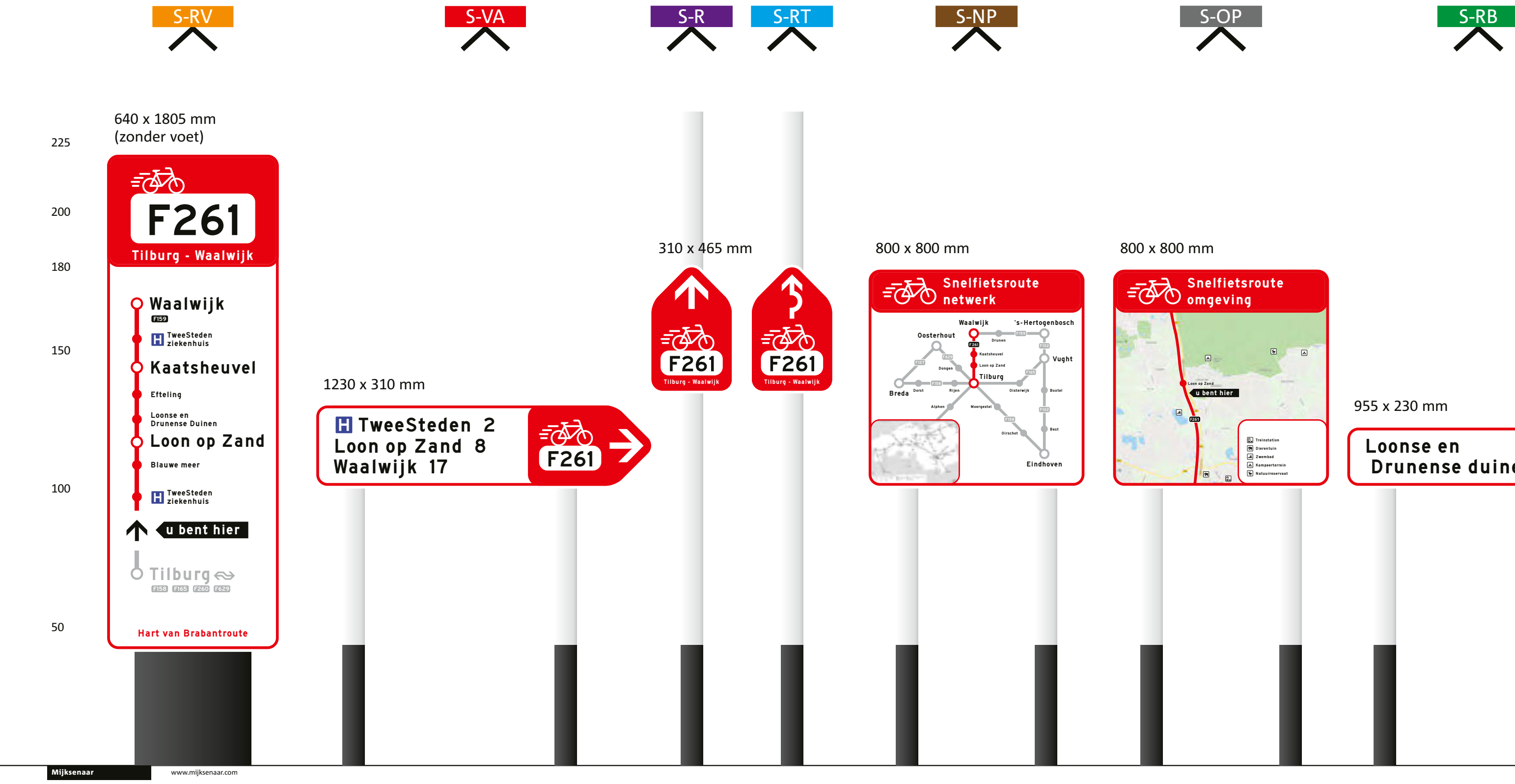
The new design draws upon previous cycle route signage, yet still differs from it. A new logo was created, but the background color and typeface were adopted. To provide better contrast and legibility, the font is now black instead of colored. Finally, the format of the signs was adjusted. They were enlarged, and directional signage was given a triangular profile to one side, so that these could be quickly recognized. Height and positioning were also considered, and the signage placement reflects the concept of a »bicycle scale.« The number of sign types was increased to ten in order to adequately inform cyclists about their route and nearby destinations in different situations.

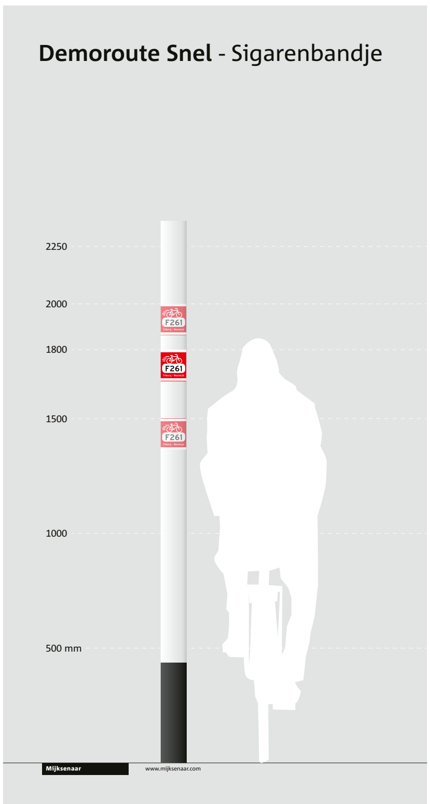
Among the innovations are signs similar to those in metro stations, which inform cyclists about their current location and indicate where it is possible to change to other modes of transportation. In addition, an overall orientation sign with the route network and ground markings has been introduced. The project's research findings are being utilized by the Dutch signage agency as the basis for the redesign of the nationwide signage system for cyclists.

Location the Netherlands Completion 2019 Status conceptual and study phases Client Province of Noord-Brabant Design Mijksenaar (design office for wayfinding and orientation systems) In collaboration with Province of Noord-Brabant, Breda University of Applied Sciences, Ons Brabant Fietst, municipalities of Tilburg, Loon op Zand, and Waalwijk, NBd

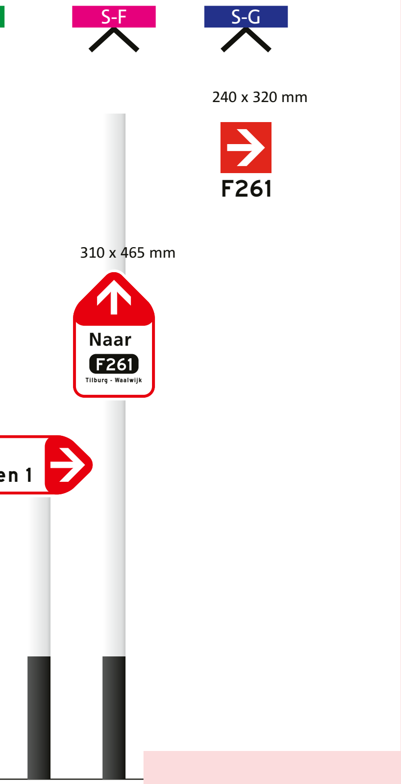
Sample sign on the Tilburg-Waalwijk route


F261
Tilburg - Waalwijk
Waalwijk
F159
TweeSteden Waalwijk
Kaatsheuvel
Efteling
u bent hier
Loonse en
Drunense Duinen
Loon op Zand
Experience Island
TweeSteden Tilburg
Tilburg
Hart van Brabantroute





Overview signage concept »Snel.« From left to right: sign with route, directional sign with distance to destination, directional sign for bicycle route, directional sign for traffic circle, overview sign for route network, overview sign for surroundings, directional sign for surroundings, directional sign for F-route, ground marking; lower left: banderole.



Directional signs on the
Tilburg-Waalwijk test route

Overview sign for the Tilburg-Waalwijk
test route network

Master Plan Amsterdam Central Station

From the very beginning, the train station building in Amsterdam was controversial: built on an artificial island, the Station Island, it obstructed the view of the IJ (body of water) and of the Amsterdam-North Quarter on the other shore. Increasing traffic congestion did not improve the situation. A remedy was finally provided by the master plan by Benthem Crouwel Architects. Based on this plan, in collaboration with Merk X and TAK Architects they renovated, expanded, and redesigned Amsterdam Central Station. The connection between the city and the water was reestablished, and the front and back sides of the train station were transformed into lively urban spaces, which no longer serve transportation alone.

In 1996, the extensive renovation of the second largest train station in the Netherlands was initiated. At that time, Benthem Crouwel Architects began with the design of the seven stations of the new North Zuidlijn Metro Line. Routing the new line that connected the city with the up-and-coming North Amsterdam Quarter through a tunnel under the train station was a groundbreaking concept.

Benthem Crouwel Architects had already established their reputation with their master plan for Amsterdam Schipol Airport by this time. In parallel with the Amsterdam train station, they designed additional train station buildings in Rotterdam, Utrecht, and The Hague. With Amsterdam Central Station, they succeeded in piecing together a complex puzzle. In 2020, it was finally completed.

Pierre Cuypers's grand late-nineteenth-century building, which has suffered numerous alterations over the years, has been freed of all additions and insertions by Benthem Crouwel Architects, in order to reveal the historical architecture. In the newly reclaimed great hall with its central stairs, everything serves the comfort and experience of travelers. Clearly demarcated zones provide for easy orientation. From the hall, the platforms are again visible and can be comfortably accessed from there, as well as from the west, middle, and east passages, via stairs, escalators, and elevators. The new materials borrow from the historical design, such as the ceramic tiles created especially for the floors. The old wing situated to the west of the hall originally served logistical purposes. Cleanly and brightly redesigned, it is now reserved exclusively for travelers.

Amsterdam Central Station has become an urban location where people can meet and relax. This is made possible by a rich assortment of shops, restaurants, and bars. In addition to the renovated, centrally-located Middentunnel (middle passageway), which primarily provides services for travelers, the IJ Passage and the Amstel Passage were created, which are two public, fully-accessible, barrier-free passageways between the city center and the IJ. Benthem Crouwel, the Powerhouse Company, and Merk X designed the Poortvrije-Passagen (gate-free passages) so that here you may shop, relax, and eat in peace away from the hubbub of the transit areas.

However, the primary focus of the redesign is the reorganization of transportation in and around the train station. Most importantly, the relocation of the bus stops from the forecourt to the rear proved to be a brilliant move. In this way, traffic was reduced in the forecourt (Stationsplein), and at the same time, the bus routes to the rear were more clearly organized. Bus lanes and stops were raised to the same level as the trains, creating a dense public transport node, while also giving cyclists and pedestrians priority at ground level to the rear. Large passageways provide visual links between rail and bus connections. Car traffic that once circulated along the rear side was rerouted underground. The separation between bus and automobile traffic makes the lanes safer and more efficient. With minimal effort you can change between bus, metro, train, ferry, and taxis. At the same time, this also underscores the clear consensus among the Dutch to give decided priority to slower transport modes.

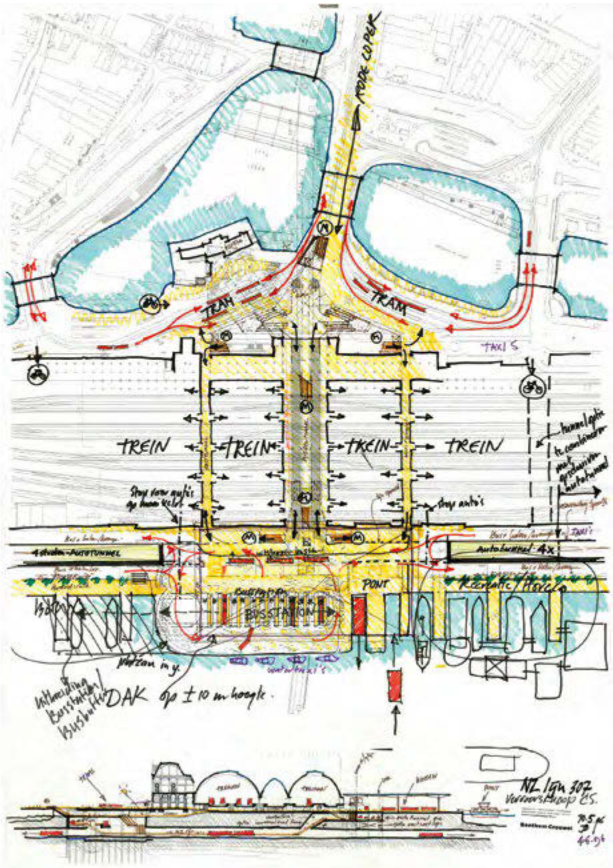
At the ground level to the rear, the IJhal was created as another passageway that provides further services. Wiel Arets Architects gave it a modern look in clear contrast to Cuypers's train station hall. The ground floor kiss-and-ride area and the bus level is covered by a 365-meter-long, transparent, segmented barrel vault glass roof, which affords a view of the IJ. This roof complements the three historical barrel vault roofs of the train station with a contemporary interpretation. Looking from Amsterdam-North to the train station today, the 20-meter-high letters laminated onto the glass roof that spell out »AMSTERDAM« in friendly national orange tones are highly visible from afar and appear to radiate towards you. Because the roof, with its 60-meter span stretches as far as the embankment, it also links water transport more closely with the train station. Through its imposing form, the roof becomes a landmark on the IJ waterfront and a new gateway to the city

An additional special highlight is the so-called slow-transport passageway (Langzaamverkeerspassage): it provides cyclists and pedestrians with a fast connection between the city, the IJ, and Amsterdam North—the latter via ferries, which dock to the rear of the train station. The Shared Space for cyclists and pedestrians, located at the end of the tunnel by the ferry, functions amazingly well (see: Cuypers Passage, p. 202).

The fact that Benthem Crouwel thought of the smallest detail in the train station is revealed by a number of features, such as the white building in the bus station that provides a workspace and break area for bus drivers. From the upper level, bus drivers have a 180-degree view of the bus station, of the IJ and Amsterdam North.

Through this large-scale redesign of Station Island, Amsterdam has gained an inviting and efficient train station, whose charm lies in the synthesis of historical and contemporary features.

Location Amsterdam, the Netherlands
Completion 2020 Client City of Amsterdam, ProRail and NS Stations
Design Benthem Crouwel Architects, Merk X, and TAK Architects



In 1996, Jan Benthem drew up the first version of what would later become the Station Island Master Plan.

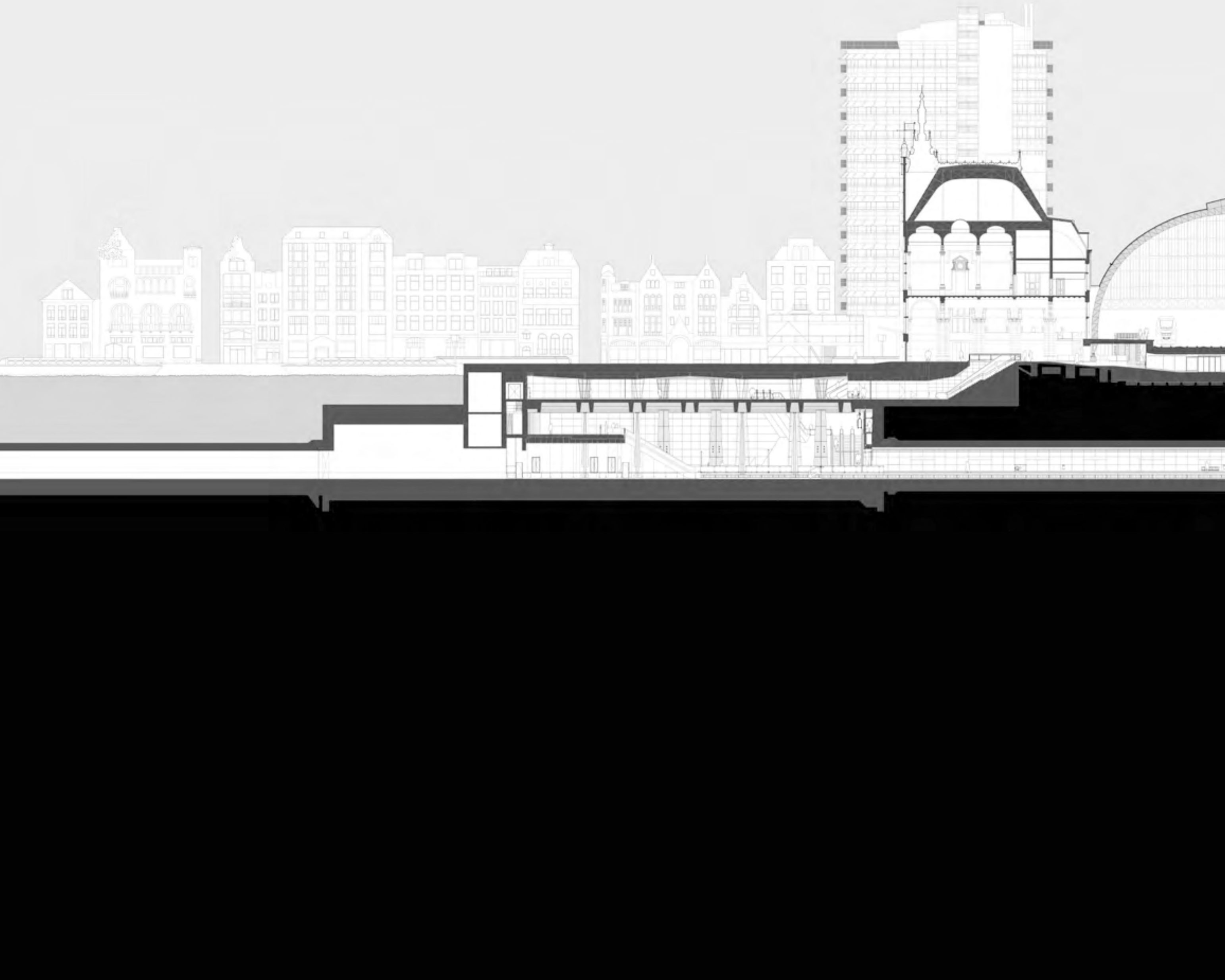

Amste

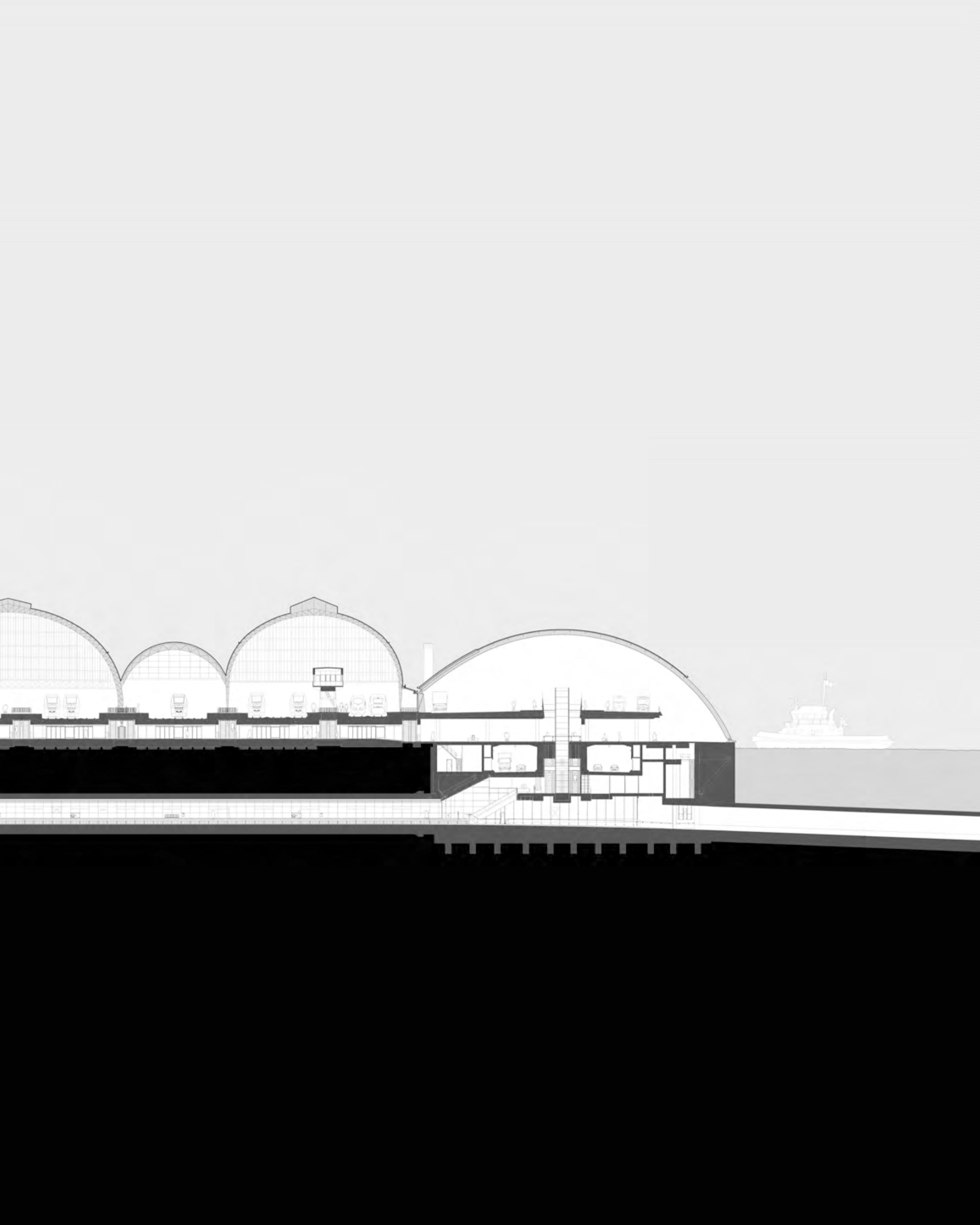
The roof adds a contemporary interpretation to the three existing historical barrel roofs of the station.

The entrance to the station. The waiting area for bus drivers is located above.

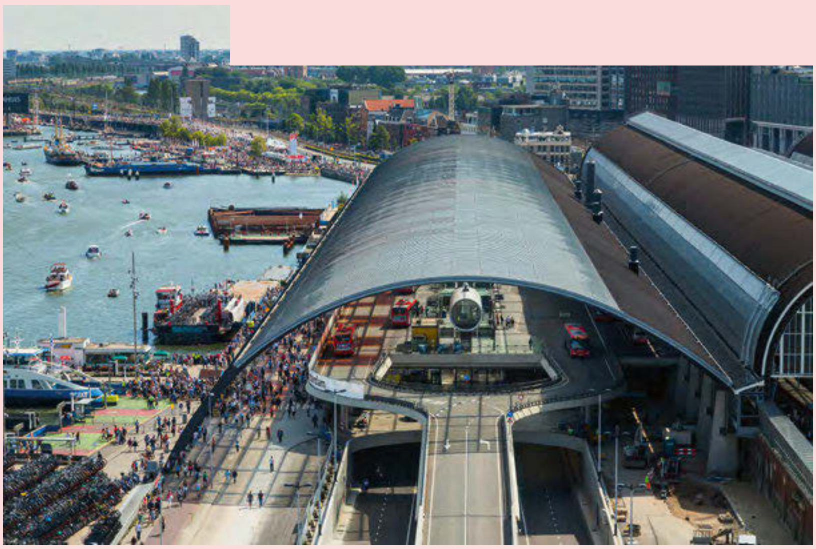
View into the Middle Tunnel

Section through Amsterdam
Central Station





In the magnificent Cuypers Hall, everything centers on the comfort and experience of travelers (rendering).



All of the bus stops for city and regional buses were relocated to the new elevated bus station on the IJ side.

Chemnitz Central Station

With its transfer-free connection between the regional rail network and the inner-city streetcar system, the Chemnitz model is causing a national sensation. Since 2002, the project has gone through several phases. The redesign of the Chemnitz Main Train Station was the first priority, with the renovation of the intersecting train shed being among the most complex measures: a full twelve years elapsed from the competition in 2004 to completion in 2016.

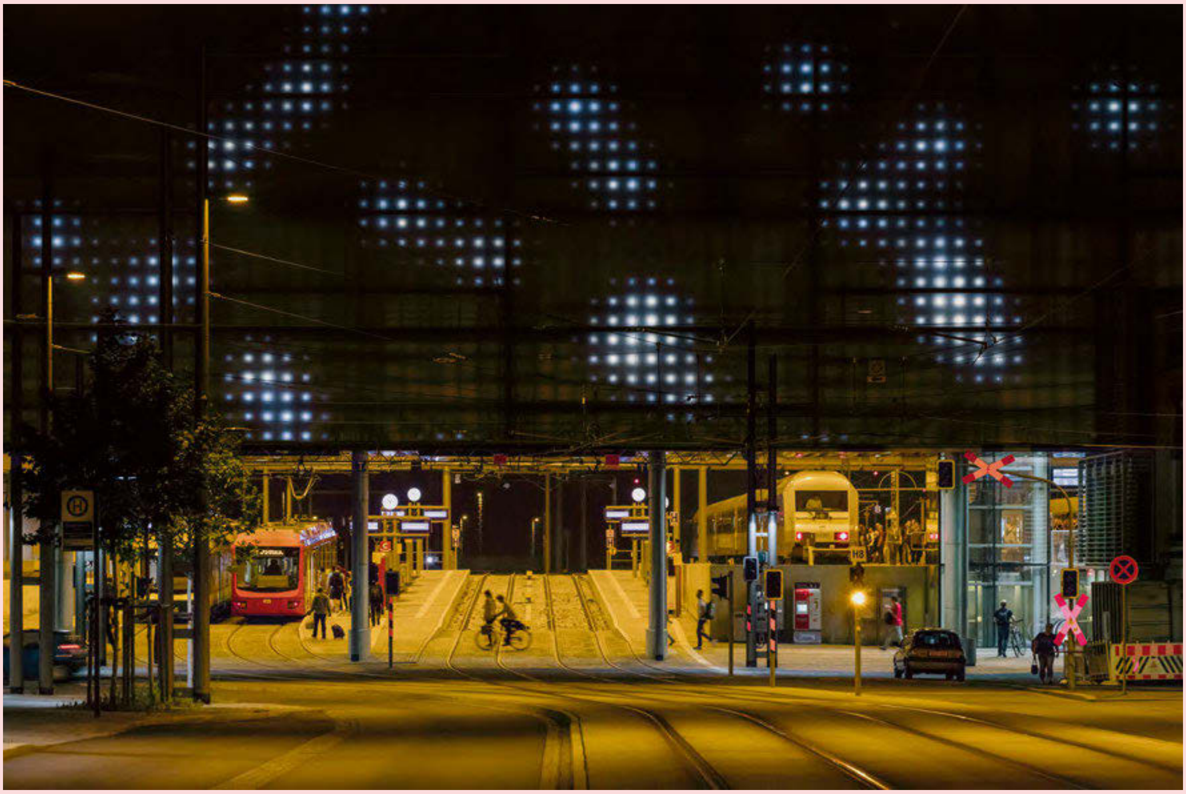
The Berlin office of Grüntuch Ernst Architects convinced the competition jury with the idea of thoroughly transforming the nineteen-seventies train shed. Making transfer »under one roof« possible was the leitmotif that led to the redesigning of the train station as a nodal point, and to opening it up as the entry to the city. In order to achieve this, the existing building needed to be partly demolished, but the support structure was to be retained. Grüntuch Ernst Architects's idea was that the train station hall would be seamlessly connected to the urban context as if under a hovering umbrella, so that it would not present a barrier for movement within the city. The architects thus referred to this structure as an »urban baldachin.« They wanted the building façades to be open on all sides: on the one hand, in order to minimize the massive volume of the building in the Chemnitz cityscape, and on the other, to stage arrival as »arrival in the city.« However, this opening up only be fully realized in the western and southern areas.

Through the redesign the train station façade was given a striking and futuristic appearance: the upper area was clad in matt, pneumatic pillow-like elements. A lighting installation by Random International uses points of light to reproduce the movements of passers-by as swarm images on the façade, which are visible from afar. The area around the train station was also newly laid out: in collaboration with Topotek 1, a dynamic landscape of steps and levels was created, which continued the structure and color palette of the transformed train station building.

The project has been awarded multiple prizes. Since its completion, the Chemnitz model has been further developed in order to expand available transport services within the region, with Chemnitz at the center, in keeping with the motto »Connecting everything that belongs together.« In the meantime, people from surrounding mid-sized communities can travel by regional rail into downtown Chemnitz, and then travel back, without having to change trains.

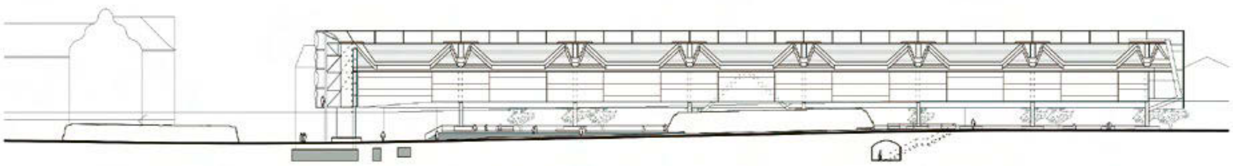
Location Chemnitz, Germany Completion 2016 Client Verkehrsverbund Mittelsachsen Design Grüntuch Ernst Architects In collaboration with BuroHappold Engineering (structural engineering/building services), Dr.-Ing. Wolfgang Stucke/Dr.-Ing. Thomas Klähne (test engineers), Ingenieurgesellschaft Lachmann-Dominok (building services), Topotek 1 (open spaces), Lichtvision Design (lighting design), Random International (art)

The opening of the station allows the streetcars to enter the concourse, which opens up generously towards the city, on lowered tracks.



Regional transportation and streetcars were brought »under one roof,« and the train station was redefined as a nodal point and the main entrance to the city.

Section



The striking, futuristic façade was clad in matt-finish pneumatic cushion elements in the upper section.

Køge Nord Station

As a means of optimizing commuter traffic to Copenhagen, in May 2019 Køge Nord Station, located 40 kilometers southwest of the Danish capital, was opened as part of the high-speed line Copenhagen—Ringsted. Køge Nord Station thus serves as the »Gateway to Copenhagen,« connecting the Danish capital and neighboring Scandinavian countries with the western part of Denmark and Germany.

Designed as a »seamless station,« the train station joins public transport modes with private transportation, for here high-speed trains, local trains, and buses travel alongside the most heavily trafficked highway in Denmark. At Køge Nord Station, you can park your car in a spacious parking lot and then change to public transport. Bike parking places and EV-charging stations are also available.

The train station was conceived so that transferring to such green forms of mobility is designed to be particularly inviting. Visible from far away as a striking symbol, a futuristic, graceful, 225-meter-long enclosed pedestrian bridge spans across the Køge Bugt Motorvejen highway, linking the two railway lines with the park-and-ride facility. While the city train runs along the eastern side, the platforms for the high-speed line are located on the western side. The pedestrian bridge thus provides an explicit invitation to car drivers to get on board.

Little by little, the traffic volume of about 100,000 cars a day is to be reduced. In the future, more than 2,000 car parking spaces are planned for Køge Nord Station. This corresponds to an annual reduction of 80,000 kilometers of car trips, and circa 8,000 tons of CO_2.

For the architects of the Danish offices of Cobe and Dissing+Wetiling, »a good travel experience« was the guiding motto for the design. Travel and transfer between transport modes was not to be purely functional: it was to become a special experience. The exciting design of the bridge contributes to this. The external aluminum cladding reflects the materials of the neighborhood, and the enclosure with its expressive character protects users from climatic extremes. In contrast to the technical appearance of the exterior, the architects of Cobe and Dissing+Wetiling emphasized the value of a pleasant, aesthetically pleasing atmosphere in the interior. Following this logic, the 9-meter-wide, minimalistic tube is lined with oak slats. The transparent northern side of the bridge provides substantial daylight, while also offering passengers a 180-degree panoramic view.

Location Køge, Denmark Completion 2019 Client Banedanmark, DSB, City of Køge Design Cobe, Dissing+Weitling In collaboration with Cowi (engineering), Bladt Industries (aluminum façade)

Following the design maxim »the good travel experience,« the journey and the transfer should not only be functional, but also become a memorable experience.

The futuristic, 225-meter-long, enclosed pedestrian bridge, which is an eye-catching landmark visible from afar, spans across Køge Bugt Motorvejen.

In the future, more than 2,000 cars will be parked at Køge Nord station—this would correspond to an annual savings of 80,000 kilometers in car trips, and thus of circa 8,000 tons of CO_2.


Køge Nord

Chattarpur, MMI

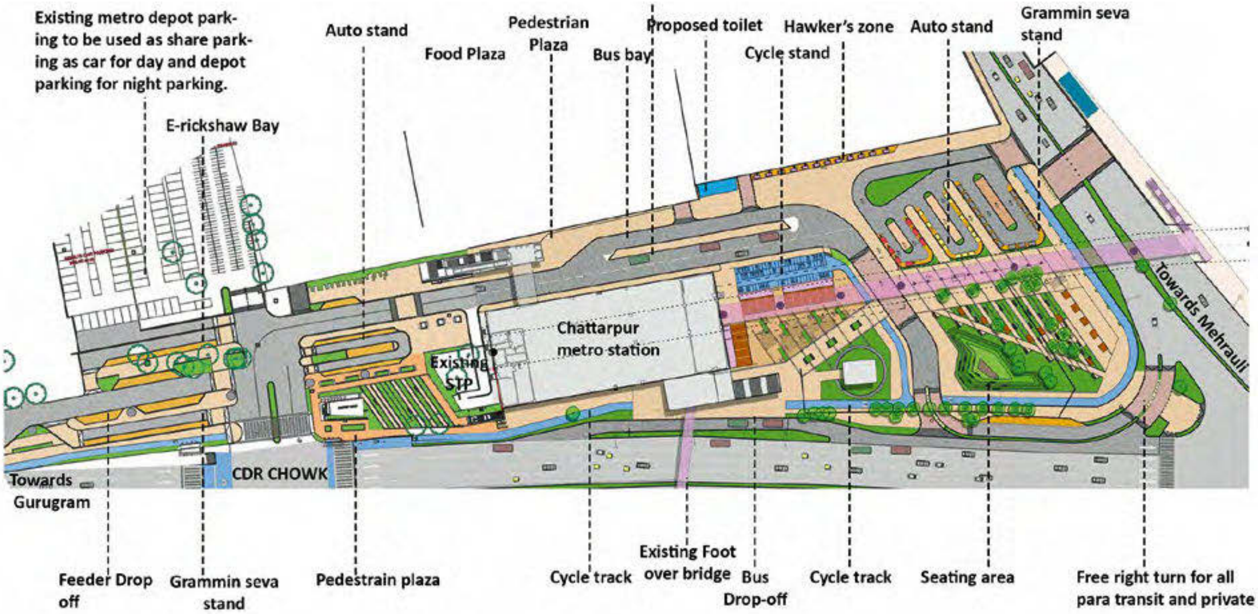
Delhi's transportation system is based on a multitude of motorized and non-motorized individual, municipal, and regional transport modes. In the past decades, a number of metro lines were introduced in the capital region; but with stations often being located directly beside large roads, they were practically inaccessible. In order to serve the enormous demand for first and last mile trips around transport hubs, a great number of para-transit services were set up—that is, auto and cycle rickshaws, minibuses, and app-based pickup and taxi services.

But this was problematic. At heavily frequented stations, some serving more than 100,000 people per day, chaotic traffic jams often occur, which not only interrupt street traffic, but also prevent easy access to the metro.

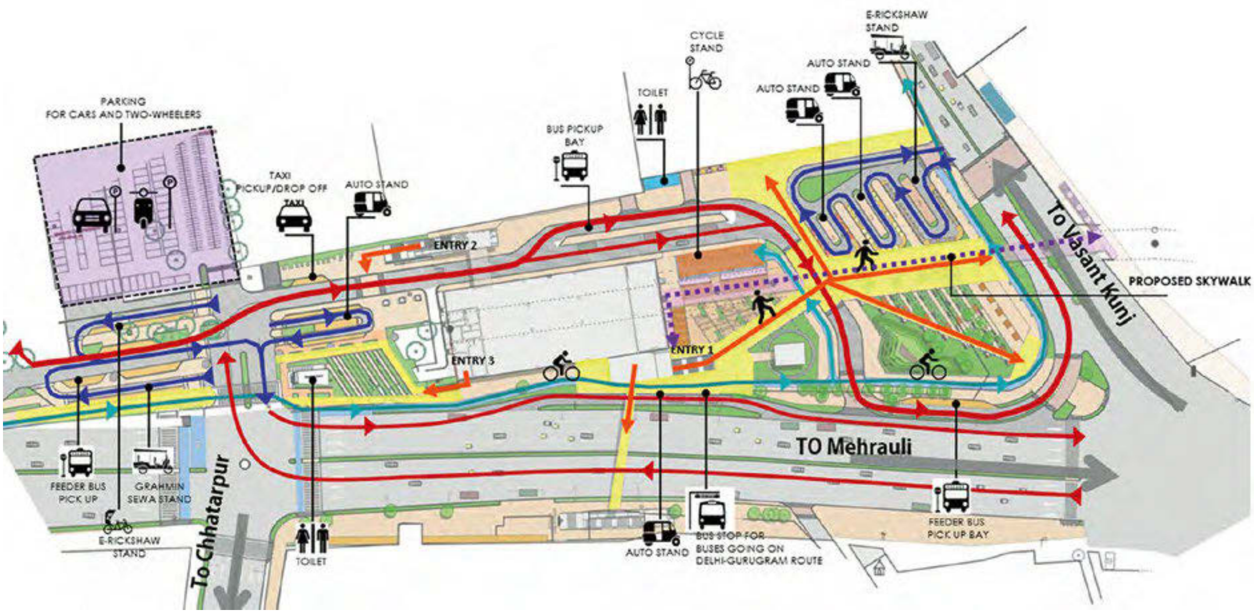
One solution that provides for a more manageable situation is multimodal integration (MMI) of all modes of transport; such an MMI concept was implemented as a pilot project at Chattarpur elevated metro station in South Delhi in 2016. The redesign of the station forecourt was realized at the initiative of the firm Oasis Designs from New Delhi, according to their planning concepts, which follow the guidelines of urban development authorities. The goal was to create a pleasant, modern, safe, and barrier-free environment—a seamless connection between the different public transportation modes, non-motorized transport, and private passenger vehicles. This is also intended as means of replacing car travel with more sustainable modes of transportation. In any case, cycle and e-rickshaws are often best suited for the generally short distances.

In order to develop an effective design for the urban space outside the station, planners first identified the needs and destinations of the more than 20,000 passengers per day. Using this data, Oasis Designs proposed a clear division of the forecourt and the prioritization of pedestrians, cyclists, and public transport services. In addition to a spacious and green pedestrian area with amenity areas and kiosks, bicycle stands and a bike rental service were provided. Thanks to separate pickup and drop-off platforms for auto and cycle rickshaws, passengers can board available vehicles in an orderly manner. This project spurred a change in strategy among public agencies, who now view the space between the metro station and the street as a unit—a model that is setting an example in India.

Location Delhi, India Completion 2016 Client Delhi Metro Rail Corporation (DMRC) Design Oasis Designs (consultancy firm for master planning, architecture and landscape design)



Master plan



Proposed planning showing movement patterns

Thanks to separate pick-up/drop-off platforms for auto and cycle rickshaws, travelers can board the vehihcles in an orderly manner.

Spacious green pedestrian areas with a pleasant atmosphere make the area around the station a public place that invites people to linger.

Bus Station Tilburg

At night it shines and illuminates the bus stops, while during the day the sunshine is filtered through its semi-transparent material: the roof of the new bus station in Tilburg not only has a futuristic look, for at the same time it also makes an ecological statement, since the solar roof provides for all the station's energy needs.

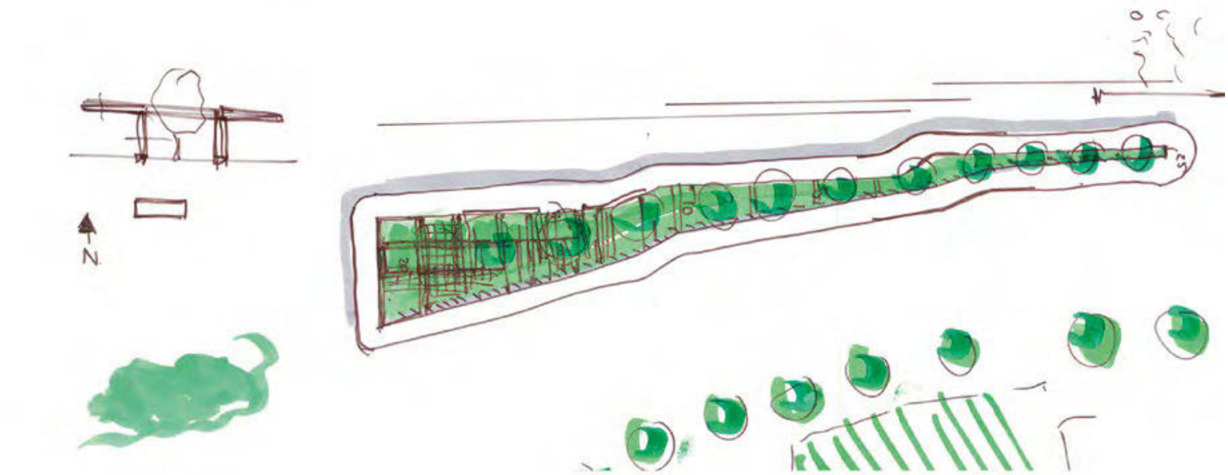
In connection with the renovation of the Tilburg train station, the bus station was conceived as a thin steel structure by the architects of the Delft firm cepezed. They were responsible for the entire project, including the modernization of the train station building and the design of a new bike parking area.

The somewhat amorphous, elegant roof runs for about 160 meters along the west side of the train station, hovering like a light ribbon over the bus stops and partly over the buses, thus protecting passengers from the weather as they board and disembark. Between 14 and 30 meters wide, it opens up in the middle in three places, allowing sunlight to reach the planting beds below. At the west-facing end is a pavilion that provides a break room for the bus drivers, a public information point, a commercial unit, and public toilets. Heating elements are integrated into the strip-steel seats, which are placed between the concrete benches.

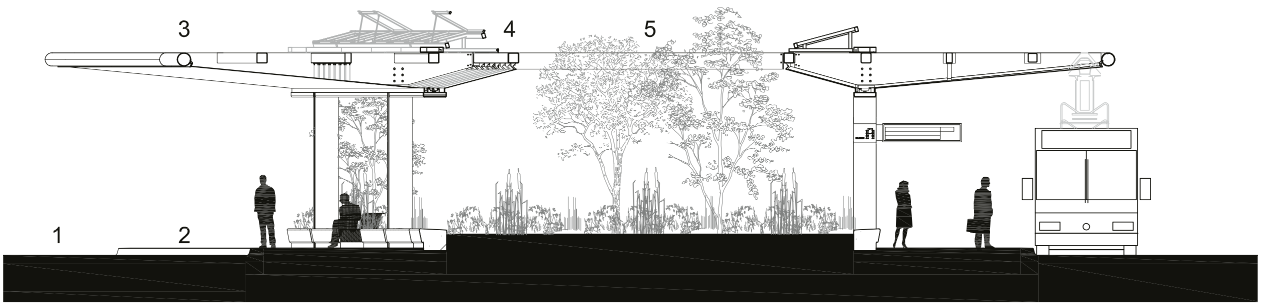
The roof-mounted photovoltaic equipment, with a total area of 250 square meters, provides electricity for all areas of the bus station, including lighting, digital displays, seat heating, and the staff room. Only the commercial unit has a separate power connection.

In order to conserve resources, the architects of cezeped designed the structure so that as little material was used as possible. For example, u-profiles and flat profiles house technical services. High-performance materials such as the self-cleaning ETFE foil used on the roof reduce maintenance requirements.

Location Tilburg, the Netherlands Completion 2019 Client City of Tilburg Design cepezed In collaboration with IMd Raadgevende Engineers (structural engineering), Nelissen Engineering Office (consulting on mechanical and electrical engineering, building physics, fire safety and sustainability), Atelier Quadrat (landscape architecture, urban planning), Atelier LEK (lighting), BAM Infra bv (main contractor), Buiting Staalbouw (steel construction), Hoppenbouwers Techniek (installations), Buitink Technology (ETFE – foil cushion roof)



Concept sketch



Section through the Awning: 1 Bus lane, 2 Platform, 3 Awning, 4 Solar panels, 5 Landscaped garden with all-round seating edge

Heaters are integrated into the strip-steel seats.

At night, artificial light shimmering through the film gives passengers a greater sense of security.

The photovoltaic system mounted on the roof renders the station energy self-sufficient.

The spacious projecting roof covers the entire bus platform and part of the bus lane. Travelers embark and disembark protected from the weather.

Central Bus Station Freiheitsplatz

Hanau is a middle-sized city in the greater Frankfurt area, about 20 kilometers east of the city on the Main River. The existing central bus station had numerous deficiencies in respect to contemporary requirements for security, functionality, and contemporary spatial quality. For this reason it was fundamentally redesigned. Previously used only as a bus station and parking area, this central inner-city location was transformed into a public plaza, which in addition to its function as a transport hub is also an urban space that invites people to linger.

Therefore, it was necessary to guarantee freedom from barriers, to avoid hidden areas, and to ensure through the lighting design that even after dark people feel secure and the plaza can still be clearly perceived.

A close collaboration among architects and engineers, transportation planners, landscape architects, and municipal partners was the basis for the successful planning and implementation. The layout derives from the typology of the historical, tree-lined esplanade. Only used in part as a bus station, Freiheitsplatz (Freedom Plaza) is designed as a unified whole. As part of this concept, a total of forty Japanese pagoda trees and tulip trees were planted across the entire plaza, even by the bus platforms. On an abstract level, this concept incorporates not only the existing trees but also the bus stop canopies. These spread out at different heights like umbrellas. With their green and yellow-green tinted glass roofs, they create special lighting atmospheres and richly varying light and shadow interplays, according to the time of day and the weather. Roofs and trees come together to form a great green roof that stretches across the entire plaza. Illumination on high, slender masts is complemented by lights embedded in the underside of the roof along the edges. Barrier-free use is ensured for the entire plaza through lowered curbs and a orientation system for the blind, which was designed in coordination with the Society for the Blind and Visually Impaired. Transparent bus shelters, a fountain area, ample benches, and surface designs that distinguish between bus lanes and pedestrian zones through a coordinated paving pattern, are all features that make this bus station into a pleasant place to relax, for both passengers and local residents.

Location Hanau, Germany Completion 2015 Client HVE—Hanau Transportation and Waste Disposal Overall planning Schüssler-Plan Design netzwerkarchitekten In collaboration with Schüssler-Plan (transportation planning), Euler Engineers (structural engineering), club L94 (landscape architecture), studiocandela (lighting design)

Site plan

The glass roofs create special lighting atmospheres and richly varied light and shadow plays.

Lowered curbs and a guidance system for the blind ensure barrier-free use of the entire plaza.


Freiheitsplatz
15:51
Steig B2
H
B2
16 min
12 Ikea
3 August-Schärttner-Halle 24 min
Kreishandwerkerschaft und A.-Schärt

The lighting concept provides
a sense of security after dark.

Concept sketch

BRT—MOVE Stations

The Bus Rapid Transit System (BRT) that was developed in the southern Brazilian city of Curitiba in 1968, serves as a model for many large cities around the world. This system is based on the concept that buses only make limited stops along their route in order to reach their final destination more quickly. Special bus lanes, often laid out as the median strip between streets and highway lanes, ensure that buses don't get caught in traffic jams.

In BRT systems, bus stops are often conceived so that passengers can board and disembark step-free. The gap between the bus and curb is only about the width of a hand, making boarding comfortable and barrier-free.

From 2012 to 2014, the firm of Gustavo Penna Architect & Associates developed bus stops for the MOVE BRT system of the city of Belo Horizonte in southeast Brazil. Following the motto »just another bus,« the architects conceived of a sheltered bus stop that itself looked like just another bus in the landscape, thus avoiding an additional visual distraction in the urban environment. The design for the MOVE stations is supposed to give passengers a feeling of modernity. To achieve this, the architects decided on a prefabricated building system of composite aluminum panels. The modules arrived at the construction site in one piece. The manufacturing methods and materials alone represent progress in Brazil, where much is still manufactured by hand. In addition, prefabrication and the modular approach meant that the BRT bus stops could be constructed quickly and within the limited budget. Material sourcing and module manufacture took place in the region—Brazil is one of the most important aluminum producing countries in the world.

To facilitate easy access to the bus stops, the modules were designed to be visually open. At the same time, it was important to give passengers a sense of security, achieved through the robust shell and the access-control turnstiles, among other measures. Inside, the modules are designed to be light and airy, allowing for a highly pleasant wait. Fresh air flows through perforated metal sheet on the sides, and light enters through large glass areas. Entry and exit via a ramp is inviting to cyclists, promoting their integration into the local urban transportation network.

Location Belo Horizonte, Brazil Completion 2014 Client City of Belo Horizonte Design Gustavo Penna Architect & Associates

To provide easy access to the stops,
the modules are visually open.

Inside, the modules are designed
to be light and airy,
creating a pleasant atmosphere.

»Just another bus«—an enclosed bus stop that looks like another bus in the landscape

Street Furniture City of Paju

To the north of Seoul near the North Korean border, the South Korean county of Paju was given the status of a city in 1997, and now 450,000 people call it their home. Due to the division of Korea into two countries, Paju looks back on a turbulent past and is still marked by the reconstruction that followed the 1950–1953 Korean War. The urban centerpiece of this reconstruction is the 1972 Imjingak Park, dedicated to refugees from North Korea. Together with the Freedom Bridge that leads across the Imjin River to the demilitarized zone, it represents the hope for reunification.

The city, with its still sterile new buildings, is to be given new, friendly street furniture. This furniture was developed by an international design collective, comprised of the German office of unit-design and the Paju-based South Korean graphic designer and typographer Ahn Sang-soo. Studio Dumbar from Rotterdam also collaborated on the corporate design, as did Hongik University in Seoul, where Sang-soo teaches as a professor. The collective designed a system from the ground up especially for Paju, consisting of paving, various seating units, benches, shelters, local transport stations, bike parking facilities, street lighting, signage systems, and even housing for the technical infrastructure.

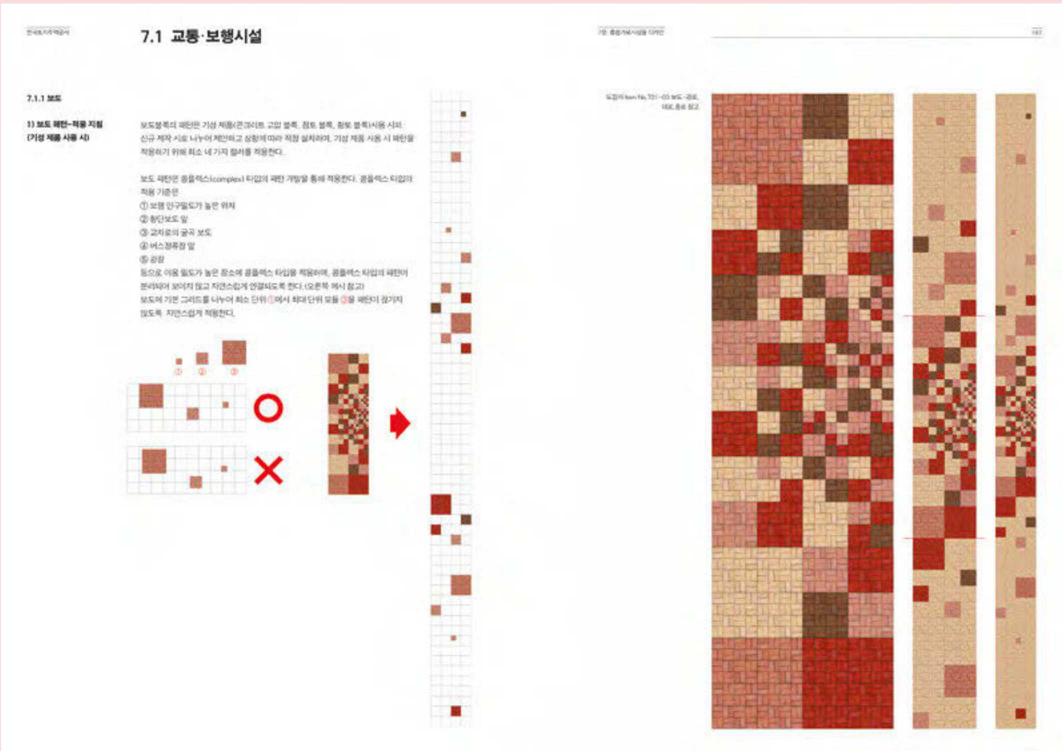
The main concept was that through the new street furniture residents would experience the »human scale.« Following this logic, the various shelters standing in front of the large new building complexes are supposed to set up spatial focal points. An additional design motif was the aspect of gesture. This has resulted in situations and places where residents feel protected, secure, and comfortable. The roofs of the transport shelters recall simple, rustic huts, while the benches resemble oversized pebbles—a symbol of meditation and peace in East Asian culture. Even the trash cans were designed in a friendly and open manner. The shape of the street lights also suggests pebbles and umbrellas. The look of the ground treatment was achieved using paving stones in reddish, brown to yellow tones, laid in richly alternating, rectangular bonds.

Even though some of the street furniture appears to be unique, through their materials, surfaces, and color scheme, they bear a familial resemblance, yet without following a strict design principle.

Location Paju, South Korea
Completion 2011 Client Humansia
Design unit-design (product design), Ahn Sang-soo (graphic design In collaboration with Studio Dumbar (communication design), Hongik University, Seoul, Director Joo-yeon Kim (consulting, planning, and realization)

Excerpts from the documentation of the Street Furniture System for Paju, South Korea, 2010, Hongik University, Seoul (Director Joo-yeon Kim)

From the first design sketch to the family of street furniture



Pavement designs. Densification at crossings

Bus stop

Benches in the form of giant pebbles

Covered bicycle stand

HOCH.BAU. KASTEN of the Glattalbahn

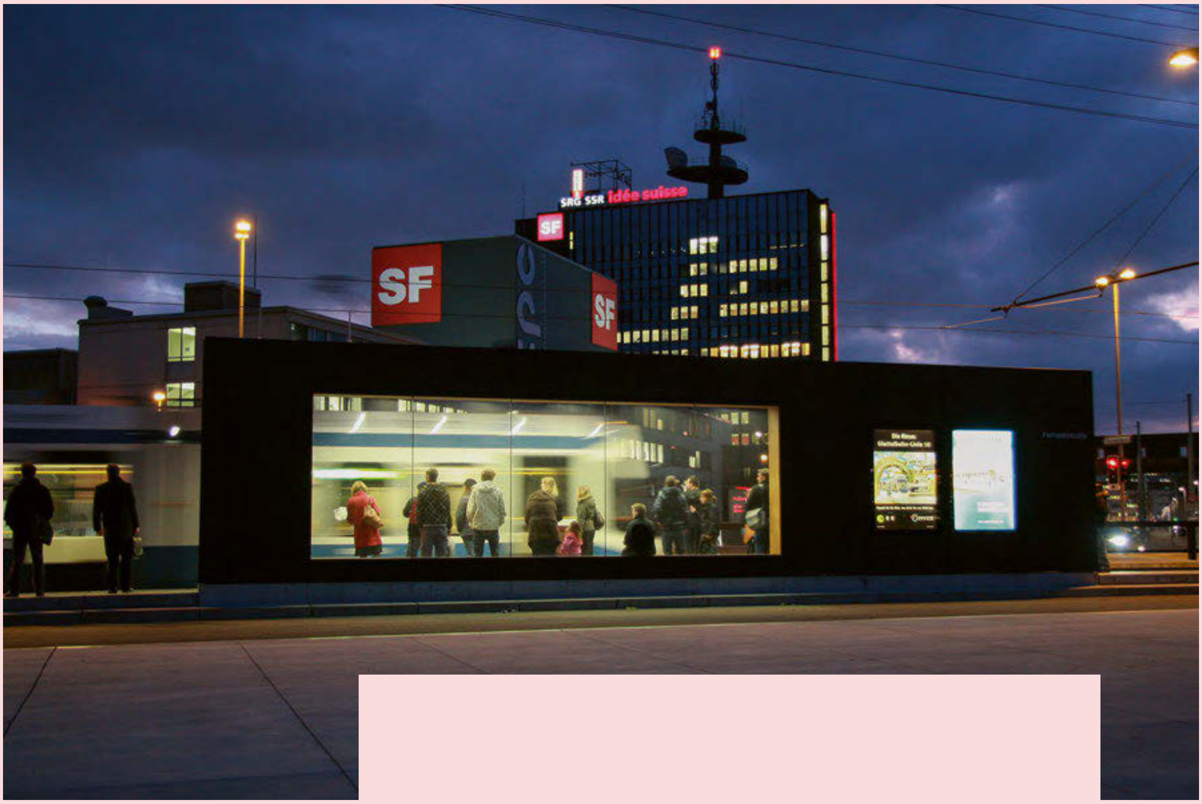
The Glattalbahn (streetcar line) connects the Districts 11 and 12 in the north of Zurich and the suburbs of Opfikon/Glattbrugg, Rümlang, Wallisellen, and Dübendorf with the public transportation network of the city of Zurich. In order to give the entire streetcar line a unified, recognizable look, a holistic design concept under the brand name HOCH.BAU. KASTEN was developed for rail lines, stops, bike parking facilities, track superstructures, civil engineering works, and overhead contact lines, all of which is coordinated down to the smallest detail.

This approach paid off, for despite comprising only a small part of the overall investment, these individual components have a decisive impact on the general impression made by the Glattalbahn. The design concept was for a modular system, on the one hand so that it could be adapted to the changing demands of the growing streetcar line, and on the other, so that costs could be reduced through serial production. Thanks to the interdisciplinary collaboration among all partners, this sustainable and integrated design concept could be readily realized.

The Glattalbahn acts like a common thread connecting places and urban landscapes, so that the stops act like business cards: these are the interfaces where rail line and passenger meet. The architect Kai Flender designed the HOCH.BAU.KASTEN for these stops to reflect the urban space: simple, striking, elegant. All stops in the Glattalbahn system are of the same dimension and construction, with the exception of the airport stop. They are distinguished by the distinctive, anthracite-colored structural assemblage of the streetcar stop shelters, which protects from weather and integrates all functions. It consists of a hollow, 44-centimeter-deep wall that supports a cantilever roof. This element contains everything that a streetcar shelter needs: ticket machine, travel info, advertising spaces, trash cans, loudspeakers, electrical and data cabinets, plus benches made of larch wood. In addition, it also incorporates the »window on the city.« This is a recurrent component that appears as a 19-square-meter glass pane, which offers passengers or those waiting a view of varying scenes, connecting each stop with its surroundings. It is the symbol of the Glattalbahn and contributes to the collective identity of the Glattal area. In addition, the HOCH.BAU.KASTEN includes bicycle parking facilities, which are also characterized by this understated design.

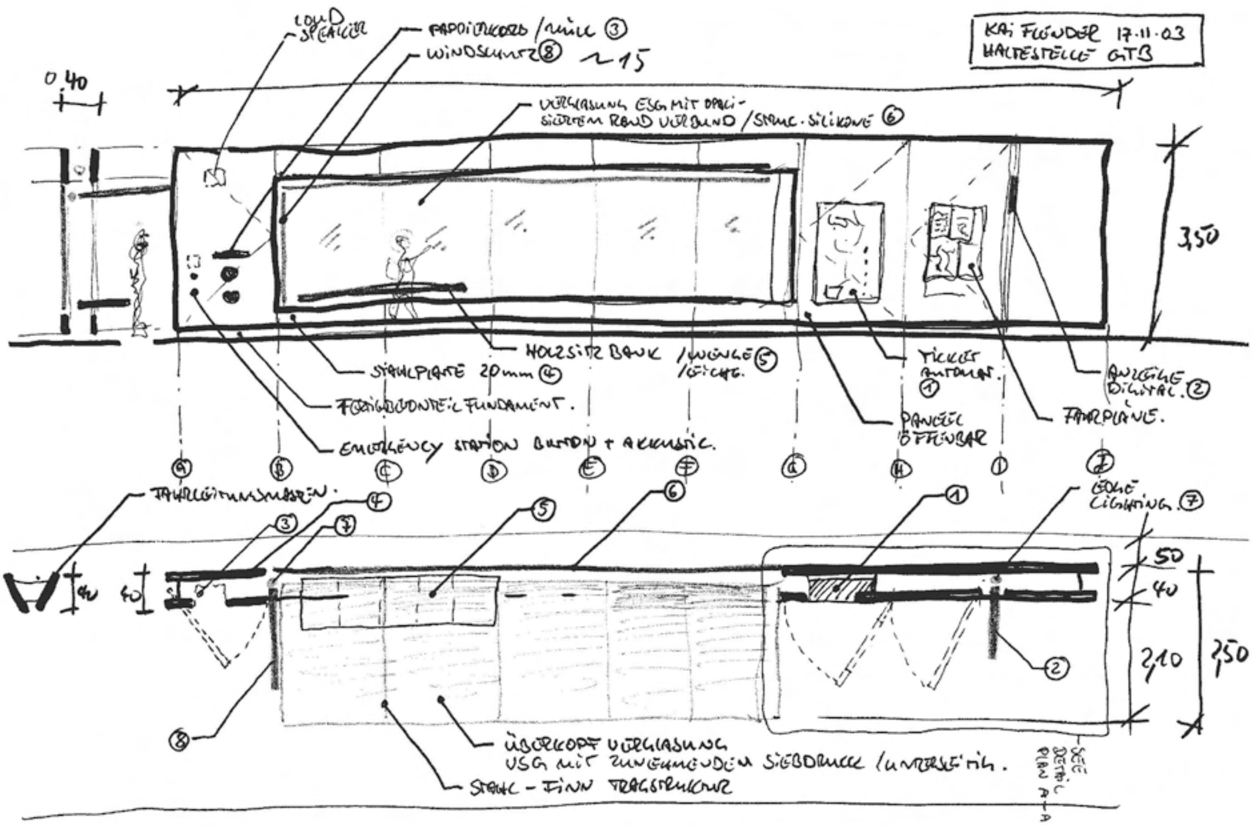
Location Glattal (Zurich metropolitan region), Switzerland Completion Phases 1–3: 2006-2010; Phase 4: 2030 (planned) Client and overall management Verkehrsbetriebe Glattal AG (VBG) on behalf of Zürcher Verkehrsverbund (ZVV) Design Kai Flender (architect) In collaboration with Gruner Wepf AG, Heierli, Hydraulik AG, DSP, Basler&Hofman, Jauslin und Stebler, Synaxis, Preisig AG, Henauer Gugler (engineering); Gresch Partner, Raum + Umwelt (environmental planning); Rosenthaler + Partner AG (project management); Feddersen & Klostermann (urban planning and design team management) Manufacturer Burri Public Elements (transport stop infrastructure); Furrer + Frey (overhead contact lines)

The »Window on the City« after dark



The main element comprises everything that a streetcar stop needs.

Integrated bench made of larch wood



Design sketch by Kai Flender

Nørreport Station

With nearly 250,000 passengers per day, Nørreport train station in Copenhagen is not only the busiest intermodal train station in Denmark, but also a pioneering project for an internationally leading bicycle city. Opened in 1918, this train station has evolved since the nineteen-sixties into a heavily trafficked transportation node in the middle of the Danish capital. Previously, the urban, regional, and long-distance trains as well as the metro ran underground, while the plaza above was dominated by an almost chaotic interaction between the different transportation modes. Passengers and cyclists were often at a disadvantage, for they really had to struggle with cars and buses to reach the train station below ground.

The new, straightforward design blends harmoniously into the urban context. Car, bus, and bicycle traffic is now organized so that the lanes are easy to understand and follow.

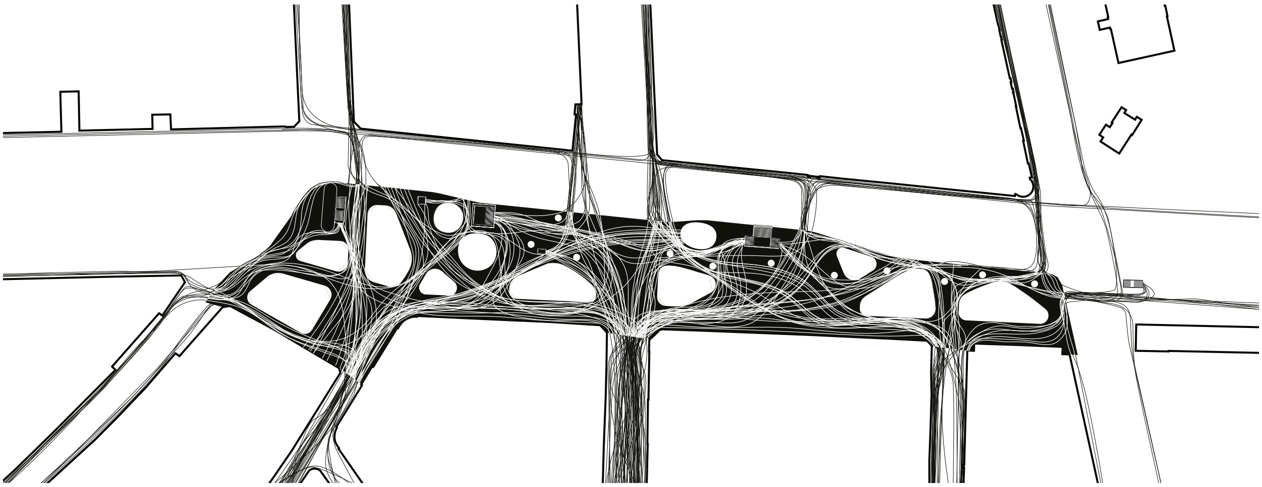
This came to an end in 2015. As a joint venture, the architects of the offices of Cobe and Gottlieb Paludan were awarded the task of giving the plaza back to people, which they dealt with in a particularly creative way. As a result, today Nørreport Station is a truly inviting place, where pedestrians and cyclists have priority and the atmosphere is pleasant. The new, well laid-out design includes bike parking and glass pavilions with broad, sweeping, green roofs that primarily serve to define the entry area to the train station, all of which blends in harmoniously with the urban scene. The traffic, comprised of cars, buses, and a substantial number of cyclists (in Copenhagen 60% of all journeys are by bike), is organized so that the lanes are immediately comprehensible and thus efficient.

Cobe and Gottlieb Paludan began by conducting a study of how pedestrians and cyclists preferred to move through the space. Using the resulting data, they laid out the main traffic lines between the bike parking areas and the six new pavilions. The lowered, clearly defined bike parking areas are a particularly interesting feature. As if in a basin, you slide down into the deeper sunken parking areas distinguished by special paving, where bikes can be secured to frames. Random bike parking has thus been brought to an end, and the space decluttered, since parts of the bikes in the sunken areas are out of sight. In addition, in extreme weather conditions these sunken areas serve for rainwater catchment. The lighting concept includes light caps on the bicycle bollards and illuminated ventilation columns with seating, thus providing orientation, security, and a pleasant atmosphere.

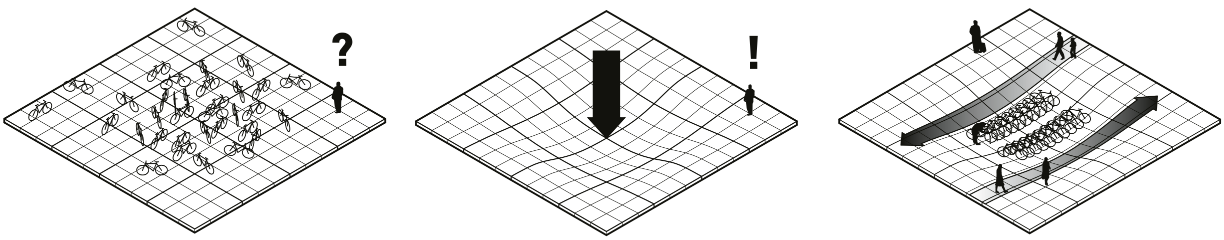
Location Copenhagen, Denmark
Completion 2015 Client City of Copenhagen, Banedanmark and DSB
Design Cobe, Gottlieb Paludan Architects In collaboration with Sweco (engineering), Bartenbach LichtLabor (lighting design), Aarsleff Rail (contractor)

Entrance to Nørreport
Train Station


TION



The planning was based on an analysis of preferred walking routes of different users.



Thousands of bicycles used to clutter the immediate vicinity of the station. The solution to this problem was to place the bicycles in slightly sunken areas.

Stationsplein Bicycle Parking

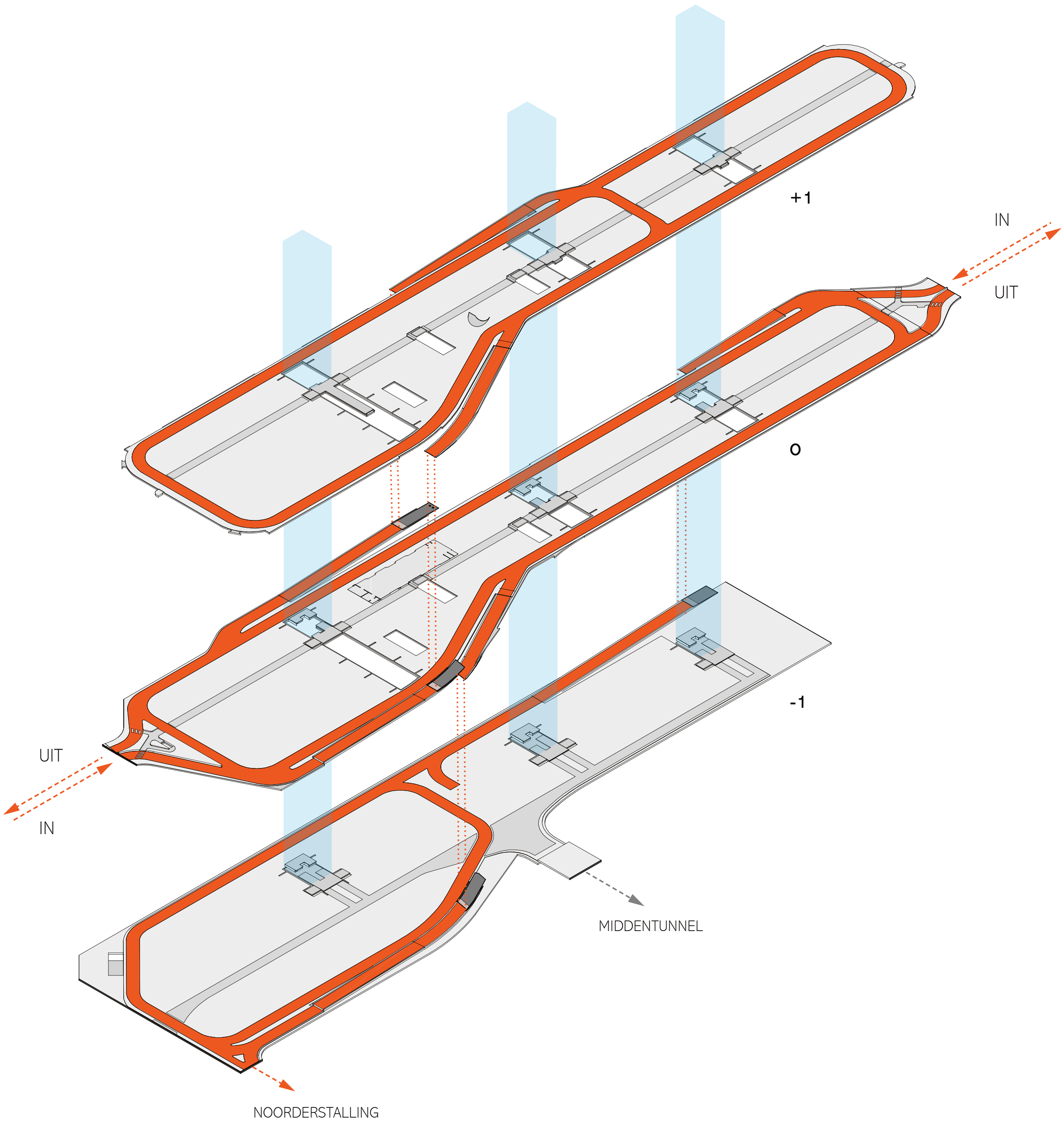
The Netherlands is a nation of cyclists. Thus it is no surprise that unusually innovative infrastructure for cyclists has been developed there. Since 2018, the bike parking garage in Utrecht has served as a model project. With a capacity of up to 12,500 bicycles, it's the largest drive-in bike garage in the world. Like the Moreelsebrug, a bridge solely for pedestrians and cyclists, it is part of the master plan for the city of Utrecht, which also calls for major traffic arteries to be removed and canals restored.

About a third of the 345,000 residents cycle every day. The train station area from the nineteen-sixties and seventies was a focal point of the master plan. The former megastructure, which connected the train station with the Hoog Catharijne shopping center, was deconstructed so that a new street, a plaza, and the bike parking garage could be created in front of the train station. This ensemble renders the replanning of the city visual and tangible through a symbolic form.

Comfort, speed, and safety were the maxims for this bike parking garage, which was built according to Ector Hoogstad Architects's sophisticated plans that ensured high experiential quality. Bike parking was thus made a truly pleasant experience for cyclists. They can ride right up to the parking space. Wide, gently sloping ramps connect the levels, while red one-way lanes marked with arrows are clearly separated from the parking areas. The walls are color-coded for better orientation, and traffic lights indicate where there are free spaces. The parking garage is open around the clock, and each level is monitored by security personnel. For the first 24 hours parking is free; charges only apply after that. Payment is automatic thanks to chipcards provided by the transport authority, which are scanned on entry. A bicycle repair shop and a bike rental facility round out the services.

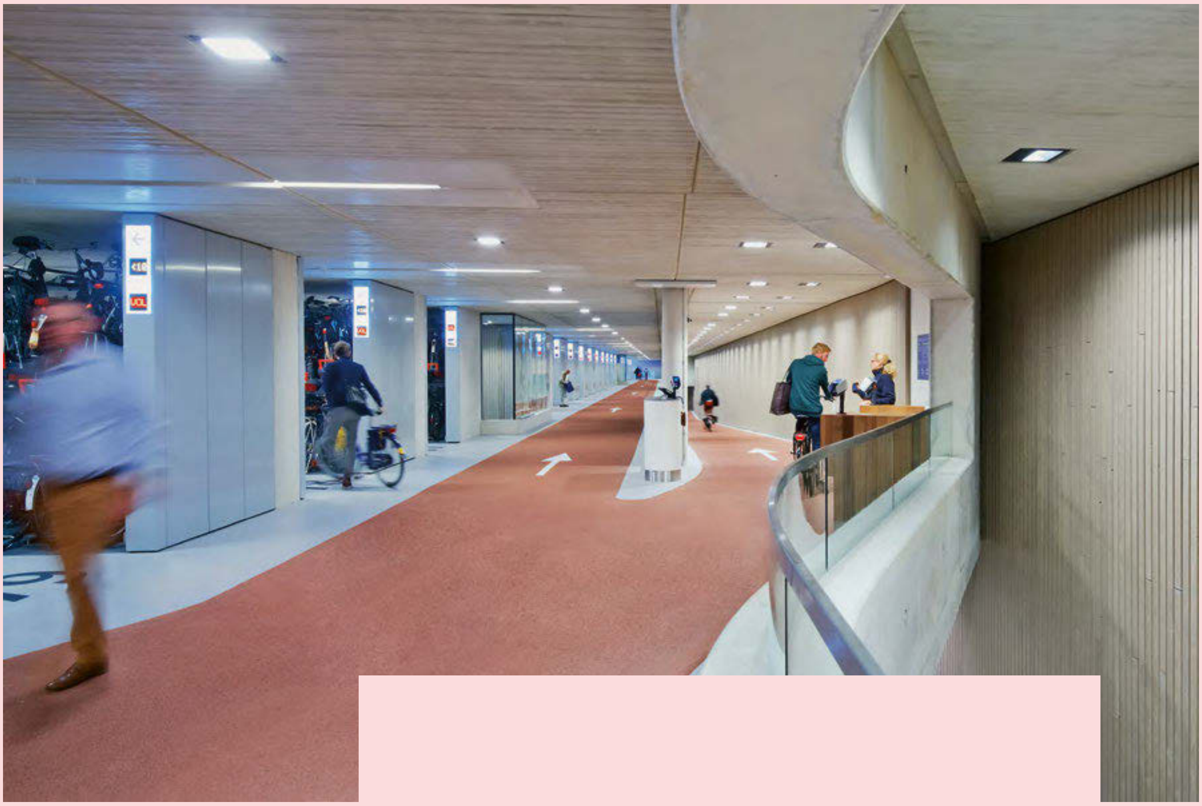
To help users orient themselves, the designers ensured that as much daylight as possible would reach the parking garage under the train station forecourt. This also creates a sense of security and well-being. Thus, large skylights flood the parking levels with natural light. Glass roofs make the stairwells and the tunnel just as bright. This is important, since the latter leads to the forecourt, the train station building, and the platforms. Particularly striking are the concrete columns that support the wide, projecting roof over the forecourt and continue down into the parking area. A material selection consisting of concrete, steel, and treated wood creates a comfortable, contemporary atmosphere.

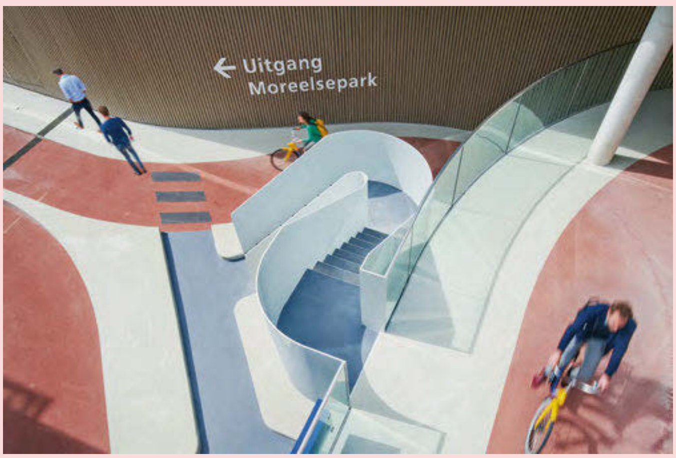
Location Utrecht, the Netherlands Completion 2018 Client City of Utrecht Design Ector Hoogstad Architecten In collaboration with Royal HaskoningDHV (construction management and installation consultation), DGMR (building physics), Arup (lighting advice), BAM Bouw en techniek (general contractor), Buro Sant en Co (landscape architecture)



Access roads lead from both sides to the middle level,
from where gently inclined ramps lead upwards or downwards.

Red one-way lanes marked with arrows
are clearly separated from parking areas.





Parking is made particularly convenient
for cyclists. They can ride right up to the
parking spaces.

Large skylights and good lighting
create a sense of security and comfort.

regiomove Ports

Intermodal mobility concepts make public transportation more efficient, climate-friendly, and, not least, more user-friendly. Whether in the city or the country: transportation is balanced out by distributing it among different transport modes. Traffic jams, fumes, and traffic noise are thus substantially reduced. On the other hand, rural areas can be better integrated into the public transport system. In addition, cities and communities are more flexibly connected with each other and surrounding areas through intermodal services.

A pilot project for intermodal mobility is now being implemented in Karlsruhe and its vicinity. Since 2017 under the motto »everything but beaming [up],« the regiomove concept has been tested step by step under the direction of the Karlsruhe Transportation Authority (KVV) and will be subsequently extended. To this end, mobility modes in the region, whether light rail, bus, car sharing, or bike rentals, will be combined into a seamless chain of mobility and service options, both public and private. The regiomove app, developed by the company raumobil, serves as the connecting digital platform. Users can individually and efficiently plan, book, and pay for their journey with the various mobility services. Changing between the apps of different providers is thus unnecessary. This new mobility network for the Karlsruhe region was made possible by the so-called regiomove pact, which unites the many mobility service providers. This project receives technical support from the Karlsruhe Institute of Technology (KIT) and the Karlsruhe University of Applied Sciences. Additional partners are the Forschungszentrum Informatik (FZI—Research Center for IT), the PTV Group, INIT Inc., raumobil, Stadtmobil, Nextbike, and the Middle Upper Rhine Regional Planning Association, the county of Rastatt, and of course the City of Karlsruhe.

An additional pillar of project support is provided by the regiomove ports: the mobility stations facilitate a pleasant transfer from one mode of transport to another. Here passengers can choose between light rail, bus, rental car, or rental bike. Taxis, shuttle services, and e-scooters are also envisioned for the future. In addition, the ports offer services such as lockers and bicycle repair facilities. Five offices were invited to a design competition for the regiomove ports. The Darmstadt office of netzwerkarchitekten together with unit-design from Frankfurt/Main were the winners. Additional support is provided to the team by Dr. Kreutz and Partner Engineers and by the scientific advice from the participating universities.

The regiomove ports will be initially tested for three years at pilot locations in the Upper Rhine region. As a leading project of the TechnologieRegion Karlsruhe, around 4.9 million Euros of funding were provided by the European Union and the State of Baden-Württemberg. In early 2021, construction of the pilot ports commenced in seven municipalities and communities: Bad Schönborn-Mingolsheim, Stutensee-Blankenloch, Karlsruhe-Hagsfeld, Ettlingen, Rastatt, Baden-Baden, and Bühl. The mobility options of the ports vary from place to place. If the pilot phase is successful, regiomove will be expanded to the entire region under the direction of the KVV.

At the request of the client, the team of netzwerkarchitekten and unit-design developed a uniform look for the ports so as to achieve high recognition value. In addition, a modular system was chosen in order to be able to build small as well as complex structures, and to enable the ports to be adapted to specific requirements and to the spatial configurations of the different locations. At the same time, the system allows for the creation of public spaces with small plazas, including entries and exits. Functions for cyclists on private or rental bikes and additional sharing services are integrated. A central element was developed for parcel stations, or information and advertising displays, which can be included within the different module configurations depending on specific needs.

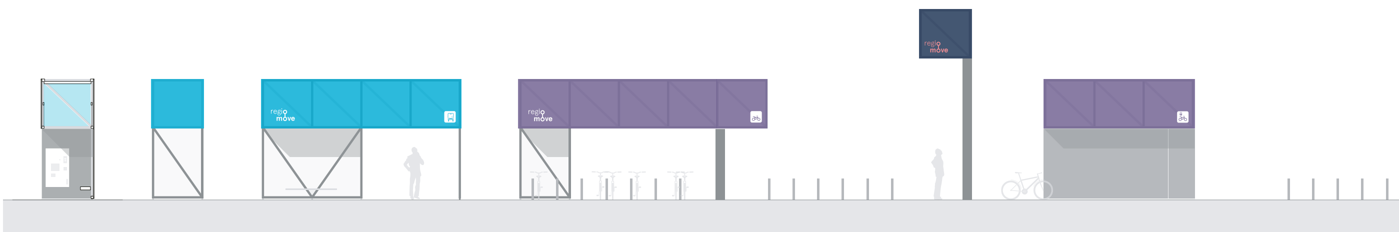
The »linear« design reflects the nature of the mobility system—the journey as a line: rendered visible through a series of colored roof elements, based upon a cubic form. As dusk falls, the elements are illuminated by integrated LED strips. The color system of the roof elements, consisting of laminated glass with translucent film, changes according to day or night conditions: either daylight shines through or they are internally illuminated. The individual colors signal the respective mobility service, while collectively they represent the entire system. The idea of the three-dimensional line of the regiomove logo was incorporated within the graphic designs: whether for the specifically developed color and pictogram system, or optionally, for overviews, maps, digital and analog information, and orientation systems. The ground surface is also designed to provide orientation through directional elements. Linear structures or flowing forms are created by changes in paving, which connect the regiomove ports.

Location Middle Upper Rhine Region, Germany Completion 2021–2022 Client City of Karlsruhe Design unit-design, netzwerkarchitekten In collaboration with Tragraum (construction engineers), Envue Homburg Licht (lighting design), raumobil (app and digital concept)

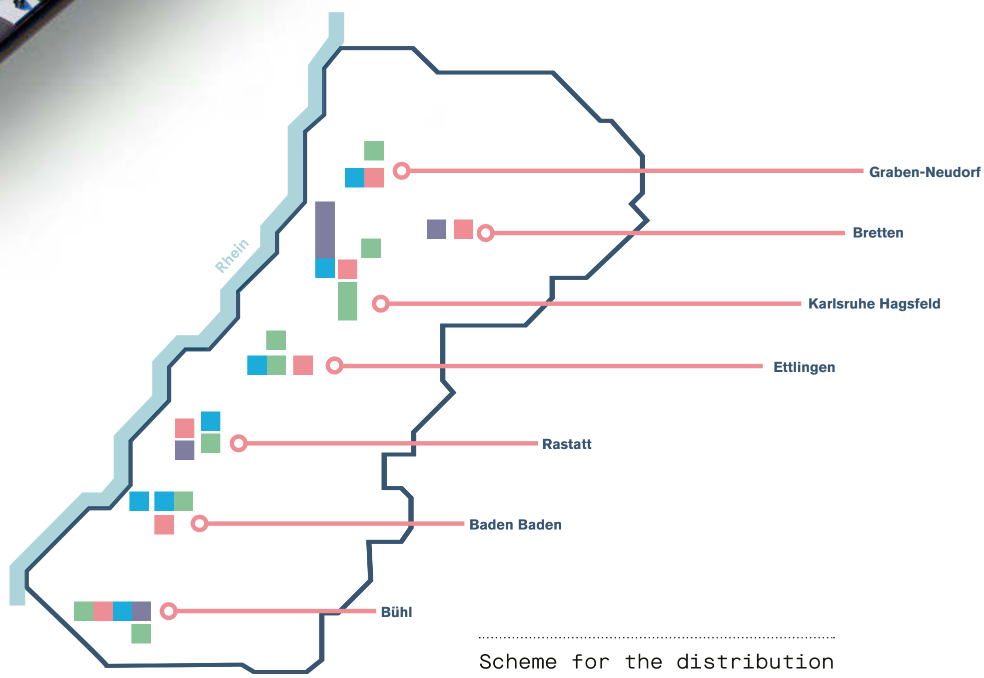
Vision of the port

Visualization of port landmark
with interactive info terminal

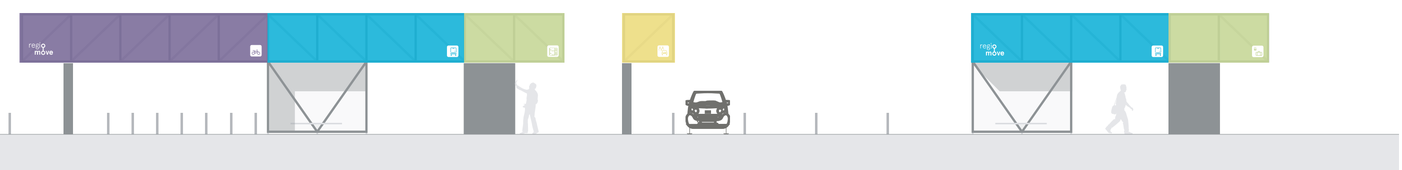
Graphical elevation and color concept

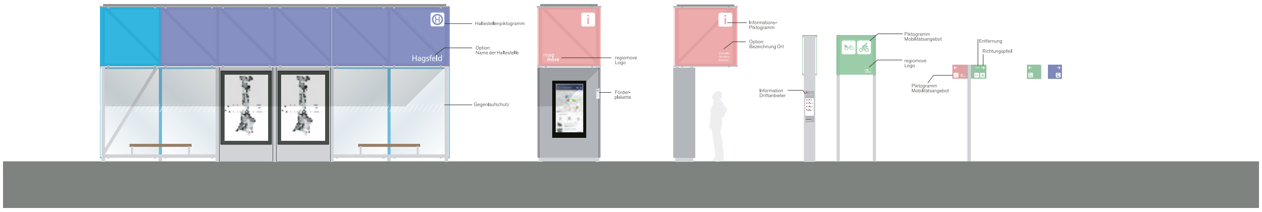


Interplay of analog and digital mobility services

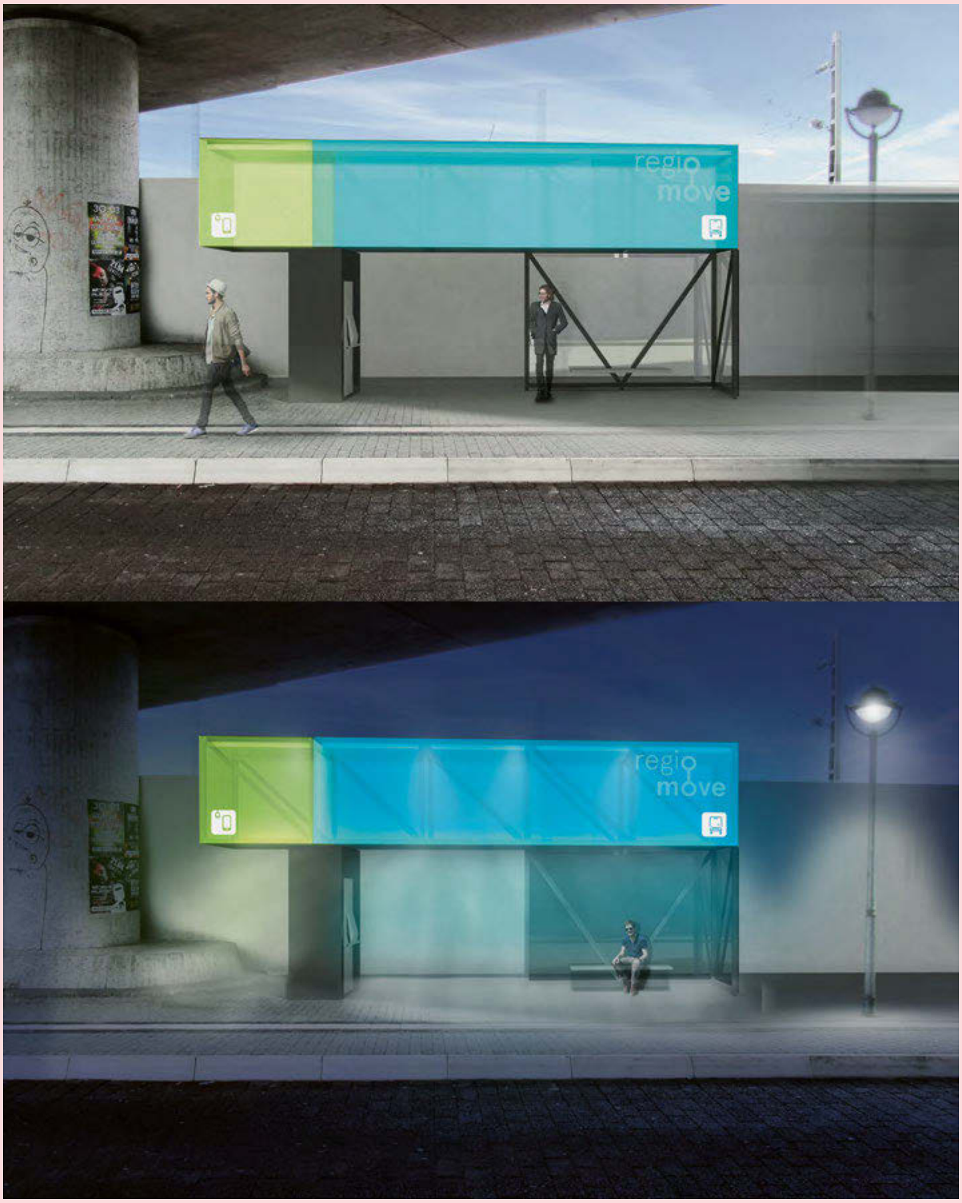


Scheme for the distribution and organization of services





Graphic concept



Design visualization of the Karlsruhe-Hagsfeld passenger shelter during the day and at night

Deutsche Bahn Service

DB Service Point

Through its Service Points, Deutsche Bahn has been presenting itself as a friendly, customer-oriented company since 2006. Developed by Dietz Joppien Architekten together with the unit-design team, these were conceived as direct contact points for passengers and those seeking travel info at Deutsche Bahn train stations. The team developed a modular system with three types: Solitary Service Point, Integrated Service Point, and Mobile Service Point. These information stands can be installed in different locations, such as in train station halls, in rooms, on the platforms, or on the interior façades of the train stations. Designed as a friendly gesture, with their prism-like faceted structural elements the DB Service Points reinforce the marketing image of Deutsche Bahn. In keeping with DB corporate design, colors and materials vary according to the type of service point, creating an unmistakable image. With the DB Service Point, an integrated solution has been found that combines all aesthetic and functional aspects: a positive atmosphere, workplace ergonomics, illumination and visibility, corporate design, structural stability, robust construction, and economical production.

Location Deutsche Bahn (German National Rail) train stations, Germany Completion 2006–2008 Client Deutsche Bahn Design unit-design (product design), Dietz Joppien Architects

Mobile Service Point

Solitary Service Point at Dresden Main Train Station

Deutsche Bahn Corporate Clothing

Following fifteen years of the same dark blue and red company uniforms, in 2017 Deutsche Bahn chose new outfits for their personnel in order to give the rail system a more modern, friendlier, and less formal look. A team led by fashion designer Guido Maria Kretschmer together with DB employees developed a number of prototypes, which were initially tested and improved upon. By August 2020, 45,000 employees had been issued the new outfits. Employees are able to assemble their own outfits individually by choosing from more than eighty items of clothing, following the »mix and match« principle. In this way, there is no longer any visual differentiation between the different positions, such as conductor or travel advisor. Dresses, polo shirts, and jeans were an absolute novelty. Burgundy (or service red) and blue run through the entire collection of new company clothing. The new red is easier combined than the old »DB traffic red.« Most importantly, this is also an advantage to passengers: well-dressed employees make a friendlier and more confident impression on customers.

Location Germany Introduction 2020
Client Deutsche Bahn Design Guido Maria Kretschmer (fashion designer)

Deutsche Bahn info graphic (as of: 05/2021)

Trainees in the hospitality division wearing the new company clothing

Employees of DB Long-distance Travel, DB Regio, DB Sales, and DB Station & Service Divisions in a group photo with managers of Deutsche Bahn

Copenhagen Metro

Since the end of the nineteen-nineties, Copenhagen has been developing one of the most advanced metro systems in the world. With this system, the municipal operating company, Metroselskabet, aims to offer residents and visitors the best possible transportation system. In part, this means minimal waiting times and shorter intervals; thus, relatively short trains are being introduced.

A special feature of the Copenhagen Metro is that it runs fully automatic, that is, without any drivers—and since 2009, it has even been operating around the clock. This is the basis for both the vehicle design and the architectural and design concept for the stations, which is virtually uniform throughout all stations. In addition, the Copenhagen Metro is considered a model project for integrative design, which addresses user needs such as efficiency, safety, and comfort as part of a universal design approach. For this reason, architects and designers were involved in the concept development from the beginning.

Since 2002, a segment of the overall project has connected the southeast with the west of the city, as well as the airport with the city center. However, the newest segments, a circle line that runs underground around the city center and a line serving the Nordhavn harbour area, were only completed in 2019 and 2020. Along four lines, a total of thirty-nine stations are served, twenty-six of which are underground. Plans include extending the M4 line to Sydhavn, the port south of the city center, and continuing it into the Nordhavn urban expansion area.

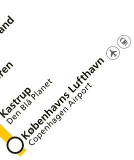
A Copenhagen Metro train is 39 meters long, 2.65 meters wide, and divided into three sections. Italdesign's train designs are distinguished by their radical, minimalist emphasis on functionality and clarity. The focus is on optimization for high passenger volumes and accessibility for people in wheelchairs or with baby carriages. Because travel times are short anyway, the train interiors provide relatively few wall-mounted seats, are open and spacious, and provide views through large windows at both ends of the train. Thanks to the simple furnishing that leaves the floors free, the trains can be easily cleaned and maintained. When Line M3 was opened, the number of seats was reduced even further.

If station stops are included in the calculation, the fully automated underground train moves through the city at an average speed of 40 kilometers per hour. The highest speed reached is 80 kilometers per hour.

Location Copenhagen, Denmark
Completion 2002–ongoing Client Ørestadsselskabet I/S, since 2007 Metroselskabet I/S Design Italdesign (vehicle design), Hitachi Rail STS (train system)

View from the driverless metro in the direction of travel.

Fully automatic and driverless metro train



Copenhagen Metro network plan

M1 Vanløse–Vestamager and M2 Vanløse–Københavns Lufthavn

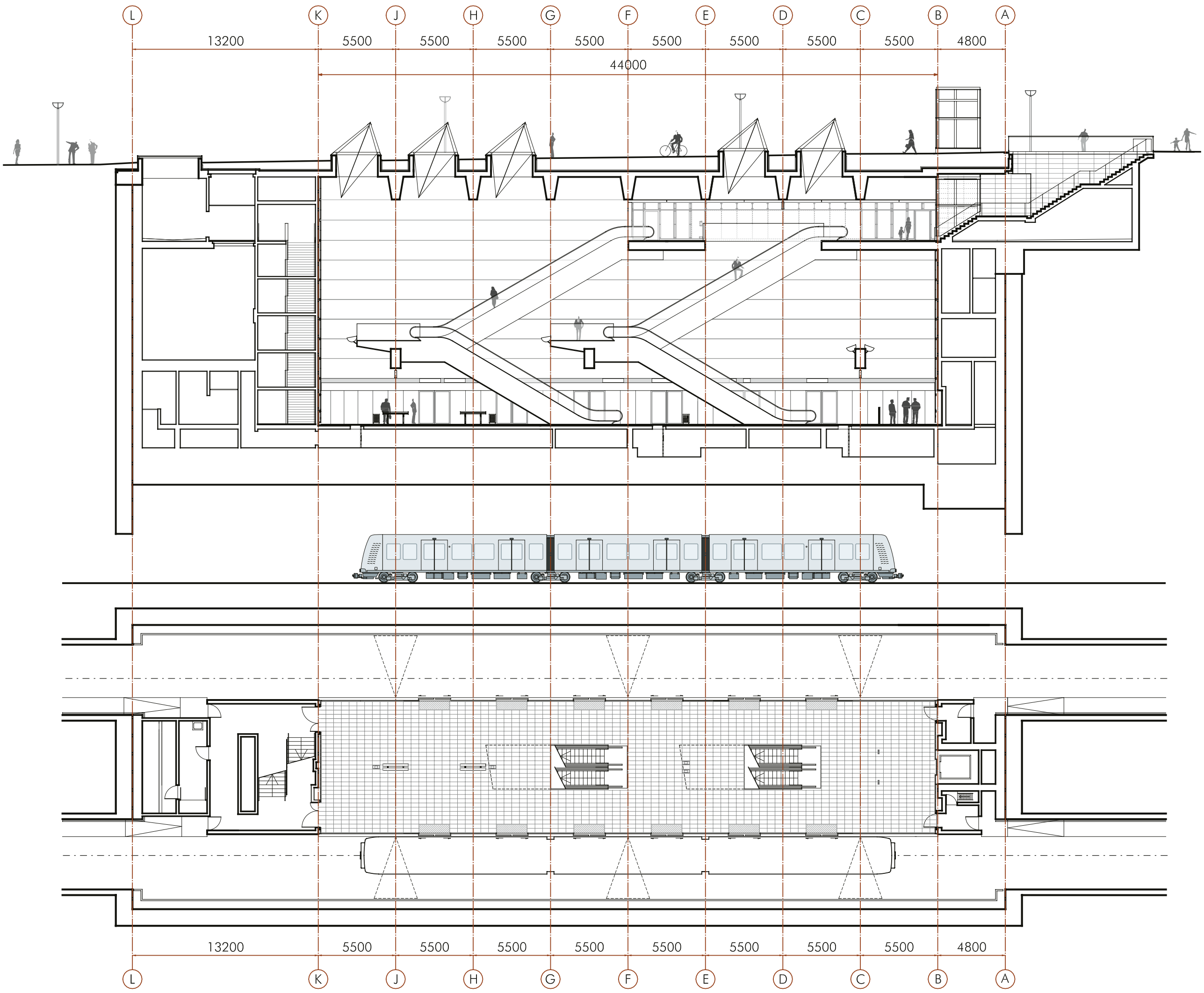
The Copenhagen Metro was opened in 2002 with the M1 and M2 lines connecting Vestamager and Ørestad south of the city center with Vanløse in the west. In 2007, the extension to the airport southeast of the city followed. In addition to the majority of stations, which are above-ground, in the city center there are nine stations that are about 20 meters below grade. The underground train stations are conceived as a compact system, whose dimensions are determined by the length of the trains, with a station layout optimized for an unimpeded passenger flow in narrow spaces.

The stations were designed by the office of KHR Architecture from Copenhagen. The main concept was a uniform design that combines a high degree of functionality and flexibility with ease of use. People should be able to orient themselves quickly and without difficulty—at every single station. To achieve this, all nine underground stations are the same in terms of organization, materials, and furnishings. From the street level, there is only one entrance leading into and one exit out of the train station—making orientation even easier. These simplified circulation routes, each with two escalators and an elevator at the entry and exit, ensure the best possible flow of passengers in the narrowest space. The stops have an open and clear design with minimal furnishing. For example, there are only supports for leaning against instead of benches, and electronic displays rather than info boards. For protection at the platform edge, there are glass walls with sliding doors, which open when the train stops. In addition, polygonal lighting columns that look like twisted pyramids allow daylight to enter the train stations. Reflectors intensify the incidence of light, and on sunny days the prisms of the glass pyramids diffuse the sunlight. This also contributes to a feeling of security and creates a visual connection between the underground and above-ground levels. In addition, the stations are easily visible from the walkways.

Architecturally, the stations were constructed as a simple, rectangular shaft. All components and technical elements comply with a 5.5-meter module, which is repeated both in the train and the tunnel cross-section. The appearance of the stations is dominated by an understated gray, resulting from the durable materials chosen: steel, glass, and granite. The avoidance of commercial and sanitary facilities helps to keep the stations compact and the costs low .

Completion 2002–2008 Client Ørestadsselskabet I/S Design KHR Architecture (architecture and planning of both lines) In collaboration with Cowi (overall project management), Rambøll, Grontmij/Carl Bro (engineering), Bartenbach Lichtlabor (lighting design), Holscher Design (industrial design)

Kongens Nytorv metro station



Lateral section through Kongens Nytorv Station

M3 Cityringen

For the seventeen stations of the Metro Line M3 Cityringen (the underground circle line), the planners of Arup have perfected the principle of unity. Repetitive structure and design provide for good orientation, with only a few train stations deviating from the norm in response to the location. Nevertheless, there is a significant difference between the stations of the lines M1 and M2. In contrast to the gray uniformity, here the interior walls are individually composed. Different material and color compositions play on details from the respective above-ground neighborhoods, such as the glazed tile roofs of local buildings, or the colors of the football club whose stadium the station serves. Passengers can thus associate train stations with their surroundings. The three train stations where passengers can transfer to the inter-city train are bathed in warm red.

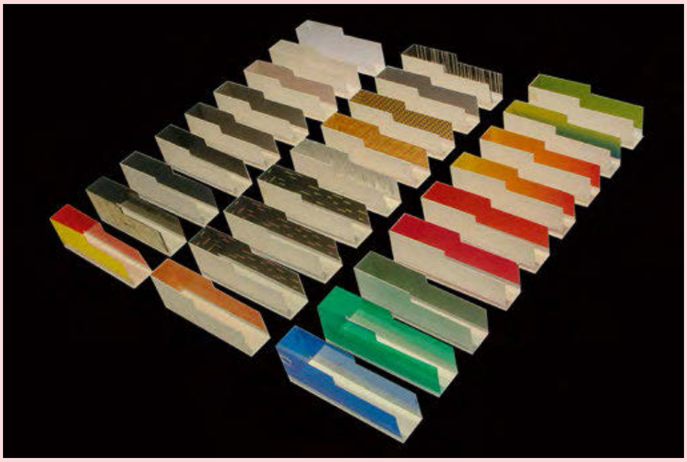
Aside from the differences in design approach, the Cityringen stations have even better lighting than either the M1 or the M2. Since a bright station is more secure, an emphasis was placed on lighting design. The light shafts were further developed; the ceilings of the underground train stations are inspired by Japanese Origami art, and their pattern supports the distribution of lighting. With the aid of strip lighting on the underside of the escalators, visual orientation is intensified for the stream of people. In order to increase the integration in the urban context, as is already the case with the M1 and M2, the exterior stairs leading into the station are often open, that is, without a roof. Escalators were generally not provided where stair runs are short. To compensate, the number of elevators was increased. Here, every underground station has two elevators that take passengers directly to the platform. In order to minimize the cost of constructing and maintaining the stations, the planners very carefully balanced modularity on the one hand with individuality on the other.

Completion 2019 Client Metroselskabet I/S Design Arup In collaboration with Cowi, Systra (multi-disciplinary technical advisors)

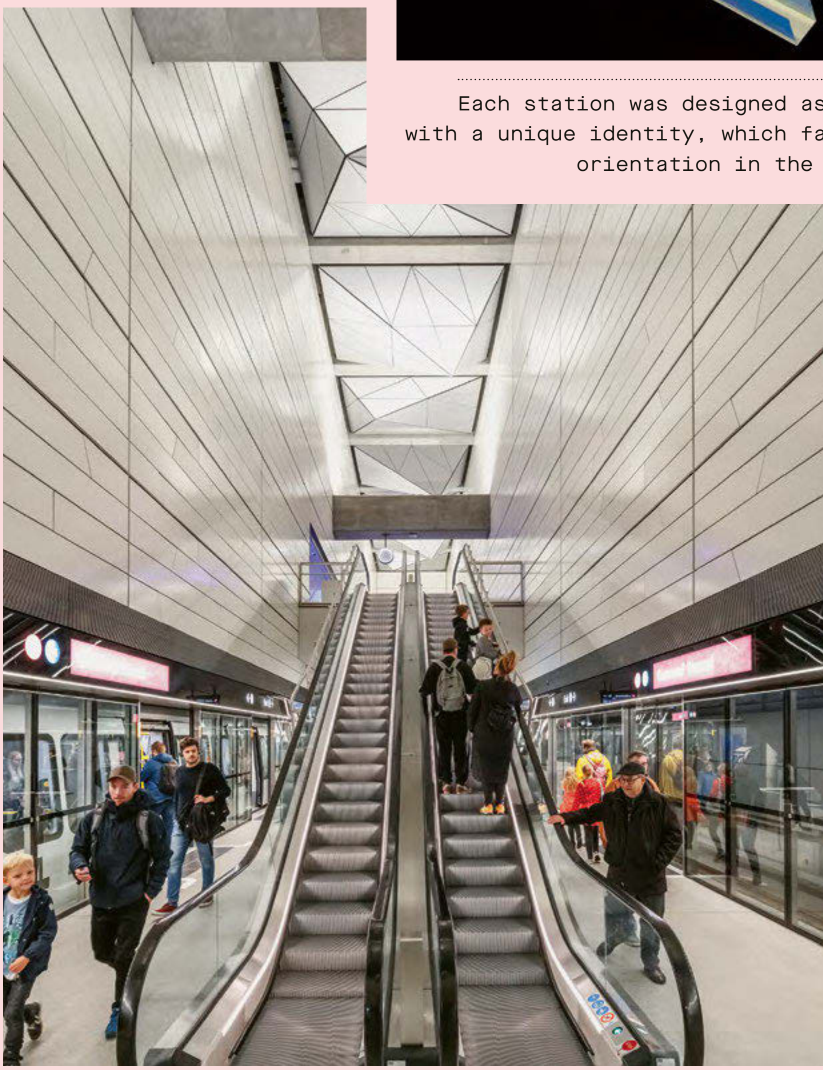
In order to strengthen integration into the urban space, the external staircases leading into the stations are usually open, i.e. without a roof.

Exit →
Exit →
Info

Stations where passengers can transfer to the urban railway are colored in a warm red.



Each station was designed as a kit of parts with a unique identity, which facilitates intuitive orientation in the metro.



Gammel Strand metro station

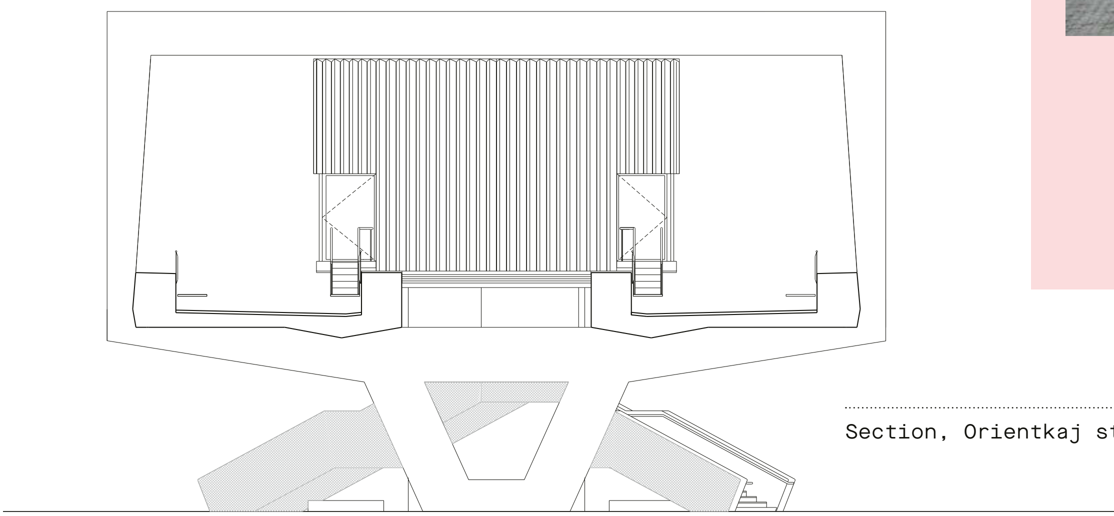
M4 Nordhavn

With the expansion of the Metro network in the direction of Nordhavn came two new train stations: an underground station for Nordhavn and an elevated train station for the temporary Orientkaj terminal station on the M4 Line. Both stations were designed by the Copenhagen architecture firm Cobe, in collaboration with Arup. The Nordhavn district is considered to be one of the largest urban regeneration projects in northern Europe. Orientkaj elevated station is thus seen as a prototype for additional stations in the urban development area—it is assumed that the line will be extended further. Up to now, the line has started at Copenhagen Central Station, run along the circle line, and then branched off to the northeast after Østerport station.

At Nordhavn Station the planners adapted the proven principles of the existing underground stations of the M3 Line. But since this is a transfer station for the urban railway, the mezzanine level doesn't just lead outside, but also through a tunnel to the existing aboveground inner-city train station. To create an intuitive, dynamic orientation system, the corridor walls were paneled in a zigzag pattern. As a result, passengers moving in the direction of inner-city trains or the exit look at a wall in different shades of gray. For people on their way to the Metro, the same walls appear in red tones.

At Orientkaj Station, the façade of the elevated station recalls a huge shipping container being hoisted by a massive crane. Two spiral concrete stairs, oriented according to the local situation, connect the platform with the forecourt underneath. The concrete beams and the V-shaped columns minimize the footprint of the station to optimize the urban space. In its scale and brutalist character, the architecture reflects the industrial past of the port area, while the interior design is softer. The Orientkaj is thus an unmistakable focal point—a box of glass, concrete, and aluminum offering a panoramic view over the port basin.

Completion 2020–ongoing Client Metroselskabet I/S Design Cobe, Arup In collaboration with RambøllArup JV (engineering); CAS JV (architectural finishes); Metnord (contractor); Sleth, Polyform (landscape architecture)



Section, Orientkaj station

The Orientkaj station was designed as a prototype for other above ground stations in the urban development area.

At Nordhavn station, the dynamic wall paneling changes color depending on which direction you walk.

Nordhavn station—towards the exit,
the dynamic wall cladding appears in shades of gray

Tours Streetcar

In August 2013, the first streetcar line entered into service in the French city of Tours and has since traversed the city in a north-south direction. Through its sophisticated design, it enters into a dialogue with its surroundings. Along the 15-kilometer-long Line A, a team of international artists, architects, landscape architects, urban planners, and designers, under the direction of RCP Design Global, implemented the idea of a »fourth landscape«—after the world-famous botanical garden, the historical architectural heritage, and the Loire River landscape.

Inspired by the results of a survey of residents, the team took into consideration the entire corridor along the streetcar line together with surrounding spaces. Train cars, train stations, street furniture, bridges, car parks, and the environs along the line were completely rethought.

Furthermore, the streetcar was to be easy to use and address the needs of passengers. Residents were able to vote for one of three vehicle types, with the »Cursor« being the favored choice. The mirrored exterior surfaces of the streetcars reflect the streets, buildings, plants, and the river. Two strips of light at the front complement the headlights, follow the lines of the rails, and emphasize the technological character of the streetcar, which slides through the city »like a cursor.« To make the entry and exits recognizable, both sides of the streetcar's double-doors are marked with seven black and white stripes, corresponding with the ground markings at the stops, which rise to form the 6-meter-high totems by French artist Daniel Buren. These are one of the seven artworks at the twenty-nine stations. These include among others, a tricolor pergola, a suncatcher, and a 7-meter-high, multi-color windbreak screen.

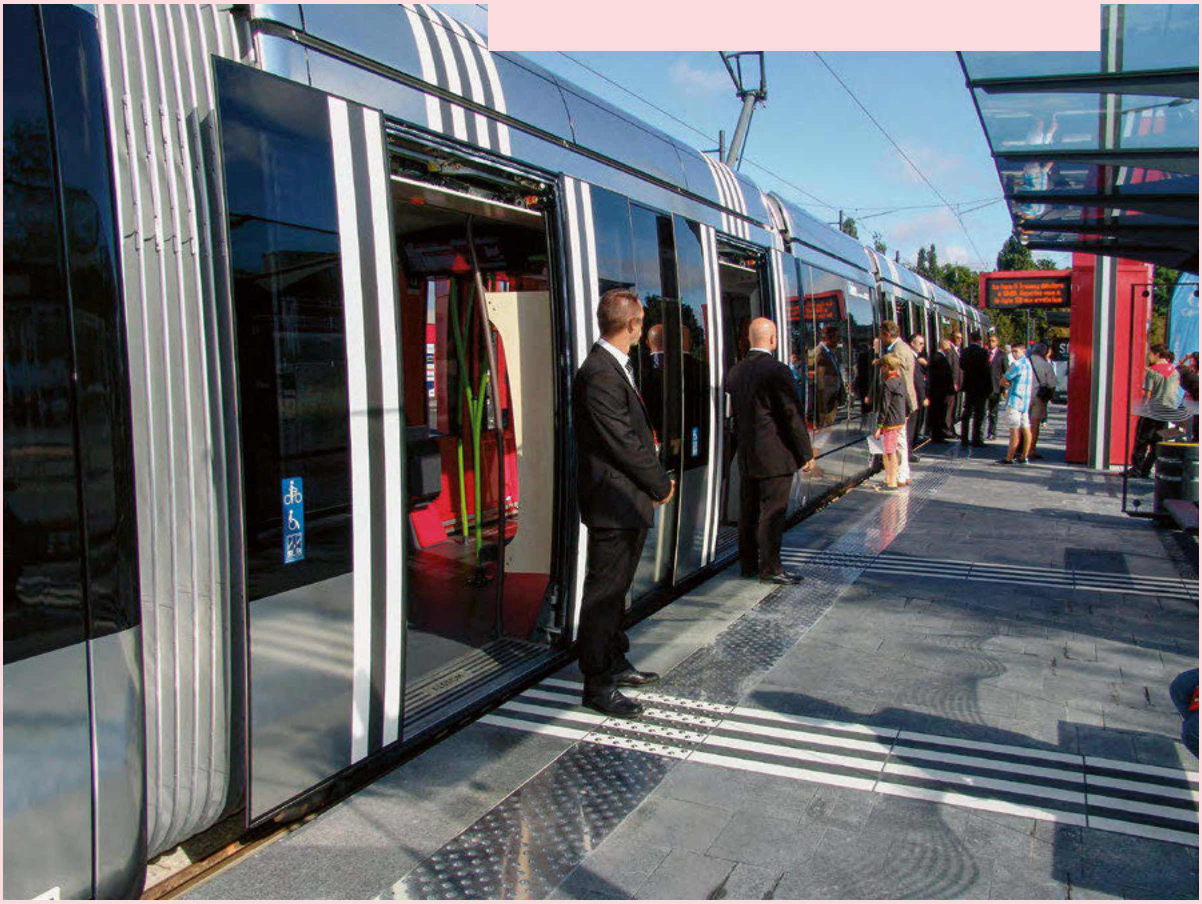
The experimental vibe continues in the interior: the asymmetrical design avoids the usual tunnel-effect and gives the streetcar a more spacious appearance. The comfortable side is finished with soft upholstery and wooden elements in homage to the silk manufacturers of Tours, while by contrast, the »harder,« cool side features shiny surface materials. On top of that, the different grabpoles vary in texture according to their function. Most surprisingly, even the artificial light in the interior changes with the season.

Location Tours, France Completion 2013 Client Syndicat Intercommunal des Transports en Commun de l'Agglomération Tourangelle (SITCAT), Groupement SET/TRANSAMO désigné »Cité Tram« Design Régine Charvet-Pello and RCP Design Global (director and public transportation design), Daniel Buren (artist), Roger Tallon, (industrial designer), Jacques Lévy and Serge Thibault (geographer and researcher), Patrick Rimoux (lighting artist), Louis Dandrel (sound designer) In collaboration with Systra and Xélis, Safège, Eccta, Richez & Associates

Rue Nationale, Tours

The mirrored exterior surfaces of the streetcars reflect streets, buildings, plants, and the river.

Two bands of light play on the lines of the rails and highlight the technological character of the »cursor.«



The stripes by the doors, which correspond to ground markings at the transit stops, are part of the artwork by Daniel Buren.

Suspension Railway Wuppertal

The Wuppertal suspension railway is one of the engineering gems of public transportation. Since 1901, the striking, internationally recognized steel structure has spanned the Wupper River and a number of streets in this city in North Rhine-Westphalia. From its twenty train stations, the suspension railway now serves 85,000 passengers per day, thus ensuring congestion-free movement along a 13.3-kilometer-long route running through the valley. Since 1997, this landmark of the city has been under a preservation order.

With the thirty-one new cars designed by the Berlin firm of büro+staubach, the Wuppertal municipal works department made its suspension railroad fit for the future in 2015. The goal was to design the cars to be more modern and comfortable than their nineteen-seventies predecessors, while maintaining visual continuity. They were nevertheless to appear traditional and timeless. For technical reasons, the dimensions and spatial configuration have essentially remained the same, drawing on their previous appearance. The front and rear windows that now slope subtly downwards are a distinctive feature. These give drivers a better view of the track, while passengers can enjoy the view through almost floor-to-ceiling rear windows. A dominant feature is the continuous band of windows, with protruding panes set in sculptural frames at either end. A uniform light blue color scheme on the exterior reinforces the clarity of the design.

Just as in the old vehicles, the passenger space is laid out asymmetrically, and despite the lower ceiling still seems spacious and open. This is largely due to the wider aisle in the middle of the vehicle and the white walls and ceiling, which join together in a curved cove. In addition to seating and standing room, a multi-functional area for baby carriages and wheelchairs is incorporated at both ends of the car, which greatly improves barrier-free access via a ramp behind the driver's door. To ensure optimal weight, the upholstered seats are designed as self-supporting molded wood shells, which avoid the usual frame construction. In addition to the basic anthracite color, the seat covers also take up the color of the flooring.

So that this generation of cars would also be perceived as a natural part of the cityscape, the designers avoided introducing any strong accents. However, the cars still have a contemporary look, thanks to their special materials and up-to-date equipment, such as the information displays and air conditioning.

Designation WSW GTW Generation 15 Location Wuppertal, Germany Completion 2016 Client WSW mobil / Wuppertaler Stadtwerke Design büro+staubach (vehicle design) In collaboration with Vossloh Kiepe and Vossloh España, PROSE, design & technics, Hammerer Aluminum Industries

Special details such as the asymmetrical composition of the front or the inclined windows at the front and rear give the monorail a modern appearance.

Passengers can enjoy great views thanks to the rear windows that extend almost floor to ceiling and the open arrangement of the seats.

The passenger compartment appears spacious and open despite the low ceiling.

The rear windows of the suspension railway

Metro Cable Medellín

The city of Medellín in Colombia is spread out over a valley flanked by steep hillsides. Construction on the hillsides often consists of informal settlements realized without official planning approval and characterized by poverty. The dense settlement patterns and topographic situation often make it difficult to connect them with public transportation. Large sections of the barrios, as the districts are called, had for many years no access to the Metro, the most important mode of transport within the city. The economic and social marginalization of greater segments of the urban population threatened to become more severe.

A solution to this problem was achieved within the framework of integrated urban development concepts that incorporate citizen input. A cable car system overcomes cliffs and gorges, connects to the Metro and the city center, and creates links to public transportation across the valley over obstacles that appeared insurmountable up to now. Medellín is one of the first cities to systematically incorporate a cable car system into their public transportation network, and to use it to better integrate informal settlements within the city.

However, cable cars not only allow for the creation of new and important connections; their operation is also cost-effective and energy efficient. It is not necessary to lay any track, and therefore very little ground area is needed. Cable car systems are light, and because speed can be adjusted to the flow of people based on real-time data, their operation is readily optimized. In addition, they are easily connected to other transport modes. And not least, every journey is an experience that offers fantastic views of the city.

Since the first cable car line was opened in 2004, four additional cable car lines have been erected in Medellín, and a sixth is already being planned. Up to 220,000 passengers per day can travel on the cable car system. Furthermore, the system is associated with an extensive educational and cultural program. Areas under the cable car lines are being developed as public places or important street connections, thus improving conditions in the barrios. The operation and expansion of these cable car systems is financed following the UN concept of climate protection through emissions trading. Because the cable car system saves about 20,000 tons of CO_2 annually, the city can sell emission certificates.

In the meantime, the cable cars have become a symbol of the city and a model for integrative and economically sound urban development.

Location Medellín, Columbia Completion 2004–ongoing Client City of Medellín Operator Metro de Medellín Urban planning Empresa de Desarrollo Urbano (urban development company) Manufacturer POMA

The areas under the cable cars are being developed as public spaces or as important road links.


Metrocable

San Javier Station, Medellín

Metro de Medellín network map with the integrated cable car lines

Every ride is an experience
offering great views of the city.

Electric Bus Irizar ie tram

Normally, a city bus is recognizable as a rolling box with an upright front and back. The Spanish company Irizar e-mobility, on the other hand, takes up the appearance of contemporary trams (streetcars) in its 2017 design for the Irizar ie tram e-bus and also promises that it will be comfortable. The »tram-bus« is indeed a new type of vehicle. It combines the advantages of a tram with the flexibility of a bus. Because exterior mirrors were replaced with cameras and screens and wheel wells were enclosed, it also has a decidedly minimalist appearance.

With minimal impact or noise, the electric bus blends into the urban environment. At the same time, its unusual exterior announces that it runs on electric power and is emission-free. Not least, the design creates an identity by reflecting the company‹s ambitions and allowing passengers to benefit from its claim to be a pioneer.

With a length of 18 meters, the articulated bus design holds up to 155 passengers, depending on the interior layout and number of doors. For every forty seats, four are intended for people with movement restrictions and there are also two to three wheelchair and baby carriage spaces. The version that is 6 meters shorter has correspondingly fewer seats. Entry and exit are barrier-free at all doors and can be further facilitated by an electrically operated, extendable ramp. The transition at the accordion joint is designed to be as even as possible, similar to low-floor trams. The interior space is bright and roomy, due in part to the relatively low frames of the side windows. If desired, improved passenger comfort can be achieved by adding USB charging stations, WLAN, braille buttons, luggage areas, information displays, and many other options to the vehicles.

All of the technology employed, such as the electronics and communications systems, the powertrain, the batteries and the charging stations, were largely developed by Irizar. The vehicles are fully charged in less than 5 minutes at each of the terminal stations. The company designed a highly energy-efficient air conditioning system. This ensures better comfort and less electricity usage.

The Irizar ie tram bus type is already operating in a number of cities in Spain and France, as well as in Schaffhausen in Switzerland. In addition, they are being tested in Germany in Hamburg and North Rhine-Westphalia.

Headquarters Spain Utilized in various European cities, e.g., Barcelona and Las Palmas on Gran Canaria (ES), Keolis–Orléons Metropole and Amiens–Amiens Metropoles (FR), Schaffhausen (AU) Introduction 2017 Design Irizar e-mobility (manufacturer)

The articulated electric bus takes the form of a contemporary streetcar.

The Irizar ie tram 18 m model can accommodate up to 155 people.

Interior of the Irizar ie tram 12 m model

The »tram-bus« integrates blends into the cityscape in an unobtrusive and quiet manner.

The joint section in the articulated bus is translucent, with additional illumination.

Laview

You might almost think that the interior of the Laview express train of the Japanese Seibu Railway Company was a comfortable hotel room: luxurious lounge chairs with plush upholstery, elegant long draperies, large panorama windows, and a charming warm-yellow color scheme. During the course of the day, the soft, indirect illumination adjusts to the natural lighting conditions. Travel time is a time for living—thus, passengers should be given a feeling of privacy and mobility at the highest level.

The train connects Tokyo with the west of the country. The journey from Ikebukuro Train Station to the city of Chichibu in Saitama Prefecture takes just under 80 minutes. For some time now, Seibu Railway has been offering special travel experiences along this route. In 2016, an older train model was redesigned as a restaurant. Both the exterior and interior were designed by Kengo Kuma. With its new vision, Seibu Railway is now preparing for the coming decades; in 2015, the company turned one-hundred-years-old. The name Laview points to the future; it stands for domestic luxury, lightning speed, and lavish views.

The new train was wholly designed by Japanese architect Kazuyo Sejima of the internationally renowned firm SANAA. However, the express train was not only to have a new appearance. Seibu Railway sees itself as the host along a rail route of outstanding natural beauty, with the Laview type offering beautiful landscape perspectives. From the exterior, the matt-silver train with its curved front and noticeably large windows looks like a time capsule that softly reflects its suroundings.

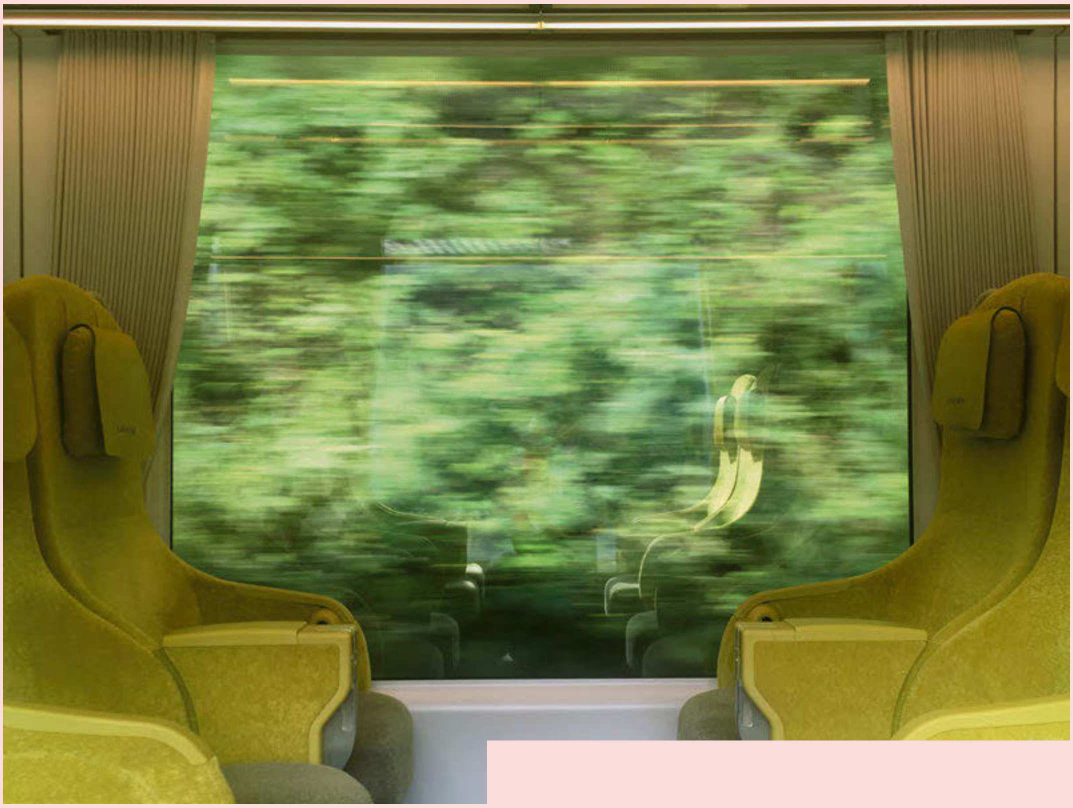
For commuters and visitors to the region, each train has eight cars with a total of 422 seats. As though you were in a comfortable lounge chair, you can curl up cozily in the seats, which are equipped with adjustable headrests, armrests, folding work tables, and small side tables. In addition to the spacious toilets with diaper-changing tables, another special feature on board are the separate ladies' toilets. In addition, there are so-called Powder Rooms, equipped with full-length and magnifying mirrors, vanity basin, hand dryer, and electric outlets; these can also serve as changing rooms. Free WLAN is available in all cars. Large infotainment displays above the compartment doors provide multilingual information about the journey.

Location Ikebukuro, Japan Completion 2019 Client Seibu Railway Design Kazuyo Sejima (train design / interior design) Design corroborators Yoko Ando (textile design), Shozo Toyohisa (lighting design), Yoshitaka Tanase (graphic design), Saburo Takama (mechanics) In collaboration with Hitachi (manufacturing and design), DENTSU, DENTSU-TECH (project coordination)

The sleek passenger compartment is lined with rows of comfortable seats.


Please do not leave anything behind.
한노우
4

Thanks to the luxurious armchairs and large panoramic windows, passengers can enjoy the scenery.



The large windows are typical for the train.

ioki

If on-demand mobility is the future of public transportation, then ioki is providing the required smart technical platform for it. This company from Frankfurt/Main is 100% owned by Deutsche Bahn and is positioning itself as the full-range service provider for new mobility platforms. With a team of ninety employees, including IT and transportation experts, software developers, and product designers, ioki is pursuing the goal of enabling individual mobility without private cars by means of a dynamic operating system for on-demand mobility, supported by digital technologies and networked services.

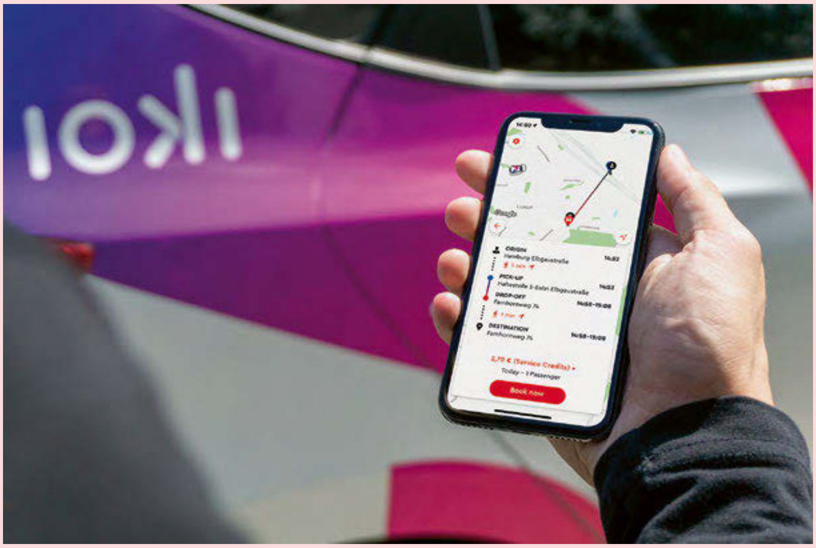
The ioki mobility analytics team identifies potential areas of application for demand-driven mobility solutions.

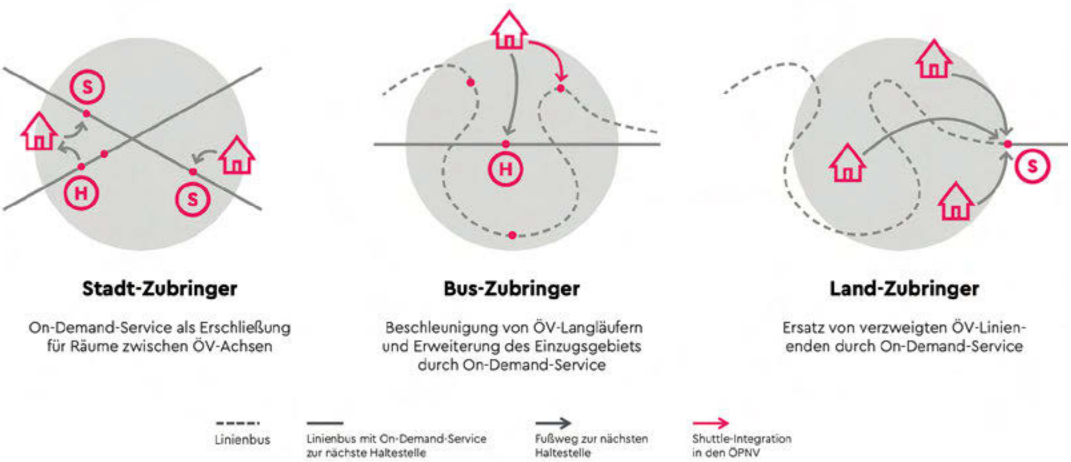
At the same time, this is intended to improve the attractiveness of public transportation. Ioki's product portfolio is primarily aimed at transport companies and municipal authorities in large, small, and medium-sized cities and in rural areas; it also offers transportation services for companies and their employees. The service provider's offering consists of a platform comprising a control center for the operator, a vehicle app, and a customizable passenger app that can be used to operate the on-demand mobility services as a white-label solution, each with its own name and corporate design.

Initially, the basis for the introduction of a new on-demand service is often data-based needs analyses. The company defines areas of application, simulates operation in advance, and assesses economic viability. The demand-oriented focus of the service aids transport companies in avoiding empty runs, saving on costs, and in reducing fleet sizes, while at the same time providing more mobility, thanks to the systemic approach within the environmental network. For example, ioki uses intelligent algorithms to enable efficient ride pooling: by bundling different passengers with similar routes, vehicles are optimally utilized. Features showing waiting times, stops, number of seats, etc. can be configured by the service providers at any time via the operating system. The system is suitable for both driver-based and autonomous transport modes. The greatest advantage is the flexibility that comes with the absence of a fixed schedule. In rural areas, existing call-a-bus services can be digitalized and company locations can easily be linked to the transportation network, while in urban areas, ioki supports local transport from the first to the last mile—barrier-free, for everyone, at any time. The system is now being used in 35 cities and communities across Europe.

Location Germany Introduction 2017–ongoing Client numerous municipalities and cities in Europe Design ioki, Deutsche Bahn

Passengers book and pay for their journey with just a few clicks. The ioki app shows users the entire itinerary in real time.





Approaches to the deep integration of on-demand shuttles into public transport

ioki Hamburg

In cooperation with the Hamburger Verkehrsverbund (HVV), Verkehrsbetriebe Hamburg-Holstein GmbH (VHH) has relied on ioki as a technical partner since 2018. Started as a pilot project, the on-demand shuttle service is proving to be a successful model that has become a fixed component of local public transport, as a demand-oriented service for covering the first and last mile. The aim is to make local transport more attractive and life without a car practical in the long term. ioki Hamburg is oriented towards commuters, people from Hamburg and the region, as well as those with limited mobility.

This is how it works: users enter their individual route in the smartphone app. If the nearest S-Bahn station or bus stop is a little too far away, then residents and visitors to the Hanseatic city and its vicinity can book a shuttle for a maximum price of one euro. Thanks to real-time routing, users are always informed about their vehicle and the dynamic pick-up and arrival time via their smartphone. The shuttle takes them either from the front door to the bus stop, or from a bus stop to the desired destination. For boarding purposes, virtual stops are indicated in the app. Along the way, the zero-emission e-vehicles collect additional passengers, depending on the number of bookings. Areas served in summer 2021 include Lurup-Osdorf and Hamburg's second-largest industrial area, Billbrook, as well as the municipalities of Brunsbek, Lütjensee, Trittau and Ahrensburg, all in the Stormarn district.

Vehicles with distinctive designs, such as cars from the British taxi manufacturer LEVC, and shuttles named with international first names such as Matilda, Henry, or Kasimir, help passengers to better recognize the vehicle intended for them. For the first quarter of 2021, ioki reports that the app has been installed more than 34,000 times so far. The more than thirty shuttles have covered 1.4 million kilometers, 75% of which were public transport feeder services, for which passengers waited on average less than 5 minutes.

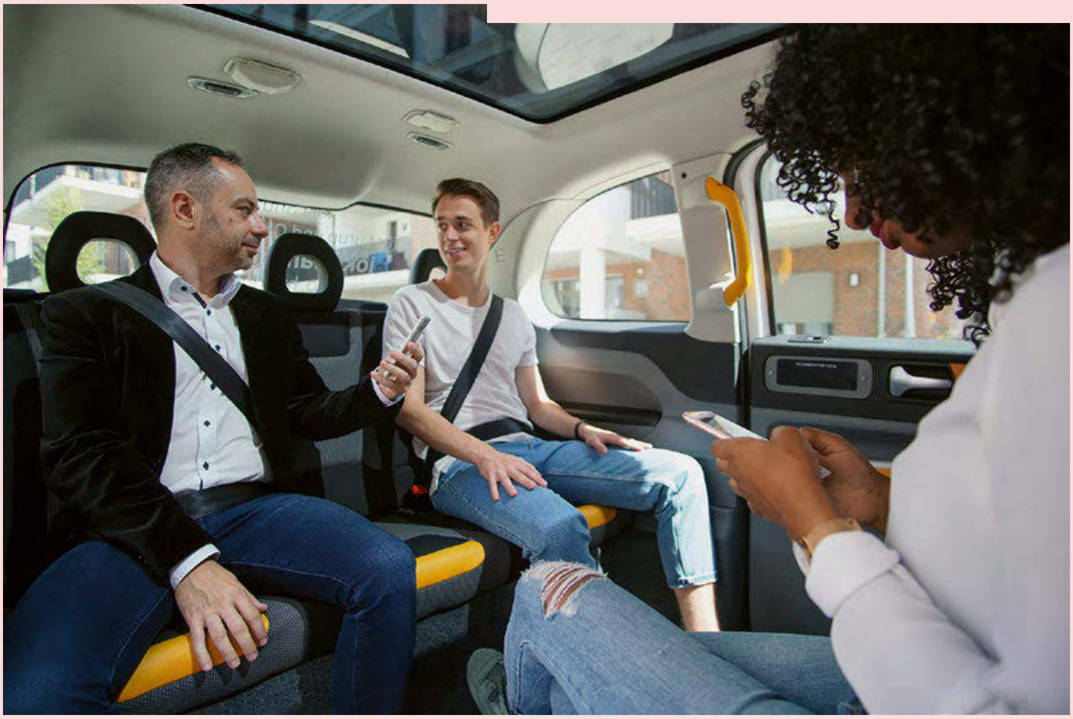
The service in the Stormarn district has been part of the Reallabor Hamburg research project led by Hamburger Hochbahn since the end of 2020. Within this framework, elbMOBIL has started up in Winsen in the Harburg district, where it is also supported technically by ioki. In these two test regions, new potentials for public transport are being identified and solutions developed to further improve connections between rural areas and urban centers.

Location Hamburg and vicinity, Germany Introduction 2018–ongoing Operator Verkehrsbetriebe Hamburg-Holstein Inc. (VHH) Design ioki, Verkehrsbetriebe Hamburg-Holstein (VHH) In collaboration with Hamburger Verkehrsverbund (HVV) and additional partners (regional) Note since 12/2020 a division of Reallabor Hamburg

The addition of a smart on-demand solution makes mobility accessible to everyone—anywhere, anytime.

The on-demand service uses modern, zero-emission electric cars from British cab manufacturer LEVC.

The shuttle takes passengers either from their front door to the transit stop or from a transit stop to their desired destination.



Transit stop intervals of 200 meters guarantee optimal accessibility in the area.

Vélib' Métropole

Since 2007, a city-wide bike sharing service has been available to residents and visitors to Paris; this was taken over by Smovengo in 2018 and extensively expanded and redesigned. The service was renamed Vélib' Métropole. »Vélib'« is a compound of vélo and liberté, that is, bicycle and freedom, referring to the promise of being able to move flexibly in an environmentally friendly manner.

Customers can choose between a subscription or a one-day or five-day pass from the mobility service provider. Rental bikes can be parked and picked up at one of the almost 1,400 stations that are distributed around the dense heart of the city, in the suburbs, or even within sixty municipalities on the Paris periphery.

The advantages of this station-based system are many: for one, the rental bikes are easier for users to find than in a so-called free-floating system, where bikes can be left randomly anywhere in the urban region. In addition, it is easier to control, more orderly, and less susceptible to vandalism. The service is popular, with bikes being rented 150,000 times per day (as of June 2020).

It is also easy to use: to start, bike availability can be checked via the smartphone app. On the handlebar is the V-Box, a control with RFID/NFC reader that can be used to unlock the bike with either the Vélib' card or the Navigo card—a mode of payment for Paris public transport and the Île-de-France region. When the smartphone is connected to the V-Box via Bluetooth, it shows the rental period, the distance traveled, and in the future, navigation instructions on a display—a truly practical feature. Thanks to an integrated handlebar lock and a cable lock stowed in the handlebar, intermediate stops are possible at any time.

The fact that the bikes can now be tracked electronically has significantly reduced the risk of vandalism, and this also allows them to be parked next to a station, even when all spaces are already occupied.

These rental bikes are now available with motor assistance as well; 30% of the total fleet of almost 20,000 bikes are e-bikes. The two bike types are color-coded to distinguish between them: bikes without a motor are green, while the pedelecs are blue.

Vélib' Métropole is intended as an extension of the Île-de-France's diverse mobility offer, and it is proving to be an integral part of Paris' »Plan Vélo« cycling plan, adopted in 2015, which envisions the expansion of a safe and comfortable cycling network.

Location Paris, France Introduction 2018 Client City of Paris Design Smovengo (operator, consortium of Smoove, Moventia, Indigo, and Mobivia)

The V-Box gives users quick and direct access to the bicycles.

The bicycles without motors are green, while the pedelecs are blue.

Docking station

Vélib'-Métropole sharing station
at Vincennes RER Station, 2020

The Oasis

With The Oasis, Swiftmile from San Carlos, California, is bringing order into e-scooter and e-bike traffic. Thanks to the free-standing parking and charging stations, electric vehicles can be easily recharged. And orderly parking eliminates the irritation of e-scooters parked indiscriminately or left lying around. On the one hand, this increases traffic safety, and on the other, the acceptance of this mode of transport.

Most importantly, however, these self-sufficient micro-mobility hubs help make e-scooters more viable and easily accessible as a first/last mile solution to and from local transit stops. In addition, e-scooters and e-bikes can be established as an efficient and environmentally friendly alternative in areas that are not well served by public transport. Swiftmile seamlessly links existing mobility options by orienting its services towards e-scooter and e-bike operators on the one hand, and municipalities, employers, public transport companies, schools, food service and retail centers, and property owners on the other.

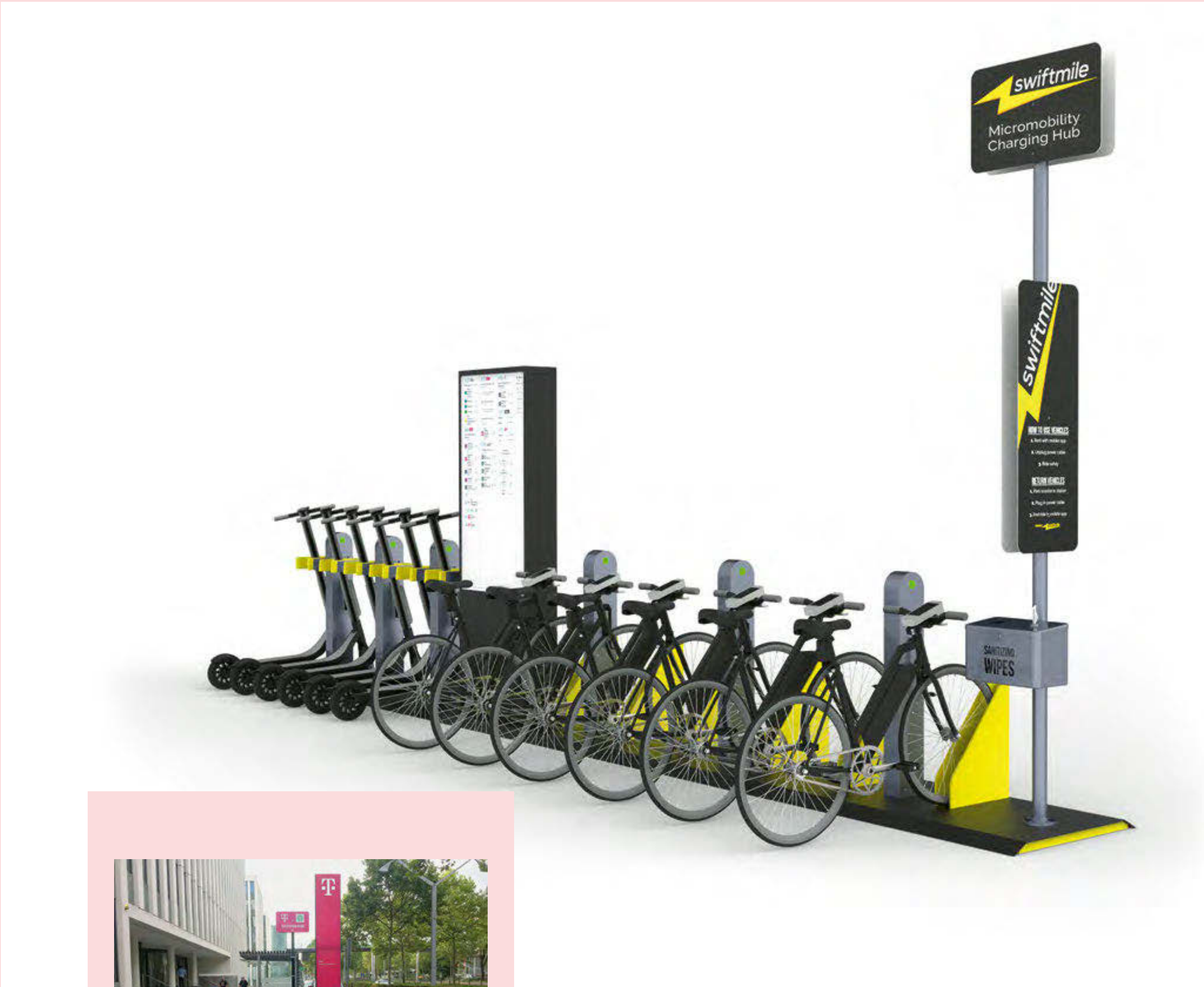
The infrastructure is easy to install and durable. Swiftmile achieves greater cost-effectiveness through a station-based system that eliminates considerable logistical efforts as compared to the free-floating principle. For example, e-scooters do not have to be collected for recharging.

Swiftmile's concept also includes a modular and customizable design. A solid steel plate forms the foundation of each station. Elements made of high-strength aluminum are installed on top of it. The functional modules can be configured so that they fit into any context, both visually and in terms of size; their design enables intuitive use. The Oasis can be set up for all e-scooter and e-bike models. E-scooters and e-bikes are parked compactly and firmly upright within it; they can thus withstand wind and weather but are still easy to take out or put back. Once the vehicle is properly positioned in the Swiftmile station, it can be charged—with solar power, when that option is chosen. The station's integrated software automatically sends the relevant charging information to the fleet manager of the respective e-scooter or e-bike provider.

Since mid-2019, The Oasis has been in use at the Schönhauser Allee inner-city train station in the Prenzlauer Berg district of Berlin, where it is part of a multimodal Jelbi mobility hub, a mobility project of Berlin's public transportation system.

Headquarters San Carlos, CA, USA Location 19 cities worldwide, including Miami, FL (US), Washington, DC (US), San Francisco, CA (US), Tel Aviv (IL), Berlin (DE), Bonn (DE), Milan (IT) Product introduction 2015 Client public and private entities Design Swiftmile (manufacturer)

The stations can be adapted for any light electric vehicle. Analog and digital advertising, information, and signage options are integrated.



Example in use on the Telekom company premises in Bonn, 2019

Example in use at a multimodal mobility hub by Jelbi.
Greifhagener Strasse S-Bahn Station in Berlin, 2019

Solar roof for mobility stations (concept, 2021)

Citroën Ami

Just like a car, except more compact. Just like an e-scooter, only bigger, with a roof and four wheels. With the Ami, in 2020 Citroën brought an easily maneuverable electric quad to the streets. At just 2.41 meters long, 1.39 meters wide, and 1.52 meters high, this micro-mobile has space for two people. With an unloaded weight of 471 kilograms, the vehicle is powered by an eight-horsepower engine that can reach up to 45 kilometers per hour. The lithium-ion battery with 5.5 kilowatt hours is so small that it can be charged in just 3 hours via a normal household electric outlet. Alternatively, the vehicle can also be charged within 1 hour at public charging stations or wall boxes.

Generally, it has a range of up to 75 kilometers, depending on driving style, route conditions, outside temperature, and how the ventilation system is used. This is certainly sufficient for urban commuter transportation. In addition, the Citroën Ami is clearly more efficient for such short trips than large cars. It also has a clear advantage when searching for a parking space or traveling in restricted traffic zones.

The dimensions may be small, but visually the Ami is quite noticeable. Front and rear look almost identical. Only the taillights and a subtle spoiler above the slightly flared rear window distinguish the rear. It is available in the base color Ami blue supplemented with color customization kits in the colors—gray, blue, orange, and khaki—and with two optional décor sets. The Pop trim set includes a real small spoiler and a roof rail for more vibe. The two doors open in opposite directions—a design trick enabling the use of identical doors.

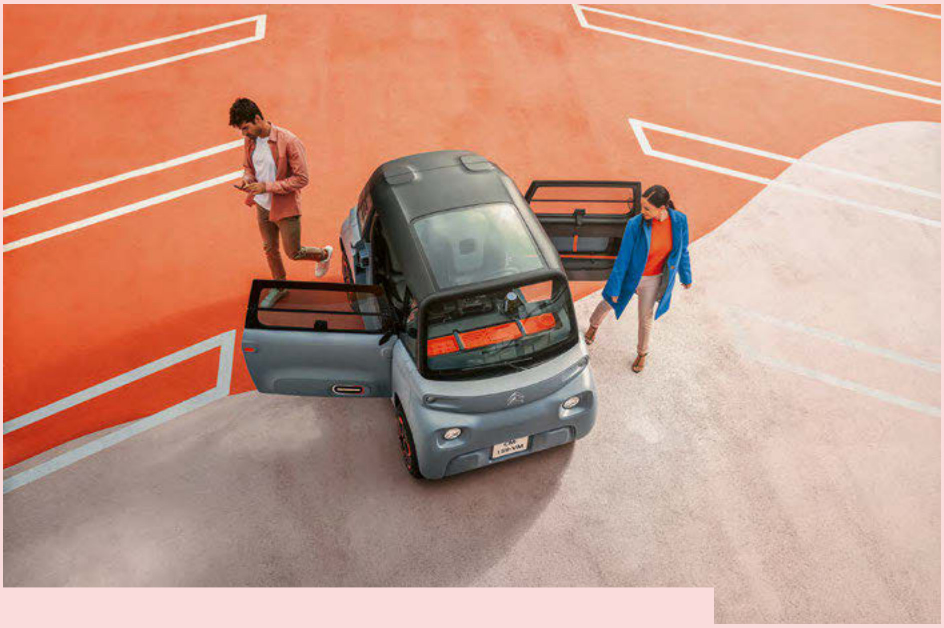
The interior is functional and exceptionally bright due to the wraparound glazing and sky-light. This ensures a clear view of the streets, as you sit at the same level as in a »normal« car. In place of expensive dashboard technol-ogy, the user's own smartphone in a cradle serves as a multimedia and navigational device and, via an app, as a dashboard computer. In addition, there are multiple storage spaces.

With the Ami, Citroën offers a compact, comfortable, safe, affordable, and environ-mentally friendly alternative to both private cars and public transport. With a base price of 6,000 euros, it is aimed primarily at young drivers. In Germany, the Ami can be driven from the age of 16 (in some states from 15), and in Italy and France from the age of 14, even without a driving license. The production method conserves resources, and thanks to the symmetrical design, the components are limited to 250 pieces.

Distribution numerous European countries, including France, Spain, Italy, Belgium, Portugal, England, and Germany Introduction 2020 Design Citroën

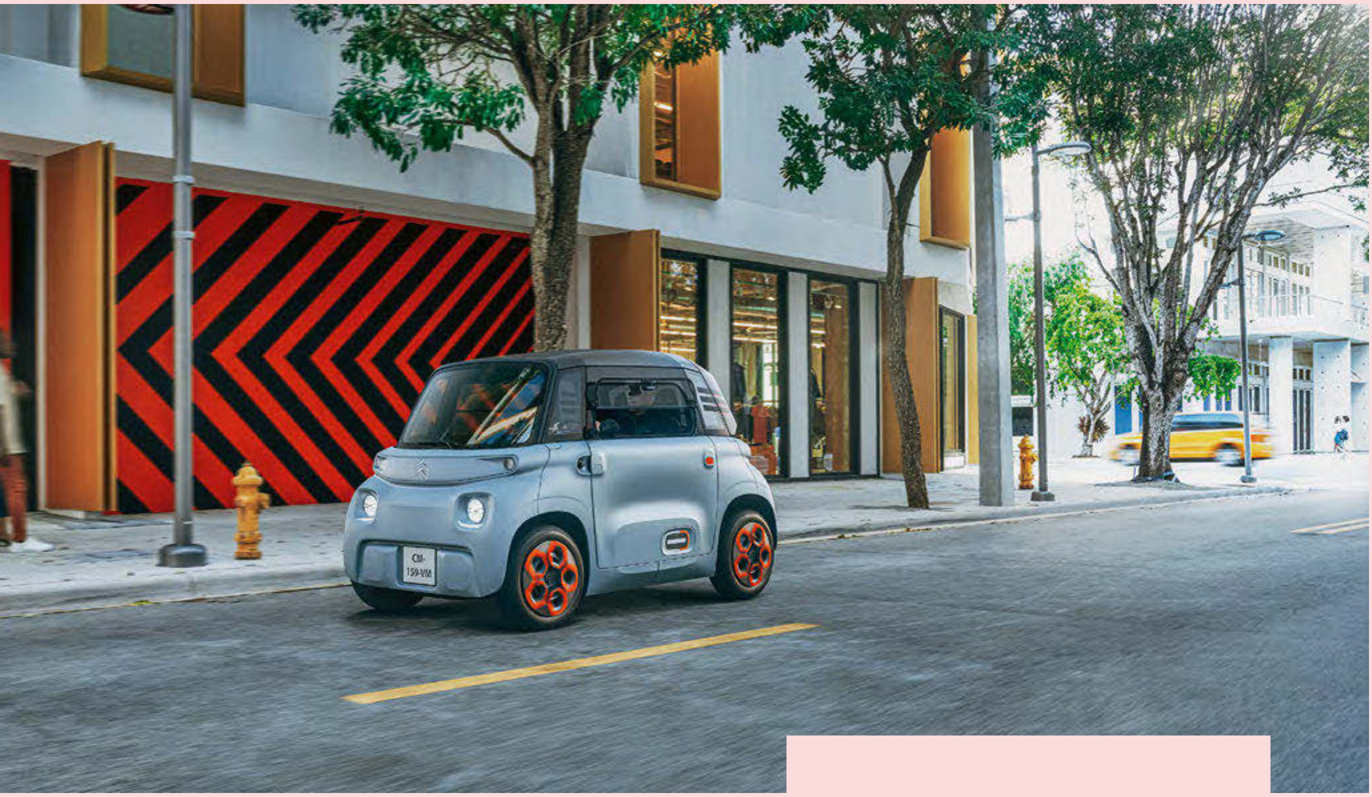
With a range of up to 75 kilometers and a top speed of up to 45 kilometers per hour, the Ami is ideal for inner-city and commuter traffic.

The two identical doors open
in opposite directions.



The features can be personalized
with an accessory kit.

Perfect for the city:
compact dimensions and two seats



The user's own smartphone serves as a multimedia and navigation device and, via an app, as an on-board computer.

Barcelona Superblocks

Barcelona is a popular city with a distinctive urban layout. During the nineteenth century, Ildefons Cerdà conceived the large-scale expansion of the Catalonian metropolis—although his plan was ultimately implemented in a far denser form than he had envisioned. The uniform grid of square blocks with cut-off corners resulted in a lively city, but created problems. Barcelona is one of the most densely built-up metropolises of Europe. The shortage of green space and a mobility system strongly characterized by motorized individual transport means noise, high levels of air pollution, and frequent traffic accidents.

With the Climate Plan (2018–2030) and the Climate Emergency Declaration (2020), Barcelona has committed itself to reducing greenhouse gas emissions by 50% in relation to 1992 values by the year 2030; by 2050, Barcelona is to become CO_2 neutral. The city's green areas are to be expanded by 1.6 million square meters, which amounts to one new square meter per inhabitant. At the same time, with its urban mobility plan, Barcelona hopes to reduce the volume of street traffic by 21%, while at the same time considerably increasing the proportion of pedestrians and cyclists, as well as local public transport.

One key to achieving this ambitious goal is the concept of the Superblock. To create a Superblock, a number of city blocks are amalgamated into a larger unit. The streets within this unit are reorganized, vehicle lanes eliminated, and the urban space transformed for the sake of amenity qualities, as well as for pedestrian and cycle traffic. On the remaining vehicle lanes, public transport is given preference. These are laid out as one-way streets, so that a destination within the block is reachable, while driving through the Superblock becomes impossible (with the exception of bus traffic), since you continually return to the place where you originally entered the block. Only a few indispensable parking places are preserved. In addition, the permitted speed is reduced substantially: to 10 kilometers per hour overall, and 20 kilometers per hour for bus traffic. Currently in planning are altogether more than 500 Superblocks, and 70% of the surface area currently devoted to automobile traffic is to be freed up for other utilizations.

The first Superblock was laid out in the older districts of Gràcia and the old town. In 2016, the Poblenou Superblock was conceived as a concrete pilot project for subsequent planning within Cerdà's grid. Tested was a three-phase implementation, which will serve as a blueprint for further steps. In the first phase, traffic was reorganized. Through markers and signage, traffic directions were altered, parking and delivery zones reregulated, the speed limit reduced, one-way streets introduced, and individual street segments closed to through traffic. These measures yielded the space needed for the second phase, which tested out new utilizations. Investigated with a minimal budget and reversible measures were strategies for opening up newly found possibilities for the people who live and work here. During this phase, flexible utilizations made it possible to discover what people desired and needed, and where. Only when these foundations have proven reliable will the third phase be launched, involving permanent redesign measures: new green areas will be laid out, intersections restructured, public squares installed. In this phase as well, there will be close collaboration with residents, tradespersons, and local organizations. Introduced in Poblenou were playgrounds and sports fields, vegetable gardens and public spaces intended for cultural and leisure activities.

The experiences to date have been highly encouraging. Created in 2018 was the Sant Antoni Superblock, and further units are in planning—pedestrian and cycle traffic has already increased considerably, and auto traffic has been markedly reduced. The concept of altering traffic behavior through attractive alternatives has proven successful. A focus of ongoing developments will be the heavily strained city center district of Eixample, which will be fully organized into Superblocks, receive 33.4 hectares of new pedestrian zones, and 6.6 hectares of additional urban green space. No inhabitant will need to travel more than 200 meters to reach the nearest public square or green space. Bound up with the Superblock concept is the idea of installing new green axes designed to link the city center with other urban districts. Systematically, a new urban network is gradually emerging, one that accords priority to pedestrians and prioritizes green spaces.

An essential aspect of this overall concept is the citywide mobility plan. It envisions linking the individual superblocks with the entire city through a cycling and pedestrian network, the provision of a well-functioning public transport system, and the achievement of a strategic balance between vehicle bans and stable connections. The current plan (2019–2024) aims to ensure that by the year 2024, more than 80% of all travel routes can be covered by foot or bicycle or with public transport. The goal of doubling the total length of the cycling network has already made great strides: it was 116 kilometers in 2013, and had grown by 2020 to more than 240 kilometers, and should reach 300 kilometers by 2030. The general rule is that the distance to the next cycle route should be no longer than 300 meters, that cycle routes should conform to the highest standards, and that they should be separated from walkways. Beginning in 2024, 75% of all streets will have speed limits of 30 kilometers per hour, with the aim of increasing safety for cyclists where space is unavailable for cycle routes.

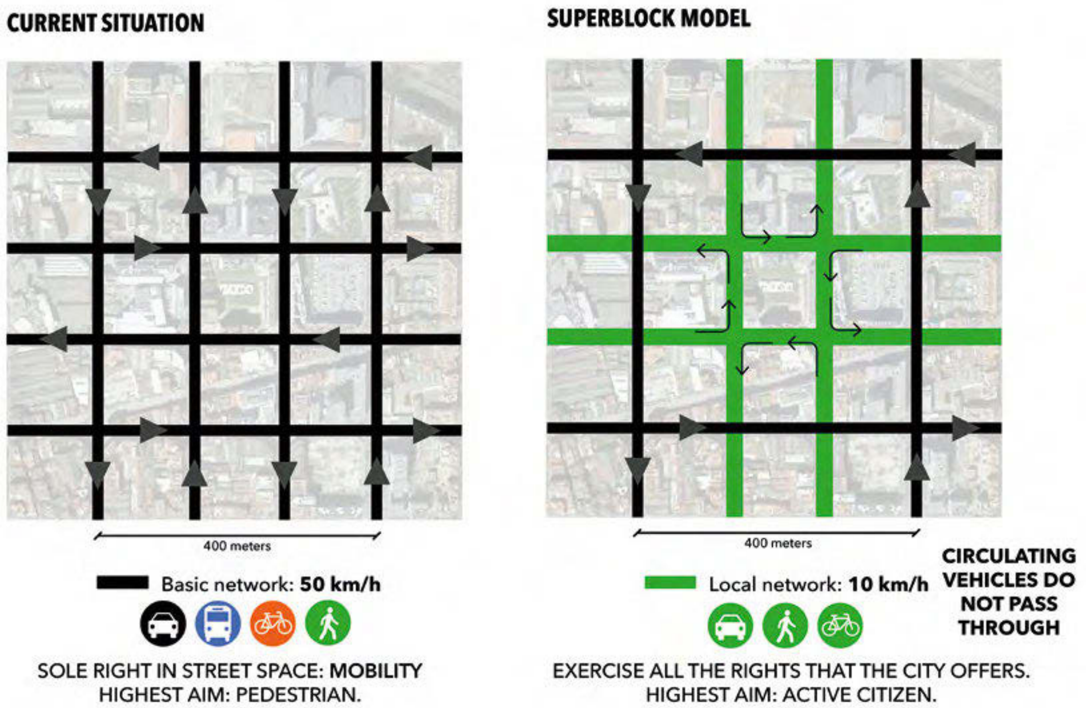
The bus network too has been reorganized and supplemented with express buses for larger distances within the city; here, too, the rule is that no one should need to travel more than 300 meters to the next express bus stop. Altogether, 90% of routes can now be covered using public transport with a maximum of one change.

The two hitherto separate streetcar lines are to be interlinked, potentially doubling the number of passengers. The construction launch for this project is 2021. Meanwhile, low emissions zones have been installed to improve air quality, and a number of bus lines are already serviced entirely with electric vehicles; by 2024, emission-free buses should be in operation on all bus lines.

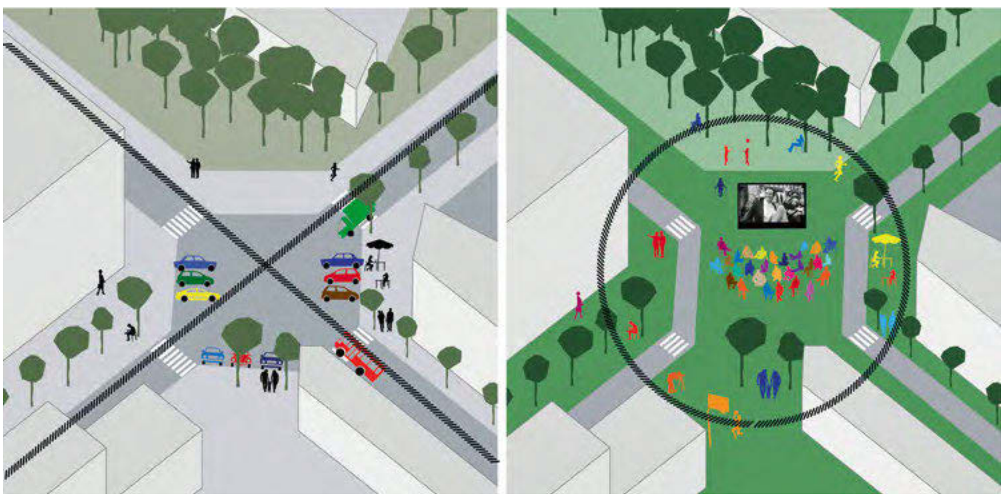
Location Barcelona, Spain Start of implementation 2016–ongoing Client City of Barcelona Initial concept Urban Ecology Agency of Barcelona Program concept and implementation Ecology, Urban Planning, Infrastructures and Mobility Area; Barcelona City Council Note further information is available at: https://ajuntament.barcelona.cat/superilles/en/

Temporary interventions in Carrer Roc Boronat, Poblenou Superblock, 2018

Temporary interventions in the Sant Antoni Superblock. Design: Leku Studio, 2019

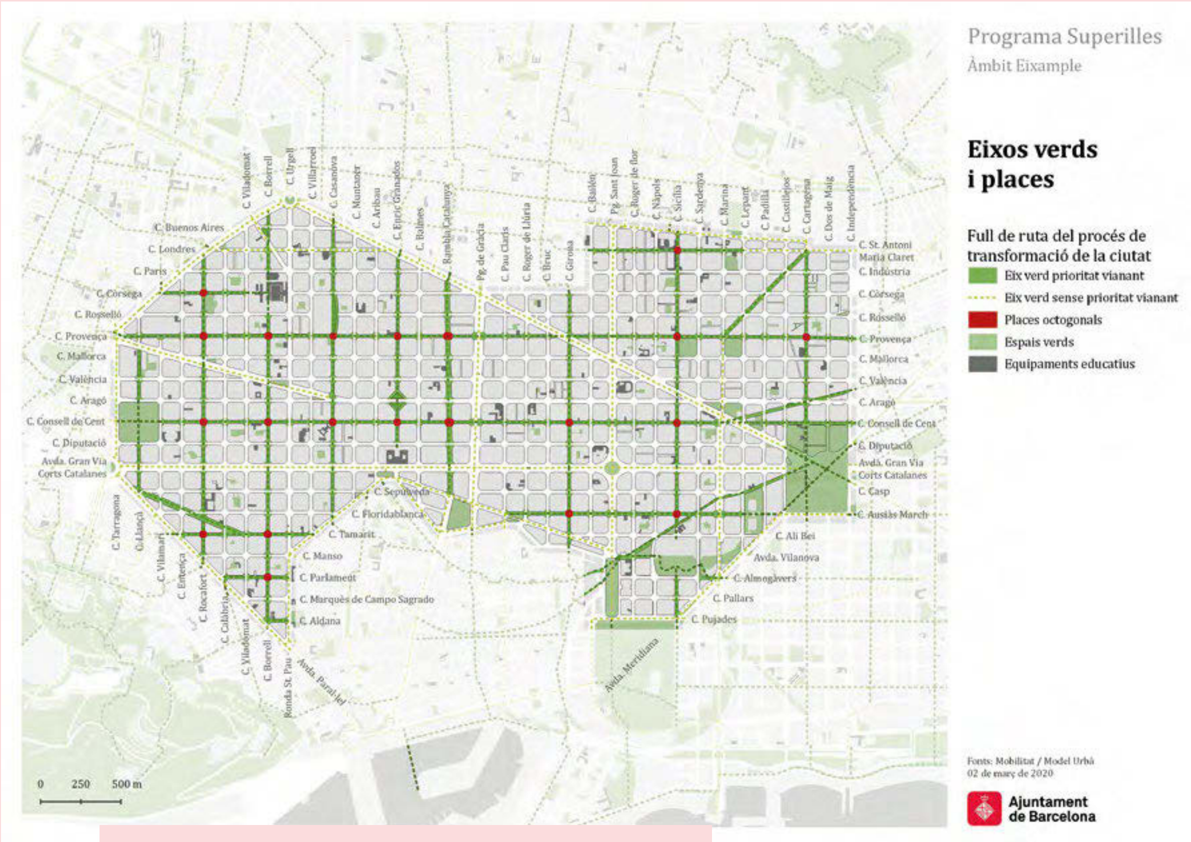


Street hierarchy in the new Superblock model (Concept diagram by the Urban Ecology Agency of Barcelona)



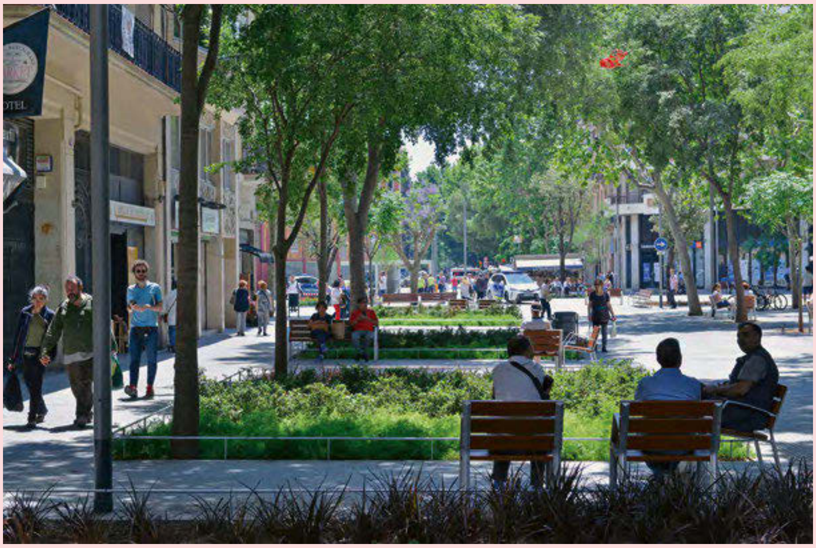
Rethinking public space in the city: from linear and function-driven, to dynamic spaces with multiple uses. (Concept diagram by the Urban Ecology Agency of Barcelona)

Development plan for the Eixample District



Permanent redesign of Carrer del Comte Borrell, Sant Antoni, 2019

Permanent redesign of Carrer del Comte Borrell, Sant Antoni, 2019



Central bike path at Passeig de Sant Joan

aspern Seestadt

Since 2009, a new, multifunctional urban district has been under construction to the east of central Vienna on the former premises of Austria's largest airport: aspern Seestadt is one of Europe's largest and most ambitious urban development projects. On a 240-hectare site, living space is being developed for more than 20,000 residents, along with space for almost as many jobs and training positions in production, business, science, research, and education. The project is based on a master plan by the Swedish office of Tovatt Architects & Planners. Alongside high-quality, affordable housing and workspace, the new urban district places a high priority on a sustainable mobility concept and generous areas for leisure and recreation.

The configuration of public space is based on a strategic concept developed by the Danish open space planning office Gehl; it encourages active mobility and offers an unusually large number of generally accessible, open spaces. Altogether 50% of the site area is reserved for streets, squares, green and recreational areas. At the center is the lake, which covers 5 hectares and gives the project its name; revolving around it is local life in all of its variety.

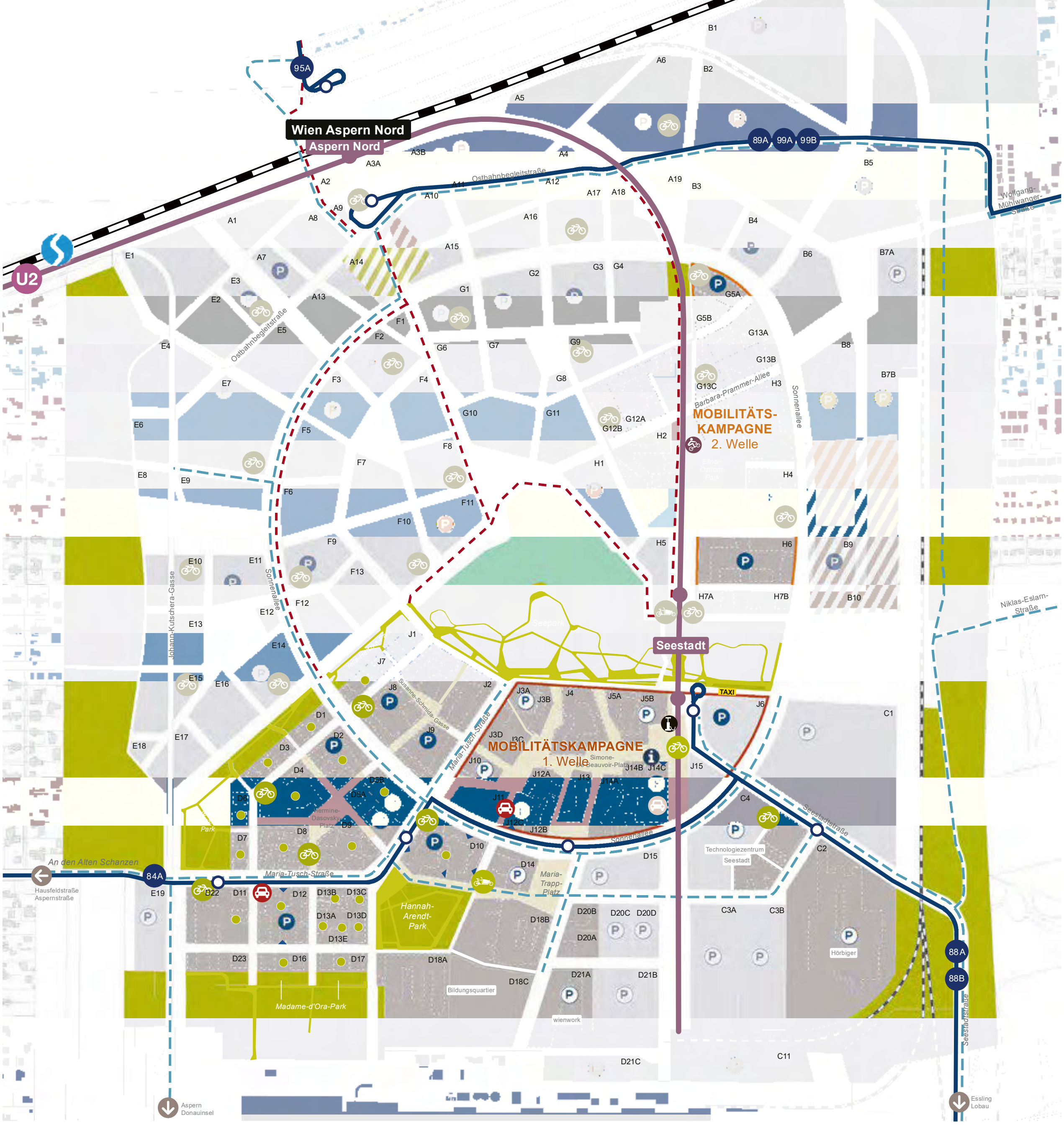
By linking living with work, education, culture, shopping, and leisure activities, Seestadt becomes an urban district of short routes that gives precedence to pedestrians and cyclists. In accordance with the desired modal share, 40% of routes should be covered by public transport, another 40% by foot or bicycle, and only 20% by auto, moped, or motorcycle. Overall, there are a number of car-free zones. The required number of parking spaces is to be 0.7 per residential unit; most cars will be accommodated in collective garages. In return, good public transport connections are guaranteed. There will be a park-and-ride facility at the Aspern Nord express train and subway hub. Moreover, Seestadt is already connected via seven bus lines, with two streetcar lines in the planning stage. Envisioned as well are two connections to the planned highway network.

Attractive and wide sidewalks and pedestrian zones, which serve as meeting places, invite people to linger and stroll. There are broad cycling routes. In addition, amenities such as a bicycle repair shop and a cargo bike rental service are offered in the traffic-calmed areas. There is also the aspern.mobil Lab, a research platform in real-time operation that promotes active mobility, shared mobility concepts, and first/last-mile logistics.

Location Vienna, Austria Completion 2010–2030 (planned) Client Wien 3420 aspern Development AG Design Tovatt Architects & Planners (master plan); Gehl, formerly Gehl Architects (planning manual for public space)

All mobility services in aspern Seestadt at a glance (as of 03/2020) aspern+ Die Seestadt Wiens

MOBILITÄTSANGEBOTE 2020



MOBILITÄT

Bestand

- Fahrradverleihstation
- Lastenradstation
- Mobilitätsstation
- Sammelgarage inkl. Kurzparkmöglichkeit
- Garagen für Eigenbedarf
- Carsharing
- Radspielplatz
- Radpumpe
- Radanhängerverleih
- öffentlicher Garagenzugang

- ÖBB-Zugverbindung
- Industriegleis
- U-Bahnlinie U2
- Bus mit Haltestelle
- Radweg / Radstreifen / Radroute
- Gehweg

in Planung

- Fahrradverleihstation
- Lastenradstation
- Mobilitätsstation
- Sammelgarage inkl. Kurzparkmöglichkeit
- Garage für Eigenbedarf
- Carsharing

ALLGEMEIN

- Baufelder in Bau / fertiggestellt
- Baufelder lt. Masterplan
- See
- Grünflächen
- Platz
- URBANES FELD
- Baulogistikzentrum

0 125 250 500 Meter

N

Mobile in the lakeside district

The Lakeside Park in the summertime

8 House

In 2010, the Danish architecture office Bjarke Ingels Group (BIG) realized »8 House« in Copenhagen, a hybrid, multigenerational residential and commercial building for which the infrastructural principles of the city were transferred onto a building. The new building is part of the still-young urban district of Ørestad, where residential and office buildings have been rising alongside educational, sporting, and cultural facilities since 1992. There is even an independent wildlife sanctuary.

Ørestad covers an area measuring 600 meters x 5 kilometers and is located on the island of Amager, south of the city center. Thanks to good public transport connections, and in opposition to prevalent notions concerning urban expansions along peripheries, the planning of the district intends to avoid increased automotive traffic while encouraging bicycle use. After VM Houses and The Mountain, 8 House, completed in 2010 and located on the southern edge of the district, was the third project realized by BIG in the framework of this urban expansion and is the community's best-known landmark.

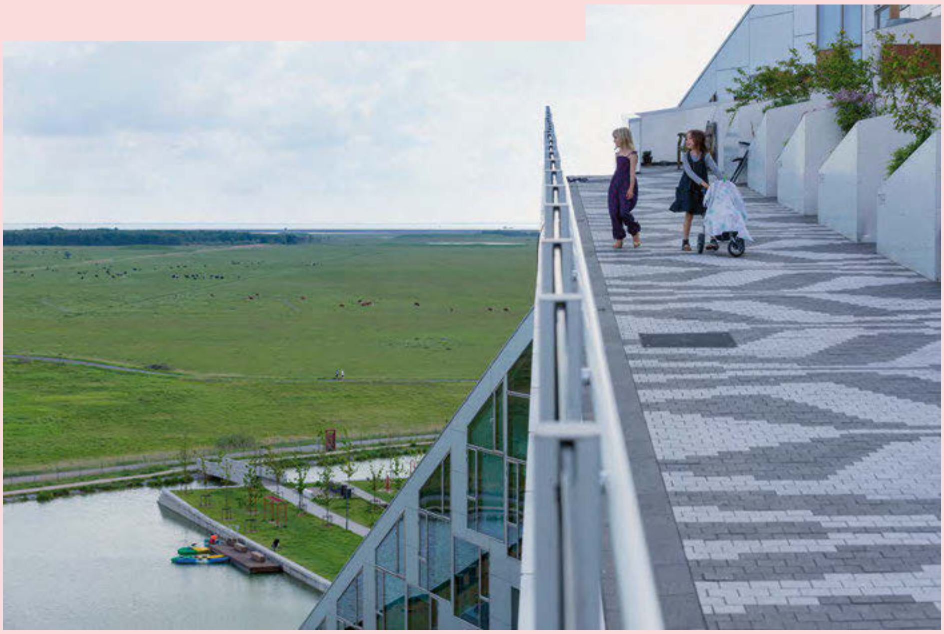
With 475 residential units, 8 House is also the largest apartment building in Denmark—and is moreover virtually an urban district on its own. Alongside residential units, it offers space for offices, shops, a kindergarten, plus a café and restaurant. A striking feature is the building's form, the source of its name: its shape outlines an (angular) figure eight. At its center, a passageway links two public urban squares. Also located at this intersection are common areas distributed across the stories, such as lounges, guest apartments, and a rooftop terrace. Moreover, the architects placed commercial uses in the lower stories, and the apartments—with their highly varied layouts—above them.

Toward the southwest, the roof—which is landscaped in this area—slopes down to the ground floor, providing ample light and good air circulation to both inner courtyards. Starting from two points, a publicly accessible path snakes upward along the stories. This allows neighbors and visitors to pass the little terraces of the residents. Bicycles can be brought right up to apartment doors. Beckoning at the topmost point is an unobstructed view all the way to Køge Bay. Although at times giving the impression of small single-family rowhouses, these are apartments within a gigantic structure. This design complexity endows the building with its multifaceted, urban flair and serves to demonstrate how a »country« feel is possible even with such outsized dimensions.

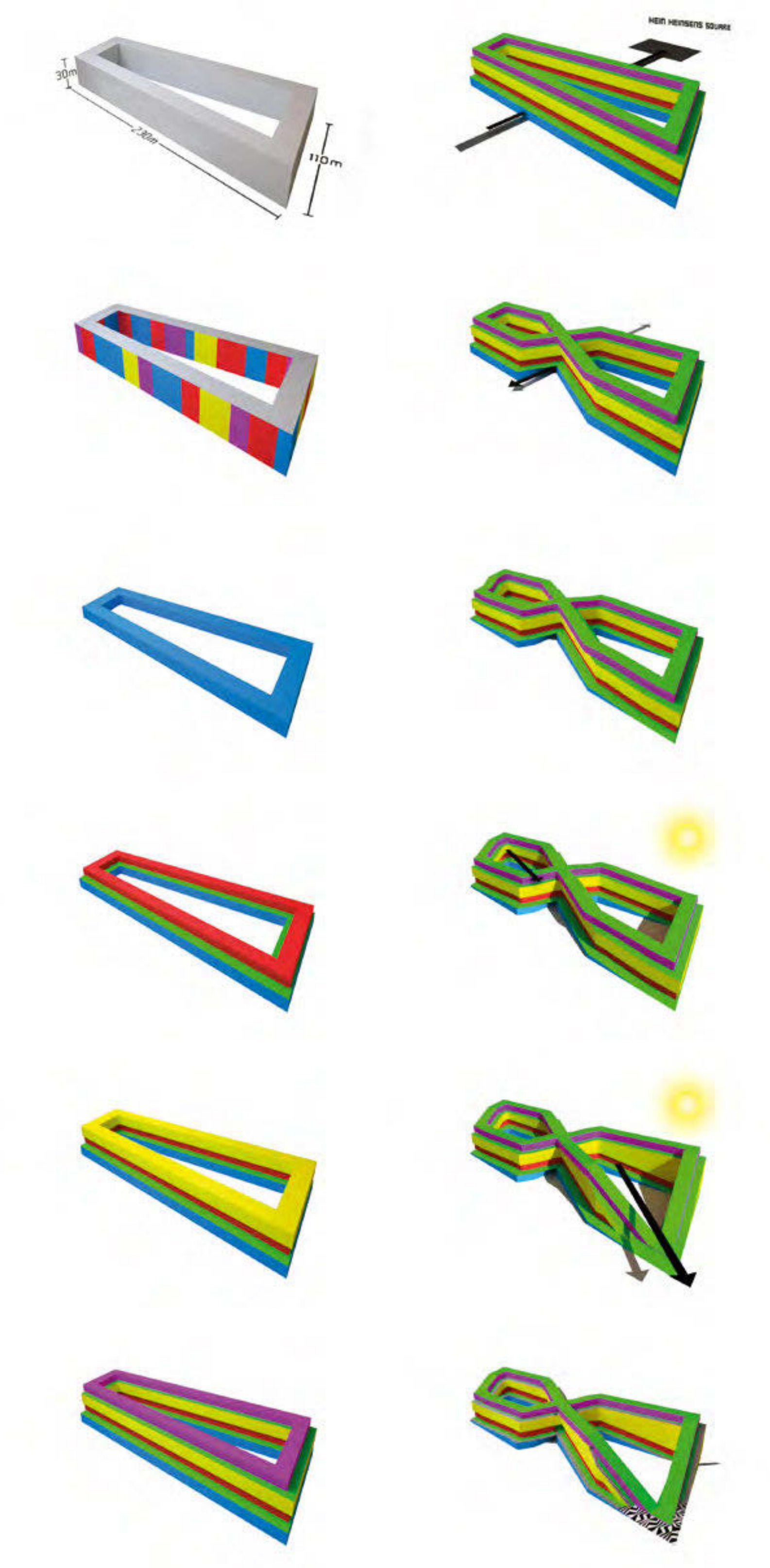
Location Copenhagen, Denmark Completion 2010 Client St. Frederikslund Holding Design BIG—Bjarke Ingels Group In collaboration with Høpfner Partners (developer), MOE & Brodsgaard (engineering), KLAR (landscape architecture)

View to Køge Bay

Nighttime view



The public path winds once all the way around 8 House up to the top floor.



Concept diagram

The Mountain

Actually, autos are deliberately excluded from the streetscape of Ørestad. Yet it is precisely for its unique connection between dwelling and parking that this new building by the Danish architectural office Bjarke Ingels Group (BIG) has attracted international attention. The hybrid building known as »The Mountain« is located roughly at the center of this flagship urban district, which extends almost 5 kilometers from north to south and has been emerging since 1992 to the south of Copenhagen's city center, developing step-by-step into a mixed-use quarter.

The »Mountain« is in a class by itself: while on the south side, the building takes up the zigzag form of the neighboring VM Houses, also planned by BIG, it rises diagonally from the ground floor at the southeastern corner up to the 11th floor. The slope forms the base area for altogether eighty residential units, each with its own terrace. The key to The Mountain: this height was attainable because the six levels located beneath the artificial slope accommodate a parking garage with 480 parking spaces, as well as offices on the lower stories facing the street. Two thirds of this duplex building, is thus reserved for automobiles. Thanks to the elevation, the apartments benefit from enhanced noise and privacy protection, for the complex lies directly alongside railway lines.

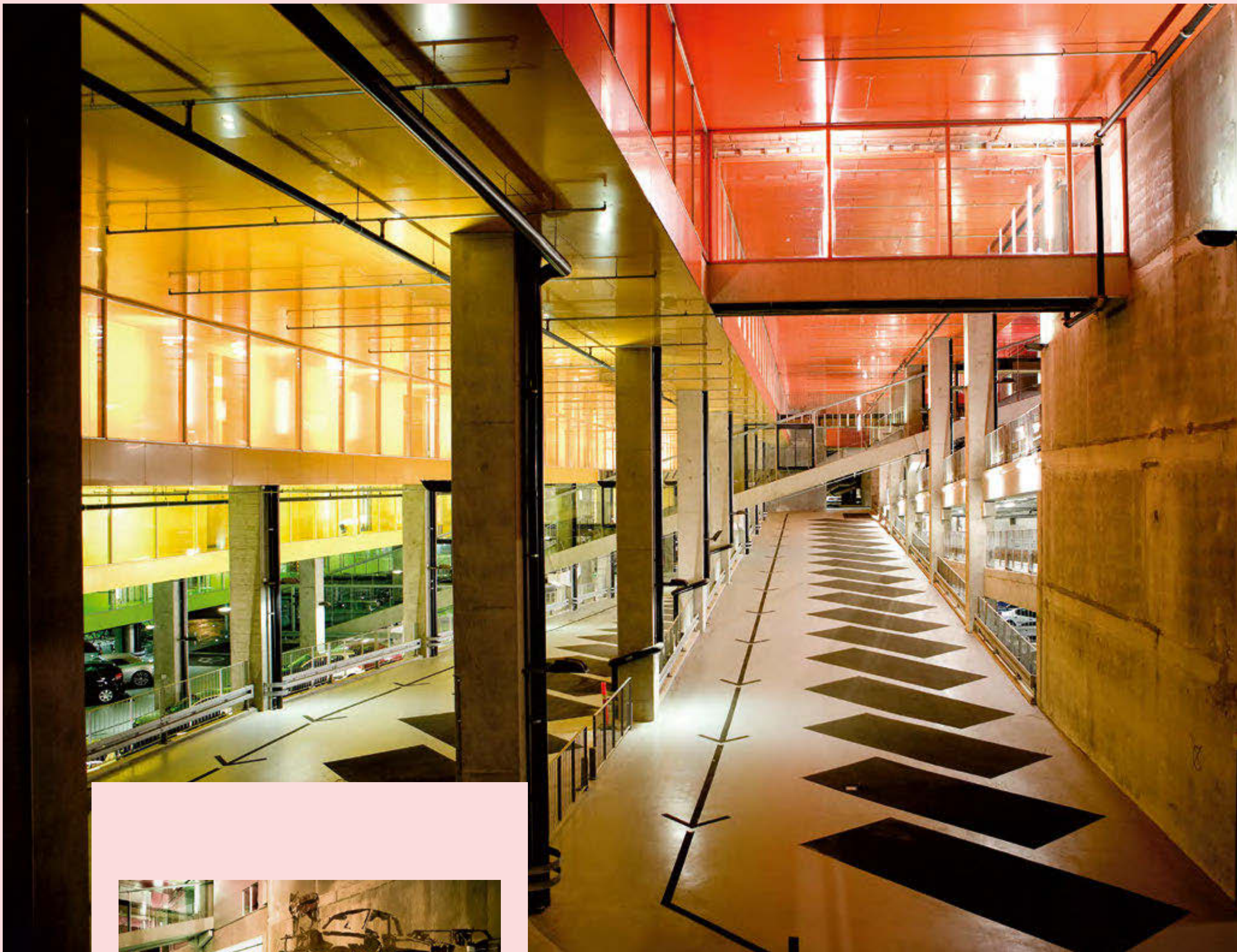
In addition to the interior staircases and an inclined elevator that provides access to parking levels, the building is climbed via staircases positioned along the perforated façade, which lead upward to publicly accessible plateaus. The glazed corridors, which glow with the colors of the rainbow, are visible from afar.

In an utterly singular way, the building—which contains 10,000 square meters of living area—brings together city and country into a unity, transporting the feel of rural life into the city. The implied wooden-hut aesthetic, together with the landscaped garden, is reminiscent of a summer camp. The automobile—compulsory for life in the country—is organized in the car park, which is enveloped by a perforated metal façade with a mountain motif. Parking areas are indicated by highly conspicuous markings. It is this amalgamation of two concepts that makes the building so special: all of the comforts of urban life, combined with a rural feel. The graffiti on the walls of the car park, which illustrates scrap cars, can be interpreted as a self-deprecatory commentary. The automobile is subordinated to dwelling. The floor-to-ceiling windows in the apartments invite the gaze to wander into the distance—with no visible trace of adjacent railway lines or autos.

Location Copenhagen, Denmark Completion 2008 Client Høpfner A/S, Dansk Olie Kompagni A/S Design BIG—Bjarke Ingels Group In collaboration with JDS Architekten/Plot, Moe & Brødsgaard (structural engineering)

Residential units on a sloping terrain with private terrace

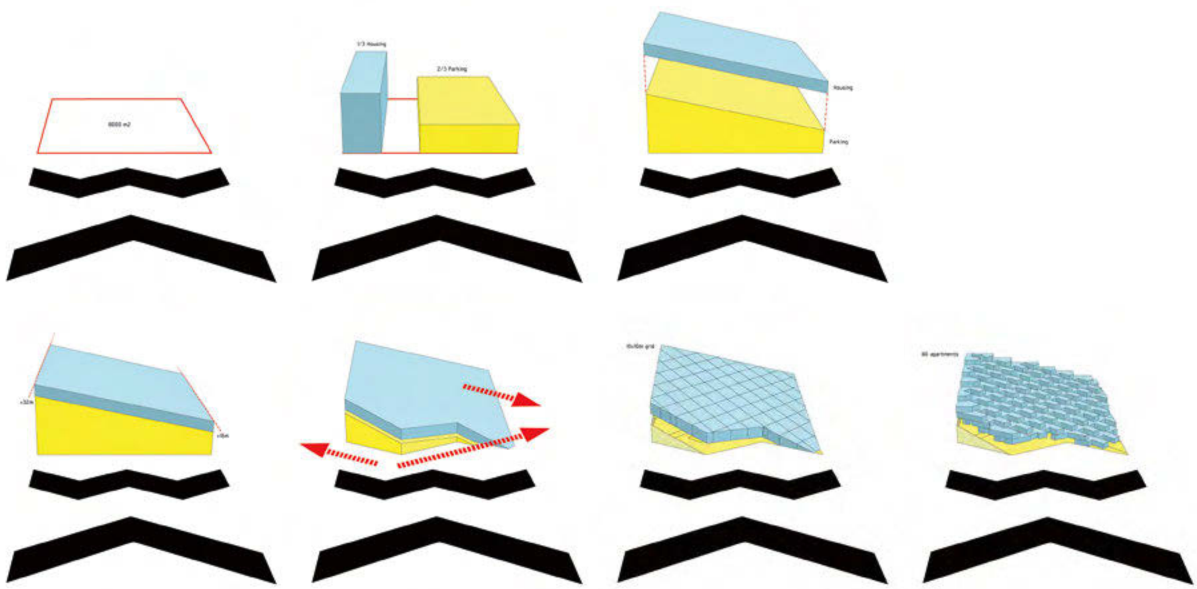
View into the parking garage



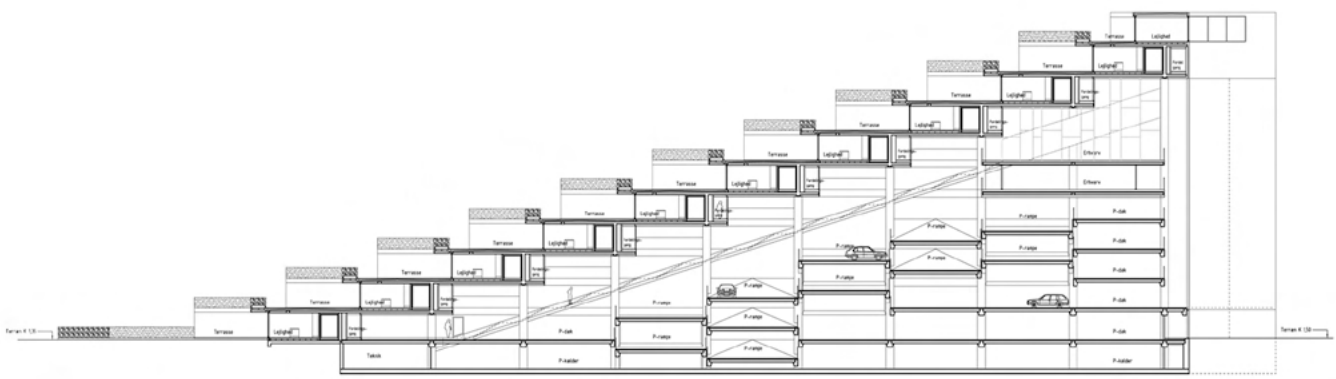
The graffiti on the walls of the car park can be interpreted as a self-deprecatory commentary.

The parking garage is framed by a perforated metal façade with a mountain motif.

Residential unit with garden terrace



Concept diagram



Section

Kalkbreite Cooperative

Found in every city are infrastructurally necessary places whose presence is comprehensible in historical terms, but which are poorly integrated in the urban space and fail to enhance the lives of local residents. Streetcar depots are such places. It seems reasonable, then, to transform some of them into generally accessible living environment. In Zurich, the Kalkbreite Cooperative has succeeded in doing precisely that.

Between 2012 and 2014, based on designs by the local office of Müller Sigrist Architekten and the landscape architects of freiraum-architektur from Lucerne, a residential and commercial complex was built west of the city center. Special here is the circumstance that the new building, sited on a municipal property measuring approximately 6,350 square meters, was erected above a streetcar hall—in extension of the existing depot next door. Streetcars from the transport services have long been parked on the premises. Formerly, the city rejected the idea of a residential development here, since the triangular site is surrounded by two heavily trafficked streets and a railway line.

All the same, the proposal by the cooperative—which was founded in 2007—succeeded in persuading the authorities. A contributing factor was its ambitious mixed-use concept: alongside workplaces in small-scale commercial and retail units, there would be living space for more than 250 people with diverse incomes, ethnicities, age groups, and household constellations, as well as spacious, publicly accessible common areas. Unit sizes range from single studios all the way to 17-room apartments for large residential communities.

The volume of the polygonal block perimeter development is staggered toward the southwest from eight down to four stories. This ensures ample natural light in the apartments. Serving as publicly accessible, open spaces are the roof courtyard and the streetcar hall, which measures 9 meters in height. It is accessed by a staircase from where the rue intérieure, an interior circulation route, interconnects the seven staircases and the roof terraces.

Thanks to the favorable location, which features connections to local public transport and sharing offerings, the Kalkbreite—with its shops, restaurants, and cinema—is well-integrated into a cycling infrastructure that includes high-quality, ground-level parking spaces, making it possible for this residential and commercial building to be completely car-free. In fact, tenants are required to sign a statement renouncing the use of an automobile.

Location Zurich, Switzerland Completion 2012–2014 Client Kalkbreite Cooperative, City of Zurich Design Müller Sigrist Architekten In collaboration with freiraum-architektur (landscape architecture), Jörg Niederberger (color design), B&P Baurealisation (construction management), Dr. Lüchinger und Meyer (engineering), Makiol und Wiederkehr (timber construction planning), BWS Bauphysik (building physics)

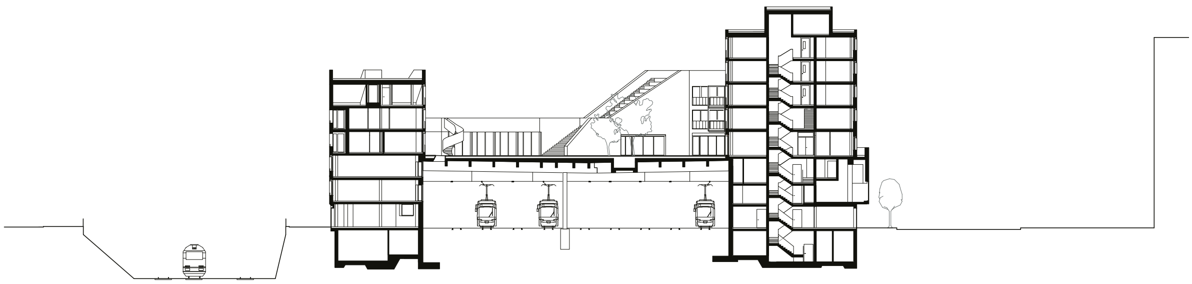
The new building was constructed over a streetcar depot.→

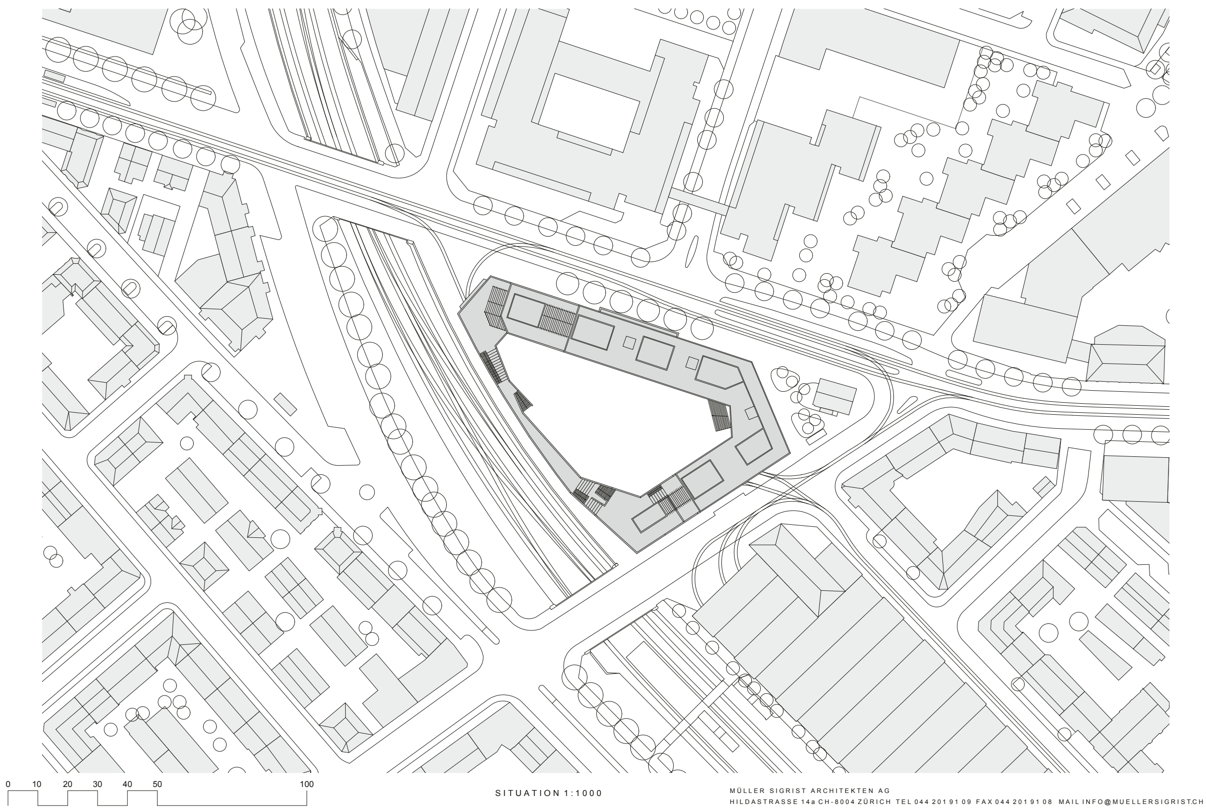

Tor A

Thanks to the convenient location with links to nearby local public transport and sharing services, the residential and commercial building can be managed completely car-free.

The courtyard on the roof serves as a publicly accessible open space.

Cross section





Site plan

Active Mobility

Peter Eckart & Kai Vöckler

Active mobility encompasses all movement that is either partly or wholly driven by human muscle power. This pertains primarily to walking and cycling, but also to the use of scooters, skateboards, roller skates, and inline skates. The use of pedelecs, which in contrast to e-bikes must be pedaled to engage the additional power of the electric motor, is (still) considered a form of active mobility. In an intermodal and environmentally friendly mobility system, walking and cycling are of central importance: they impose the least burden on humans and the environment, are resource-saving and low-noise, and require little surface area. The positive effects of active mobility on health have been scientifically proven.

Walking is such a natural form of locomotion that it requires close attention to grasp its importance. Along with cycling, for local mobility it offers a particularly attractive alternative to cars. And not least, drivers also have to go by foot in order to reach their cars, even if this short travel distance has a somewhat marginal effect on human health and the environment. Considering that almost half of all car trips in Germany are less than 5 kilometers long, and that a fifth are even less than 2 kilometers, the importance of active mobility in the composition of an intermodal mobility system becomes even clearer. Therefore, this aspect will be explored in a separate section. From a planning perspective, it was clearly formulated how active mobility in urban areas can be strengthened: through a substantial expansion of pedestrian and cycle paths that takes into particular account the real danger of motorized traffic. When pedestrian and cycle paths are made to be truly secure and separate from car traffic (and also from one another), the proportion of active mobility clearly increases. Numerous cities have demonstrated this, from Portland to Copenhagen. However, added to the mix is the subjective feeling of safety, which is strongly affected by mobility experiences in public space, such as the fear of undesired contact. Here, design measures can have a decided effect on mobility experience—for example, through the calming effect of lighting composition, or through spatial configurations that improve visibility and facilitate self-orientation. Not least, comfort as well as spatial and experiential quality are also important: how clearly are the routes laid out, how usable are they, and how is the ground surface treated? But also: how varied is the route? What kind of visual relationships and unusual perspectives are experienced when walking and driving? All of this influences mobility in a positive sense. Do the spaces that walkers and cyclists travel through appeal to them, do they feel that their needs have been taken seriously? The design solutions introduced in this section show how this can be achieved.

However, integrating active mobility within an intermodal mobility system also requires systemic consideration of the design requirements. This starts with the recognition that the pedestrian and bicycle paths connected to public transport stops, train stations, or mobile stations for sharing services are part of a cohesive system. Yet, what is often lacking is essential information indicating route connections to the various comprehensive mobility services. As already mentioned in the section on »Connective Mobility,« information and wayfinding systems are of critical importance here, since these set up the connections between the various mobility modes and, in addition, ensure that the system itself is immediately recognizable as such. However, it is the »transport mode« itself, the feet and even bicycles, which should be understood as a system component, as a link within the intermodal mobility chain. Sensory experiences are of concern here: such as how the materiality of the ground is felt, how the spatial configuration of the path is perceived, and how movement is experienced as uninterrupted »flow«—as mediated through bicycles and the feet as forms of transportation. Then there are also the connections to other mobility services, for the bike stand should also be seen as part of the mobility chain configuration, as should the shelter at the stop, or the texture of the path. Only when both the path and the transitions from one form of mobility to another is made »seamless,« that is, uninterrupted and unhindered, will active mobility be regarded positively. However, even the bicycle as a means of transport needs to be rethought in this respect, as part of a mobility system that must satisfy various requirements, such as accompanying children along the way, or providing for daily needs: the problem with crates of beer or water—how do I get it transported on my bike on the way home? In particular the latest approaches, which reconceive the bicycle in a new functional context, are pointing to future solutions in this regard. Furthermore, the bicycle not only gives me the freedom to move the way I want to, for the design of the bicycle mobility system also gives me a feeling of independence and self-efficacy by being related to the surrounding space via the mobility system design: for example, by structuring the spatial interaction via visual relationships or by symbolically conveying the importance of active mobility via the design of paths, objects, and information along the route.

How can the progressiveness and social meaning of this often overlooked aspect of mobility be emphasized? The bicycle in particular is winning in this respect: nowadays it is the very epitome of fitness and coolness. It can even help you achieve social distinction. The must-have is the original 1934 Bianchi racing bike (the first bicycle with gears), if you're image-conscious. Or, you can proudly flaunt the beat-up bicycle of your youth. And memories of youth are also awakened by the first banana bike, or the earlier model BMX bikes (like the one that played a central role in Steven Spielberg's *E.T.* in 1982). The bicycle as a transport mode is here associated with memories of youthful feelings of freedom. This can also be translated into a mobility experience of a free and unfettered floating through an intermodal, interconnected mobility system, whether traveling by foot, bicycle, or other means of transport. The design and production of bicycles is experiencing an enormous upswing, which should spur on massive investment in new mobility that in the future will shape the identity of the city itself—and not only in Copenhagen. Helping a city to develop a new self-image through the expansion of environmentally friendly mobility is not only a challenge in terms of organization and planning, for most importantly this needs to be communicated via its design. This requires a holistic view of public space. By giving sufficient space back to pedestrians and cyclists, quality of life is improved and the urban environment is again experienced as a place that I can actively explore and physically feel.

Picture Credits

↳**pp. 185** photos provided by Gehl, with kind permission of the New York City Department of Transportation (NYC DOT); **pp. 186, 188, 189** album: Broadway Greenlight for Midtown, 2009; description single photos: **p. 186** Times Square: After; **p. 188 top/bottom** Herald Square Before/After; **p. 189 upper picture left/right** Times Square Before/After; **p. 189 lower picture top/bottom** Columbus Circle Before/After; photos by: New York City Department of Transportation (NYC DOT); license: CC BY-NC-ND 4.0, https://creativecommons.org/licenses/by-nc-nd/4.0/; source: https://www.flickr.com/photos/nycstreets/sets/72157622973444484/; **p. 187 left** Gehl (graphical adjustment by HfG); **p. 187 right** Gehl, New York City Department of Transportation (NYC DOT)

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↳**p. 203** Benthem Crouwel Architects; **pp. 204, 205** Jannes Linders (photos)

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↳**p. 211** ZUS—Zones Urbaines Sensibles, Fred Ernst (photo); **pp. 212, 213** ZUS—Zones Urbaines Sensibles, Ossip van Duivenbode (photo), **pp. 214, 215** MVRDV, Stadslab Hoogkwartier, Cathelijne Beckand Verweé (photos), **p. 216 top** Marco Canevacci (photo); **pp. 216 bottom, 217** Raumlabor Berlin (photos)

World Class Streets: Remaking New York City's Public Realm

Beginning in 2007, New York City has succeeded in restoring its public spaces to the people who live there. The basis for this transformation was set out in a strategy paper commissioned by the New York City Department of Transportation (NYC DOT). In 2008, under the title *World Class Streets: Remaking New York City's Public Realm*, the NYC DOT published a catalog of ideas, prepared with support from the research, planning, and consulting firm Gehl, with offices in Copenhagen, New York, and San Francisco. Developed on its basis was the »World Class Street Program,« which prioritized measures designed to provide safety and quality of life, and which pursued a context-sensitive approach intended to promote a visually appealing city.

For decades, New York City was oriented toward private car transport. Urban qualities played virtually no role, although the metropolis is among those with the heaviest pedestrian traffic worldwide. In the mid-2000s, the city administration adopted a greener and more sustainable approach designed to reduce car traffic, promote cycling and pedestrian routes, and improve quality of life overall. The *World Class Street* report compiled facts and figures concerning the utilization of public space. Based on a methodology developed by Jan Gehl and his team, data was gathered concerning typical forms of use of streets, sidewalks, and existing squares at important target locations in the boroughs of Brooklyn, the Bronx, Manhattan, and Queens. Researchers also evaluated the quality and condition of seating options, along with additional key factors concerning open space amenities. One key finding was the realization that New York is indeed a pedestrian city. Unfortunately, sidewalks are often crowded, and the effective usable area for walking—due to people waiting at bus stops and a variety of obstacles such as urban fixtures and kiosks—often amounted to only half of the actual sidewalk width. There was also a lack of public squares for lingering—with a negative overall impact on safety, but also on commerce. The victims of this situation were in particular people with baby carriages, the elderly, and wheelchair users. Another astonishing finding was that approximately 90% of the area at Times Square is devoted to auto traffic, although pedestrians amount to 90% of the people there.

The guiding principles developed from these surveys envisioned a redesign of existing public spaces for the sake of people-oriented public squares and pedestrian routes. On this basis a series of highly visible, quickly implementable, cost-effective pilot projects were initiated. Prior to the introduction of permanent changes, the initially temporary character of these measures was designed to facilitate their evaluation. To begin with, three important public squares and one section of Broadway were redesigned. The pilot project Broadway Boulevard, between Times Square and Herald Square, launched in summer of 2008, and planned by Gehl, envisioned a strip of areas for social encounter and a protected bicycle lane. Visually striking furnishings along the strip were intended to encourage strolling. In a subsequent step, Madison Square was inaugurated as a sheltered public space measuring more than 41,000 square meters at the edge of the Madison Square Park. Essential to these pilot projects was their capacity to trigger a process of rethinking not simply within NYC DOT, but among passersby as well. The changes were received enthusiastically by New Yorkers and visitors alike and quickly established themselves as options for use at popular locations around the city.

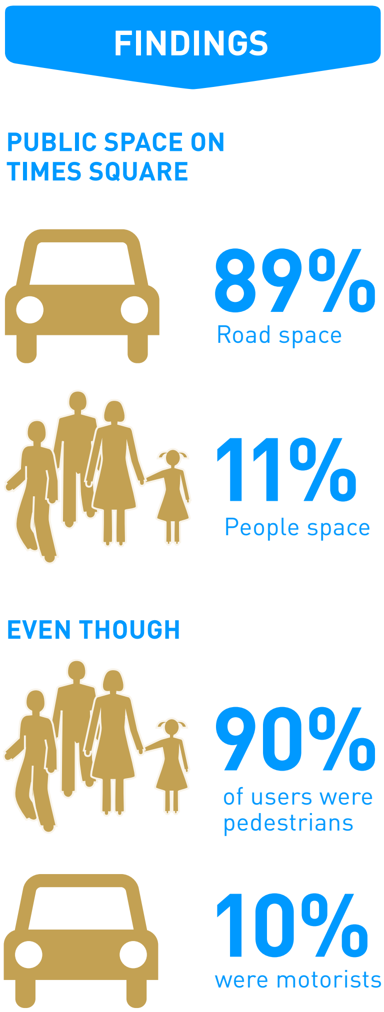
Based on this data, a new cycling network was developed that connects the surrounding boroughs. Incidentally, it also became clear that a simple change such as the laying out of bicycle lanes between longitudinal parking spaces and sidewalks would make both walking and cycling far safer and more pleasant. Most notably, the »World Class Streets« initiative also forms the basis for new design standards as well as additional programs of NYC DOT, among them »Public Plaza.« The program facilitates organizations and initiatives that work to inaugurate new public squares citywide. They may apply, for example, to initiate improvements to a public square, provided they can certify their ability to provide for upkeep. To date, 73 new public squares throughout the city have been created in the framework of the »Plaza« program. The program »Street Seats« functions similarly. Individuals, businesses, institutions, and initiatives may apply to convert underutilized streets into lively public spaces between the months of March and December. Tables, chairs, and planters are installed along the curb on broad sidewalks or streets, creating attractive places to eat, read, work, meet, or relax.

The first and most prominent pilot plaza was Times Square, which was completely and permanently reconfigured in 2015. Since this change, the entire length of Broadway has been perceived and used differently. Up until 2015, altogether 400,000 square meters of surface area in the middle of Manhattan had been reclaimed for the people. Statistics confirm the success of the newly created squares: the number of people spending time in outdoor spaces has increased by 86%. The number of people leaving their offices during work breaks has increased by 26%. For good measure, autos are able to travel more efficiently than previously. Finally, in 2015, Gehl, the J. Max Bond Center, and Transportation Alternatives issued a report evaluating life on these public squares under the title *Public Life & Urban Justice in NYC Plazas*: it confirms the overall positive influence of the program on public life and the social climate through the enhancement of accessibility, transit connections, participation, creative innovation, and beauty.

Location New York City, USA Completion 2007–2009 Client New York City Department of Transportation (NYC DOT) Design Gehl, formerly Gehl Architects (analysis, strategy, and design)

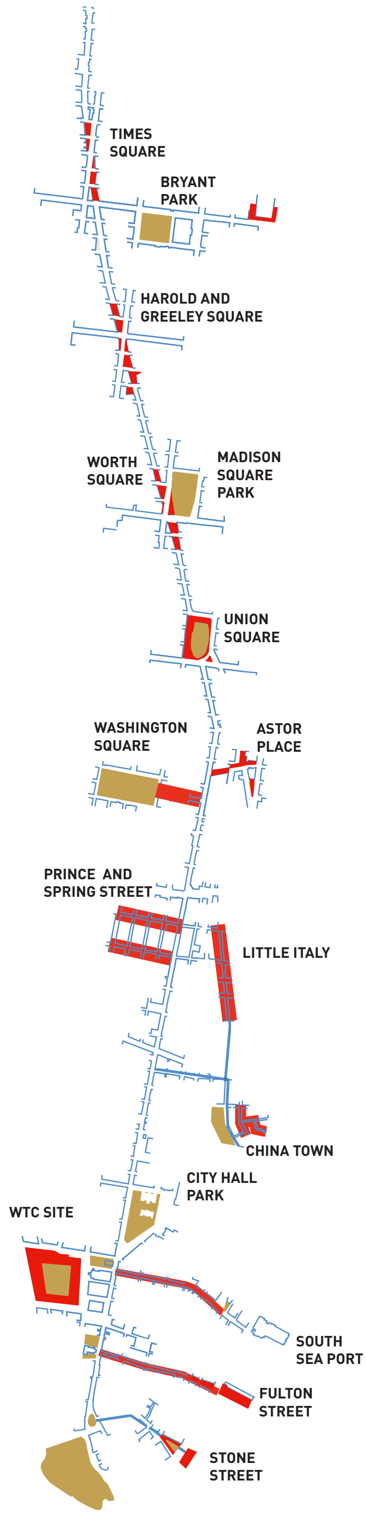
Times Square, permanent redesign, 2017


TIMES SQUARE
TIMES SQUARE
NYC
HERSHEY'S
HERSHEY'S
Reese's
HOTEL FOR DOGS
HSBC
SAMSUNG
Coca-Cola
Corona Light
Sherwood Outdoor
The Best and Brightest
IS PLEASED TO ANNOUNCE
A NEW INTERNATIONAL COMPANY
AT THIS LOCATION
COMING IN MID-SEPTEMBER
ONLY
Kodak
LG



Public space allocation prior to the redesign of Times Square

Times Square, temporary redesign, 2009

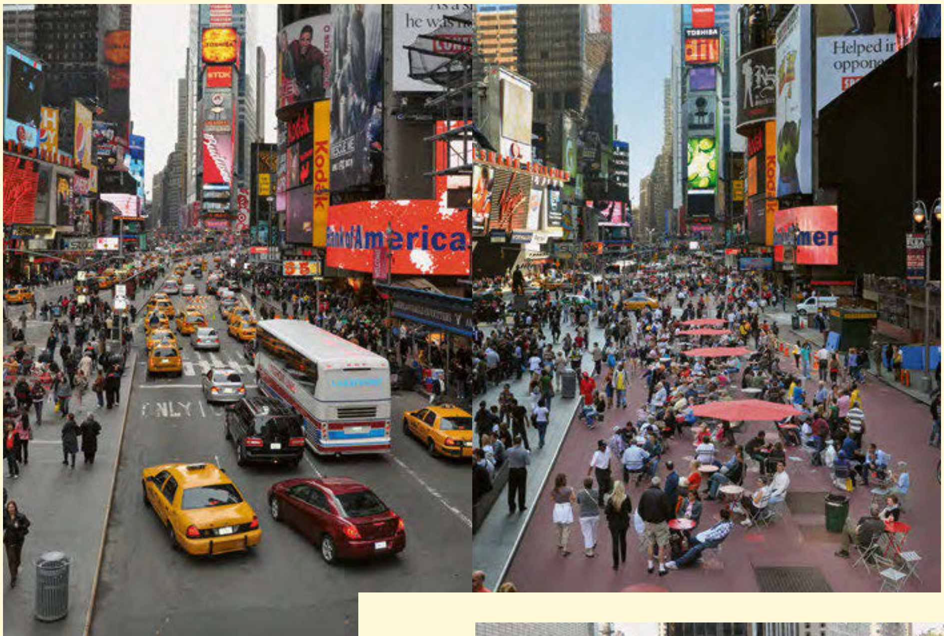


In order to improve the public space of Broadway as a whole, the Gehl team identified key areas for redesign.


DAFFY'S
MACY'S
Subway
Transel Elevator Inc.
NYC TAXI


STAPLES
DAFFY'S
West 35th St
SLOW
DO NOT ENTER
EXCEPT BIKES
NEW
DO NOT ENTER
EXCEPT BIKES
NEW
ONE WAY

Times Square before and after, 2009



Herald Square before and after, 2009

Columbus Square before and after, 2009

Rosenplatz Osnabrück

What is to be done when a public square—which is actually no longer anything of the kind—is scheduled for reconfiguration? Osnabrück's Rosenplatz is a through road south of the Wallring (ring wall). Formerly set before the gates of this city in Lower Saxony, it mutated during the years of rapid industrialization in nineteenth-century Germany into an urban square—with a boulevard character, spacious, and planted with rosebeds. During World War II, the flower beds were replaced by an underground bunker; and in the postwar era, the auto traffic of Bundesstrasse B68 began rolling through the multilane street.

The aim of a design competition—which was ultimately won by the city planners of yellow z, with offices in Berlin and Zurich, jointly with lad+ landschaftsarchitektur diekmann of Hannover—was to restore some of the original qualities of the public square while allowing through traffic to continue to flow. The designers sought to activate real urban space in its full potential: the design concept would need to do justice to the ambivalent status of the location while resolving functional issues—not simply resorting to »prettification.« Clearly, Rosenplatz would remain primarily a traffic zone—albeit with considerably enhanced amenity qualities. In 2012, following a conversion phase lasting one year, refurbishments were complete.

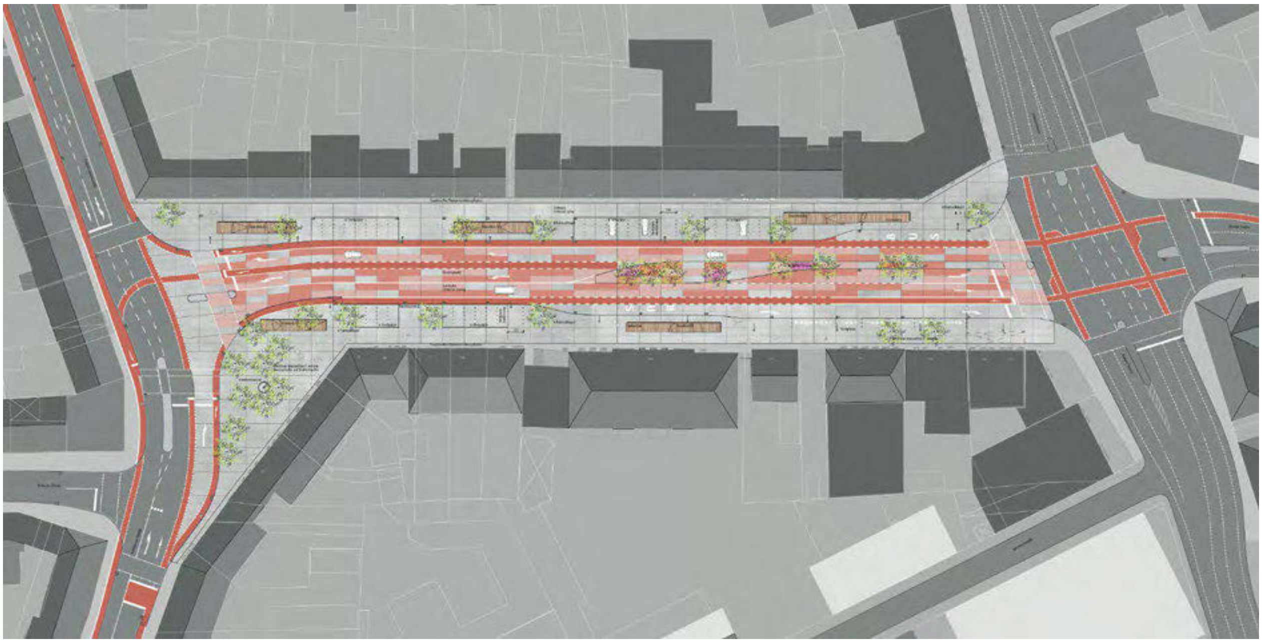
The conversion had three foci: the street surface, the street furniture, and the edges of the square, all three united by the idea of overwriting and fracturing the square's prevailing character in a number of ways. The result is a combination of walkways with objects, more compact vehicle lanes, and street landscaping consisting of trees and green areas. The walkways and road surfaces are entirely in in-situ concrete, while the roadway is dyed with a variety of red rectangles. This deliberate disruption is intended to generate attentiveness, hopefully reducing travel speed, with the darkest tones marking out the bicycle lanes.

Distributed throughout the walkways are isolated objects in wood and steel, along with benches and shelters at bus stops. Equipped with luminaries along their bases, wooden decks generate additional points of light along the footpaths during the nighttime, supplementing streetlamps. In combination with vegetation, these spacious and appealing items of street furniture invite strollers to linger in comfort. Rosenplatz has been converted into a hybrid through road—a combination of street and square that unites mobility and urban life.

Location Osnabrück, Germany Completion 2013 Client City of Osnabrück Design yellow z urbanism architecture, lad+ landschaftsarchitektur diekmann In collaboration with bpr (traffic planning and local construction supervision)

Since the redesign, Rosenplatz has become a hybrid thoroughfare—a combination of street and plaza.

The darkest color marks the bicycle lane.



Overall plan

The roadway is covered with rectangles in different shades of red. This intentional distraction helps to reduce speed.

Bus stop with spacious and inviting wooden seating platform


Beiß ohne Not
ins Butterbrot

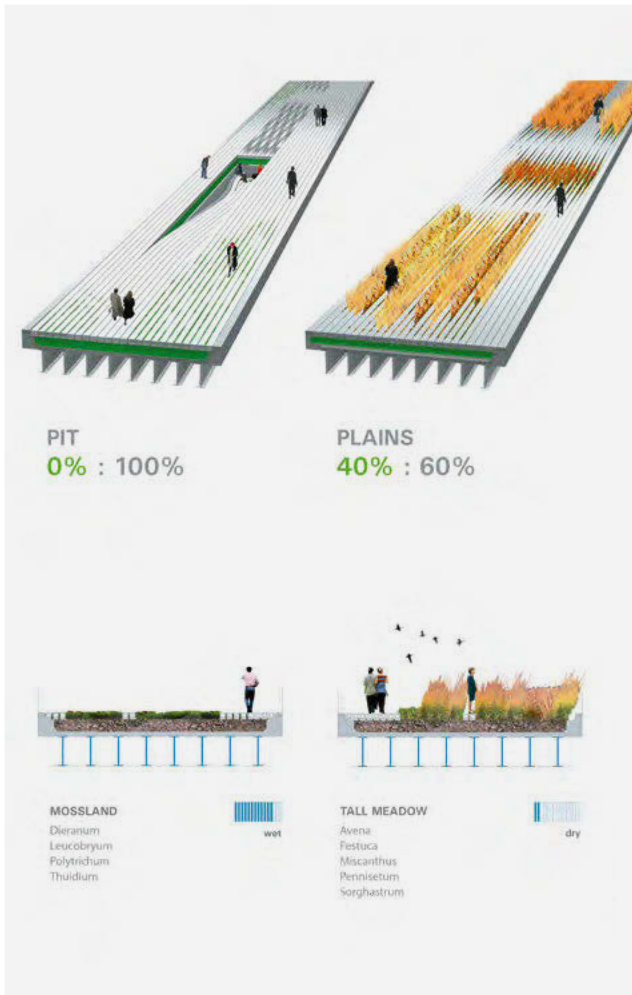
High Line

It took more than ten years to transform a former elevated railway on Manhattan's West Side into the High Line elevated park. In 2019, the final section of the structure—which runs from Gansevoort Street to the Hudson Rail Yards on 34th Street—was finally finished. Since then, the High Line, circa 2.3 kilometers in length and with diversified greenery, offers unexpected views onto and through the urban canyons and a chance to take a stroll at a height of 10 meters above ground level. The continuous course of the park is surrounded by a varied urban landscape. Here, pedestrians traverse twenty-three urban blocks, passing through three distinctive neighborhoods: the Meatpacking District, West Chelsea, and Hell's Kitchen/Clinton.

The origins of the railway line reach back to the nineteen-thirties, when the streets were to be freed from freight traffic towards the industrial zones of West Chelsea and the former meat market. Beginning in 1980, the route was disused. It was long regarded as an eyesore and was threatened with demolition, until an initiative launched in 1999 proposed its preservation and the conversion of the now overgrown railway tracks into a publicly accessible space—ultimately with success.

The result is a hybrid consisting of park, walkway, and square; realized under the direction of the local landscape architecture and planning office James Corner Field Operations, in cooperation with the New York design and architecture studio Diller Scofidio + Renfro, along with Dutch garden designer Piet Oudolf. The designers handled the preexisting industrial structure with a combination of preservation measures plus restoration and supplementation. The design mirrors the movements of strolling visitors.

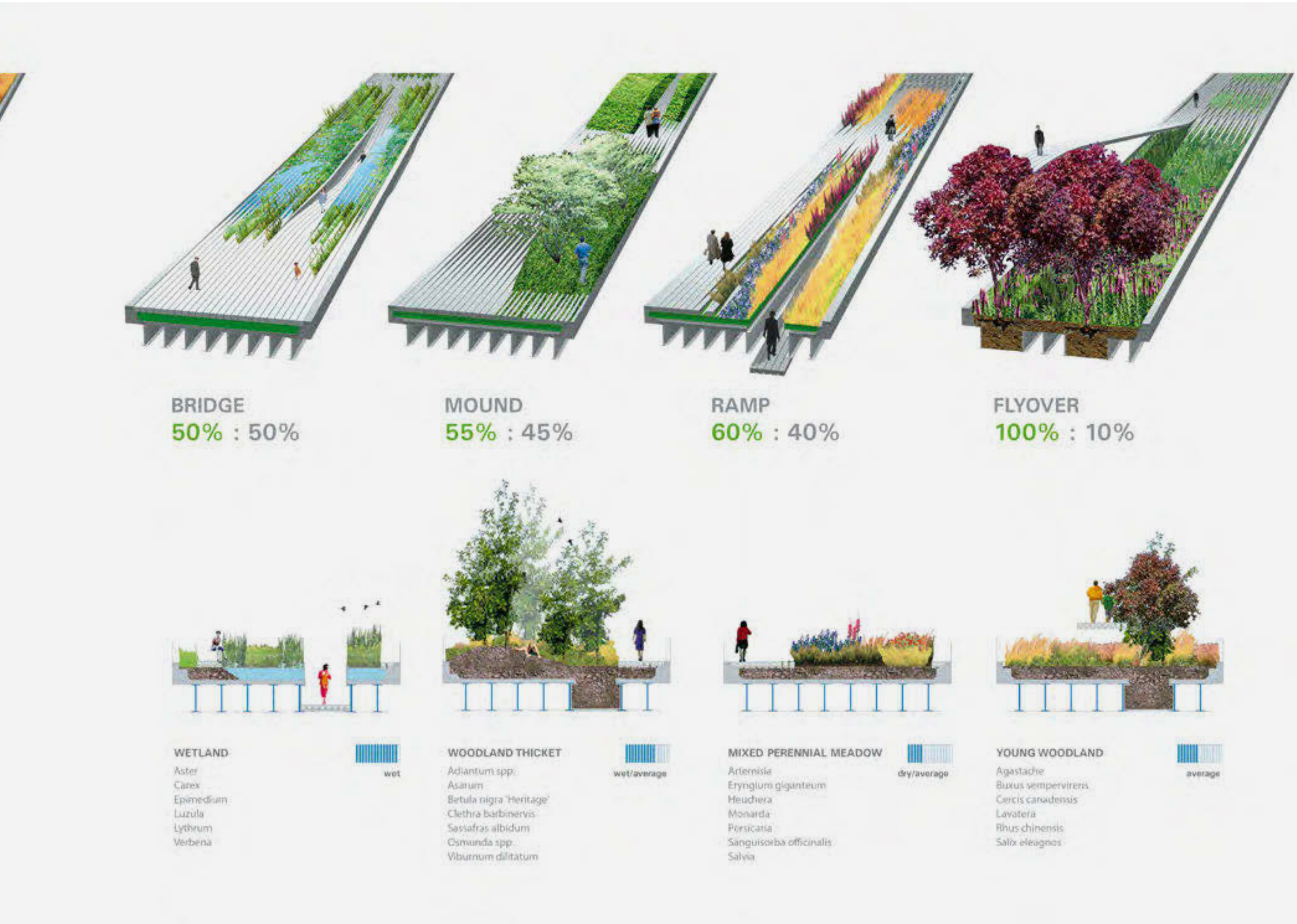
Since its partial opening in 2009, the High Line has been regarded as an icon of urban transformation. There were eight million visitors in 2019, one third of them New Yorkers. The park has long since become a distinctive Manhattan landmark. Moreover, the High Line has encouraged investors to create a new, mixed-use district in the vicinity—showing the project to be politically, ecologically, historically, socially, and financially sustainable. The park also illustrates the degree to which public



spaces are capable of activating urban life and the local economy. Worldwide, the High Line is regarded as exemplifying the potential to be discovered in the preservation and transformation of infrastructure.

Location New York City, USA Completion 2009–2019 Client Friends of the High Line and the City of New York Design James Corner Field Operations (project lead, office for landscape architecture), Diller Scofidio + Renfro (design and architecture office), Piet Oudolf (garden design) In collaboration with BuroHappold (structural and MEP engineering, life safety engineering, waterproofing), Silman (structural engineering, historical preservation), L'Observatoire International (lighting), Pentagram (signage, identity, orientation and guidance systems), Northern Designs (irrigation systems), Philip Habib & Associates (civil and traffic engineering)

Planting concept



The High Line in Manhattan's West Side

Wet biotope gardens thrive next to the water feature, a visitor favorite.

De Paleisbrug

With De Paleisbrug, realized according to plans by Benthem Crouwel Architects of Amsterdam, ’s-Hertogenbosch in the Netherlands has acquired a hybrid that is simultaneously a park and a foot/cycle bridge. Since 2015, the bridge has linked the historic center with the Paleiskwartier, a newly developed neighborhood in this town of 150,000 inhabitants. With a length of 250 meters, the rust-red structure spans the railway tracks and the nearby train station. The 6-meter-high bridge is accessed via staircases with narrow bicycle ramps and via inclined elevators at both ends.

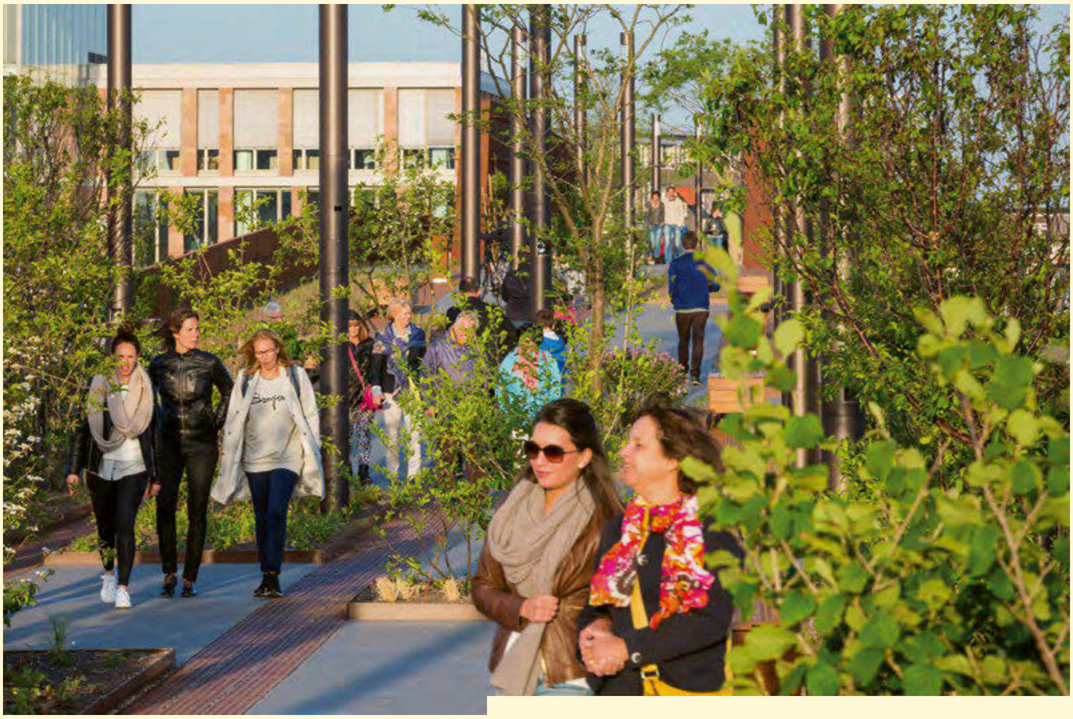
The planting of the elevated park was supervised by Dutch garden designer Piet Oudolf and is divided into three zones: savannah-style vegetation with just a few trees toward the city center gives way to low vegetation above the train tracks, followed by the denser, more forest-like character of the section oriented toward the Paleiskwartier. So that the bridge remains a pleasant locale at nighttime as well, the plants, benches, and footpaths are illuminated by LEDs luminaries after sundown. De Paleisbrug harmonizes with the greenery found along the Dommel River and on the banks of the Hofvijver, an artificial lake in the Paleiskwartier. The bridge/park serves simultaneously as a transit crossing and a place to linger: it offers views across the town, the railway tracks, and all the way to Gement, a nature preserve located south of ’s-Hertogenbosch.

To ensure a lifetime of at least a century, the shell of the bridge consists of weather-resistant construction steel. In wintertime, however, both the plantings and the steel pose a challenge: the use of de-icing salt to prevent falls would have an impact on both the plants and the building material. Fortunately, the architects devised a sustainable solution: during the winter months, integrated floor heating keeps the foot/cycle path and stairs free of ice. The required energy is harvested during the summertime by a hot/cold accumulator (ATES), for which the bridge serves as a gigantic solar collector.

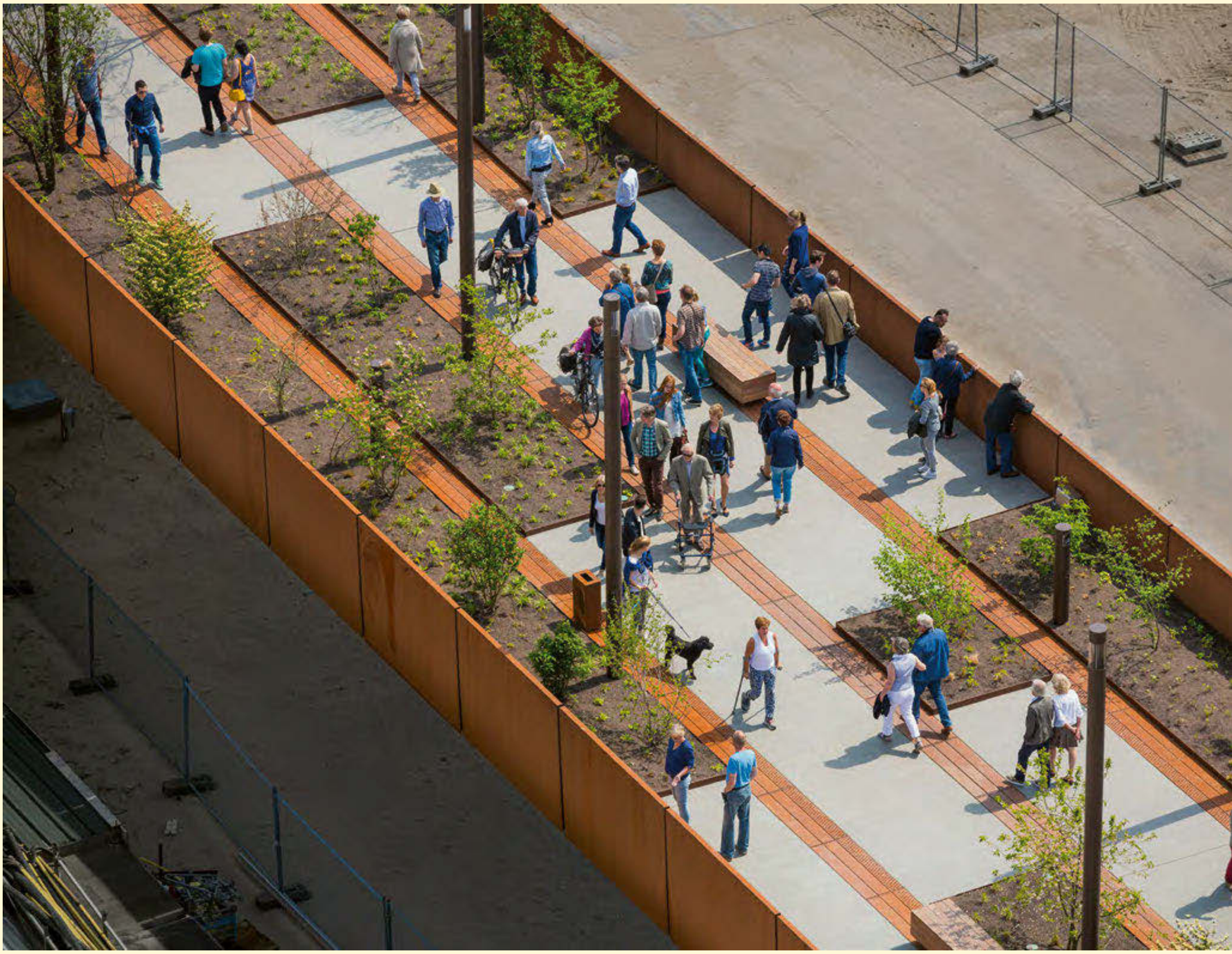
Although the elevated park has no designated cycling lane and is accessible only via steps and an elevator, extended observation has shown that among cyclists, it is thoroughly preferable to take this shortcut rather than bypassing it for a less attractive route. This demonstrates that well-designed infrastructure will be popular despite minor inconveniences.

Location ’s-Hertogenbosch, the Netherlands Completion 2015 Client City of ’s-Hertogenbosch, City Development Department Design Benthem Crouwel Architects In collaboration with Arup and subsequently Grontmij (structural engineering), Piet Oudolf (garden design)

Green features on the bridge

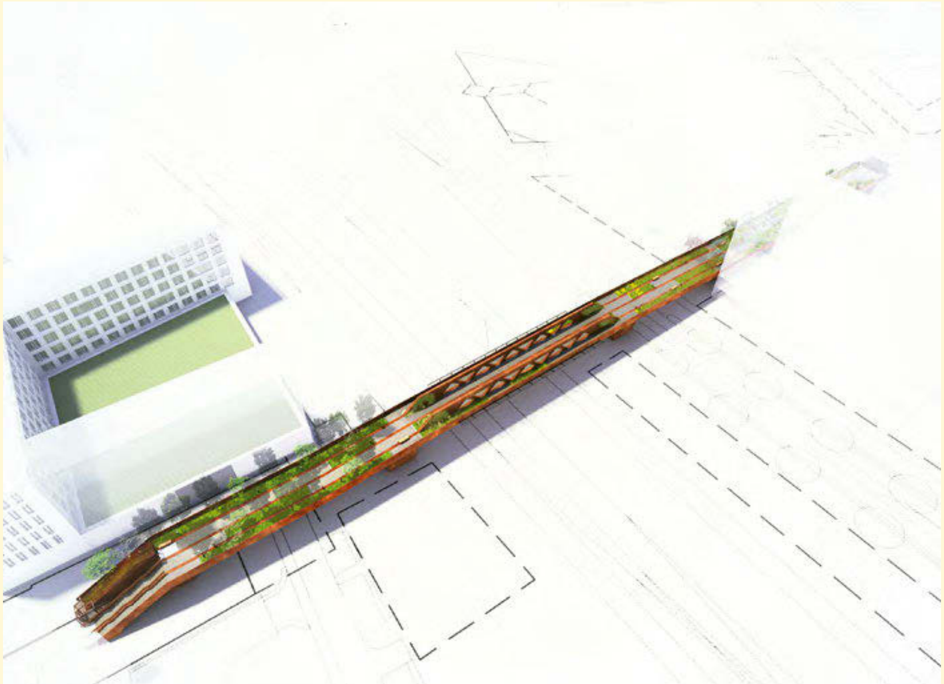


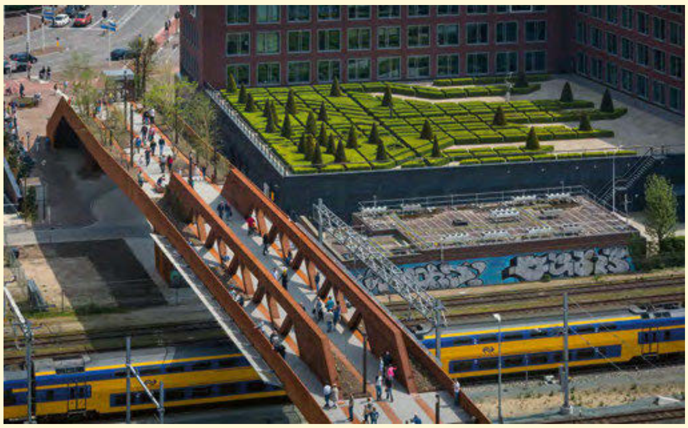
The bridge is accessed via stairs with narrow bicycle ramps and inclined elevators.



Paths and planting beds

Design visualization





The bridge connects the historic center
with the Paleiskwartier,
a newly developed district.

Cuypers Passage

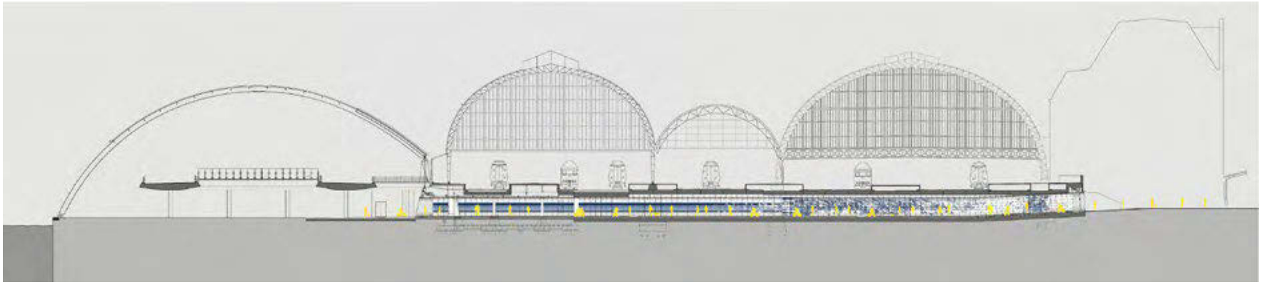
Since late 2015, the Cuypers Passage at Amsterdam Central Station has linked the city center with IJ Ferries, which provides connections to Amsterdam Noord. The 110-meter-long tunnel is part of a larger master plan for Amsterdam's Central Station, and was conceived in particular for cyclists and pedestrians. The comfortable passageway, the work of the Amsterdam office of Benthem Crouwel Architects, is used daily by circa 25,000 pedestrians.

The tube—which is 10 meters wide and 3 meters tall—owes its special appeal to its high-quality design. One half of the lane is paved for bicycle traffic. The walkway is situated on the other side and separated by a threshold. This curb is echoed in the ceiling; otherwise, floor, walls, and ceiling merge with one another via rounded transitions. A spectacular mural depicting ships out at sea is the work of the Dutch graphic designer Irma Boom. Consisting of nearly 80,000 mostly hand-painted tiles in Delft blue, it interprets a work by the Rotterdam painter Cornelis Bouwmeester (1652–1733), which can be admired in the nearby Rijksmuseum. Boom and the architects thereby generate vivid allusions to the city's history and its seaside location.

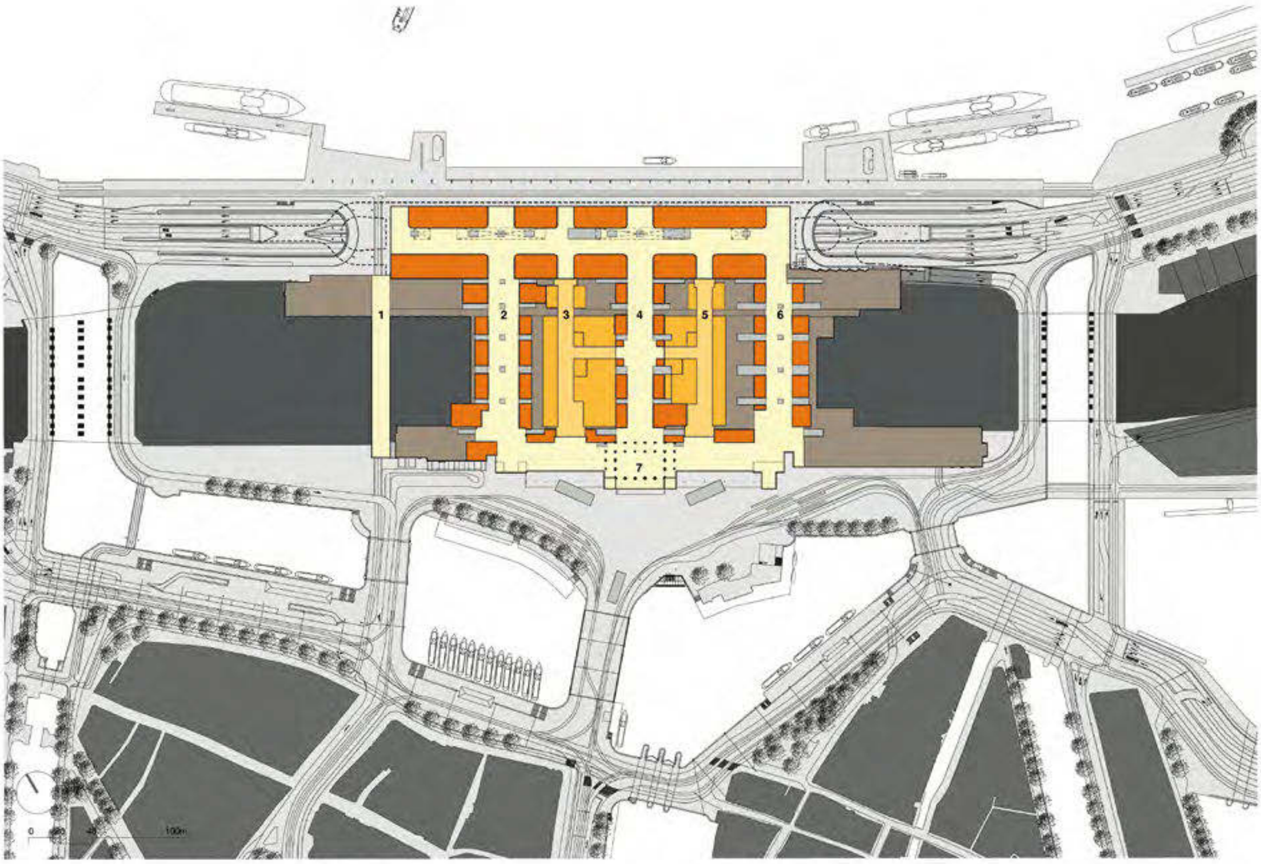
The transition from the historical to the new part of the city is translated symbolically—toward the water, the mural is transformed into abstract hatching that darkens toward the end of the tunnel. Inside, both the elaborate arrangement and the bright illumination provides a reassuring perception of safety. The designers proceed from the assumption that the tile tableau will receive enough respect to protect it from vandalism. The grated cladding on the wall and ceiling of the bicycle lane side is designed to prevent people from putting up posters or spraying graffiti. Concealed behind it is a sound absorptive material that enhances user experience by dampening noise in the tunnel.

Through the conspicuously contrasting design, cyclists and pedestrians know intuitively where they belong, and hence avoid getting in one another's way. Moreover, the curb separating the two traffic areas is indicated by a light stripe. In the Netherlands, the targeted use of design to influence behavior is quite common and is often a more efficacious solution than the installation of signage.

Location Amsterdam, the Netherlands Completion 2015 Client Municipality of Amsterdam, ProRail and NS Stations Design Benthem Crouwel Architects, Merk X In collaboration with Irma Boom Office (graphic design)

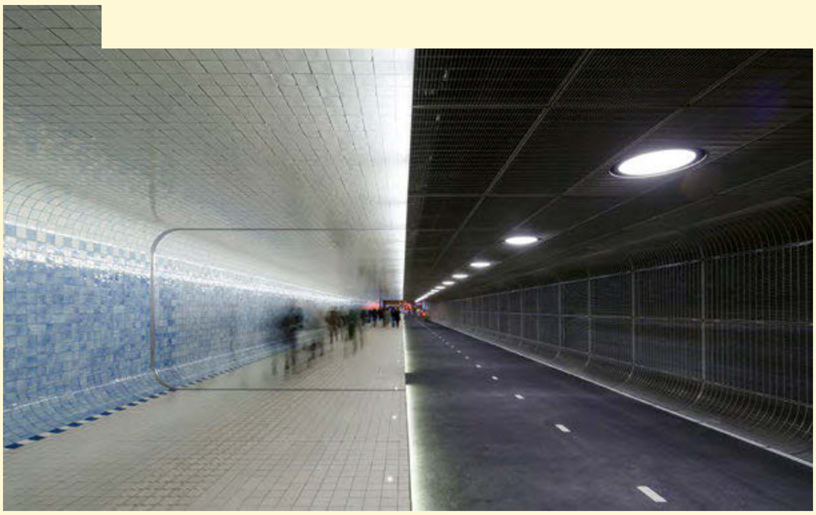


Cross-section through Amsterdam Central Station
and the Cuypers Passage



Floor plan of Amsterdam Central Station: 1 Cuypers Passage (low-speed transit corridor), 2 West Tunnel, 3 IJ Passage, 4 Middel Tunnel, 5 Amstel Passage, 6 East Tunnel, 7 Cuypers Hall

The spectacular mural by Dutch graphic designer Irma Boom is composed largely of hand-painted tiles.



Due to the strongly contrasting design, cyclists and pedestrians know intuitively where they should be.

Entrance on the city side

Bicycle Snake

Internationally, Copenhagen is regarded as a flagship metropolis of bicycle traffic. This is partly due to striking cycling infrastructure projects such as the Cykelslangen, the Bicycle Snake, constructed according to plans by the local architectural office Dissing+Weitling. This harmoniously curved cycling bridge winds its way along Copenhagen South Harbor between formerly disconnected buildings, crossing the water and the walls of the quay along a length of 230 meters.

In 2014, the Bicycle Snake eliminated a major weak point: the place where the paths of pedestrians and cyclists intersected and the journey was interrupted by stairs. More precisely: between the west side of Sydhavnen, which lies south of the city center area, and the preexisting Bryggebroen, a swing bridge that leads further toward the east side of the harbor. Now, both bridges are joined together seamlessly on a harbor promontory, where the Cykelslangen accelerates cycle traffic—but for pedestrians as well, amenity qualities underneath the high-speed cycle route have been substantially enhanced through design upgrades.

The bridge is an eyecatcher, and not just by virtue of its columns, which tower up from the water in a seemingly haphazard way. Equally striking is the bright orange road surface with a non-skid synthetic surfacing sprinkled with dyed quartz sand. Marked out are two lanes, one in each direction. The lighting has been integrated into the railings. The ascent of the ramp to its highest point is so gradual that the crossing, with a height difference of 5.5 meters, can be managed comfortably by all cyclists.

With the Cykelslangen, Copenhagen has gained a highly functional and aesthetically appealing element of cycling infrastructure, one that has seen heavy use right from the start and enjoyed popularity both day and night. In the quieter, off-peak hours too, it enlivens the waterfront area with its sober, austere new buildings. More importantly, this attractive piece of cycling infrastructure supplements the existing network of cycle routes at a problematical point, making daily commuting within the city more convenient and efficient. Besides providing users with a rapid and secure connection, the bridge also offers privileged city views, enhancing the pleasures of cycling.

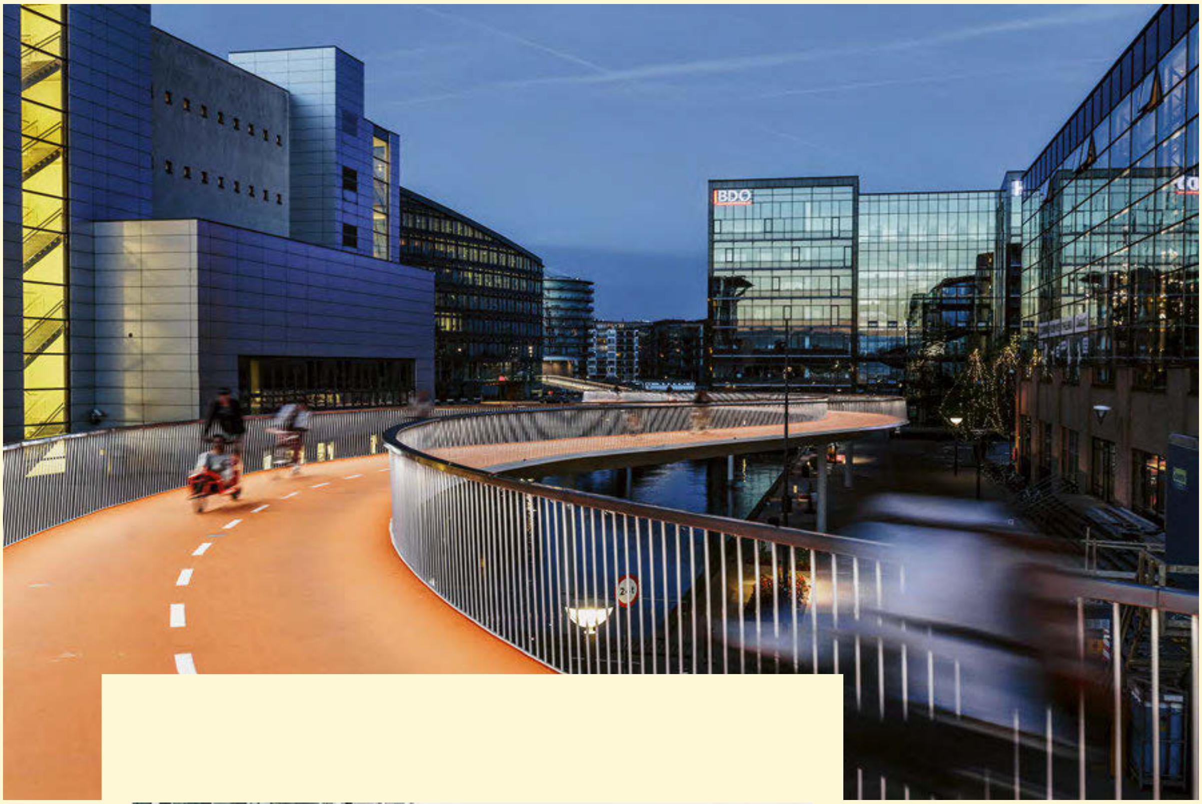
Meanwhile, the Bicycle Snake has become a symbol of Copenhagen's bicycle friendliness—while exemplifying the vision of transforming cities into green places that featuring emissions-free mobility.

Location Copenhagen, Denmark Completion 2014 Client Municipality of Copenhagen Design Dissing+Weitling (architecture office) In collaboration with Rambøll (engineering), MT Højgaard (contractor), Lightconstructor (lighting design)

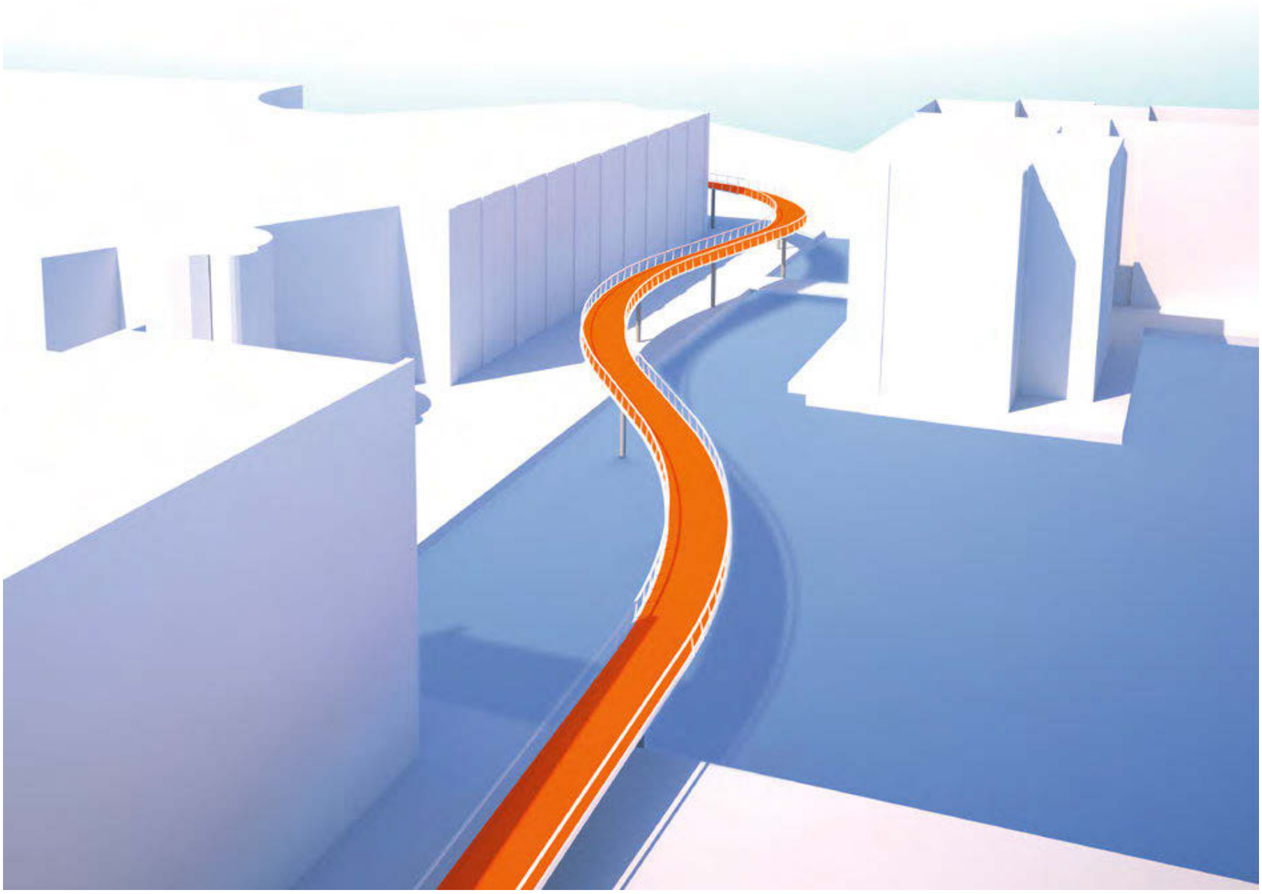
The Bicycle Snake shines in bright orange between the buildings.


BDO
24t

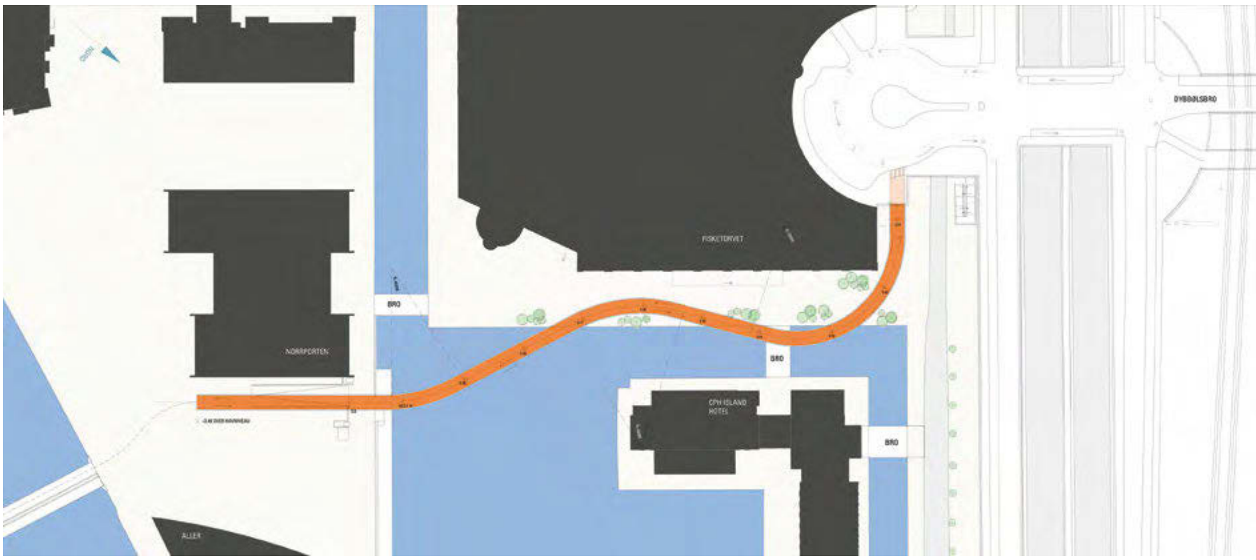
Users enjoy exceptional views of Copenhagen Harbor.



The quality of the space for pedestrians underneath the cycle path has been significantly improved through design upgrades.



The harmoniously curved route relates to its surroundings.



Site plan

Activating Spaces

Established in many places in recent years is the practice of implementing reversible, cost-efficient, and quickly achievable urban interventions. Prior to the accomplishment of permanent planning measures, they also serve as an experimental method for testing the limits and potential of proposed changes, along with their popular acceptance. They are also a form of self-empowerment and of the appropriation of urban space through civic initiatives that are designed to call attention to deficits in public space, to instances of restricted utilizability. The following three projects illustrate the relevance of such interventions, and the potential spectrum of their applications.

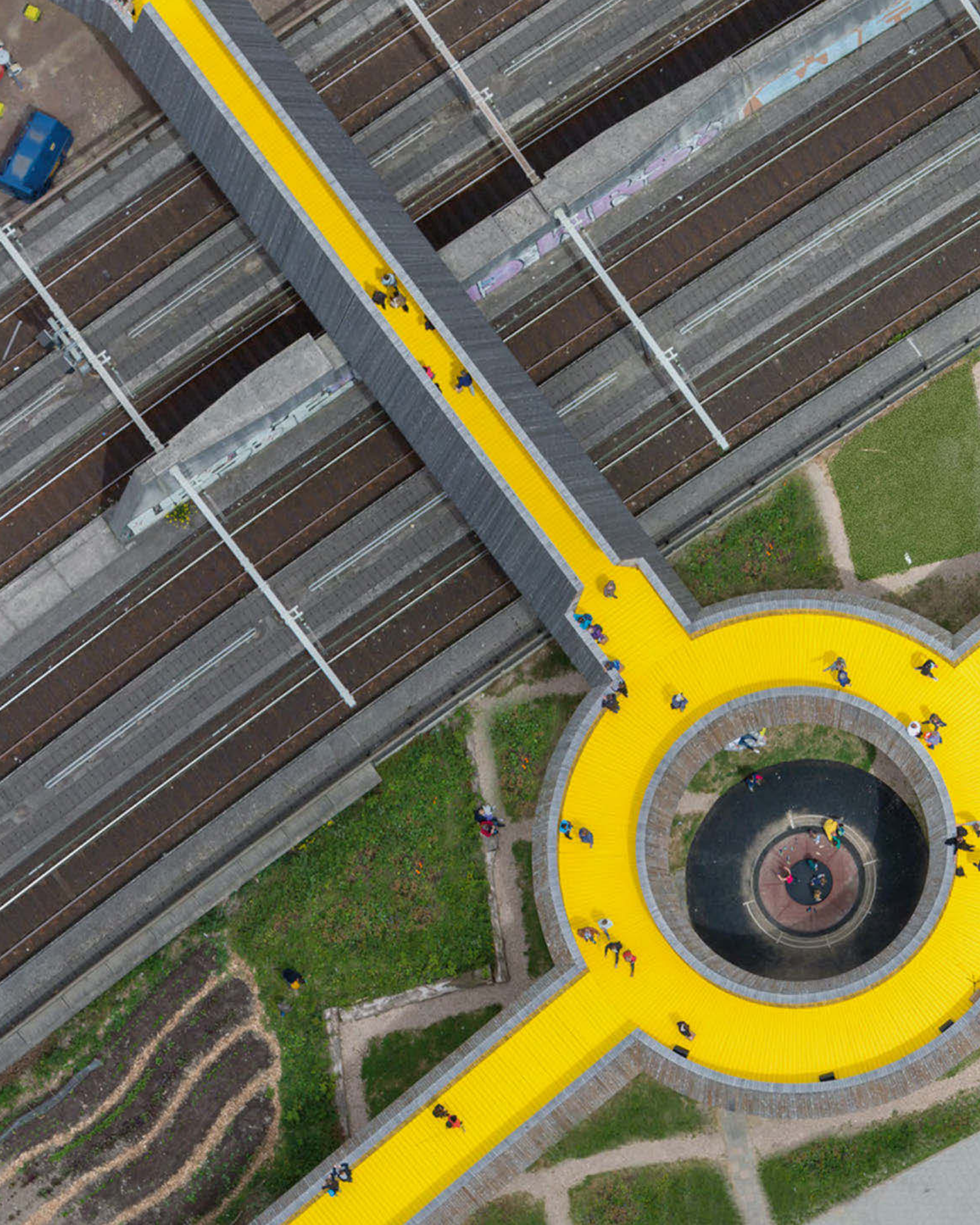
Luchtsingel

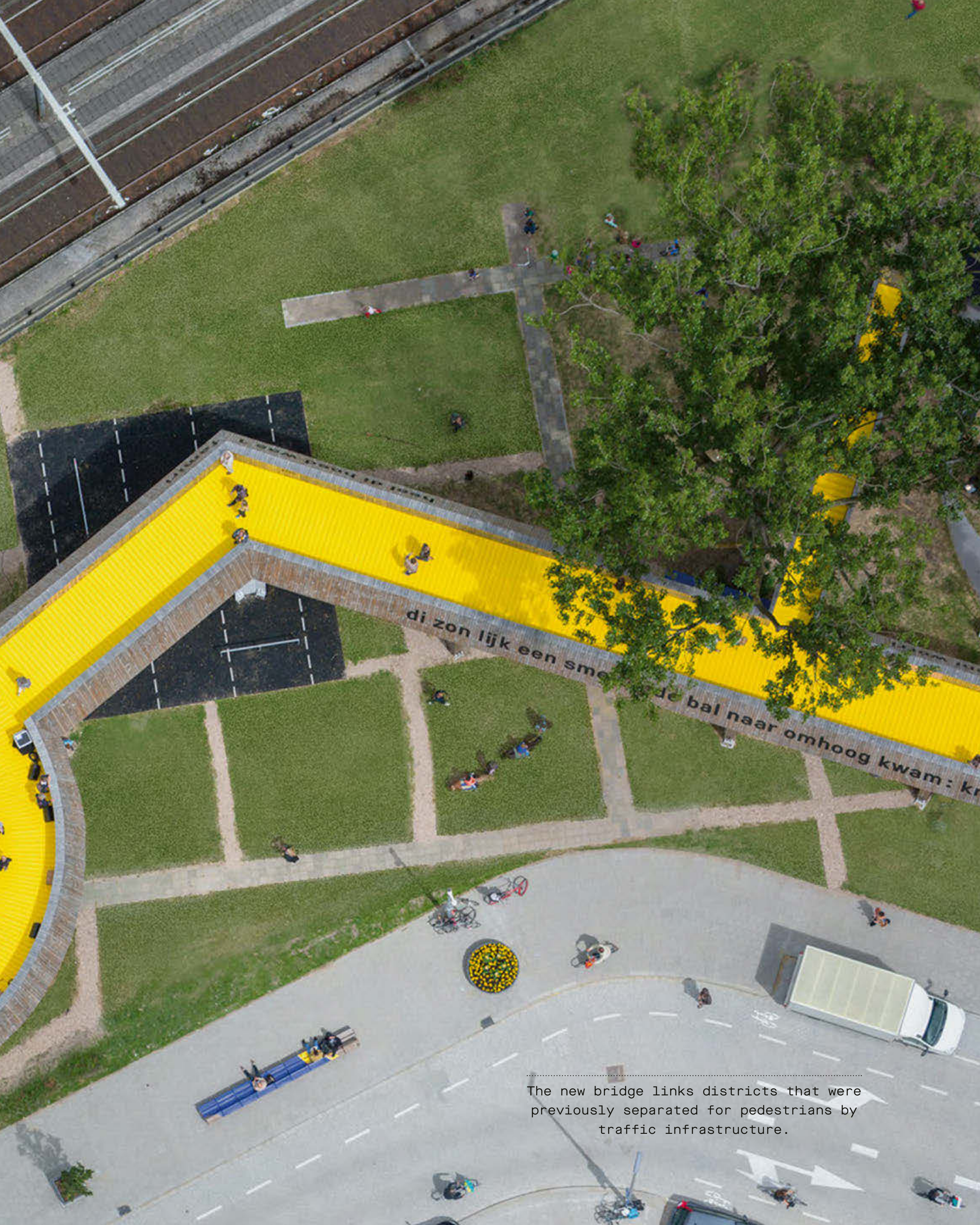
The Luchtsingel has become
a landmark and a meeting place.

The Luchtsingel, a 390-meter-long pedestrian bridge erected between 2012 and 2014, is the first infrastructure project worldwide to be realized via crowdfunding. It was created in connection with the 5th international Architecture Biennale in Rotterdam (2012), which was co-curated by the local landscape architecture office Zones Urbaines Sensibles (ZUS), and devoted to the theme of »Making City.« ZUS has already rescued a disused office block from the nineteen-sixties, situated west of Rotterdam's Central Station, from demolition, transforming it into a place for young, creative startups. To liberate it from its disadvantageous location (wedged between railway tracks and multilane traffic arteries) while linking together additional neighborhoods, formerly cut off from one another by traffic infrastructure, a crowdfunding project was launched to finance the wooden bridge. Participation was possible for as little as 25 euros, and contributors were named on the bridge itself or else offered the option of having a personal message inscribed on it.

Completed in 2015, this simple pedestrian link illustrates how an initiative, referred to by its creators as an instance of »temporary permanence,« can infuse fresh energy into urban neighborhoods. Activated as well were additional projects involving the long-term utilization of existing resources, including the use of roofs as community gardens and the creation of playgrounds, design shops, and cafés. The bridge itself has become a meeting point, and its color—a powerful yellow—has also made it a landmark within Rotterdam's urban fabric, previously so unfriendly to pedestrians at this location.

Location Rotterdam, the Netherlands Completion 2012–2014 Client ZUS–Zones Urbaines Sensibles, Stadsinitiatief Rotterdam Design ZUS–Zones Urbaines Sensibles (office for landscape architecture, urban planning, and architecture) In collaboration with Groot Lemmer (contractor)





The new bridge links districts that were previously separated for pedestrians by traffic infrastructure.

Mobility Challenge Hoogkwartier

Put to the test during 2019 in an experimental phase lasting two months—also in Rotterdam—was the question: To what extent would people be willing to alter mobility decisions to improve the quality of the residential environment? The densely built-up Hoogkwartier, where the experiment was carried out, lies east of Rotterdam's city center. The Stadslab initiative developed within the quarter itself and has functioned since 2018 as a link between municipal politics and the neighborhood, which organized and implemented the Mobility Challenge Hoogkwartier (MCH) together with the city of Rotterdam.

Rotterdam is strongly characterized by auto traffic, as reflected in Hoogkwartier: the nearly 768 parking spaces on the streets occupy more public space than the neighborhood's green zones. At the same time, there is a growing demand for open space for fitness, leisure, and social encounters.

In the context of the MCH, residents, small business owners, and workers in the quarter agreed not to use their cars for a period of two months, resorting instead to sharing options and public transport. During this interval, participants parked their cars outside the quarter. Made accessible at a central location in the neighborhood were alternative mobility offerings according to the sharing model: two gasoline and two electric autos, electric bicycles, and traditional bicycles and cargo bikes. At the same time, the temporary introduction of one-way streets and special illuminated zebra crossings tested strategies for making traffic and transport in the neighborhood safer. Installed as well was a temporary green space. In all, 47 people participated—and when the experiment had concluded, the majority voted in favor of perpetuating these temporary measures.

The projects demonstrate that the involvement of local residents, combined with visible changes, increases preparedness for engagement. The link between mobility and the residential environment—provided the connection is explained effectively—encourages greater receptivity to changes in mobility behavior. A set of guidelines was developed to allow other cities and urban districts to profit from the results.

Location Rotterdam, the Netherlands Time period Sep–Nov 2019 Initiative Stadslab Hoogkwartier In collaboration with City of Rotterdam, Hely, MVRDV, Bende, Studio 1:1, Drift, Erasmus UPT, Veldacademie, BIZ Hoogkwartier, Stichting Bewoners Hoogkwartier, RADAR, Humankind, Marcel Jongmans

The Mobility Challenge relied on highly visible signs to engage residents.

Mobility Hub: residents were provided access
to alternative mobility services
at a central location in the neighborhood.

Temporary redesigns highlight the benefits
of fewer parking places in public spaces.

The Kitchen Monument activates previously underused public space—as shown here in Duisburg. (2010)

In Hamburg's Kirchdorf district, the Kitchen Monument was integrated into the International Building Exhibition. (2010)

The Kitchen Monument

Beginning in 2006, the Kitchen Monument, a temporary intervention installed by the Berlin architect collective of Raumlabor and the artist group Plastique Fantastique in various cities in Germany, as well as in Liverpool and Warsaw, has illustrated how neglected urban spaces can be activated and revitalized. The Kitchen Monument consists of a solid box and a pneumatic shell that can be inflated quickly and used as an event space. A footbridge connects the box, containing a cloak room and reception area, with the »bubble.« A fan installed underneath the footbridge provides the pneumatic element with air. When not in use, the Kitchen Monument requires only the surface area of a parking space.

The Kitchen Monument is designed to demonstrate how disused or underused public places can be enlivened and activated as places of encounter, thereby revitalizing a neighborhood. As a tangible, visible place of communal life, it is readily adaptable to specific spatial conditions and can be assembled and disassembled in not time at all. For events and gatherings of all kinds, it provides a protective shell for up to 120 people. When not in use, it requires virtually no space and consumes no resources. It is mobile, can travel quickly between locations, and is usable even in urban spaces that lie idle due to unfavorable framework conditions. The Kitchen Monument, then, is also a mobile bellwether of concrete improvements in urban space.

Location various, among others Berlin, Frankfurt, Hamburg, Giessen (DE); Liverpool (GB); Warsaw (PL) Completion at any time; first installation in 2006 Design Raumlabor Berlin (architect collective) and Plastique Fantastique (pneumatic shell/bubble)

Installation in Liverpool: as a short-term intervention, the Kitchen Monument enables the street space to be perceived in a new and different way. (2011)

Augmented Mobility

Peter Eckart &
Kai Vöckler

Augmented mobility refers to the expansion of a mobility system through the growing possibilities for digital information exchange. This is bringing about a digital reinvention of mobility, made possible through mobile internet that is accessible via smartphones and tablets, as well as future »wearables« (wearable computer technologies). In addition, there is also the progressive connection with the »Internet of Things« (IoT): objects of daily use that are equipped with sensors and actuators, software, and additional technologies, which are interconnected through the internet. Together these form a communicative infrastructure through which people move and information is exchanged. A significant expansion of the user's action space is thus made possible, provided that the infrastructure guarantees service (via dependable access to the internet everywhere) and also ensures that all levels of society can participate in the service (via access to networked mobile end devices, and in the future to additional interfaces).

In principle, an (ideally) uninterrupted internet connection will not only make permanent access to information possible, but also the creation of another personal communication space. The latter transcends the benefits of providing information to form a private sphere of its own while one is on the move, even in shared modes of public transport. The functional advantages of a digitally supported, augmented mobility for an intermodal, environmentally friendly mobility are obvious. This already begins with the planning (and booking, if necessary) of trips. By choosing from the spectrum of services offered by public transportation, as well as those of corresponding sharing services, users can configure the different transport modes on their respective route according to their needs and personal preferences (which includes their own feet and bicycle). Even while traveling, users can adjust their mobility plans through digitally supported information provided in real time. For example, they can flexibly react to a lack of available transport modes (due to delays) by switching to other travel options. Or, if they change their mind (for example, when a sudden burst of sunshine suggests going by foot or bicycle), they can deviate from their original plan and select appropriate mobility services according to their needs. Individualized digital information provides orientation at any time, informs planning as well as »finding your way,« and offers alternatives. The consequent expansion of possible options increasingly allows for spontaneous decisions and makes individual mobility fundamentally more flexible and dynamic. This entails being freed from dependence upon a single means of transportation. When the various services on a route can be easily interlinked, i.e. seamlessly and without interruption, this substantially increases the feeling of self-empowerment—that is, of simply having control over your own decisions and being able to act according to your own will, while no longer being dependent on your own car. The precondition for this is, of course, that the transport infrastructure and the information and communications technology system are implemented and interlinked. And not least, the services must all be accessible.

Whether the digital innovations supporting environmentally friendly mobility are effective or not depends upon social, political, legal, and economic parameters. Mobility design, in the sense of a human-centered design oriented to their needs and desires, plays a critical role in this context by mediating between people and the mobility system through its digital and physical interfaces. It enables access, positively influences experiences, and imparts meaning, thus promoting acceptance. From a systemic perspective, it should be borne in mind that individual needs for autonomy, privacy, and comfort must be brought into accord with overall societal goals, such as generational climate protection and social equality. For this reason, the optimization of existing motorized individual transportation through digitally supported intramodal mobility—that is, the future integration of self-driving private cars in the »Internet of Things« that exists within an interconnected transport infrastructure—is not the right approach to responsible and sustainable design. The focus on e-mobility, automated and networked driving reinforces the continual increase in mass-motorization through automobiles, with all of the attendant problems. Thus, the digitalization of private vehicles through artificial intelligence, which controls and optimizes traffic flows with future autonomous »driverless« vehicles, can make this form of mobility appear more attractive: it provides relief from driving and for increased private time, all while being in a private protected space. The attractiveness of this option is understandable from a subjective perspective. However, objectively, it would perpetuate traffic-related pressures on people and the environment, such as: paving over land, requisitioning land at the expense of other modes of transport, noise, the occupation and domination of larger parts of public space to the detriment of all, resource depletion. Vehicles that are parked for more than 23 hours and rarely used by more than one person do not belong to the image of a future-oriented, sustainable, resource-saving mobility. Therefore, it is the responsibility of mobility design to reinforce collaborative and environmentally friendly mobility services. This should be achieved not only by functionally improving the accessibility and practicality of digitally supported intermodal and environmentally friendly mobility, but also by addressing our need for privacy, sense of safety and comfort, and further, by facilitating correspondingly positive experiences through the design of the mobility system. This also means communicating the symbolic aspect of collective, climate-friendly mobility through design. The design of digitally supported mobility not only concerns the interface with the mobile internet (as the design of user interfaces and their manual, acoustic, and gestural control), but also the action space of users. In this context, a digital information and communication layer is superimposed on the physical environment, along with the mobile and immobile objects and the people acting in and between them. This is a mixed world of digital and analog elements that will be more strongly fused together in future. The personal digital environment that is available everywhere and at all times requires serious measures to protect data security and the private sphere, which is a political responsibility. Users willingly permit private service providers to collect and utilize their data and information via traffic control operations so that they will have more »convenience,« along with the advantage of simplified route selection, and in the future, more personalized services as well. For example, this has benefitted ride-sharing services to the disadvantage of public transportation. A policy oriented towards the general well-being must therefore take back control over the flow of data and proactively intervene in order to achieve a sensible as well as orderly integration of privately offered services within the public mobility system. Part of the designing of digital interfaces together with their underlying information systems is to make clear what happens with private data, and to ensure that the interface is set up to make this easy to track. How can trust in communal data storage and data accessibility be achieved? With the superimposition and increasing circumstantial intrusion of digital data in the real world come new challenges for mobility design. One example is orientation: how are digital spatial markers that are represented as symbols on virtual maps, for example, correlated with their equivalents in real space? This requires the coherent organization of digital and analog information. Or, how can a subjective feeling of security be reinforced, or trust in the capability of the system be established, through the communication and design of information relevant to the user's situation? These questions point to the challenges posed for mobility design: the user's action space in digitally supported mobility should not be limited to the interface on a technical device alone, but rather should also be understood in terms of interaction with the physical world. The projects discussed here illustrate this.

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↳**pp. 226 top, 227** Scholz & Volkmer; **p. 226 bottom** Scholz & Volkmer, Teresa Sdralevic (illustration)
↳**pp. 229 top, 231 bottom** HfG Offenbach
↳**p. 229 bottom** photo: Citi Bike; author: Shinya Suzuki; license: CC BY-ND 2.0, https://creativecommons.org/licenses/by-nd/2.0/; source: https://www.flickr.com/photos/shinyasuzuki/8859409854/in/photolist-euSMTL-euSM65-2icxDyc-wQYm6m-x6gKo1-wbHPt8-euPE8M-wbHNuV-fnbw2D-iJqRHN-euPEqz-2agTUfV-euSMy3-iRS6Sp-QirhK1-pb6siB-eERR4L-284uyYH-2kPw7De-hcmAFJ-eJSb4b-etHHhP-xexFzQ-eERMe5-z9cSQ3-2kQ1Wrh-w9HiJB-2kJzXx5-eZ2L3U-2kZsAVS-ew6tqM-284uKWp-2kJvZAZ-fPi7mb-2kJvZum-vjM11g-fP1yKr-2kJvWBN-fP1zSz-H92jaM-evsM68-2k5Ufys-2kntAEx-gwHFey-2fu7P68-265mNJ5-2jUbfC5-2kxexLU-2knp9G4-2hNDScx
↳**pp. 230, 231 top** Tomorrow Lab (photos)
↳**pp. 233, 234** Springlab
↳**pp. 236, 237** overkillshop
↳**p. 239 top, 240** press images Transport for London; **p. 239 bottom** iStock.com/burcuaytas (photo)
↳**pp. 242, 243, 244 bottom** Screenshots created by the HfG Offenbach, with kind permission of the city of Herrenberg; **p. 244 top** HfG Offenbach
↳**pp. 246 top, 247** Press images Transit App Inc.; **p. 246 bottom** HfG Offenbach
↳**pp. 249, 250** Work & Co; **p. 251** Allen.G (photo)/Shutterstock.com

COBI.Bike

Meanwhile, the smartphone is also used on bicycles as an audiovisual, networked, digital cockpit. For electric bicycles equipped with Bosch motors, Bosch eBike Systems has offered COBI.Bike, a retrofittable, digital system that links the e-bike with the digital world, since 2017. Intuitive, contextual, and playful connectivity is designed to make the cycling experience more comfortable while enhancing safety in road traffic.

With the COBI.Bike app, e-bike users see everything at a glance: the dashboard, with its clear, convenient design, displays information about velocity, the roadway, altitude, weather conditions, plus fitness and performance data. Free of charge and worldwide, the COBI.Bike app makes available 2D or 3D navigation, along with online and off-line maps. The app also contains popular functions such as music control and fitness tracking; pedal frequency, velocity, power output, and calorie consumption can be displayed. Functions can be selected either by typing on a smart phone or by using a separate controller mounted on the handlebars. Some functions are available only when stationary, allowing both hands to remain on the handlebars while cycling. Much information can be read out via audio response—for example via Bluetooth headphones.

COBI.Bike also offers practical safety functions: an electric bell, an acoustic alarm function that offers additional protection against bicycle thieves and responds to suspicious movements. The optional front light and cordless taillight turn on automatically when the e-bike system is started. Users may also turn on lights manually using the COBI.Bike app or a switch on the Hub. Available now—so far only to users of the German mobile phone network—is the Help Connect function: in the event of an accident, a service team that offers around-the-clock assistance is notified.

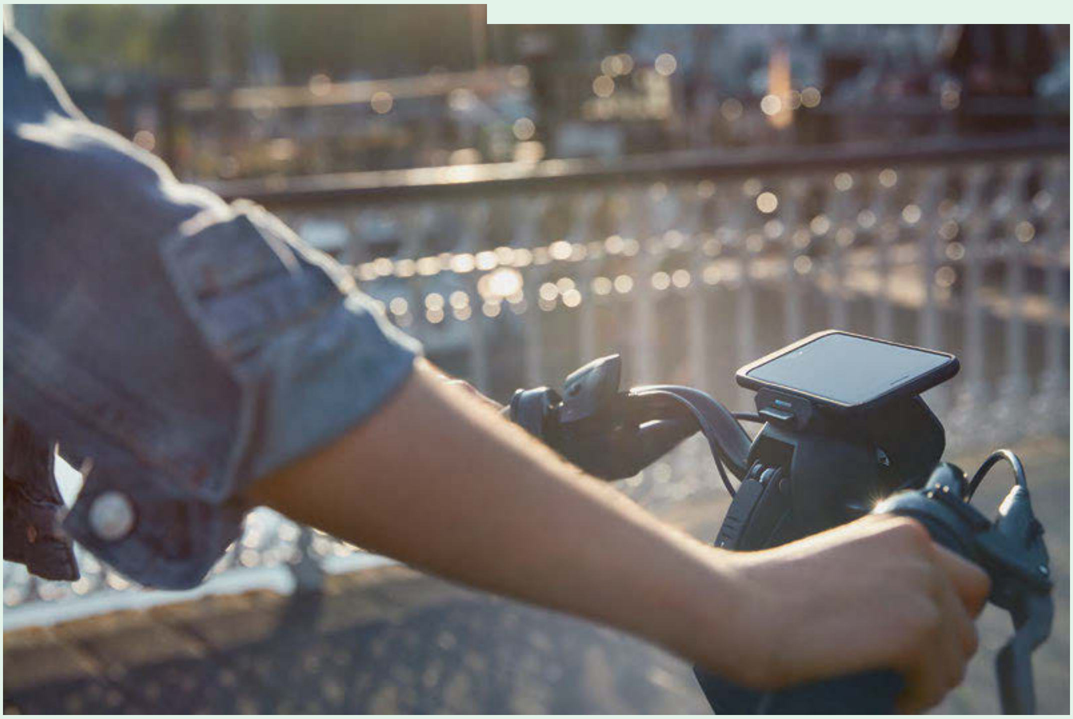
The COBI.Bike Hub can be mounted on the cradle for the Bosch onboard computers Intuvia and Nyon and is usable for many smartphone types. All that is needed to charge a smartphone during travel is the energy from the e-bike battery. Updates for the Hub and new features for the app are downloaded automatically.

Distribution worldwide Product introduction 2017 (performance description: model year 2021) Manufacturer Robert Bosch GmbH, Bosch eBike Systems Design COBI.Bike, Bosch eBike Systems

With the COBI.Bike app, e-bikers can keep an eye on everything while cycling.

The system is controlled by tapping on your smartphone or by pressing the controller with your thumb.

The wireless front and rear lights of the optional lighting system switch on automatically in the dark.



The holder can be used with many types of smartphones.

DB Rad+

Deutsche Bahn regards itself as an all-embracing, sustainable mobility provider whose offerings go far beyond the railway tracks. The enterprise is therefore also committed to strong cycling communities, for the bicycle is an integral component of a sustainable mobility chain. With »Zukunftsbahnhof« (Station of the Future), Deutsche Bahn launched an initiative in 2020 at sixteen train stations that test innovative solutions for improved customer service and new ideas for an environmentally friendly interconnected mobility.

One section of the project is called »Innovativer Fahrrad-Service am Bahnhof« (Innovative Bicycle Service for Our Customers), which provides a framework for the DB Rad+ App project, developed by Deutsche Bahn in collaboration with the Wiesbaden creative agency Scholz & Volkmer. The idea is that bicycle users tend to travel by rail. Therefore, commuters are rewarded for riding their bicycles—in a digital system with its own currency.

To date, the free app has been addressed to cyclists in selected municipalities. The test phase was launched in Ahrensburg in 2020, and beginning in 2021, the app has also been available in Wiesbaden, Freising, Hamburg-Harburg, Hamburg-Bergedorf, and Renningen. Following activation, and once the GPS has been switched on, Rad+ App keeps track of kilometers traveled. These are converted into a credit balance and can be redeemed at one of numerous participating businesses located around the train station of the respective town. In exchange for 30 kilometers traveled, for example, users may get a coffee at their favorite café. Depending on the city, between fifteen and thirty shops participate. Through reduced car traffic, the city becomes more attractive. And users are rewarded directly—also through the benefits of a healthy form of locomotion.

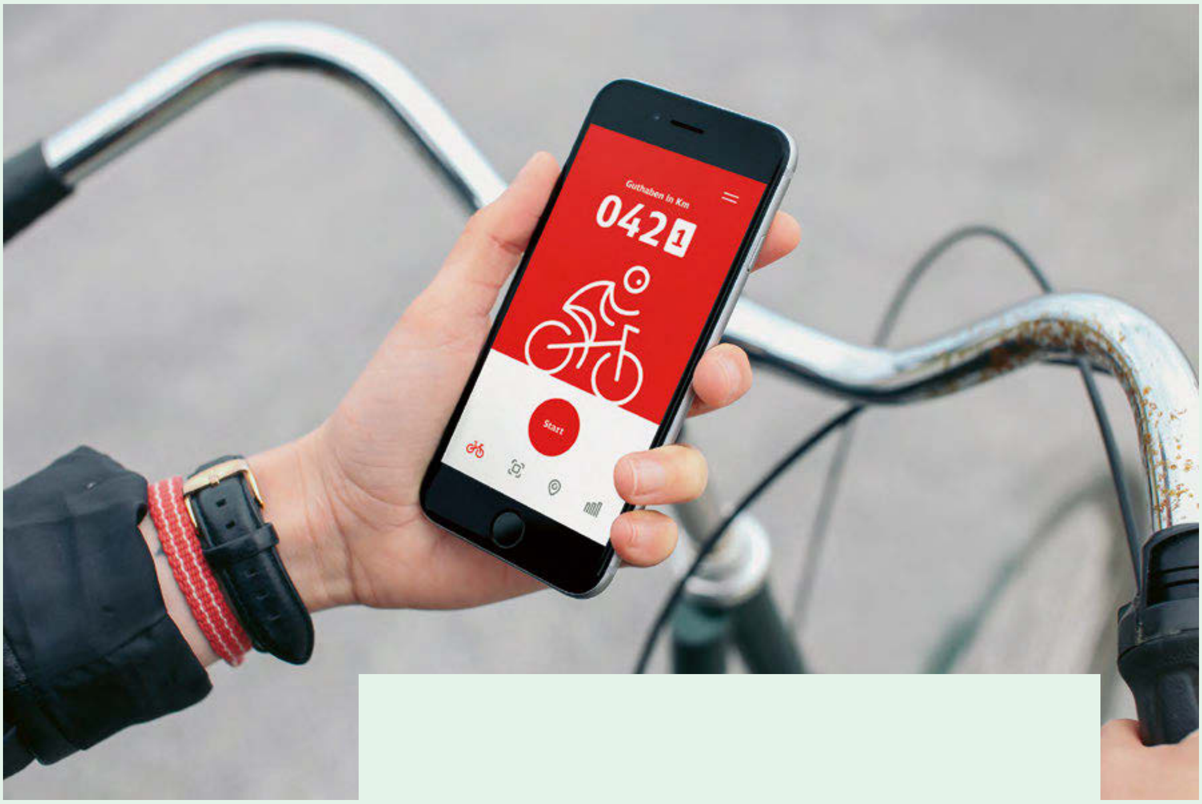
At the same time, users deposit the collected kilometers into a joint account. When a community account shows a particularly high number of kilometers, Deutsche Bahn provides bicycle-friendly facilities at the local train station, for example, a bicycle service station—or bicycle checkups free of charge. The service station is a reward for a collective 25,000 kilometers of bike travel. Implemented in Wiesbaden in collaboration with the municipal authorities after the city had accumulated 100,000 kilometers was a car-free Sunday. The digital collection system, hence, has a concrete and tangible impact on the individual's environment. Introduced as a complement is a push campaign: via SMS, user groups are targeted, and cyclists are informed about new developments, encouraged to cycle more, and to redeem their saved kilometers.

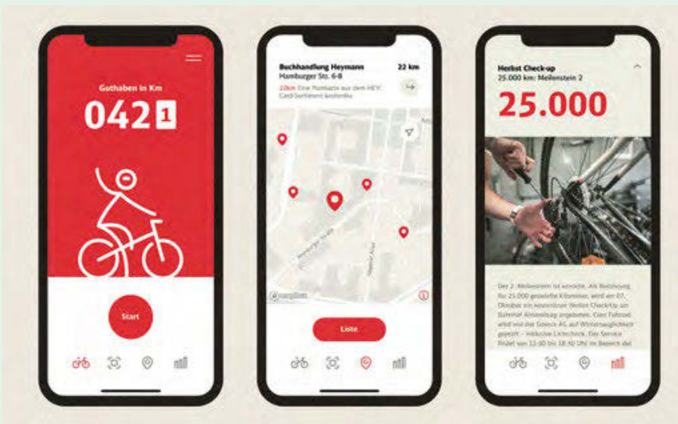
Available in Germany, status in 2021: Ahrensburg, Freising, Renningen, Wiesbaden, Hamburg (Harburg and Bergedorf), and further cities upon request Introduction 2020–ongoing Client Deutsche Bahn Station & Service Design Scholz & Volkmer

At participating partners, the kilometers are deducted from the credit via QR code.

The »25 km« poster-advertising the action as part of a climate campaign (concept: Scholz & Volkmer, illustration: Teresa Sdralevic).

It couldn't be simpler: press the start button before setting off and add up the kilometers.





Overview showing participating partners with their respective services, as well as the end reward when a milestone is reached.

Citi Bike—Bike Angels Rewards Program

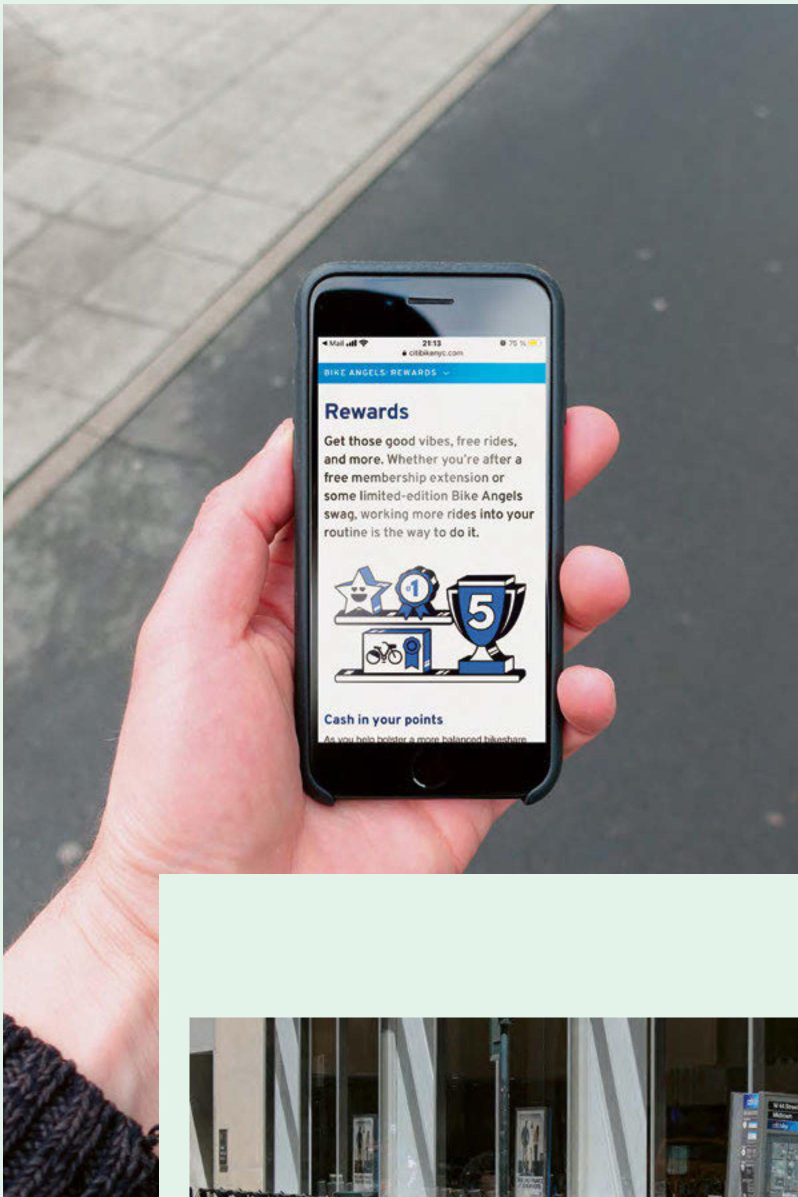
Citi Bike provides New York City residents and tourists with an extensive bicycle rental system. Launched in 2013, it now has hundreds of docking stations throughout Manhattan, Brooklyn, Queens, and Jersey City, where 20,000 two-wheelers (as of April 2021) can be picked up or parked. This makes Citi Bike—offered until 2018 by Motivate, and later taken over by Lyft—one of the largest bike sharing networks worldwide.

A major disadvantage of this station-based system, however, is that there are often too few bicycles at popular stations, while others remain well-stocked. Conceived in 2016 was a method that would avoid an costly and time-consuming redistribution by service teams and facilitate the consistent distribution of bicycles: the »Bike Angels« concept. Through the 'nudging principle,' users participate in the distribution system by bringing bicycles from heavily stocked to less well-supplied stations in exchange for bonuses.

Bike Angels can be understood as a continuous game designed to yield a profit for the wider community: it unites pragmatic problem-solving with competition. To participate, users register with the Citi Bike app. If bicycles are needed in certain neighborhoods, the locations are accorded point values between 1 and 3. Anyone delivering bicycles to these stations collects the corresponding number of points. In exchange for their services, participants receive monthly and lifetime points, which can be converted into credit or free weekly memberships. Those accumulating more than 200 points in one month receive a reward, a voucher or a cash premium, for example. There is no limit to points collected—instead, a ranking list shows who collected the most points in a given month before the monthly score returns to zero at the start of the following month.

As a reward for their lifetime points, particularly ambitious Bike Angels (as the players are called) receive little trophies and gift merchandise. Developed in 2018 by Tomorrow Lab as a premium reward was the Steel Angel Key. Participants can use this RFID key to unlock bicycles at Citi Bike stations. Unlike the standard plastic keys owned by all members, this one has an engraved steel base and an individualized design of the New York City map.

Location New York City, USA Introduction 2016 Project participants provider: Motivate (2014–2018), Lyft (since 2018); partners: New York City Department of Transportation (DOT), Healthfirst; design of the Steel Angel Key: Tomorrow Lab (2018)

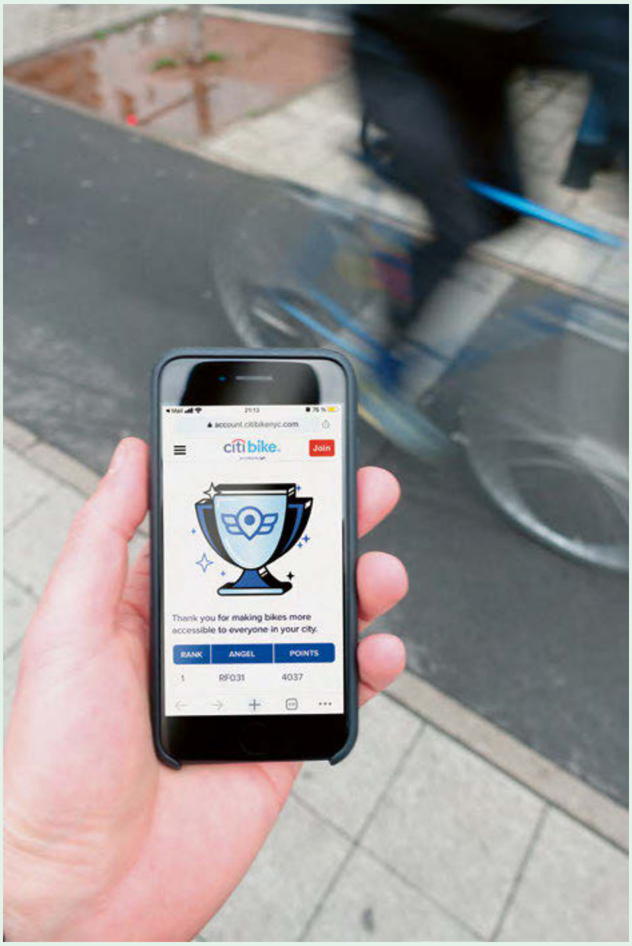


Those who collect at least ten points a month are rewarded with a choice of either credit or weekly subscriptions.

Not all of these New York docking stations are equally well utilized. Therefore, users are involved in their distribution according to the nudging principle.

The personal RFID keys are used to unlock the bikes at the stations.

For the top Bike Angels, Tomorrow Lab designed the Steel Angel Key as a special trophy.



Having fun for the benefit of the community: the most active Bike Angels are presented online in the monthly leaderboard.

Flo

Utrecht has done much to shore up its image as an excellent town for cycling, and not just since the inauguration of an internationally regarded bicycle parking garage in 2018 (see Stationsplein, p. 99). The Flo project is one of several ideas contained in the bicycle agenda of 2017–2020, initiated by stakeholders, which aims to improve bicycle traffic in the Netherlands through the use of information and communications technology (ICT).

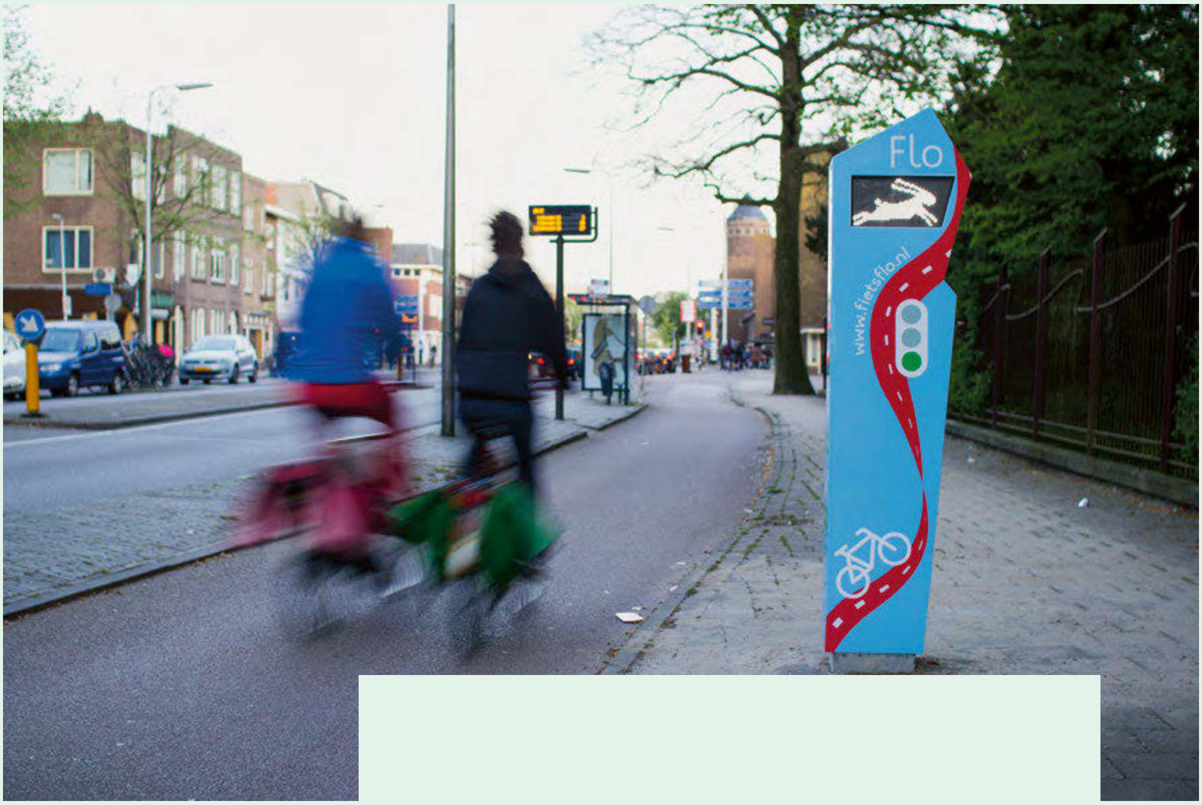
Beginning in 2017, Flo has made it possible to pass through a test intersection in Utrecht according to the principle of »green wave,« which allows continuous traffic flow. The system was developed by the innovation agency Springlab in cooperation with the traffic technology experts of Ko Hartog Verkeerstechniek.

The project was preceded by a survey of 1,500 cyclists, which discovered that missed green phases were among the most frequent sources of frustration. For even in the bicycle-friendly Netherlands, traffic light changes are optimized with autos in mind, and often interrupt bicycle traffic flow. As a result, traffic lights are often ignored or alternative routes are preferred, which may actually be longer, despite often being perceived as shorter. This is where Flo comes into play: to avoid unnecessary annoyance over traffic lights, a stele positioned 100 meters before the intersection uses radar to measure the velocity of the individual cyclist, using intuitive symbols on a display to signal how much the traveler must accelerate to reach the crossing when the light is green. A hare, for example, means »step on it,« while a turtle advises the cyclist to hang back. A thumbs-up means the current travel tempo is just right. Only those who see a cow on the display will encounter a red light no matter what they do.

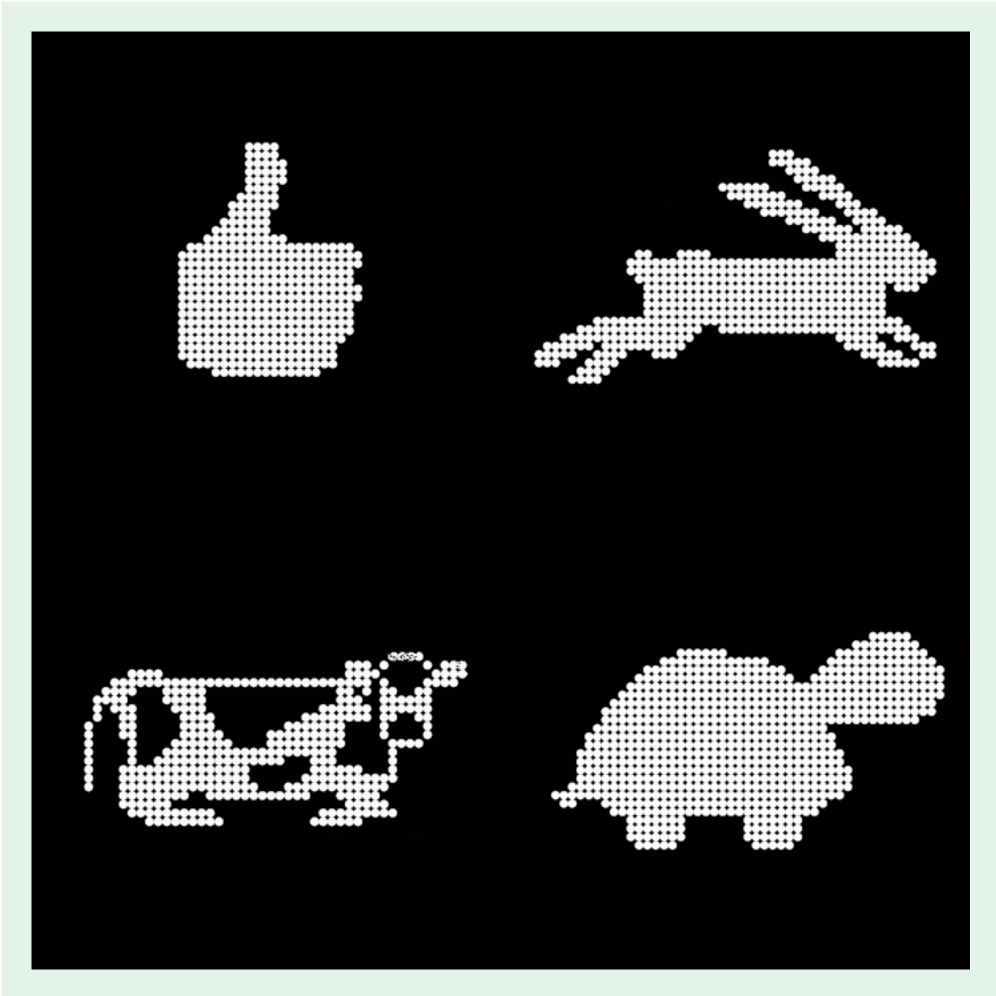
The University of Utrecht provided support for the project through an initial study on effectiveness and user satisfaction. It determined that most cyclists found the system helpful and that the symbols were readily comprehensible. Traffic flow was improved and the cycling experience enhanced. As a universal solution, Flo is applicable to any intersection and any traffic control system. Of course, the system cannot switch lights to green, but the Municipality of Utrecht is working on integrating Flo into the traffic light control system, allowing it to react to cycling traffic as well—and hence making cycling more attractive, comfortable, and safe. In addition to Utrecht, Flo has also been installed near an intersection in Eindhoven.

Location Utrecht and Eindhoven, the Netherlands Completion 2017 Status prototype Client municipality of Utrecht and Eindhoven Design Springlab (innovation agency) In collaboration with Ko Hartog Verkeerstechniek, Kenniscentrum Sport, Utrecht University

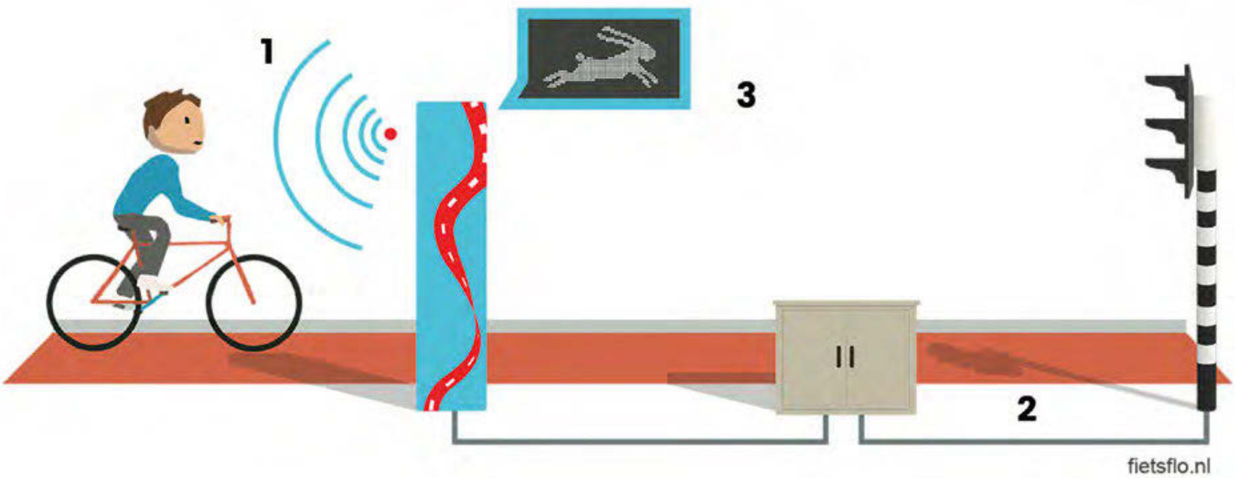
Hurry up now! A radar-equipped stele
measures the speed of approaching cyclists
and recommends accelerating to catch the green light.



If the display shows a turtle,
then you should slow down a little.



With the help of four symbols, Flo indicates whether or not you will catch the next green light, and at what speed.



The operating principle in three steps

BVG x adidas EQT Support 93/Berlin

The Berliner Verkehrsbetriebe (Berlin Public Transport System: BVG) »love« their passengers—as they have emphasized repeatedly through a motto adopted in 2015. Among Berliners, the sentiment is evidently reciprocated, despite or perhaps because of the system's special characteristics. But even before #weilwirdichlieben (#becauseweloveyou), local public transport in the German capital had already developed into a lifestyle.

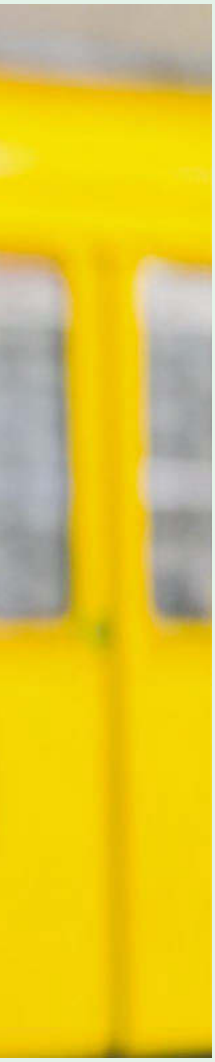
The strength of the emotional connection between passengers and the transport services is indicated by an image campaign that attracted considerable attention in 2018. Conceived by the advertising agency Jung von Matt SAGA and launched through a collaboration between the BVG and the sports and streetwear manufacturer adidas was the exclusive sneaker EQT Support 93/Berlin. More a collector's item then an everyday shoe, the design of the upper material cites the typical camouflage pattern used since the nineteen-nineties for seat covers on Berlin's subways. The laces are glowing black and yellow, the colors of the transport authority. Applied to the shoe's tongue, moreover, is a textile version of the BVG annual ticket, which was valid on all buses, streetcars, and subway lines within the AB tariff zone starting from the sales launch in January until the end of December 2018. Upon request, ticket inspectors were simply shown the shoe—the only precondition was that it be worn on both feet.

Altogether 500 pairs of limited edition EQT Support 93/Berlin shoes were sold in Berlin at the adidas Originals flagship store and the cult shoe store Overkill in Berlin-Kreuzberg. Demand was intense, with sneaker fans camping out for several nights in front of the Kreuzberg shop to snag a pair for 180 euros. The price was a bargain compared to that of the BVG annual pass: at that time, the least expensive subscription option was 728 euros.

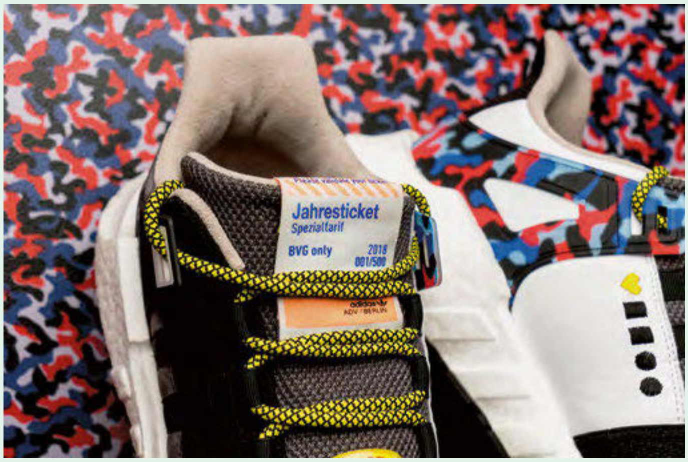
During the run-up and parallel to the sales effort, the campaign was promoted via all media channels of the BVG, adidas, and Overkill—primarily via social media, given the exceptional reach of the BVG, well known for its clever and self-deprecating posts. The viral success was assessed by Jung von Matt: 10.6 million media impressions, 32 million video views, 323 million social likes. Evolving from the agency's atypical advertising idea was a new approach to addressing a target group, one that exploits the identification of Berliners with their city to enhance the attractiveness of a major component of urban infrastructure.

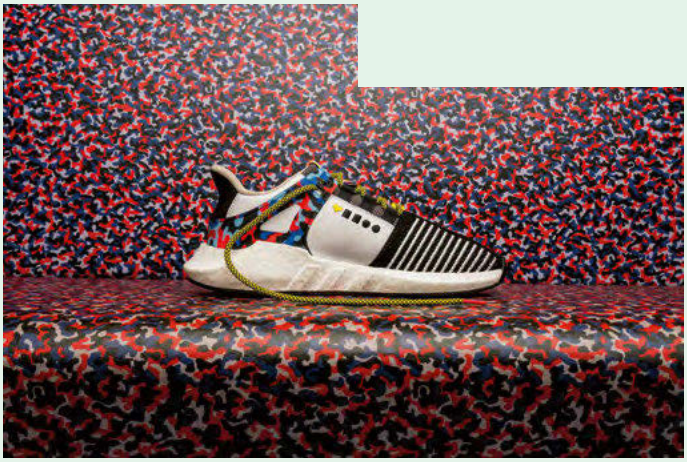
Campaign area Berlin Year 2018 Client Berliner Verkehrsbetriebe (BVG) Design Jung von Matt SAGA, adidas In collaboration with Overkill (sneaker shop, distribution)

Fashion meets public transport: the shoe was valid as a ticket on all BVG buses, streetcars, and subway lines.



An annual ticket made of fabric
is sewn into the sneaker tongue.





A shoe for real subway fans:
the adidas EQT Support 93/Berlin

Sales of the adidas EQT Support
93/Berlin was limited to 500 pairs.

Oyster Card

It is easier to encourage public transport use if the sources of potential irritation are eliminated. One cause of annoyance is the process of ticket purchasing: you wait in line, unsure of which ticket is the right one, unclear about whether a new ticket is required when switching from one mode of transport to another. Then there is the question of whether a day pass is advisable.

The Oyster Card, launched in London in 2003, was the first card-based, contactless ticketing system to be adopted by a public transport system. The Oyster Card is provider-independent and can be used for nearly all public local transport in London: at altogether 650 subway stations, on all buses, trains, water taxis, and the cable car that links Greenwich with the Docklands. Its enormous success—just ten years after it was introduced, fully 85% of all train and bus trips in London were purchased using it—is explained by the coherent overall concept, which offers users security, speediness, and comfort.

Security: the card is charged at a terminal, and only this amount can be debited. It reliably calculates the cheapest fare, and you pay only for kilometers traveled, never more than for a day pass. Comfort: the Oyster Card makes using public transport child's play. The card is held briefly in front of the scanner when entering or exiting, depending upon the form of transport. Moreover, it is possible to set a threshold level: if it is exceeded, the shortfall is debited from your bank account—no need to find a reloading machine when the stored amount runs low. Commuters can decide whether to top-up their Oyster Cards weekly, monthly, or annually, while tourists can purchase a registration-free, transferable 7-day ticket (pay-as-you-go). Speediness: the processing tempo is three times faster than for paper tickets.

Contactless payment has been possible since 2012; since 2014, credit cards and mobile devices have been usable like an Oyster Card—offline as well, for greater security. Meanwhile, most trips are paid for this way. For tourists, it means goodbye to unused credit balances.

News of the card's success has traveled fast: Transport for London has assisted New York, Sydney, and Boston when they introduced comparable systems.

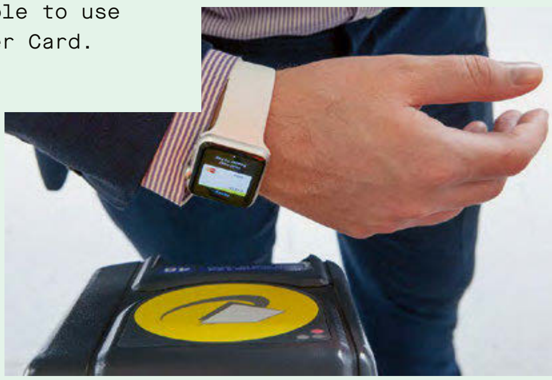
Location London, Great Britain
Introduction 2003 Client Transport for London Design Cubic Transportation Systems

The Oyster Card is briefly held against a scanner when entering or exiting the system.

The card is valid for almost all public transport services in London.

Only the kilometers traveled are billed.

Since 2014, it has also been possible to use mobile devices just like an Oyster Card.



Compared to paper tickets, check-in is almost three times as fast.

stadtnavi

Under the motto »Rethinking Mobility Together,« the town of Herrenberg—located near Stuttgart—has developed a web platform for sustainable, intermodal mobility based on the open-source principle. It received support from the Federal Ministry of Traffic and Digital Infrastructure in the framework of a nationwide model town initiative for clean air.

The aim is to facilitate intermodal travel at the municipal level and to call attention to environmentally friendly transport resources, while offering all mobility products a platform which integrates them in a nondiscriminatory manner, thereby providing an alternative to commercial navigation providers, which moreover harvest user data. Beginning in May of 2020, the platform has been usable free of charge by all mobile devices as a responsive website at herrenberg.stadtnavi.de.

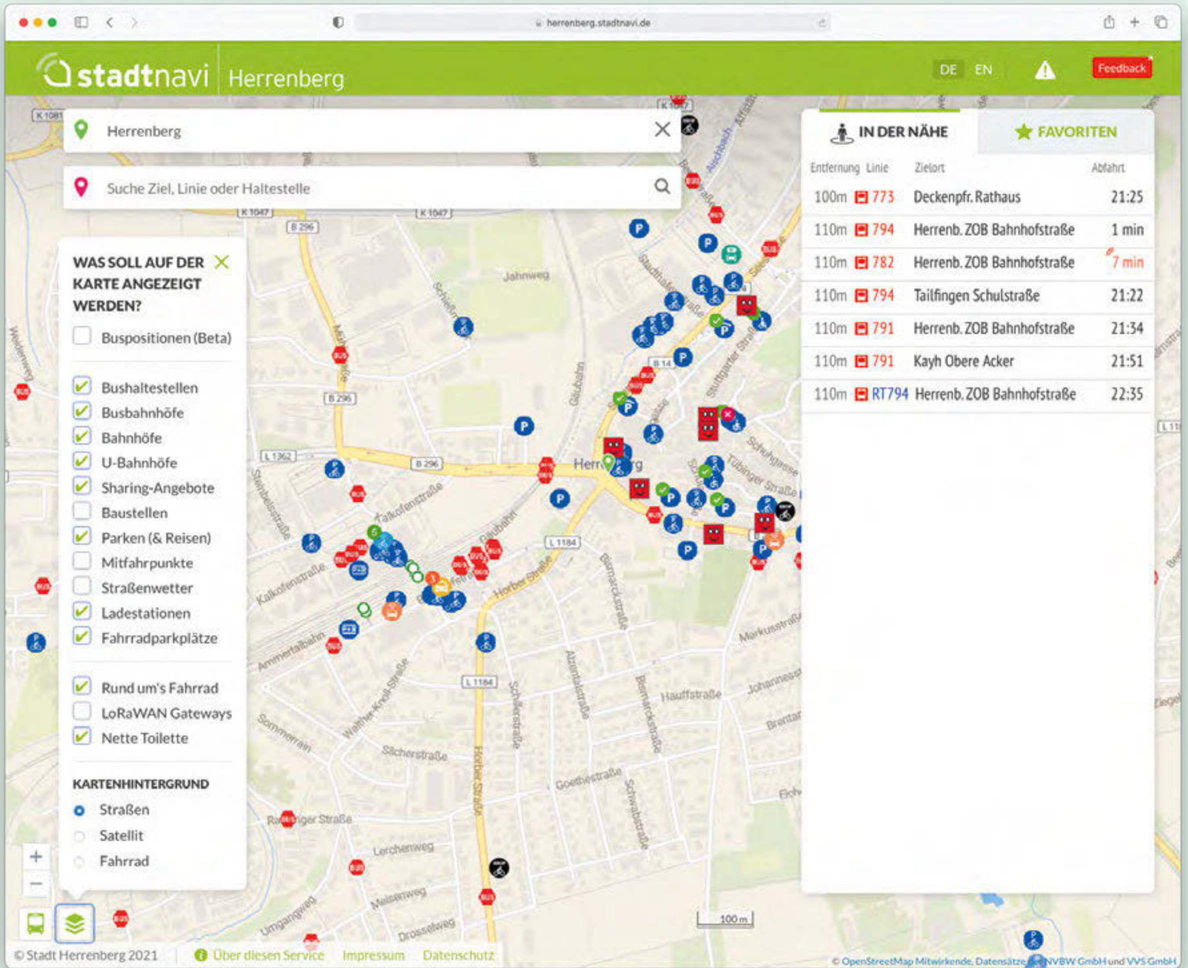
The website gathers and networks regional data, making it available in real time. The software also makes suggestions regarding mode of transport and connections for a specific destination—whether using train, bus, on foot, by bicycle, auto, or bike sharing. At the same time, it shows where cycle routes, bicycle service stations, car sharing, and EV-charging stations can be found. There is also real-time data concerning available parking spaces (for mobility-impaired travelers as well), available bike rentals and taxis, plus departure times for bus and train routes. Used in addition to data from the municipality and private mobility providers are sensors, which are installed in Herrenberg and linked with the service via the low-power radio network Long Range Wide Area Network (LoRaWAN).

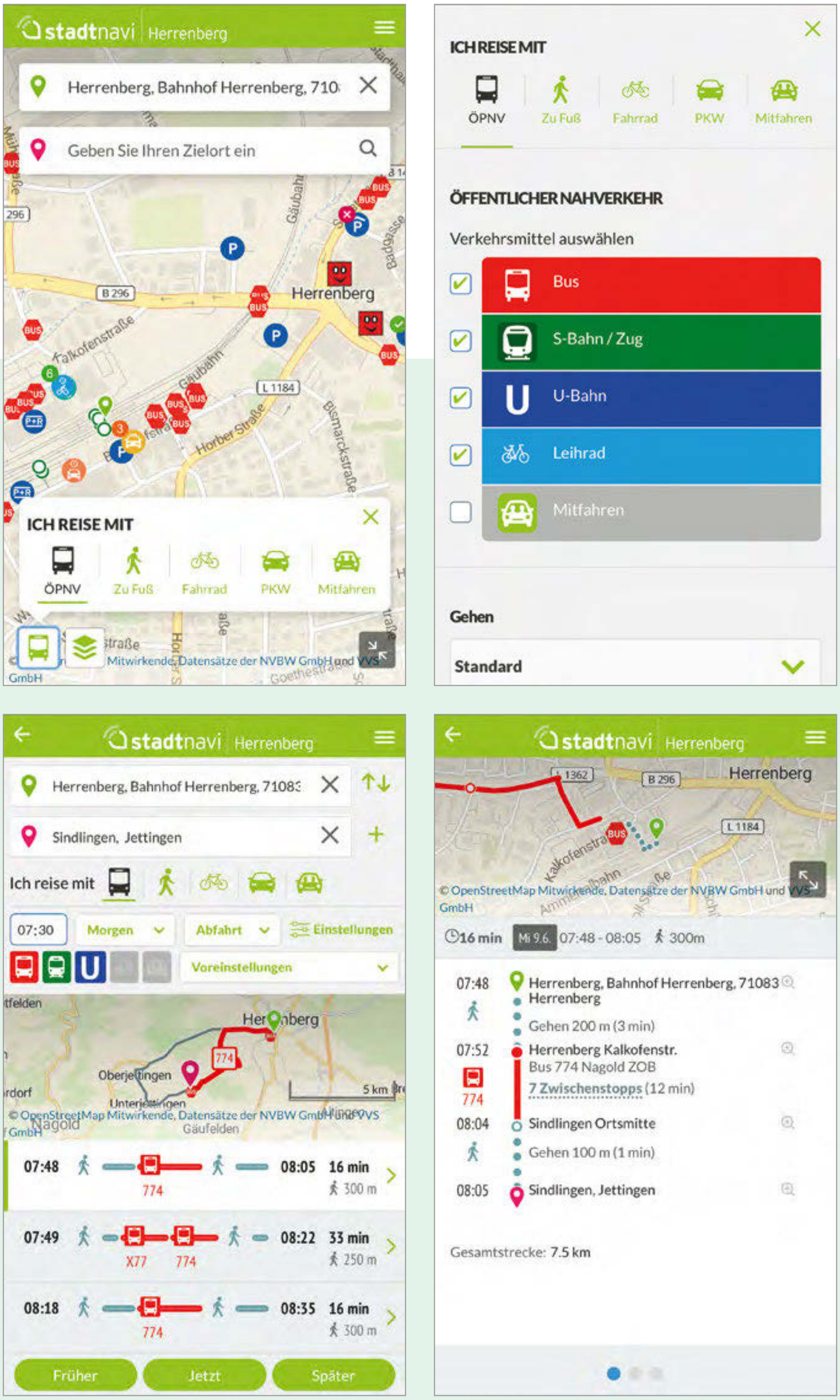
The stringent local and regional project has enormous advantages compared with commercial platforms: stadtnavi prioritizes the most environmentally friendly modes of transport, including mode combinations such as foot-bus-train or car-park-commuter rail. It does not store user-specific navigation data. Also, the software is far more economical for municipalities in comparison with licensed software.

The town of Herrenberg developed the software themselves with a small team based on the digitransit mobility platform used by the Finnish Transportation Authority and the backend service OpenTripPlanner (OTP). The town also works together according to the open-source principle with communities such as the free map project OpenStreetMap—in keeping with the spirit of their self-image as a »participatory town.« As free software, stadtnavi is also available to other communities, which they can use in conjunction with their own names.

Available in Herrenberg, Germany Introduction 2020 A project by the Town of Herrenberg Design Town of Herrenberg

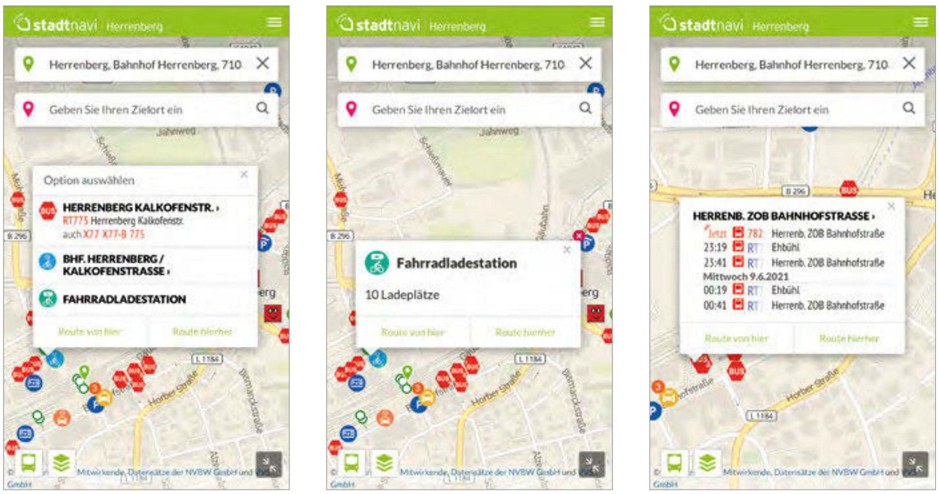
This web platform supports sustainable, intermodal mobility based on the open-source principle.





When selecting a destination, the software suggests various transport modes and connections.

Information on available rental bikes
can be accessed in real time.



The platform collects and cross-links regional data,
while making it available in real time.

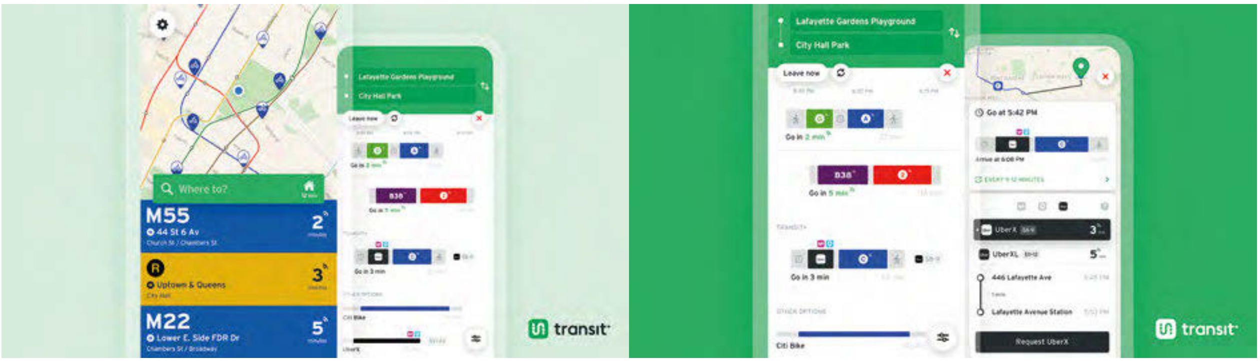
Transit (App)

In cities, the auto has long since ceased to be the quickest mode of transport. Drivers waste time in traffic or searching for parking places. To date, alternatives have failed to establish themselves because their use can be cumbersome: restriction to a single mode of transport is rarely feasible. For the most part, it is challenging to determine which form of transport is ideal, and transfers between modes can be complicated. This is where the Transit app, developed in Quebec, Canada by Sam Vermette and Guillaume Campagna, comes in.

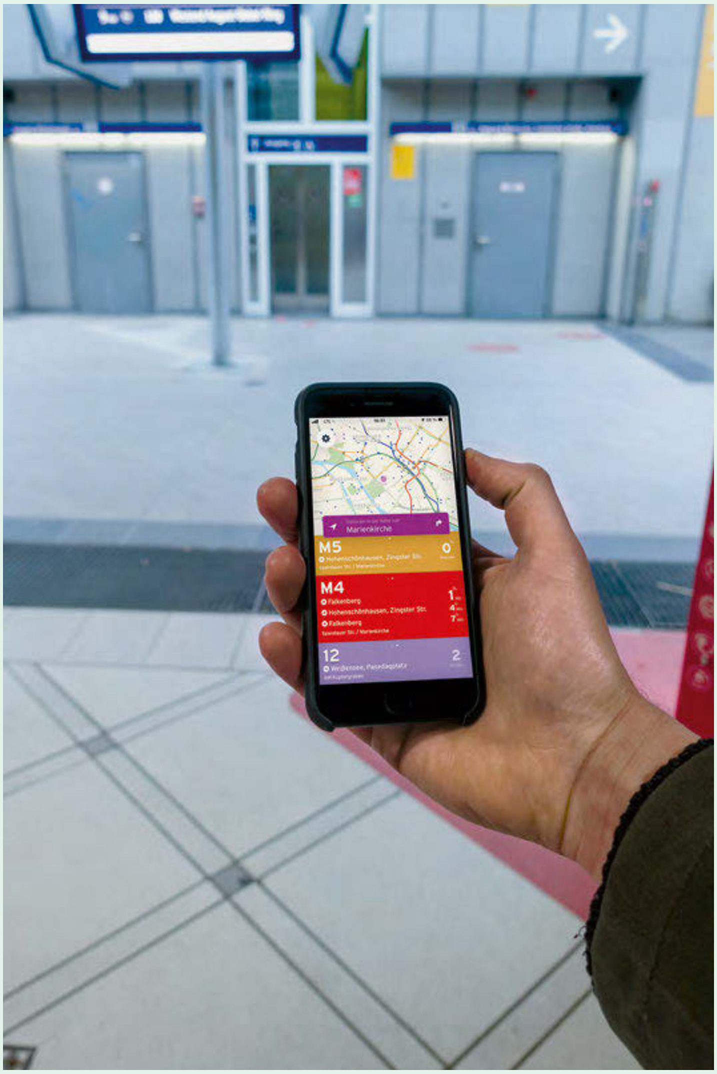
As an intermodal and multimodal service, Transit links all of the services that are potentially available to travelers and commuters: public local transport, train links various sharing offerings and pedestrian connections. Real-time information, travel time planning, and notifications when a destination has been reached—the app makes these functions genuinely user-friendly. Used are open data standards and programming interfaces, from which other enterprises and the general public benefit in turn—for example when they are used by the municipality.

The app was launched on the market in 2012 and has developed—thanks to continuous improvements—into a popular resource for planning car-free travel: it has meanwhile been introduced in more than 300 cities and towns and 10 different countries on 4 continents. The success of the app is attributable not just to the service offerings, but in particular to its easy and intuitive usability: it employs a color system that makes the various transport options readily distinguishable and matches the colors of analog transport plans. Dialog and control elements are reduced to essentials and clearly configured. Displayed on the start screen is simply the map of the surroundings, the destination input, an overview of available transport resources, and information about the immediate vicinity. The search bar, for example, allows for thumb operation and respects the size of a cell phone, illustrating the care that went into the app's development. In some cities, user fees can be paid directly via app. Among the latest developments are altitude-dependent travel itineraries, useful in particular for cyclists, and an off-line travel planner—in the event network access is interrupted or the available data volume has been consumed.

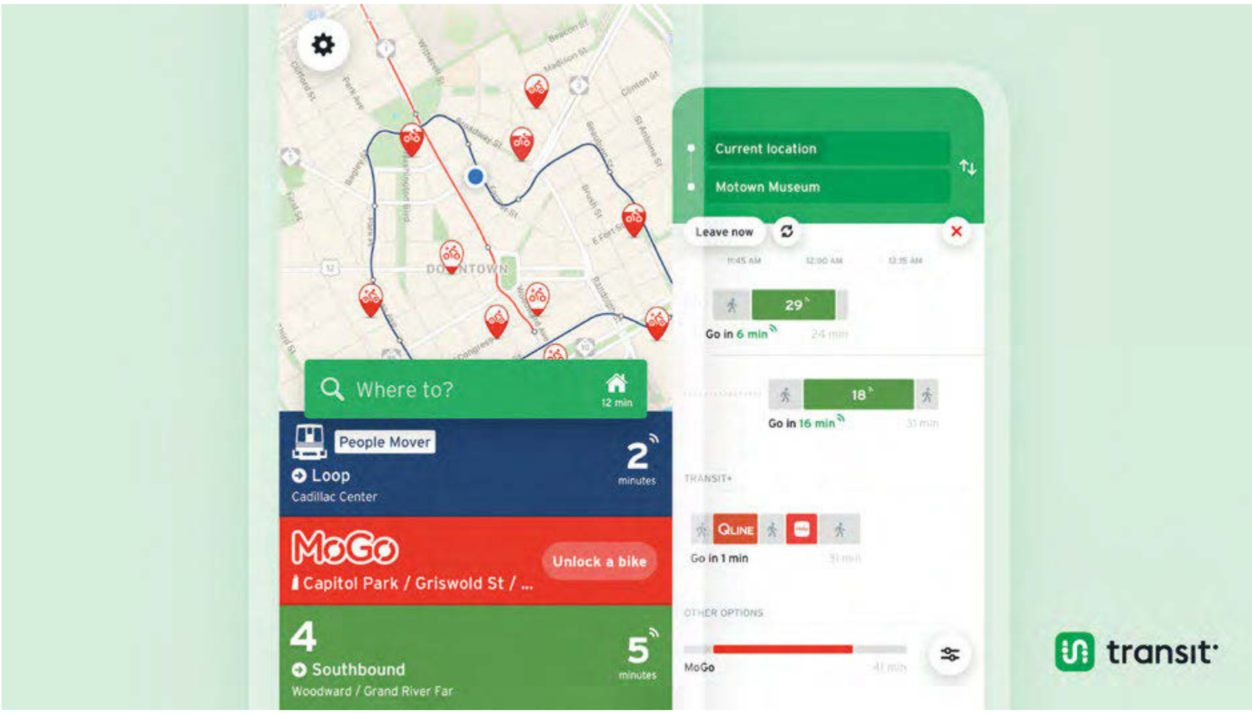
Headquarters Montreal, Canada Available in 300+ cities, 10 countries, 4 continents Introduction 2012 Design Transit App (developer)



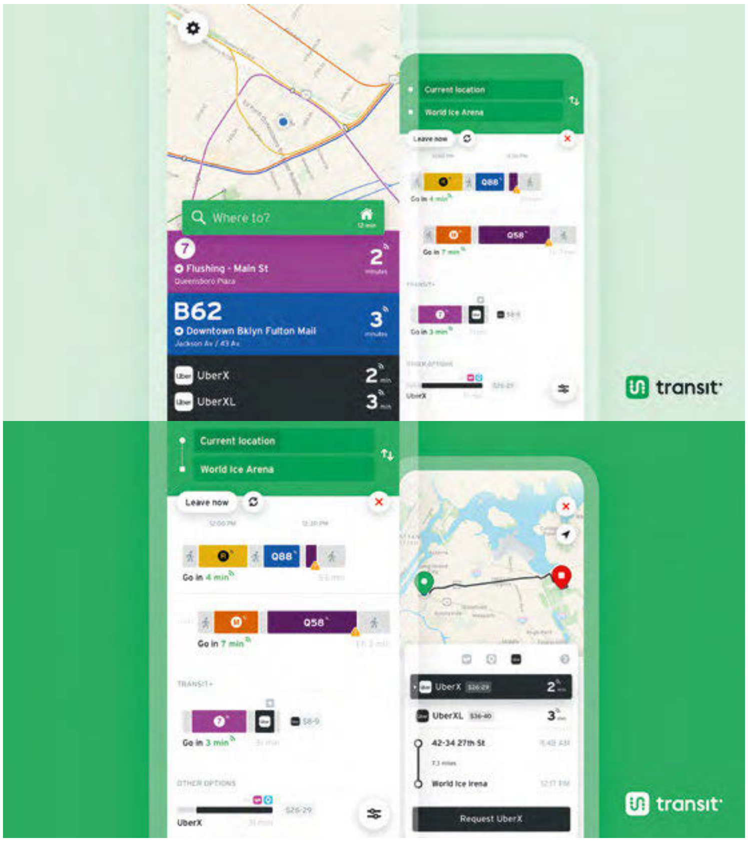
The inter- and multimodal app Transit links public transport options with rail services, along with sharing offerings and pedestrian connections.



Displayed on the start screen is a map of the vicinity, the destination input, the available transport resources, and information on the immediate surroundings.



Bike sharing options showing the real-time locations of available rental bicycles can be integrated into the app.



Ride-hailing local transport services can be incorporated and suggested optionally.

MTA / Live Subway Map

Thanks to a smartphone app, it has become much simpler to navigate complex subway and urban rail networks. Of course, not everyone needs information on connections based on departure and destination points. Equally relevant—to commuters, for example—is up-to-date information on departure times and line closures. In New York City, where mobility offerings can change virtually every minute, the first real-time subway map was introduced in 2020. Initially available as a web-based beta version, the Live Subway Map makes it easier to plan trips by showing traffic disruptions and train movements in real time.

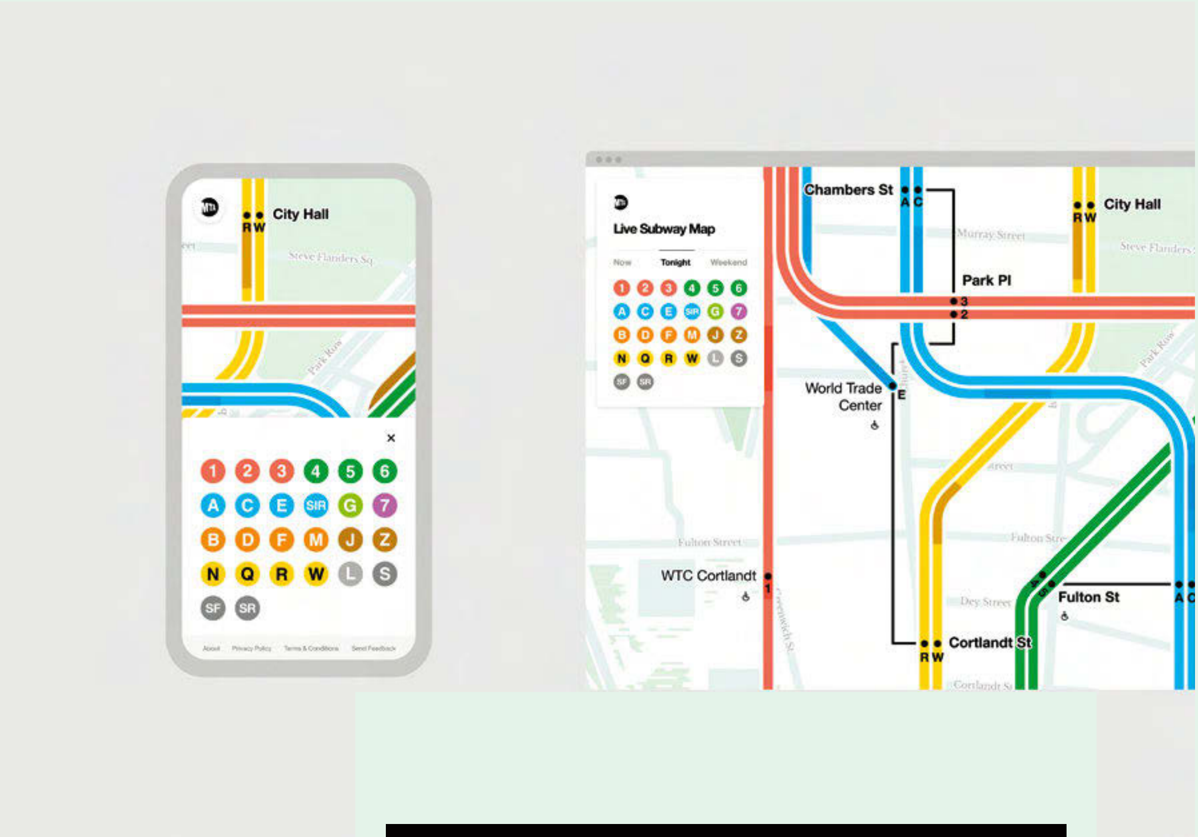
The idea was developed by New York City's subway operator, the Metropolitan Transportation Authority (MTA) and the Transit Innovation Partnership in collaboration with the Brooklyn-based design and technology firm Work & Co. Remarkable here is that the entire technical and graphic treatment by Work & Co was purely a labor of love, a pro bono contribution. The most recent revision of the MTA map was already forty years old. Back then, Unimark International and Michael Hertz Associates upgraded the map, originally created by Massimo Vignelli a few years earlier, which had been criticized for its misleading scale and absence of geographical references.

The Live Subway Map combines Vignelli's diagrammatic approach with the ideas of Unimark and Hertz. It is a precise, intuitively operable alternative to printed maps and is optimized for access via smartphone. The more you zoom in on the map, the more detailed are the particulars about train lines, subway entrances, stations, and street names. For every station, users can call up arriving trains within the next hour, as well as lines that run at nighttime or on weekends. People with impaired mobility can select stops with elevators. The current position of trains is indicated by moving rectangles, underscoring the live character. Under discussion is integration into the existing MYmta app.

Work & Co has demonstrated that design and technology can simplify the use of one of the most complex transport systems worldwide: precise timetable data not only facilitates the improved management of commuter streams, but also helps passengers travel more efficiently. The Live Subway Map hence has enormous potential for use in cities worldwide.

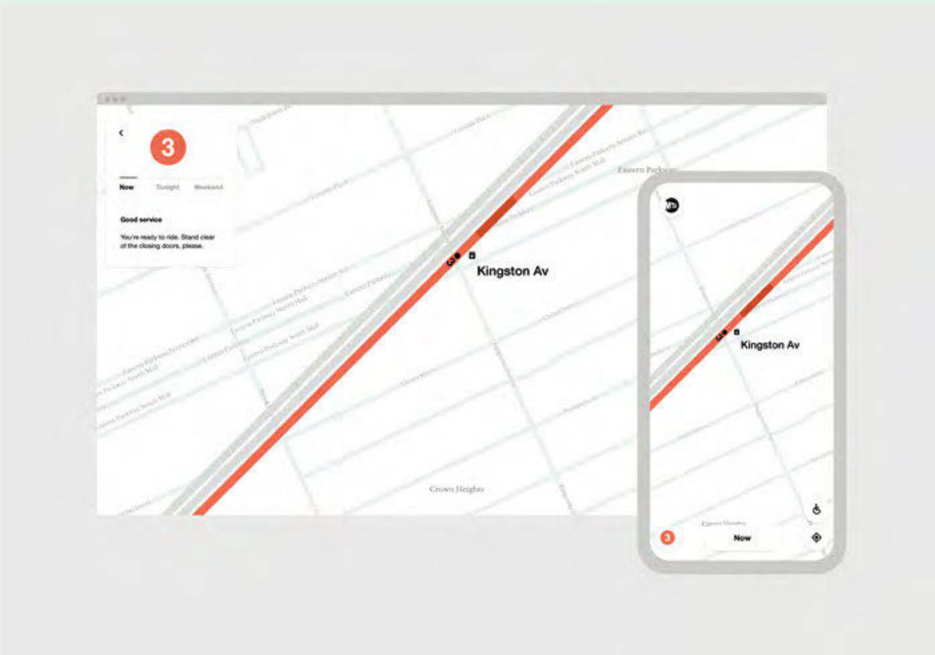
Location Ney York City, USA Introduction 2020 (beta version) Design Work & Co (technology and design firm) Partner Metropolitan Transportation Authority (MTA), Transit Innovation Partnership

Always be up to date with the world's first real-time subway map from the New York Metropolitan Transit Authority (MTA).



The »Live Subway Map« can be accessed via a browser on smartphones, tablets, and desktops.

For nighttime travel, i.e. information after 9 p.m., the display switches to dark mode.



The further you zoom in, the more detailed the map becomes. By clicking on a subway line, the respective positions of the subway trains, travel times, and possible restrictions are displayed.

Accurate subway train data can help commuters to travel more efficiently and limit the time spent at stations.

Visionary Mobility

Peter Eckart &
Kai Vöckler

Visionary mobility anticipates new forms of mobility based on emerging technological developments, taking into account their social dimension. Spatial mobility is not just about movement, it is part of our everyday reality, and at the same time it ensures participation in social life. In concrete terms this means supporting a sustainable, energy-efficient mobility, which is made accessible to all through innovations that take advantage of new technological developments. In the projects introduced here, the focus is on pathbreaking designs and concepts, as well as on projects that are already in the test phase.

Predictions of the future are always problematic. Yet future scenarios can play an important role in societal debates by highlighting development options and influencing decisions. However, they are always subject to the lack of certainty about how developments will in fact evolve. In this sense, they are always bets about the future. In order to make decisions based on application and design principles, this means focusing less on future visions as literal previews or products of imagination, and more on solutions that can be realistically implemented. Therefore, such solutions are limited to a ten-year timeframe. However, this also means defining the design parameters for future mobility.

In general, it may be concluded that the digital interconnection of transportation systems that previously operated independently represents a revolution in transportation technology. As already mentioned, this is not only a matter of the expanded and more individualized options available to users (»augmented mobility«), but also of the further development of the mobility network as an adaptive and responsive system controlled by artificial intelligence. The creation of a data-based, real-time, decentralized, individualized, and self-optimizing technical system will bring about a fundamental change. While mobility system structures used to be fixed, in the future they will be based on a dynamic algorithm, and thus be able to anticipate and adapt to usage patterns. However, there is still a long way to go before this is achieved. To begin with, this involves further developing the conventional components of a mobility system (i.e. vehicles, built structures, user equipment) as smart objects. These would be able to display information and could even store data about themselves and their environment, and then share this with other mobility system components and with people. Furthermore, these smart objects that are integrated within the digital context could independently set up relationships to other components and people within the network. In this way, in the future »intelligent environments« may be established that could present different options to users. Based on available user data, these could also predictively adapt services to individual users in advance, thus optimizing their ability to choose. One of the primary challenges for the user-oriented design of future mobility systems will be to ensure the transparency of the criteria upon which the selected services are based, so that users will continue to have control over their own options. However, the integration of AI technology for the optimization of an intermodal mobility system is highly promising. An automatically controlled, digitally networked transport mode, together with the resulting individualized provisioning of mobility services, can improve accessibility to intermodal mobility and facilitate more efficient handling of transport demands. Consequently, this further aids the transition to sustainable and environmentally friendly means of transport. However, this also requires social consensus in support of the development of a collaborative and environmentally friendly mobility. This is a development that must also be reinforced by regulatory measures implemented by a political system committed to the common good. The design of digital infrastructures must protect the personal rights of citizens and ultimately should allow the community, i.e. the local authority, to determine how it deals with information by enabling control over data flows. And not least, mobility services should be created that are available to all, in other words, that are affordable.

In concrete terms, this means that in future a sustainable public mobility system should be symbolically coded and designed, such that it is perceived as a (literally) self-evident component of urban development. Furthermore, this means that it is not only to be treated as a priority within transportation infrastructure planning, but also that through its design it will be recognizable as a cohesive system, and thus will clearly communicate its importance. For example, this is also the case with the integration of self-driving electric cars into public transportation systems. Available on demand and powered by renewable energy, these must be given a form that makes them clearly recognizable as »public vehicles,« in keeping with their function and meaning. In addition, technological innovations, in this case new transportation technologies that may initially be confusing, also require a design that inspires confidence, which at the same time conveys their progressive and sustainable character and their social significance. New locomotion technologies (with associated acceleration or even deceleration), the digital interconnection of transportation systems (with resulting greater efficiency), and a future mobility system that anticipates and adapts to individual usage requirements are the future aspects that remain to be designed.

Picture Credits

↳**pp. 257–260** MVRDV
↳**pp. 261, 262, 263 bottom** Press images MIT Senseable City Lab and Amsterdam Institute for Advanced Metropolitan Solutions, **p. 263 top** Screenshots created by the HfG Offenbach, with kind permission of the MIT Senseable City Lab
↳**p. 265 top** Friedrichshafen AG; **p. 265 bottom** Uli Regenscheit Fotografie (photo); **p. 266** RABus
↳**pp. 268, 269** Neomind GmbH
↳**pp. 271, 272 middle** Hochschule Karlsruhe, Tobias Schwerdt (photo); **p. 272 top and bottom** Hochschule Karlsruhe, IUMS (graphics: Arash Torabi)
↳**pp. 274, 276, 277** Virgin Hyperloop; **pp. 275 top, 278** Virgin Hyperloop, BIG—Bjarke Ingels Group and SeeThree; **p. 275 bottom** Virgin Hyperloop, Teague and SeeThree
↳**pp. 280, 281** PriestmanGoode
↳**pp. 283–286** Canyon Bicycle
↳**pp. 288, 289** Press images Volkswagen AG
↳**pp. 291, 294** BIG—Bjarke Ingels Group; **pp. 292, 293** Squint/Opera
↳**pp. 296–299** Henning Larsen Architects

Super Walk Hong Kong

In Hong Kong today, getting around on foot is a genuine challenge. While the street is shared by autos, scooters, trucks, buses, and the famous double-decker streetcars, pedestrians traverse the city center via a complex network of walkways and elevated or subterranean passages. In an international competition, the initiative Walk DVRC sought strategies for making parts of the city center more accessible, while making the city safer and better integrated through the introduction of high-quality public spaces. Specifically, the project addressed a 1.4 kilometer segment of Des Voeux Road Central (DVRC), located in the midst of Hong Kong's central business district.

One submission was the work of the internationally active Rotterdam architecture office MVRDV. In a master plan called Super Walk, they proposed freeing the entire road section from motorized traffic in multiple phases, with an eye toward street crossings. According to the plan, only the double-decker streetcars would continue to use the road. A continuous pavement surfacing in the form of a zebra crossing pattern would give the new pedestrian zone identity and a visual order. At the same time, the pattern would function as a subtle wayfinding system. Variations identify various utilization areas: streetcar stops through zigzag lines, for example, and playgrounds through a checkerboard pattern.

The project encourages people to enliven the street space and to discover its amenity qualities. Given due consideration are a number of parameters: elements that provide light and shadow, seating options, drinking fountains, vegetation, and much more. New roofing, pavilions, and bridges at main nodal points link existing elevated walkways, generating a vertical public realm that compensates for space shortages at ground level. The architects refer to this new microclimate, consisting of temperature, humidity, air circulation, odors, light, and navigation, as an »urban-scaled interior.« The »infinite zebra crossings,« which extend from the southern hills toward the harbor to the north, are meant as a gesture: public space is to be restored to pedestrians, who are provided with mixed offerings ranging from street food markets to open air art galleries, and all the way to playgrounds.

Although the design by MVRDV was among the five finalists, they did not ultimately prevail in the competition.

Location Hong Kong, China Year 2018 Status Concept Client Walk DVRC (NGO, Hong Kong) Design MVRDV

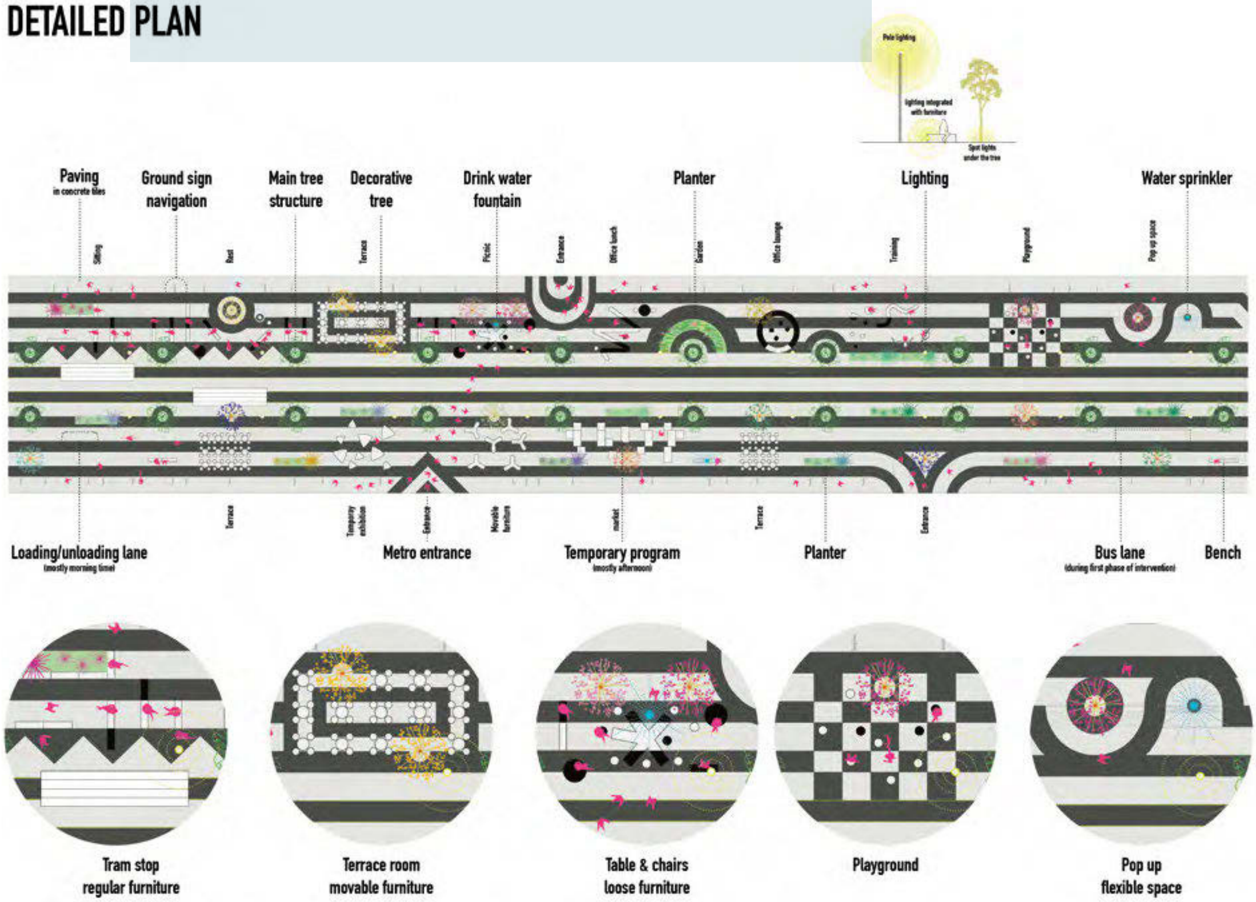
Usage Zones, connections, and planting plan

Traffic-calmed area: only streetcars and delivery vehicles are allowed to use the Hong Kong Super Walk.


浴潮流桑拿
Yuk Chiu Lau Sauna
直入地庫

The surface of the entire pedestrian zone is cover in crosswalk stripes over a length of 1.4 kilometers.

DETAILED PLAN



Different surfaces indicate the respective usage zones.

roundAround

In Amsterdam, research into autonomous mobility has led to the exploration of a perhaps unexpected area of application: self-driving boats designed to navigate urban space. In collaboration with the Amsterdam Institute for Advanced Metropolitan Solutions (AMS Institute), researchers at the Senseable City Lab at the Massachusetts Institute of Technology (MIT) in Cambridge (USA) developed a concept for the so-called Roboats.

Where a wide canal separates Amsterdam's city center from the harbor area of Marineterrein, which has been transformed into an innovation hub, the small boats are to provide the ferry service. On foot, it takes 10 minutes to navigate a circuitous route from one side, where the NEMO Science Museum is located, to the other. Thanks to direct connections, the route will now be shortened to 2 minutes. This »dynamic bridge« named roundAround will be the first of its kind. It can be used as a short-term, temporary solution, whereas the construction of a permanent bridge would be a protracted process, and moreover difficult to realize at this location due to the presence of large ships.

In terms of technology and design, the project sets new standards for city center mobility. Using Roboats, hundreds of people could be transported per hour. The Roboats move in a continuous circle on the canal. Passengers embark and disembark comfortably from platforms, which also serve as charging stations where the e-boats replenish their batteries through induction. The boats are equipped with cameras and Lidar technology, which perform a continuous, computer-assisted assessment of the surroundings, maximizing security and efficiency. When a ship passes on the waterway, the Roboats avoid it automatically. Artificially intelligence allows them to learn from the dynamics of the waterway, so that the new local transport concept could be readily introduced later on in other parts of the city—as autonomous boats on the grachten, or even at other locations worldwide.

The RoundAround is one of the first application concepts of the five-year Roboat research project, which will explore additional potential uses alongside personal transport. Conceivable ways to disburden streets would be the disposal of household waste or the transport of building materials on the waterways. As a living laboratory for an adaptive, flexible, and intelligent on-demand infrastructure, the project demonstrates how solutions to urban challenges can emerge through the interplay of science, technology, and design.

Location Amsterdam, the Netherlands
Year 2019–ongoing Status concept and prototype A project of Roboat Project Design MIT Senseable City Lab (idea), Amsterdam Institute for Advanced Metropolitan Solutions (AMS)

Hundreds of people per hour could be transported by roundAround from the pier at the NEMO Science Museum to Marineterrein.

The autonomous e-boats are accessed via footbridges that also serve as charging stations.

A convenient shortcut: roundAround connects Amsterdam's city center with the Marineterrein port area by water.

Roboats instead of bridges: the roundAround can be implemented quickly and temporarily. The e-boats simply yield to passing vessels.

The boats travel from one side of the canal to the other in just 2 minutes by moving in a circular formation. By comparison, walking previously took 10 to 15 minutes.

RABus—Real Lab for Automated Bus Operation in Public Transport in Urban and Rural Areas

In Mannheim und Friedrichshafen, the dream of autonomous local public transport is about to become a reality. In these towns, both located in Baden-Württemberg, the »Real Lab for Automated Bus Operation in Public Transport in Urban and Rural Areas,« or RABus for short, plans to test fully automated vehicles in real operations in late 2023.

Unlike previous road-based test projects, which for the most ran in so-called demonstration operations very slowly and only on designated stretches, the RABus vehicles will drive in regular traffic through both towns and rural locales, and moreover at speeds of at least 40 kilometers per hour on city streets, and 60 kilometers per hour beyond the town limits. As a result, the research and development group hopes to see greater acceptance and an increase in demand. The project is also designed to investigate the concept's everyday usability, which is to say its actual impact on traffic conditions, its operational reliability, and its economic efficiency, along with legal aspects of an autonomous public transport system.

On the basis of this data, the RABus consortium plans to facilitate a travel operation that could serve as a model for an efficient public transport system with self-driving buses in Baden-Württemberg. In the future, transport services could offer attractive, affordable, environmentally friendly shuttle services that could transport passengers from door to door comprehensively as needed, day and night. To achieve this, RABus relies on two different foci: in Mannheim, automated operations are being tested in mixed traffic within a new urban district; in Friedrichshafen, following an initial phase in the city center area, the focus is on automated overland operations. In both test areas, buses are being deployed independently of timetables. Use as test vehicles are electric minibuses produced by 2getthere, which travel bidirectionally and hence have no need to turn between trips.

The vehicles—which are 6 meters long and 2 meters wide—can accommodate 22 people, and passengers embark and disembark through doors located on either side. Insight gained from the test operations, and through passenger surveys on both stretches, will make it possible to draw conclusions concerning customized and secure road performance and regarding public expectations of automated and networked mobility.

Location Mannheim/Friedrichshafen, Germany Anticipated test period in late 2023, several months Project participants a consortium that includes the Research Institute for Automated Engineering and Vehicle Engines Stuttgart (FKFS, project management), the Institute for Transport Studies at the Karlsruhe Institute of Technology (KIT), the Rhein-Neckar-Verkehr GmbH (rnv) transport service, the Stadtverkehr Friedrichshafen GmbH (SVF) transport service, the DB ZugBus Regionalverkehr Alb-Bodensee GmbH (RAB), and ZF Friedrichshafen AG Vehicles 2getthere, a subsidiary of ZF Friedrichshafen AG Note for further information, please visit: www.projekt-rabus.de

Vehicle design for the automated shuttle RABus
in Friedrichshafen and Mannheim

Ceremonial handover of the funding award, with Minister of Transport Winfried Hermann and Prof. Hans-Christian Reuss from the Research Institute for Automotive Engineering and Vehicle Engines.

Friedrichshafen route: here the actual operation of fully automated vehicles will be tested in the countryside at the end of 2023.

Mannheim route: in the city, speeds of 40 kilometers per hour and up are tested in normal traffic.

Universal Train

Today, an urban railway that offers almost exclusively standing room; tomorrow, a regional train with comfortable seating areas and tables: since 2012, the Munich design office Neomind has been developing a concept for a modular train that unites the two. The design team hopes to meet the challenge confronting transit services in large cities and metropolitan areas: How to ensure that the right train travels at the right time?

After major events and during trade fairs, for example, more passengers must be conveyed than on quieter days. Indispensable for trips to the countryside, meanwhile, is travel comfort and storage space for bicycles and other sporting equipment.

The minimalist, all-purpose concept of the Universal Train focuses on a train's basic functions, while also taking into account aspects such as lighting, clarity of arrangement, and accessibility. Multifunctional furnishings and modular service stations make it possible to vary each compartment's configuration and equipment. The centerpiece of the concept is the Multiseat seating unit: partition walls feature folding benches on either side. Distributed throughout the carriage, they offer standing passengers stability. When rotated at right angles in relation to the outer wall, they serve, for exemple, as seating groups for four people: there is no need to use different train types.

Conceived in accordance with the modular systems, the various service stations can be incorporated into the vehicle as self-contained modules and exchange as needed. When exceptionally high passenger volumes are anticipated, necessitating quicker embarking and disembarking times, snack and drink modules or toilet modules may be exchanged for additional doors. Another advantage of the modular strategy is that the time-consuming and organizationally complex restocking of automats during quick changeovers can be reduced to just a few seconds. Transport service employees will not restock automats inside trains at the terminal station, but instead access them from the outside, exchanging entire modules for newly stocked and cleaned ones.

Up to this point, traveling on the Universal Train is only a fantasy. The aim of the design study is to offer passengers and operating companies added value in the form of enhanced comfort, flexibility, and efficiency. The initial elements of the concept are already being implemented as prototypes and in vehicle concepts.

Location Germany Year 2012–ongoing Status concept and initial prototype; implementation in collaboration with Deutsche Bahn Design Neomind Design Studio

Thanks to its Multiseats, neomind's concept train can be immediately adapted to variable needs at different times of the day or week.

The cars can be equipped with different service modules such as vending machines for beverages, snacks, or tickets.

One car, three scenarios
for utilizing the space

SmartMMI

To convert the windows of the Karlsruhe city trains into smart infoscreens is the aim of a research project entitled »Model and Context-based Mobility Information on Smart Public Displays and Mobile Devices in Public Transport,« or SmartMMI for short. Coordinated by the Institute for Ubiquitous Mobility Systems (IUMS) at the Karlsruhe University of Applied Sciences and sponsored by the Federal Ministry for Transport and Digital Infrastructure, it joins five project partners from industry and research who are striving to improve the »mobility experience« and enhance the appeal of local public transport.

Between 2017 and 2021, to achieve this goal, the team turned its attention toward concepts that combine the most diverse data sources into an intelligent data platform: in the future, passengers will be able to view various situation-specific mobility data on semitransparent display panels, the so-called SmartWindows, or on a smartphone, ensuring that they stay well-informed along the travel route. Conceivable here is context-sensitive information about tourist attractions, transport connections, and weather reports. Information needs are highly individual in character, so passengers receive precise, up-to-date information about potential service interruptions, and about services and offerings available along the travel route. To allow the system to process information accordingly, it is upgraded semantically. This ensures, for example, that sensitive information is displayed only on the smartphone, while supplemental information—in the form of augmented reality, for example—appears on the SmartWindow. The panels can be installed in vehicles and at stations.

Under investigation as well are the operating options of the intelligent city train window, meaning the advantages and disadvantages of multi-touch, gesture, or voice control in various situations. A series of comprehensive usage studies also evaluated information needs, potential control elements, and the effective arrangement of information on the SmartWindow. A major role in determining the acceptance of the proposal is data protection and security, achieved by the system through the encapsulation of user information.

The first field test using a system prototype was launched in spring 2021 in a vehicle of the Karlsruhe transport services.

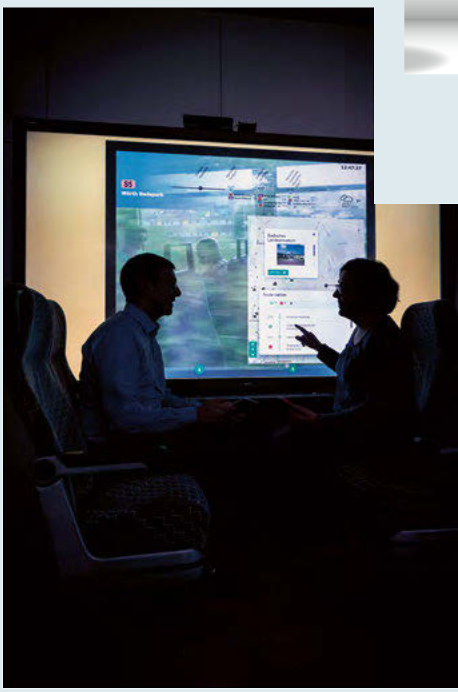
Location Karlsruhe, Germany Year 2017–2021 Status concept and prototype Design consortium consisting of: Institute for Ubiquitous Mobility Systems (IUMS) at the Karlsruhe University of Applied Sciences, ANNAX GmbH, AVG mbH, MENTZ GmbH, USU Software AG Associated partners KVV, HÜBNER GmbH & Co. KG, BOMBARDIER In collaboration with the Federal Ministry for Transport and Digital Infrastructure

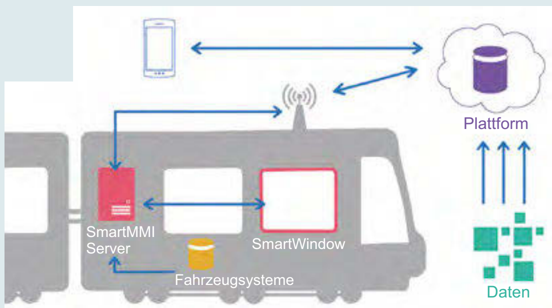
The city train window as touchscreen and information display, seen here in a test setup in the IUMS Laboratory of the Karlsruhe University of Applied Sciences.


12:07:22
Innovative smart window

Possible information includes tourist attractions, travel connections, or weather data displayed via the so-called SmartWindow or the SmartMMI app.

During their journey, users should be able to access mobility data as needed.





SmartMMI system components

Virgin Hyperloop Pegasus

A trip from New York City to Washington, D.C.—330 kilometers—in fewer than 30 minutes? With the Virgin Hyperloop, it may one day be possible. As early as the eighteenth century, inventors have studied the idea of transporting people and goods across great distances in vacuum tubes. More recently, the entrepreneur and visionary Elon Musk took up the idea, presenting the Hyperloop principle in 2013 as an open-ended development concept for high-speed transport.

The Virgin Hyperloop combines the idea of a magnetic levitation train with a vacuum tunnel, which eliminates all air resistance. This should make possible travel speeds of more than 1,000 kilometers per hour—and moreover in virtual silence. The first test drive with passengers on board took place in 2020. In Las Vegas, Josh Giegel, cofounder and chief technology officer of Virgin Hyperloop, and Sara Luchin, head of the passenger experience department, were propelled through the 500 meter-long test track in a test vehicle, the two-seater Pegasus. Velocity: 172 kilometers per hour. The test drive demonstrated that safe travel with the Hyperloop is indeed possible.

The design of the Pegasus is the work of the Bjarke Ingels Group (BIG) and Kilo Design. The design team devised an entirely new vehicle type, in the process establishing the characteristic features of a future Virgin Hyperloop vehicle: a design characterized by smooth forms and clearly designated entry and exit points at the front. A radical deviation from other transport vehicles, it is nonetheless intended to afford travelers a sense of familiarity. Through its integrated design, BIG and Kilo Design have united the need for security with a fascination with velocity, but are also attentive to the interplay between the capsule and the architecture of future train stations. Since the vehicles move in a virtually airless environment, there is no need to worry about aerodynamics.

With the Passenger Experience Vision, Virgin Hyperloop now presented a concept for mass transit in early 2021. Collaborating with BIG, which is responsible for the design of the portal, are the renowned offices Teague (interior design of the capsule), SeeThree (video and animation), and Man Made Music (sound design), all joining forces to develop a comprehensive, multisensory travel experience for up to 28 passengers per capsule in the future. Virgin Hyperloop expects to commence operations in 2030.

Location test site Las Vegas, Nevada, USA Completion 2020 Status prototype Client Virgin Hyperloop Design BIG—Bjarke Ingels Group (architecture office), Kilo Design (industrial design) In collaboration with Aria Group (fabrication and engineering support)

On a 500-meter-long test track in Las Vegas, Nevada, the two-seater Pegasus has already reached a top speed of 172 kilometers per hour with passengers.

Visualization of a Virgin Hyperloop station.

Visualization of the passenger compartment,
with capacity for 28 passengers

The design team developed a new vehicle typology to achieve Hyperloop journeys at speeds over 1,000 kilometers per hour.


CAUTION

Visualization of Virgin Hyperloop platforms

Autonomous Network Transit—Dromos Technologies

For urban public transport in the twenty-first century, the Munich firm Dromos Technologies is proposing an innovative on-demand transport resource based on the concept of Autonomous Network Transit. First, the project responds to the growing number of residents in urban agglomerations and the resultant increasing requirement for effective and efficient transport services.

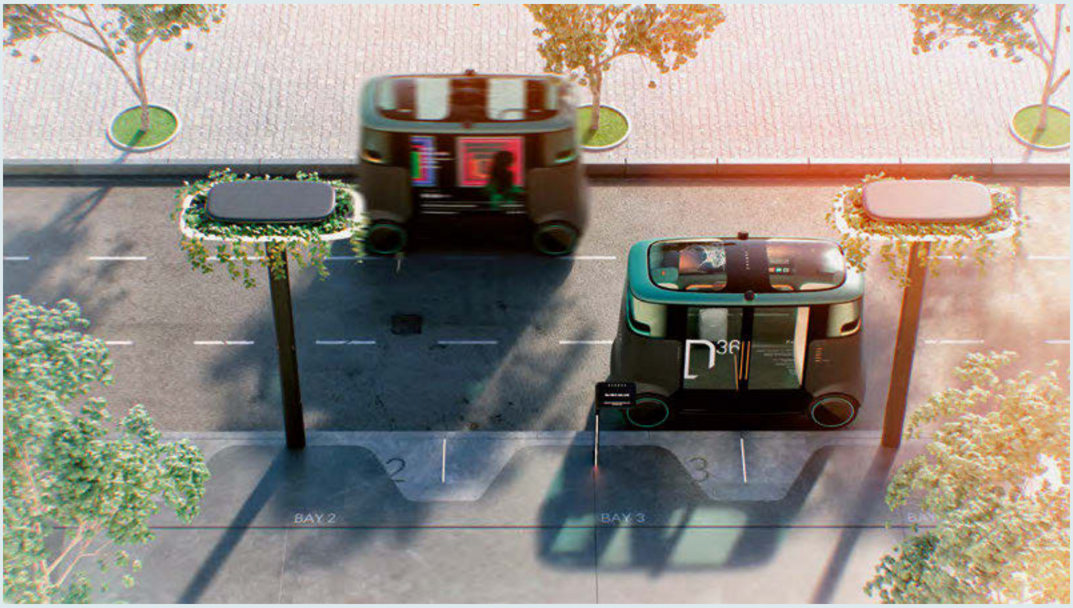
Second, it addresses the high construction and maintenance costs of rail-based train services such as subways, urban railways, and streetcar lines, which are no longer financeable for many cities. And it is precisely here that the concept comes into play: it is designed to cope with challenges such as high operational costs, aging technologies, and lack of comfort in existing rail transport, saving space and time while at the same time markedly improving performance and costs—and ensuring significant improvement in customer benefits.

Dromos operates its own infrastructure, based on a fully automatic, electric vehicle fleet. The initial vehicle design was the work of PriestmanGoode from London. The design studio envisages a compact vehicle that is oriented toward the diverse needs of users. The designers characterize their method as an »approachable minimalism« that dispenses with superfluous elements. Every detail fulfills a purpose. Thanks to its modular structure, the vehicle offers manufacturing and maintenance efficiency, along with maximal passenger comfort. The interior design is well-adapted to the transport of people but also goods, luggage, bicycles, and other sporting equipment. For wheelchairs and baby carriages, there is stepless boarding via extra-wide doors. A large sunroof and maximized window areas provide daylight and attractive views. Tinted, patterned, reflecting glass reduces the solar gain. Seats consist of sustainable, easily cleanable materials.

If implemented, the concept will feature considerable advantages over contemporary rail systems: Dromos Technologies cites a 50% reduction in construction costs, along with a 50% reduction in both construction periods and land use, along with a reduction in maintenance costs of ca. 60%. At intervals of between 100 and 300 meters, passengers would be picked up and dropped off at designated stops, to some extent at or in buildings, always with short travel times and without intermediate stops—around-the-clock, CO_2 neutral, free of particulate matter, and virtually noiseless.

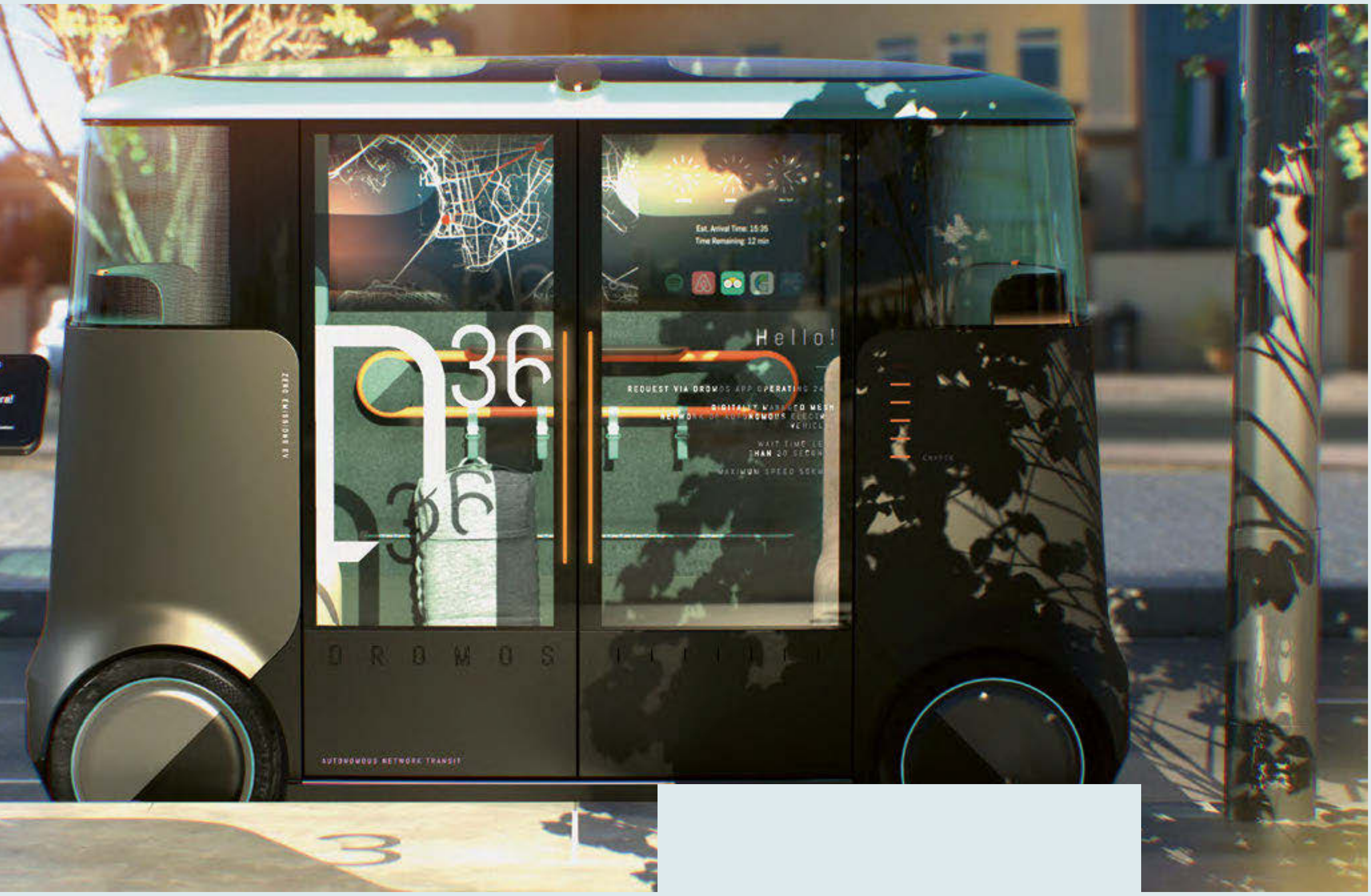
Location cities worldwide Year 2020 Status concept Client Dromos Technologies Design PriestmanGoode (transportation design)

A large skylight and maximized window areas provide daylight and attractive views.



Autonomous Network Transit is an on-demand transportation system based on an infrastructure of autonomous vehicles.

Powered by electricity, the vehicles travel along their respective routes and stop at designated stops for boarding and disembarking.



In addition to passenger transport, Autonomous Network Transit can also be used for freight transport.

Canyon Future Mobility Concept

In 2020, in collaboration with the Institute for Automotive Engineering (ika) at the RWTH Aachen University, the Koblenz bicycle manufacturer Canyon developed the Canyon Future Mobility Concept, a hybrid vehicle that combines the electronic automobile and the pedelec.

The development team provides three convincing arguments for the vehicle's use: it saves money in comparison with an automobile! It saves time! Just consider that the average German spends ca. 161 hours annually sitting in traffic or searching for parking spaces. It helps you stay healthy! A lifestyle based on active mobility increases life expectancy.

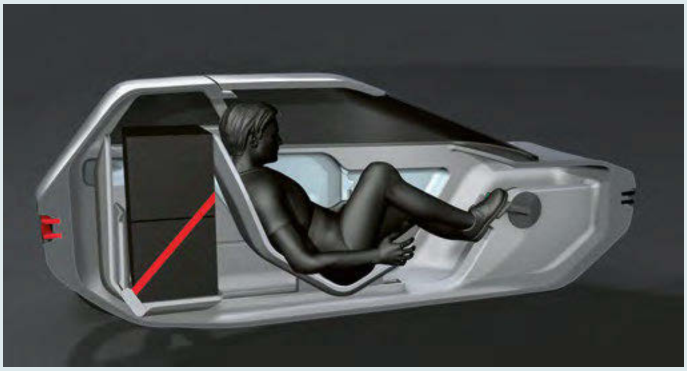
The vehicle is best described as a recumbent bicycle with an electric motor and a weatherproof panoramic capsule. It measures a compact 230 centimeters in length, 110 centimeters in height, and only 83 centimeters in breadth—thereby uniting an electronic-bicycle-inspired design with minimal weight, the stability of four wheels, and protection of the driver from the elements.

Canyon's design language is characterized by simplicity, precision, and dynamism, and these traits are reflected in the futuristic aesthetic of the Future Mobility Concept. The minimalist silhouette reduces weight while providing good aerodynamics. The cockpit was developed by a team of designers and engineers from Canyon and RWTH Aachen as an innovative synthesis of form and function: a capsule with wraparound windshield, whose roof can be shifted forward on two tracks and left open. In warm weather, one can drive with the top open. Behind the driver is enough space for a child, luggage, or shopping purchases.

To power the Future Mobility Concept, the team has envisioned a dual-mode system: as with a pedelec, continuous pedaling is required to set the vehicle in motion. From a comfortable reclining position, the vehicle is steered with joysticks located to the left and right of the seat. The turning radius is 7 meters. The drive system is supported by two electric motors, and allows travel of up to 60 kilometers per hour on streets, and up to 25 kilometers per hour on bicycle routes, which corresponds to the legal limit for electronic bicycles. Depending upon the traffic situation it becomes possible to avoid congestion by continuing on the cycling lane. In the long-term, the Canyon Future Mobility Concept will hopefully become an important element of a future mobility chain—thereby making a contribution to a healthful and sustainable lifestyle.

Headquarters Koblenz, Germany Year 2020 Status concept Design Canyon Bicycles (bicycle manufacturer) In collaboration with Institute for Automotive Engineering (ika), RWTH Aachen University

There is storage space behind the seat for luggage and shopping. Or a child could ride there instead.



A hybrid of e-car and pedelec: the Canyon Future Mobility Concept


FUTURE MOBILITY CONCEPT

It can do more than a car and more than an e-bike: a visionary alternative to both means of transport.

Thanks to motorized assistance, the Future Mobility Concept is suitable for use in moving car traffic. In traffic jams, the maximum speed can be reduced and the vehicle can switch to the bike lane.

SEDRIC

At Volkswagen, the name SEDRIC stands for the firm's first autonomously driving concept automobile, the SElf DRIving Car—and for the first integrated mobility concept ever developed by a car manufacturer. Presented in 2017, the futuristic vehicle shows the way forward for the company: from a pure vehicle manufacturer, explains Volkswagen, to an integrated supplier of hardware, software, and digital mobility services.

With SEDRIC, Volkswagen offers an alternative to individual transport while ensuring sustainable and secure mobility that is available on demand at any time. Since the focus of its development was a user-centered universal design approach, the potential target group for SEDRIC is vast: from children to adults of all ages, with or without driver's licenses, for seniors, for individuals with physical limitations, and for visitors and residents of a city. To fulfill this mission, the chassis, power unit, body, software, and interior of this universal concept car have been fundamentally reconceived. With the assistance of a digital interface, the vehicle can be summoned to any desired location, not unlike a taxi. With the push of a button on a remote control unit, the vehicle—conceived for fully autonomous level 5 driving—operates independently of human intervention. A glowing, colored ring on the control element signals when the vehicle has arrived, ready to transport passengers to the desired destination. Blind passengers are guided toward the vehicle by means of a vibration signal.

Thanks to the remote control, the mobile unit identifies passengers automatically and immediately opens the double doors, which are tall and wide enough to get in and out conveniently. In the interior, the SEDRIC offers plenty of comfortable leg room and seats two pairs of passengers opposite one another. Serving as an entertainment and communication centre is a transparent OLED display set into the windshield. The control system, which is as innovative as it is intuitive, allows users to select destinations, stopovers, and individual preferences as desired either via voice control or smartphone app.

The compact and congenial design engenders confidence and conveys reliability; elements typical of automobiles, such as engine hood and shoulder line, have been deliberately avoided. The SEDRIC could be available from one of the group's brands, either as a shared mobility vehicle or as a configurable owned mobility vehicle.

Location Wolfsburg, Germany Year 2017 Status concept vehicle Design Volkswagen Group

The compact and congenial design engenders confidence and conveys reliability.

The vehicle is summoned via the OneButton remote control. A flashing ring or vibration signal announces the arrival of SEDRIC.

In 2018, Volkswagen introduced the SEDRIC School Bus variant.

The company is emphasizing the availability of a sustainable and safe vehicle for everyone, regardless of age.

Toyota Woven City

On a site measuring 175 hectares and located at the foothills of Mount Fuji in Japan, Toyota is hard at work on the city of the future. Introduced in early 2020, Woven City serves as a »living laboratory.« Here, circa 2,000 residents and researchers are developing and testing a networked, sustainable, community-based city whose mobility is organized with the help of technologies such as self-driving vehicles, smart home, and artificial intelligence.

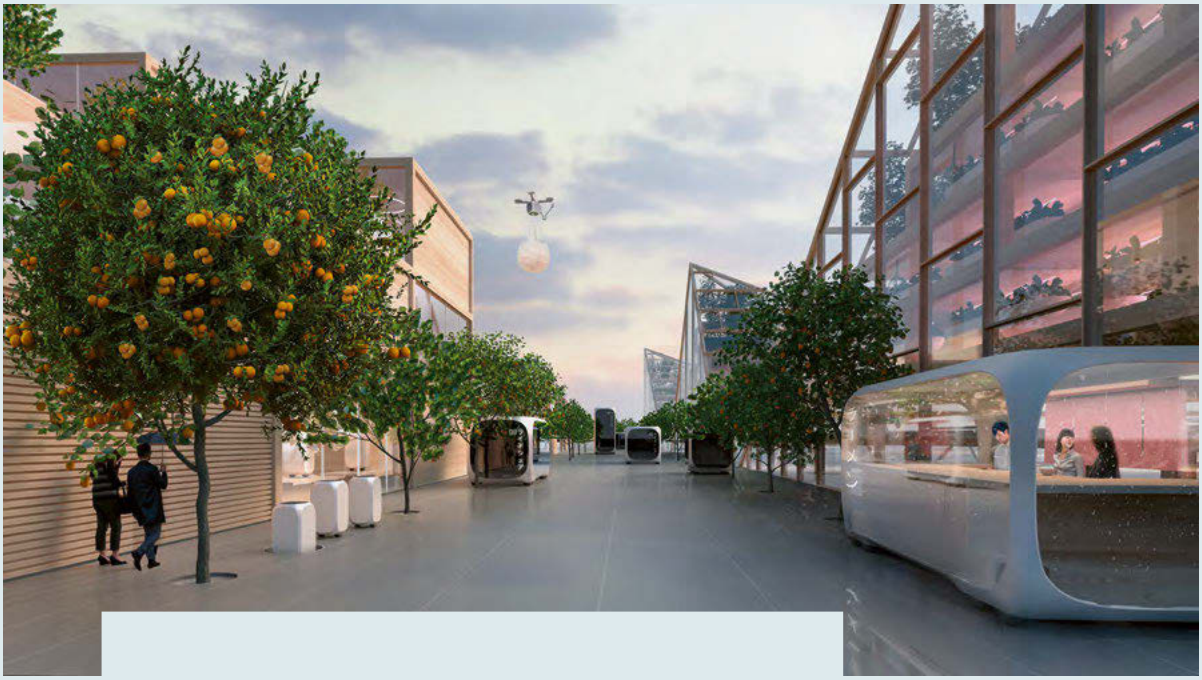
The model town, which occupies a former factory premises in the town of Susono in Shizuoka Prefecture, is supplied with emissions-free energy from sources such as solar and hydrogen fuel cells; all buildings and all infrastructural elements are constructed from resource-conserving material such as wood. The design of Woven City is the work of the Danish architectural office Bjarke Ingels Group (BIG). Their proposal underscores the thesis that technology should strengthen public space and social togetherness.

The name Woven City does not refer exclusively to digital networking—the transport system, too, has been woven flexibly into the town. Unlike streets, which are customarily given a tripartite division, with roadways and subterranean metros for rapid mobility, and sidewalks as slow lanes, the various forms of mobility are treated as equals in Toyota Woven City, and are yet operated separately. Found on Toyota Primary Street are self-driving, emission-free multipurpose vehicles, which transport people and goods. The second traffic route is reserved for cyclists, scooters, and other personal modes of transport. Together with pedestrians, people on the so-called Promenade move individually at reduced speeds; these routes are lined by spacious green zones. The third route, a green corridor that links Mount Fuji with Susono Valley, is reserved for pedestrians. The linear park is also used for relaxed strolls and pauses in nature.

The three street types are woven into three-times-three urban blocks, producing a grid structure with central plazas and parks that are accessible only via the Promenades and the Linear Park, and which can be laid out in various sizes. Were this woven block module to be repeated, the result would be a city that would be seamlessly integrated via these three street types and would be expandable in a multiplicity of variations.

Location Susono (Shizuoka), Japan Year 2020 Status work in progress Client Toyota Motor Corporation, Kaleidoscope Creative Design BIG—Bjarke Ingels Group In collaboration with Squint Opera (Animation), Mobility in Chain (transportation consultants), Atelier Ten (sustainability)

On Toyota primary streets—the main roads—
only fully autonomous, zero-emission,
multi-purpose vehicles are used.



The second street type—the promenades—are
intended for pedestrians and all other means
of micro mobility.

At the foot of Mount Fuji
in Japan, a networked,
sustainable, and community-
oriented urban mobility
system is being tested.→

The third path—a linear park—
may only be used by pedestrians.

Toyota Woven City is to serve as a living laboratory
devoted to developing the city of the future.

Vinge—City and Station

Vinge was planned as one of the largest urban development projects in Denmark—conceived in 2014, it was to have been developed around a new regional train station, which would have served as an urban center. Henning Larsen Architects developed the concept for a new town for circa 20,000 inhabitants, situated to the northwest of Copenhagen in the direction of Frederikssund. According to the plan, everything in Vinge revolves around diversity and sustainability. Every element of the holistic concept—which integrates dwelling, work, and shopping, and features flexible connections to the center of Copenhagen, located just 40 minutes away—is strongly inspired by nature.

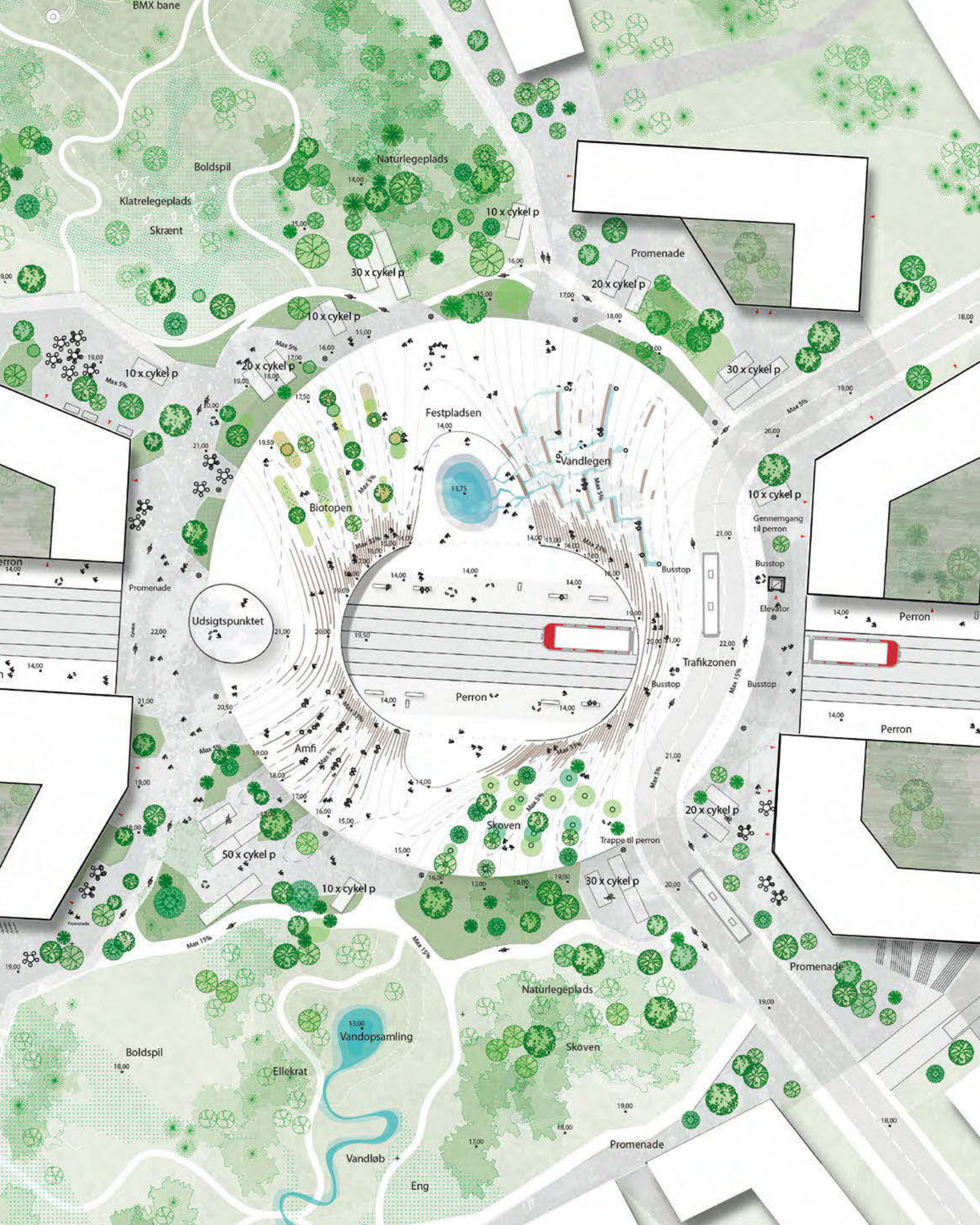
In particular, the design emphasizes green zones within the urban realm—just as envisioned in the development plan for the Copenhagen metropolitan area. Nature as an integral component of the town is reflected in the design of the regional train station as well. Set along the line linking Copenhagen and Frederikssund, the station has been embedded harmoniously in the central, green urban landscape.

The train station constitutes the »green heart« of the new town, and lies within a landscape corridor that traverses the town longitudinally from north to south. The buildings surrounding the station are taller and more densely structured, while those on the edge of town are more widely spaced and lower. The structure, designed by Henning Larsen Architects in collaboration with Tredje Natur, has nothing in common with the traditional concept of large, massive station buildings. Integrated into the natural surroundings and situated at the center of town, the station, with its subterranean routing, is open on multiple levels. It has been inserted into the new community like a hub, but without dominating it. The green corridor lies like a roof on top of the sunken station building, forming a public square that invites people to linger. Thanks to the elliptical openings, visitors arrive at the platforms via park-like routes. This flowing transition between the different spatial levels eliminates the separating effect so characteristic of railway tracks. A terraced structure, along with links to the surrounding landscape, generates exceptional amenity qualities. The station concept is also attentive to fresh air corridors and rainwater utilization.

Regrettably, the project could not be realized as designed, and planning was halted. For the moment, this integrated urban planning concept must remain a vision.

Location Frederikssund, Denmark
Year 2014 Status concept Client Municipality of Frederikssund
Design Henning Larsen Architects
In collaboration with master plan: Effekt Architects, Moe & Brødsgaard Consulting Engineers, Marianne Levinsen Landskab; station concept: Tredje Natur (landscape architecture), MOE (engineering), Railway Procurement Agency (specialist consultants)

Buildings and structures are higher and denser around the station, and lower and more spread out on the outskirts of the city.


BMX bane
Boldspil
Klatrelegeplads
Skrænt
Naturlegeplads
10 x cykel p
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Promenade
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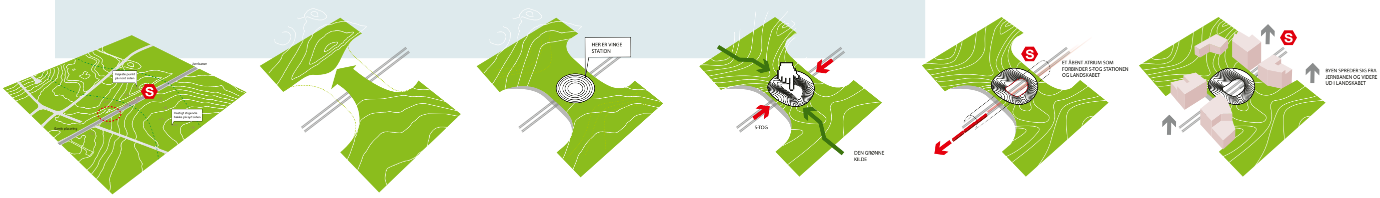
10 x cykel p
30 x cykel p
Festpladsen
Vandlegen
Biotopen
Udsigtspunktet
Promenade
Perron
Busstop
Trafikzonen
10 x cykel p
Gennemgang til perron
Busstop
Elevator
Perron
Perron
Perron
Busstop
Amfi
Skoven
Trappe til perron
20 x cykel p
50 x cykel p
10 x cykel p
30 x cykel p
Promenade
Naturlegeplads
Vandopsamling
Boldspil
Ellekrat
Skoven
Vandløb
Eng
Promenade

The station area forms the »green heart« that is located in the middle of a landscape corridor running through the city.

The Vinge urban development project in Denmark was developed around a new regional train station.

The holistic concept by Henning Larsen Architects is strongly inspired by nature.



The underground station opens up in the city center and becomes a hub.

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