REVERSE INNOVATION

Rethinking Urban Transport through Global Learning

Imprint

Federal Ministry for the
Environment, Nature Conservation,
Building and Nuclear Safety

Federal Ministry
for Economic Cooperation
and Development

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Introduction

In Europe, close cooperation and exchange among cities and countries have a long tradition. Especially in the framework of joint European Union (EU) activities, best practices in sustainable urban mobility are exchanged and innovative ideas spread. During European Mobility Week for instance, cities all over Europe show how sustainable urban mobility can be realised and encourage their citizens to experiment with more sustainable and innovative concepts of urban transport.

This paper, written mainly for transport planners in European cities, intends to provide a glimpse beyond Europe's borders to understand recent transport-related innovations in developing and emerging countries. Not only in mega cities worldwide, decision makers, entrepreneurs and planners are currently testing new approaches to urban mobility – driven by enormous pressures, such as urban sprawl, congestion and air pollution, but also new opportunities related to new digital technologies and rapid economic development. Learning more about their successes as well as potential difficulties may inspire sustainable urban transport development in Europe and Germany.

By 2050, the world's urban population will nearly double, making urbanisation one of the twenty-first century's most transformative trends (UN-Habitat 2016). The Sustainable Development Goals (SDGs), the New Urban Agenda (NUA) and the Paris Agreement on Climate Change highlight the role of cities in the context of sustainable development. Against this background, cities are catalysts for change and a window of opportunity for the innovations needed for transformation. Whether cities are developing or developed, they are constantly creating new solutions. A key sector for sustainability is transport – supplying cities with goods and connecting people to the various city functions.

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Cities worldwide are in search of sustainable mobility solutions

In Germany, the German Environment Agency (Umweltbundesamt, UBA) has the task to ensure that citizens have access to a healthy environment with clean air and water, free of pollutants to the greatest extent possible. Based on research results and expert knowledge UBA provides information and gives advice to public and federal bodies such as the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) or the European Commission. In spring 2017, the UBA-department for transport, noise and spatial development published a vision for "Tomorrow's Cities" (UBA 2017). In this vision, cities will overcome many of the current mobility and transport-related challenges and environmental problems. Tomorrow's Cities are compact, green, functionally mixed and without unhealthy noise and air pollution.

On behalf of the German Government, the European Union and other commissioning parties, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is collaborating globally to promote sustainable urban mobility solutions. Similar to UBA, the work of GIZ applies the "Avoid-Shift-Improve"-approach: avoid the need to travel, shift to more environmentally friendly modes of transport and improve the efficiency of transport systems. On behalf of BMUB, the German Federal Ministry for Economic Cooperation and Development (BMZ) and others, GIZ is advising partners in national ministries and municipalities in a number of countries in Asia, Africa, Latin America and Eastern Europe. The MobiliseYourCity Partnership and the Transformative Urban Mobility Initiative (TUMI) are good examples for this international cooperation.

The first partnership aims at integrated urban mobility planning and the establishment of investment pipelines in 100 cities as well as shaping the pertaining national regulatory frameworks. The latter builds capacities of 1000 urban leaders and generates investments into sustainable urban transport. Additionally, GIZ offers its partner countries access to expertise and experiences in sustainable development solutions from Germany and explores options to adapt those to the local context. Increasingly however, inspiring and innovative solutions can be found in cities all over the world.

GIZ and UBA decided to cooperate to reverse views and to explore the potential of these innovations for German cities. Already being active in the EU-context and coordinating the European Mobility Week in Germany, UBA intends to contrast its vision of Tomorrow's Cities with innovations outside of Europe. GIZ on behalf of BMUB and BMZ has used its networks and project teams all around the globe to screen interesting approaches and open new insights into the process of urban mobility transformation.

This publication acknowledges that cooperation with developing and emerging countries is not a one-way street. Cities in these countries are also home of ambitious decision-makers, well-educated engineers and planners and attract global risk capital because of their sheer size and potential. In the framework of the European Mobility Week 2017, UBA and GIZ want to jointly discuss the vision of Tomorrow's Cities in light of global innovation processes.

The idea behind reversing innovation processes

In this paper, the term "reverse innovation" is used in the context of urban transport development. It describes any new concept or idea that is adopted first in the developing world, shaped by the local context and has the potential to inspire urban transport development in developed economies. The term originates from product development, firstly used by Vijay Govindarajan in 2009 (Govindarajan 2009 and 2012). However, it can also be useful for urban mobility, particularly since data becomes more important and new apps are invented almost every day.

Reasons for reverse innovation

Multinational companies discover the potential of emerging markets as globalisation proceeds. They often enter emerging markets with slightly modified but globalised products. Most of these products are simplified and cheaper versions of the initial products from domestic markets. However, companies such as Pepsi and General Electric realised that such a slight modification is not enough to satisfy local markets in emerging countries. Instead of simply exporting products to those markets, they need to tailor the products specifically. This change in thinking and operating marked the beginning of the concept of reverse innovation. General Electric is known for being a pioneer in the field of reverse innovation: A portable electrocardiogram was especially designed for the local market in India, but later introduced to industrialised markets as well.

In transport, there already exist examples of reverse innovation, with the most prominent occurring years before the term was first used. The Bus Rapid Transit (BRT) system was invented in Curitiba in Brazil in 1974 (SUTP 2005). BRT is a high-quality bus-based public transport system that delivers fast, frequent and cost-effective services at metro-level capacities. BRT buses run on separated, dedicated bus lanes with stations in the centre of the road offering metro-type transport services at much lower costs. BRT systems spread all over the world: Today more than 205 cities operate BRT systems, of which 59 are in Europe, and transport more than 34.3 million passengers per day (BRT Data 2017). In addition, key elements from BRT-like dedicated bus lanes have been adapted and implemented in many European cities as well.

Recent examples for reverse innovation are the electric scooter sharing system Coup in Berlin (page 38) or the dockless bike-sharing systems in some European cities such as Manchester, London, Amsterdam or Munich (page 30).

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BRT system in Curitiba, Brazil

With China as a forerunner in electromobility and new mobility services emerging in many different places, there is a huge potential to find inspiration abroad. Around the world, cities face similar challenges in urban transportation and try to find sustainable solutions through innovations and experiments. Hence, innovation can happen everywhere and take many different forms. Urban mobility solutions, however, are not confined to products. Instead, urban mobility solutions may also include services, operational processes, business models or policies. They range from entirely new products to innovative aspects that can complement and optimise existing systems.

REVERSE INNOVATION

Gogoro Scooter:
From Taiwan to Berlin

MoBike:
From China to Manchester

BRT:
From Brazil to the US

Measures for Tomorrow's Cities in Germany

How can Tomorrow's Cities look like, where sustainable transport has become reality? UBA envisioned such cities – cities in which sustainable transport materialised and lead to quiet, green, compact, mixed and climate friendly cities in Germany. The concept of sustainable transport lies at the core of that vision and shapes the cityscape noticeably in more than one aspect. Noise, emissions and the use of space change fundamentally as the result of a less "car-centred" transport system.

More concretely, in Tomorrow's Cities inhabitants do not suffer from traffic jams, unhealthy exhaust gases, noise and time wasting journeys. Due to a functional mix, facilities of their daily life as well as green areas are just around the corner. It is possible to travel to work by bike or use trains and electric buses that run in frequent intervals. In the unlikely event, that public transportation or bikes are not an option one can order a quiet, emission-free electric car via app. Due to that, all inhabitants of Tomorrow's Cities are as mobile as they are today, but in a different way. They no longer need a private car to get from A to B and perform their daily routines. In fact, in Tomorrow's Cites a target density of 150 registered cars per 1,000 inhabitants is envisioned – including car-sharing vehicles and taxis.

The vision of Tomorrow's Cities primarily focuses on large cities with more than 100,000 inhabitants and concentrates exclusively on ecological questions related to noise, emissions and the use of space. This however, does not mean that this vision is not relevant for smaller municipalities or ignores social and economic questions. It is merely for simplification, that the vision does not encompass all sizes of local government and decides against focusing on social and economic questions to the same degree.

While there is currently no German city that comes close to that vision, Tomorrow's Cities are still achievable. The German Environment Agency not only developed this vision, it also suggests concrete bundles of measures that need to be implemented to realise Tomorrow's Cities and stimulate a much needed turnaround in the transport sector. Ten closely interconnected bundles of individual measures form the basis for the realisation of Tomorrow's Cities. Those suggested bundles, however, should not be looked at in isolation. Instead, many measures fit in several bundles and complement each other on many different levels.
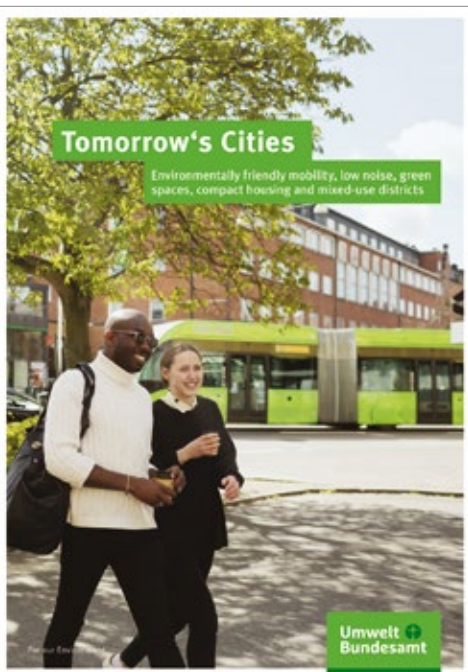
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Learn more about UBA's vision for Tomorrow's Cities

Implementing compactness and mixed use in cities

Tomorrow's Cities encourage the development of compact, mixed-use districts with a vibrant and creative community as to cope with the increasing amount of people drawn to big cities. To do so, a qualified inner-city development strategy is implemented: In Tomorrow's Cities, compact housing is combined with the further development of green and recreational spaces and consequent incorporation of environmental standards. Those much-needed spaces, for instance, can be freed up by reducing oversized roads and parking spaces.

Providing urban green spaces and public areas

Desirable living quarters and public space for conviviality are integral parts of Tomorrow's Cities. In that regard, the number, size, quality and accessibility of green and blue spaces is crucial, since green spaces and water bodies play an important part in social life. Urban planning in Tomorrow's Cities acknowledges the different demands on the use of space, ensures a broad involvement of relevant stakeholders and aims at maintaining a high ecological and recreational value of green spaces. This includes introducing vegetation to buildings (roofs, facades), streets as well as sports facilities and playgrounds.

Reducing noise

One of the most relevant sources of noise in cities is road traffic. It is not just a nuisance, but can make people ill when 40 dB(A) at night and 50 dB(A) during the day are exceeded. Hence, Tomorrow's Cities implement a wide range of measures to reduce noise exposure and preserve quiet zones: This includes long-term strategic approaches to traffic prevention and measures such as local speed limits, regular speed checks, night-time flight restrictions for airports close to cities, soundscaping in residential areas, the use of low-noise surfaces, rail grinding at regular intervals, bans on through traffic and protection of quiet areas.

Expanding active mobility networks

Cycling and walking are healthy, quiet, emission free and use far less space than car traffic. Nonetheless, this form of mobility is not yet as popular as it deserves to be. Therefore, Tomorrow's Cities make this mode of transport more attractive by providing a comprehensive, safe and closely connected network of paths, appealing pedestrian-friendly shared spaces, convincing, direct and safe cycle route infrastructure and, where possible, super-highways. This is complemented by safe, accessible and secure cycle parking in all relevant locations. Lower speed limits (30 km/h) additionally support active mobility.

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Urban vertical gardening in Singapore as a measure of urban green

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Public transport is the backbone
of Tomorrow's Cities

Encouraging integrated mobility services and e-mobility

In Tomorrow's Cities, new service providers offer online information, booking and payment systems, which make multimodal travel easier. Such services include car-sharing, bicycle and e-bike rentals as well as car-pooling. Alternative and flexible services such as flexi buses or shared taxis must be pushed, fair competition in the taxi business ensured and the integration of public transport and car-pooling support-ed. Moreover, as a matter of principle, car-sharing should have priority over individual transport. These changes are complemented by an energy transition to enable clean, quiet and carbon-neutral transport of people and goods in urban areas. Only electrically operated vehicles are permitted in Tomorrow's Cities, phasing out combustion engines gradual-ly. A tight and reliable network of charging facilities further supports electromobility. Charging stations will become an integral part of urban planning routine, ensuring charging infrastructure not only in public areas but also in new housing as well as commercial and industrial estates.

Improving public transport quality

Since public transport makes efficient use of space and energy and is cost-effective and safe, it is the backbone of environmentally friendly mobility in Tomorrow's Cities. All public transport vehicles run electrically and environmental standards for air pollutant and noise emissions are applied throughout procurement processes. Different measures ensure that public transport is reliable, accessible, clean, safe, user-

centred and comfortable, thereby becoming the most obvious choice for travelling distances too far for walking or cycling. Hence, services must run frequently with a network that gives access to remote parts of the city and its surroundings while relevant information is well presented and comprehensible. Separate lanes and tracks for buses and trains ensure that connections are fast and reliable. Participation in transport development planning further ensures that mobility services meet the needs and expectations of their users.

Making commercial transport within the city environmentally friendly

Commercial transport is a source of air pollution and noise that cannot be neglected, since it is expected to play an ever more prominent role in times where more and more people order goods online. In Tomorrow's Cities freight and goods will be directed into micro-depots and consolidated in urban distribution centres, thus shortening travel distances. Emission-free last mile solutions as well as parcel boxes will complement those processes. Environmentally friendly and efficient logistics concepts, including long-haul traffic, will be the norm in Tomorrow's Cities, since freight traffic is embedded in an overall urban traffic and development strategy. Additionally, IT-supported routing systems find routes with the lowest environmental impact.

Managing motorised transport

In Tomorrow's Cities private car traffic is consistently managed so that its environmental impact can be reduced while other, more future proof alternatives can establish themselves on the market. The overarching principle behind measures to reduce and manage private car traffic are monetary incentives, such as demand driven parking space management and distance-dependent tolls on city roads. Additionally, traditional regulatory instruments, such as speed checks and issuing parking tickets are consistently applied in Tomorrow's Cities. To prevent negative effects such as increasing out-of-town shopping instead of visits to the more regulated city centre, urban and regional planning are well connected and coordinated.

Electric car recharging on a dedicated parking spot

Exploiting digitisation for the benefit of the environment

Digitisation plays an important role in organising mobility in Tomorrow's Cities. It applies to technological infrastructure, buildings and services as well as traffic and administration. Comprehensive digitisation offers many opportunities: Integrated ticketing improves multi modal travelling, digitised systems help steer freight traffic, intelligent routing keeps HGVs out of residential areas at night time, electric shared cars can reduce car traffic significantly and new forms of

participation and communication are available. At the same time, digitisation must be coordinated in a way that maximises the environmental benefit while minimising the associated risks and uncertainties, such as data protection, data security and reliance on particular IT systems. Tomorrow's Cities have access to free data on traffic surveys and models, include all stakeholders benefits from a suitable legal framework.

Fostering participation and collaboration in planning and implementation

Planning and decision-making processes in Tomorrow's Cities are characterised by an early involvement of citizens and relevant stakeholders, transparency, clear decision criteria and high procedural standards. Informal dialogue forums alongside official planning routes, experimental spaces such as urban transition labs as well as concepts such as citizen science are only a few ways to involve the public. New digital tools and platforms further expand these means and instruments. Additionally, cooperation within and across communities help deliver an integrated development policy for regions, cities and their traffic. In that regard, integrated traffic planning has proved to be a useful way of synchronising overlapping policies and sectors as well as different administration levels.

These bundles of measures show how Tomorrow's Cities can be planned, coordinated and put into practice. While not all solutions are new, the value of those concepts has not decreased over time. Until consistently implemented, they are as important today as they were 30 years ago, when some of them first came up in discussions.

Short travelling time, digital mobility, efficient technology, integrated planning and innovative logistics are not only important in the German context. Many cities in developing and emerging countries equally suffer from the negative effects of fossil-fuel traffic such as exhaust gases, noise and lack of green and recreational space. In some cases, these severe negative effects and pressures force those cities to find and implement quick and efficient mitigation and prevention measures. Increased pressure and different regulatory frameworks inspire different solutions in cities from emerging and developing countries. Some of the measures are fundamentally different from anything tried in Germany, some are on a different scale and some add innovative twists to already existing measures. This in turn means that solutions found in the developing world can very well inspire successful concepts and ideas in German municipalities.

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Promoting active mobility,
Amsterdam/Netherlands

Bundles of measures

Implementing compactness and mixed use in cities

Providing urban green spaces and public areas

Reducing noise

Expanding active mobility networks

Encouraging integrated mobility services and e-mobility

Improving public transport quality

Making commercial transport within the city environmentally friendly

Managing motorised transport

Exploiting digitisation for the benefit of the environment

Fostering participation and collaboration in planning and implementation

Innovations from cities around the globe

Together with international partners, colleagues, and online sources, GIZ researched 50 promising innovations from around the globe. UBA and GIZ selected ten innovations that will be presented in more detail. The three selections criteria were:

Contribution to sustainable urban mobility: The innovative example aims at improving urban mobility in a sustainable way and has a direct impact on liveability and overall wellbeing in urban areas. The innovation directly contributes to "Tomorrow's Cities

Country of origin: The innovative examples come from different countries with diverse backgrounds.

Type of innovation: The innovative example is not limited to technological innovations. Social and regulatory innovations as well as new business models were considered.

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Electric urban vehicle

ELECTRIC BUSES
CHINA

Electric vehicle fleet

Political will, large-scale pilot projects, copious funding programmes and a close feedback-loop between industry, research, policy and local implementation facilitated an 'electric bus boom' in China. This led to the operation of more than 100,000 electric buses.

▶ www.chinabuses.org

◎ *China*

Description

The Chinese government is the central player in facilitating the transformation of the public transport sector towards electromobility. With promotion and subsidy programmes, the government has boosted electric buses to support the vehicle manufacturing industry, public transport operators and the provision of charging infrastructure. It also facilitates science, research and practical experimentation.

The government released a new regulation, which obliges local governments to promote the integration of electric buses in public transport fleets. Ambitious targets like an 80 % share of "new energy buses"[1] in public transport by 2019, together with an extensive subsidy programme depending on vehicle type and vehicle size, accelerated the transition towards these buses. National strategies are supported by local policies such as local clean action plans and local subsides. Subsidies relate to manufacturers per sold vehicles and to public transport operators per purchased vehicle. The setup of charging infrastructure is also strongly subsidised.

Demonstration and pilot projects began testing and evaluating possible solutions for alternative drives. These politically supported, large-scale pilot implementations provided early knowledge to improve new systems and make them ready for the market. Different technologies like fast charging, battery swapping, station-based charging, grid connection management, use of light materials and engines, have been tested all over the country, depending on existing infrastructure and industries. Direct feedback loops between local industry and pilot projects enable a quick response to further improve technology. A pilot project worth mentioning here is an electric BRT-trolley bus in Beijing equipped with batteries to run without catenary wire along the feeder routes outside the main corridor. This design of the infrastructure enables a perfect interplay between operation and charging requirements.

Local context

Chinese cities grow rapidly. In Beijing, every day about 6,000 cars are added to the road. Thereby citizens suffer from heavy air pollution to which transport contributes intensively. At the same time, most Chinese cities depend on bus systems as the backbone of their urban transport systems. In 2008, the state council issued a "Public Transport First" strategy to reduce congestion and air pollutions in cities. The local context for new bus technologies is mainly characterised by industrial policy and the political aim to develop a local bus industry. Becoming independent from oil imports and reducing air pollutants are the main drivers to action. Strong supportive policies including action plans and subsidy programmes are the two most significant drivers in China for new energy buses.

INNOVATIVE ASPECTS

#LARGE-SCALE PILOT PROGRAMMES
#EXTENSIVE SUBSIDY SCHEME
#TRANSDISCIPLINARY COOPERATION
#OPERATIONAL SYSTEM

1 New energy buses include battery electric buses as well as plug-in hybrid electric buses.

"E-buses are getting more affordable. In the beginning, one electric bus equalled the cost of three diesel buses. Now, one e-bus equals nearly one and a half diesel buses. Moreover, policy pushes testing. Thereby, the technology gets improved, operation and fleet management gets practiced and e-buses become more reliable in service. One great advantage is the experience that China has gained from large fleet experiments."

Shengyang Sun – GIZ China, Project Manager of the "Transport Demand Management" project in Beijing

SIMILAR EXAMPLES

- ▸ E-Taxi Beijing
- ▸ E-Carsharing: Kandi EV CarShare
- ▸ E-Scootersharing: Zeebike

China possesses a strong vehicle manufacturing industry, including global players such as BYD or Foton buses as well as local manufacturers, such as Shanghai's Aowei Technology Development Co and Zhongtong bus. The proximity of industry and practice significantly simplifies the exchange between policy, research and industry, which expedites development, innovation and optimisation of technologies and operations. The combination of promotional policies, funding and local industries offers an environment that promotes experimentation, resulting in the huge number of pilot and demonstration projects of electromobility in public transport.

Lessons learned

- ▸ The effective interplay between policy, research, industry and local implementation as well as instant feedback loops, are essential for a successful learning process and the implementation of electric buses into daily operations.

- ▸ Industrial policy as a driver: High investments in research, infrastructure, manufacturing and implementation allow a quick and efficient synergy between practical trials and optimisation through learning.

- ▸ The subsidy programme, with higher amounts in the beginning and a progressive reduction over time, reduces the risk for vehicle manufactures and operators. After discovering misuse of the subsidies, the government addressed this problem by making subsidies dependent on a defined, required operational run. Due to higher costs for purchasing electric buses compared to conventional buses, alternative commercial ownership models were elaborated. Instead

of buying and owning buses, public transport companies have more options to separate ownership and operation as well as related risk.

▸ The large-scale deployment of electric buses highlighted crucial points for implementation, especially with regards to operations. Routing, regarding route length and station distances, had to be adjusted to battery ranges corresponding to existing technologies. The outcomes of demonstration projects helped define technological development needs and translate them into technological solutions.

▸ Repair and maintenance were tested and optimised. To ensure a reliable service, a modular set-up proved itself in practice. Replacement of batteries can take place within two hours, reducing non-operation periods to a minimum and almost reaching the 95 % availability-rate of conventional diesel buses.

Similar examples from developing and emerging countries

Due to the exceptional electromobility promoting policy, there are several other interesting examples for other electrified modes of transport in China. Besides many others, electric taxis, electric car-sharing or electric scooter sharing implicate innovative urban transport solutions. The Kandi EV-vending machine is a car-sharing scheme, with a little smart electric car that can run for 75 miles at up to 50 MPH. They store the cars in giant vertical vending machines that deliver the cars on demand. China also puts great efforts into developing a market for private electric cars.

HEAVY
AIR
POLLUTION

PROGRESSIVE
POLICIES FOR
PROMOTING
E-MOBILITY

LOCAL BUS MANUFACTURER
INDUSTRY

SOCIALIST
MARKET
ECONOMY

ROOM FOR
EXPERIMENTATION

Relevance for German Cities

Germany already has established strategies and promotional programmes to stimulate electromobility on national and federal levels, aiming at making Germany a key market for electric vehicles. Nonetheless, despite divergences in local conditions, especially in political and economic systems, Germany could learn from certain aspects of the Chinese approach to electromobility:

▸ Currently, Germany prepares a subsidy programme for electric buses. As China has developed its national and local level subsidy programme over the years (e.g. from subsidies for bus purchases to subsidies based on the driven mileage, addressing public transport operators as well as the industry), China's experiences could inspire new or different funding schemes in Germany.

▸ The Chinese eagerness to experiment on a larger scale could be inspirational for Germany. German pilot projects are often small-scale, which makes it difficult to examine the resistance of tested technologies for daily business.

▸ The transdisciplinary cooperation between industry, research and policy on different levels is exemplary. China is therefore a good case of local cooperation and effective common learning in the field of electromobility.

GO-JEK
INDONESIA

Integrated Transport Services

Go-Jek is an app-based transportation, delivery, lifestyle and payment service start-up. Originally founded in Jakarta in 2010 as a motorcycle taxi service, Go-Jek soon included other services ranging from food and groceries delivery to cleaning and beauty treatment services.

▶ www.go-jek.com

◉ Indonesia

Description

Go-Jek originates from the Indonesian word "ojeks", which is the translation of motorcycle taxis. Go-Jek's core business is the motorcycle taxi service Go-Ride. With 200,000 drivers, it has become one of the most popular ways to get around in Indonesian cities. In order to ensure a seamless interchange between motorcycle taxis and public transport, Go-Jek also offers Go-Busway, which locates nearby stations and provides real-time schedule information. These services are complemented by Go-car, an UBER-like car hailing service.

Go-Jek also offers services related to urban logistics: Go-Send is a courier service for basic goods within urban areas and Go-Box provides different modes of transportation like vans, pickups, trucks and transport containers. In addition to these transport-related services, Go-Jek includes food delivery (Go-Food), groceries delivery (Go-Mart), medication delivery (Go-Med), doorstep massage (Go-Massage), cleaning (Go-Clean), beauty treatments (Go-Beauty) and mechanics for car maintenance (Go-Auto). Go-Jek service requests can be tracked by users in real-time, resulting in enhanced service predictability and consumer trust.

All Go-Jek services are accessible via smart phone applications, which are location-based and match nearby users and drivers. The app displays the exact fare for each ride and offers different modes of payment. You can either pay in cash or with Go-Pay: a free, smart, cashless payment system. Users can top-up their balance at any ATM, or through mobile or internet banking and use it for all Go-Jek services. One of the challenges Go-Jek still has to overcome is misuse of its services; for example, when people order a ride and do not show up.
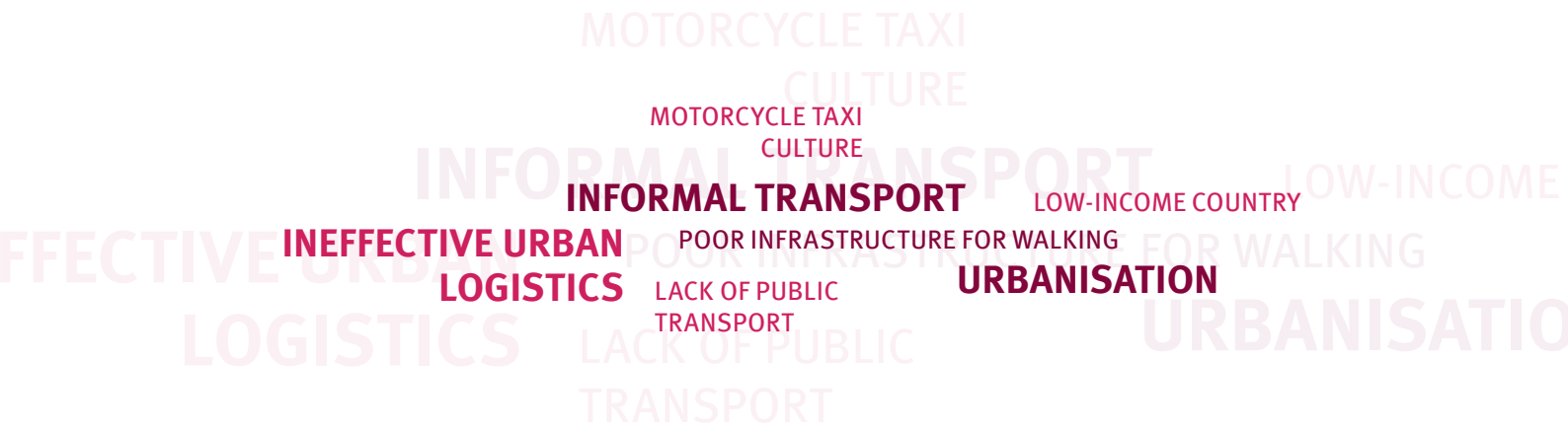
INNOVATIVE ASPECTS

#INTERCONNECTED SERVICES
#SMART PAYMENTS
#REAL-TIME DATA

MOTORCYCLE TAXI
CULTURE

MOTORCYCLE TAXI
CULTURE

INFORMAL TRANSPORT

INFORMAL TRANSPORT   LOW-INCOME COUNTRY   LOW-INCOME

INEFFECTIVE URBAN   POOR INFRASTRUCTURE FOR WALKING   FOR WALKING
LOGISTICS   **URBANISATION**

LACK OF PUBLIC
LOGISTICS   TRANSPORT   URBANISATIO

LACK OF PUBLIC

TRANSPORT

SIMILAR EXAMPLES

On-demand transport applications:
▸ Grab Indonesia
▸ Didi Chuxing
▸ Helobike in Nairobi
▸ SafeBoda from Uganda
▸ Go Bike in Thailand
▸ Ola India

On-demand logistic services:
▸ ninja van
▸ GoGoVan
▸ Easy Van or Lalamov

Local context

As a developing country, Indonesia still struggles with challenges related to massive urban growth, ill-equipped public transport systems and urban congestion. These challenges support the use of motorcycle taxi services as a form of informal transport. They are commonly used to get through traffic jams, as they are deemed quicker and more reliable than other modes of transport. In fact, informal transport services have been used as the primary mode of transportation in Indonesia for a long time.

Due to the high local demand, motorcycle taxi services are profitable businesses, generating large numbers of jobs. Low living costs, low wages and subsidised fuel prices allow for Go-Jek's low-cost business model to flourish. With its low pricing scheme, Go-Jek enables most Indonesians to make use of its services. Moreover, services like Go-Jek are not regulated by Indonesian transportation law, since they are not defined as public transport.

However, this makes Go-Jek's low-price policy highly controversial, as it competes with public transport as well as mini-bus services that cannot match their low prices. Decades of research and development on paratransit and new forms of mobility services have not yet solved this controversy. Since Indonesia lacks a developed urban logistic network, Go-Jek was able to fill this gap. As opposed to most conventional Indonesian courier services, Go-Jek offers and delivers transparent and networked urban delivery services. Within the given legal, political and economic framework, Go-Jek constitutes a desirable alternative for passenger and freight transport and additional services at low cost.

Lessons learned

▸ Go-Jek is a good example of how app-based services substantially improve the quality and reliability of urban transport: It provides real-time data tracking, a cashless payment system, quick transportation and reliability.

▸ With its business strategy, Go-Jek attracts private customers and businesses alike: businesses often use its courier and shuttle services. This does not only integrate passenger and freight transportation, but public and private spheres.

Similar examples from developing and emerging countries

With their potential to structure informal transport services – such as motorcycle taxis, tuk tuks/rickshaws and tricycles – hailing apps represent a fast-growing, dynamic business sector, especially in South-East Asia. Applications providing pre-bookings for informal transport services operate in nearly every Asian country. In addition to on-demand transport applications, there are innovative on-demand logistic services that offer deliveries by registered, private drivers.

Relevance for German Cities

Even though the German and Indonesian contexts differ substantially, there are many innovative and relevant aspects of applications such as Go-Jek:

▸ The integration of taxi services and urban delivery in one app can potentially reduce the total number of trips. Expanding this to craftsmen, cleaning or nursing services, urban transport could become substantially more efficient as it generates synergies between different businesses.

▸ Integrated GPS tracking and smart payment options are innovative aspects that further enhance user friendliness and transparency.

Using electric cars, e-scooters, pedelecs or cargo bikes for Go-Jek-like services could generate additional environmental benefits. This example highlights the huge untapped resources also prevalent in German transportation systems indicated by millions of empty seats traveling. Introducing low-cost innovative solutions like Go-Jek or other systems already introduced in Germany requires comprehensive reforms in the transport sector, especially within the legal framework. Thus, the integration of various public transport modes and diverse forms of using private vehicles (e.g. carpooling, car-sharing, ridehailing) can substantially reduce transport volumes, congestion, external costs, etc. and contribute to smaller carbon footprints. But at the same time it must be ensured that these new services don´t cannibalise the public transport in Germany.

PERMANENT PARKLETS
BRAZIL

Urban Green

The Brazilian city of São Paulo released a comprehensive programme for permanent parklets. This programme enables citizens and local stakeholders to create public parklets according to clear guidelines.

▸ http://gestaourbana.prefeitura.sp.gov.br/rede-de-espacos-publicos/parklets/

⊙ *Brazil*

Description

Parklets are small outdoor recreational areas built on parking spaces. They provide additional resting places for people in the streets and can be equipped with benches, chairs, tables, trees or bike racks. The city of São Paulo released its parklet programme (Decree No. 55,405) in 2014 to define and regulate the creation of permanent parklets.

With that regulation, the city has given a green light to citizen or business proposals to transform parking spaces into public parks. Since then, anyone can submit proposals as long as they meet certain requirements defined in the "Guidelines of the Permanent Parklet Programme". The whole application process for permanent parklets is organised and conducted in a fair and transparent way. After approval, candidates are free to create their own parklet with respect to the guidelines. Parklets have to:

▸ be open to the public (private parklets are not permitted) and have clear signage,

▸ provide safety installations such as rails or barriers, to protect users from car and bus traffic,

▸ be installed on roads with speed limits not exceeding 50 km/h,

▸ comply with prescribed maximum depths and widths specifications,

▸ make sure they don't contain certain non-permitted installations,

▸ keep bike- and bus lanes clear.

Practical designs include gastronomy, greening, bike parking, waiting or relaxing areas. In fact, many people use a parklet every day. Additionally, more than 200 Brazilian cities as well as cities in Chile and Colombia followed the example of São Paulo and now allow the construction of parklets.

URBANISATION

ENHANCING AWARENESS OF PUBLIC SPACES

REDUCING MOTORISED TRANSPORT

PROMOTING NON-MOTORISED TRANSPORT

INNOVATIVE ASPECTS

#REDESIGN PARKING SPACE
#CLEAR GUIDELINES ON PARKLETS
#PUBLIC PARTICIPATION

"There is a clear message that a parklet pulls a car out of the public space. But in fact, it's the other way around: one car less pulls up to 300 people into the public space. More people are walking in the city and are using more public spaces. Before the Parklet Programme, people had little perception about the use of public space; they did not care about public spaces and they did not use them frequently. We also realise that people who use parklets often, use other types of public spaces as well. They have a greater perception of the rights to the city as a citizen."

Lincoln Paiva – President of the Green Mobility Institute Brazil

Local context

High levels of motorisation, safety issues and limited space lead to the poor quality of public spaces in the past. Smog, noise, crowded and confined spaces have not been appealing to people. That is why the city, supported by international guidance, worked out a package of measures to revitalise the cities' public spaces.

São Paulo pursues a vision of people-centred urban development, legally defined in the city's Master Plan. This also includes a provision to promote a pedestrian-friendly environment. Like many other big cities, São Paulo strives to mitigate the consequences of urbanisation and car-centred policies of former times.

In order to improve the quality of public space, the city experimented with replacing parking spaces with parks, including special events like the (Park)ing Day and pilot programmes. But previous trials have always been only temporary.

Lessons learned

▸ The city authority of São Paulo realised that car-use was excessive and that a reduction of car circulation within the city through a combination of different measures is possible and also desired by the population.

▸ The positive feedback to initial experiments with replacing parking spaces for green areas and parks, urged the local authority to adopt measures that allow for permanent parklets. Experiments showed that clear standards are essential to ensure the safety of users, organise the submission of proposals and specify the design and use.

▸ The amount of proposals submitted and the frequent use of implemented spaces demonstrate the acceptance and success of the Permanent Parklet Programme.

▸ The programme lead to an increased awareness for public spaces: People come together, make use of public spaces, rediscover the city and collectively take care of these spaces. The city started to build up other green infrastructure, organisations were born for the maintenance of public spaces and companies were created that specialise in the construction of parklets and urban furniture.

Similar examples from developing and emerging countries

Alongside parklets there are other innovative solutions to reuse parking space: In Buenos Aires, car-shaped bike racks are installed on parking lots. These bike racks accommodate ten bicycles within a single parking spot. In Gurugram in India, parts of parking lots are reclaimed to make space for 40 bicycles and a sitting area for visitors.

Relevance for German Cities

There are already some parklet projects in German cities, but a programme like that in Sao Paulo provides interesting and innovative aspects worth considering in the German context:

▸ The formalisation of the Permanent Parklet Programme as a Government initiative is very interesting. In order to promote the diffusion of these urban green solutions, technical and legal guidelines are required to integrate permanent parklets into German city planning.

▸ The promotion of public participation in designing parts of the city is a great approach that raises awareness and acceptance for green urban planning and can help reduce potential conflict.

▸ It is a positive motorised-transport reduction measure: Reducing parking spaces for motorised transport and building up public spaces for recreation at the same time.

RAYE7
EGYPT

Urban Carpooling App

Raye7 is a culturally sensitive urban carpooling application combined with a social networking element. The app matches trips of users who belong to predetermined social communities such as co-workers or friends.

▸ www.raye7.com

◉ *Egypt*

Description

Raye7 started as a pilot project in cooperation with Smart Village, a high-tech business west of Cairo, Egypt. The employees, who had the common denominator of working in the field of communications and IT, were the first defined community. Employees could register for the community by using their corporate e-mail as a verification. Users can record the data of their daily work trips in the Raye7 app. By matching participants according to distance radius between them, the application locates nearby colleagues, who offer trips to work and back. Registered users can simply select one of them and, after being accepted by the driver, the application matches both users to start their trip. The application includes an indirect payment model. Costs are charged to passengers' phone accounts and paid to drivers monthly. The payment model is a cashless pointing based system: drivers earn points for every shared ride. These points can be converted into a financial reward after a certain number of points are earned, while a person, who shared his or her car before as a driver and uses the service later as a passenger, would pay from the points that he or she obtained before.

After the success of Raye7 within the Smart Village, Raye7 collaborated with more companies and institutions in Cairo. It opened new communities for those companies and for new target groups, like corporate or university communities. With 15,000 current users in Cairo, Raye7 is planning to expand to other countries around the world, including Finland. There, it collaborates with one of the largest financial groups worldwide to launch the app in the Finnish market. At a later stage the company is targeting other developing markets such as India, Nigeria and the Middle East.

Local context

Because of a high number of private cars, Cairo is affected by massive traffic jams that make urban trips time-consuming and stressful. Even though Cairo disposes of three high-capacity metro lines, the public transport system is still based on informal buses and minibuses, which lack reliability, safety and comfort. Therefore, people prefer shared taxis or their private cars (Araby 2013). As 70 % of private cars in Greater Cairo have vacant seats, urban ridesharing is an effective approach to reduce the number of private cars on Cairo's roads and related traffic congestion. Because of high crime rates, people in North Africa are more sceptical about sharing rides with people they do not know and pay special attention to the safety of passengers and drivers.
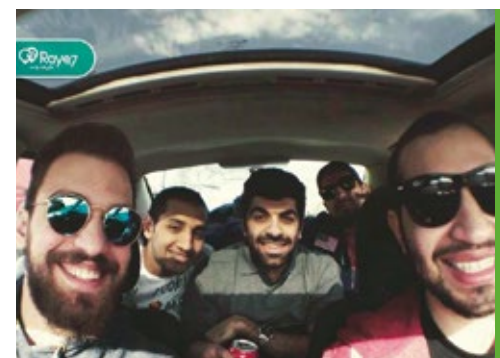
INNOVATIVE ASPECTS

#URBAN CARPOOLING
#SOCIAL COMMUNITIES
#CULTURALLY SENSITIVE RIDE-SHARING
#SMART PAYMENTS
#REAL TIME RIDE-MATCHING

SIMILAR EXAMPLES

▸ Caronetas Brazil
▸ Jump.In.Jump.Out India
▸ Gett Israel
▸ She taxi India

Similar examples from developing and emerging countries

To address the problem of congested cities, there are various endeavours for the collaborative use of cars in developing and emerging countries. They range from applications for taxi services to car hailing and ridesharing. Due to different cultures and safety issues, many of these services include social aggregation components. In countries of the Middle East, where interaction between unrelated women and men are restricted, or in India and North Africa, where women face real threats by men, transportation services are offered for women in particular. Other services specifically address commuters and cooperate with local companies, such as Caronetas in Brazil.

Lessons learned

▸ As a ridesharing application within narrow social networks, such as working or educational communities, Raye7 satisfies local needs for transportation options that ensure the safety of commuters. Additionally, features like an e-mail verification process, cashless payment methods, transparency through GPS tracking and real-time information, enhance the feeling of safety among users and make the service attractive and easy to handle.

▸ As a car-pooling platform, it contributes to the reduction of individual motorised transport. The pointing system functions as an incentive for drivers to encourage them to share their vehicle with colleagues or friends.

▸ The contracting of companies generates new communities of users and financial revenue at the same time.

CONGESTION
LOW VEHICLE OCCUPANCY RATE
HIGH CRIME RATE AND
SAFETY ISSUES

"In Cairo there are 20 million empty car seats moving around the streets and causing congestions. Our goal is to reduce them."

Samira Negm – CEO at Raye7

Relevance for German Cities

Germany has several ridesharing providers, but most of them focus on long distances. Ridesharing services, especially designed for urban areas and including innovative and attractive features, could reform urban ridesharing in Germany:

► The aggregation of trips within social communities can attract more people to ridesharing, particularly those with higher incomes, where the cost argument is not convincing enough, or those more sceptical of sharing a car with strangers. The social grouping of friends or colleagues could break this barrier.

► Potential target groups could be universities, large-scale enterprises or industrial parks in greater urban areas and agglomerations of different companies like stores at shopping malls or ministries and organisations within a district.

► Cooperation with companies could further promote ridesharing and raise acceptance. Especially for large businesses, where colleagues do not know each other, an app like Raye7 would be a great way of pooling work trips and connecting people. Preferential parking for carpooling vehicles can significantly raise interest and participation at company level.

► For general public application, parking management and a carpooling bonus system ("points") should be combined with public transport payment systems (commuters can change their modes on a daily basis and reduce parking expenses).

► The smart payment system reduces the burden of payments. Especially small amounts are inconvenient to pay in cash. Thus, the smart payment system enables a precise but cashless billing. An integrated pointing system would be an additional incentive to offer rides and to use services as a reward.

MoBike
CHINA

Bike-sharing

Founded in 2015 in Beijing, MoBike became one of the most successful dockless bike-sharing start-ups in China. This is due to its high convenience and large-scale supply in urban areas.

▸ http://mobike.com/global/

◉ *China*

Description

The system is quite simple: users register by uploading an identity document and paying a deposit of CNY 299 (ca. 40 €). After downloading the MoBike app, users can locate nearby vacant bikes via GPS and reserve them for up to 15 minutes. The easily visible bikes are just everywhere in Chinese cities. To unlock the bike, users scan the bike's QR code with their smartphones. The fee of 0.13 € per hour is automatically debited through mobile payment. The bike is returned by closing the lock. Bikes can be picked up and left wherever the trip starts or ends. In response to concerns of many Chinese cities, that the high numbers of parked shared bicycles by different operators will congest sidewalks and public space, MoBike is using Geo-fencing to incentivise correct parking. A credit score (100 points in the beginning) should further avoid vandalism or bad parking. When reaching less than 80 points, the rental price increases.

While dockless bike-sharing was invented in Germany by Call-a-Bike, MoBike and other Chinese start-ups improved convenience and scaled-up supply. With their low-cost strategy, MoBike cannot cover its operating costs. However, this leads to new business models: Besides the investment of paid user deposits, bike-sharing companies in China are supported by venture capital. Local and global investors, including large-scale enterprises like Tencent, Foxconn and Vodafone, back up MoBike financially. MoBike is linked to Tencents' smart payment system 'WeChat Pay' and benefits from collected data. With more than 20 million rides per day, MoBike records information on usage, movement and consumption patterns of their users as well as length, time and destination of trips. This information is valuable input for MoBikes' own service optimisation and for local urban and transport planning, but also for commercial purposes, which is what makes bike-sharing that attractive for investors from the IT industry.

Due to its success in China, MoBike has already started operations in Singapore and is planning to expand globally. In June 2017, the first MoBikes entered the European market in Manchester.

INNOVATIVE ASPECTS

#SIMPLE ACCESS
#BUSINESS MODEL
#LARGE-SCALE FREE-FLOATING FLEET
#RELOCATION SOLUTION
#GPS TRACKED
#CORPORATE FUNDING
#USING BIG DATA
#MOBILE APPLICATIONS

Local context

Two decades ago, China was called the kingdom of bicycles. With an increase in motorisation followed by air pollution and congestion in urban areas, bikes became once again a focus of transport planning. In 2008, the first bike-sharing pilot started in Hangzhou. In the beginning, station-based schemes were subsidised by the government, but – except Hangzhou with the densest network of stations – were far less successful than current start-ups. The design of Chinese cities with large arterial roads (based on Soviet planning guidelines) also create a last-mile challenge that flexible bike-sharing can address. In recent years, the bike-sharing sector experienced rapid growth, making China a world leader in public bike-sharing with at least 170 programmes across the country. In terms of fleet size, 17 of the world's top 20 schemes can be found in China. Biking became fashionable again, especially among younger people. Attracting users with low prices in comparison to relatively more expensive public transport, bike-sharing is becoming an alternative solution for short and medium-length trips. Based on the current "boom", bike-sharing start-ups are constantly rolling out in China's cities while Ofo and MoBike are the biggest players now. This leads to price and service competition between existing and new companies.

Lessons learned

▸ Bike-sharing systems like MoBike benefit from the smartphone affinity of Chinese users as well as from online payment and tracking systems. Users value the high density of available bikes as well as the easy access through smartphone app and mobile payment. It is convenient, easy to use and affordable. Following an effective promotion, concentrating on the smartphone app use and the modern design of the bikes, cycling is cool again in China.

▸ The collaboration with global companies provides venture capital and at the same time enables additional services, such as payment functions or smart bike locks. Moreover, data gained with GPS tracking results in new business models that small-scale systems cannot achieve. This data not only enables new business models, but also constantly improves services and provides valuable insights for transport and urban planning. However, the large scale use of personal data raises questions with regard to data handling and data protection.

▸ Challenges like vandalism and bad parking forced MoBike to optimise its services (geo-fencing, scores) and to introduce incentives for users to care for the bikes. Besides these reactions of start-ups, planning agencies consider regulations – e.g. to cap the number of shared bicycles within a city, make GPS obligatory and provide maintenance workers.

URBANISATION
FORMER BIKE NATION AIR POLLUTION
MOTORISATION

▸ The booming bike-sharing sector is still in a rapid growth phase and could soon see mergers or consolidation. Different competitors endowed with risk capital currently try to increase their number of customers to ensure the development of a sound business model.

Similar examples from developing and emerging countries

As part of the bike-sharing boom in China, several start-ups have conquered the bike-sharing market. The biggest is OFO-Bikes, originally invented as university campus bike-sharing. OFO is currently planning to start services in London. Worth mentioning as a public system is Hangzhou Public Bicycle, which is internationally renowned for and is characterised by its commendable integration into public transport. One smartcard can be used for both – bike-sharing and public transport. Moreover, bike-sharing is available at all stations of Bus Rapid Transit (BRT) and integrated into the BRT infrastructure. Even though bike-sharing schemes are existing in many countries, in terms of scale, success and innovative aspects, China is leading the developing world.

Relevance for German Cities

Bike-sharing is already widespread in Germany, but in terms of success and scale, German cities are still lagging behind. Innovative Chinese bike-sharing systems combine various aspects that provide valuable learning:

▸ The large-scale roll-out of bike-sharing not only affects travel choices significantly, but also creates new business models. The competition of start-ups led to a leap in customer convenience and integration with other services.

▸ New lessons in operation of bike-sharing systems help to deal with relocation and vandalism (such as geo-fencing, scores and financial incentives).

▸ The transport data generated by these systems can be highly valuable for transport planning if protection of personal data is ensured.

SafetiPin App
INDIA

Data Crowdsourcing

SafetiPin is a mobile application and online platform that provides safety information on public places. It was founded in India in 2013 and its basic functions include a safety scoring of public spaces, a GPS tracking function for users and a safe route planning option.

▸ http://safetipin.com

◎ *India*

Description

The SafetiPin app is a crowdsourced app that anyone in the world can download and use. The concept is easy: users share information by completing safety audits. SafetiPin analyses and edits collected data and provides compact safety information for all users as well as for city planning. SafetiPin uses nine parameters to assess the state of security of public spaces: Lighting, visibility, openness, crowd, diversity of people, nearby public transport, availability of walkways, presence of security personnel and the associated feeling. Based on these nine parameters, an algorithm calculates a safety score for public places. Pins on the city map display the safety information and the safety score of each location. Ongoing audits of users allow a continuous update of the safety score algorithm to ensure up-to-date data. This crowdsourced safety data can be fed into Google Maps. Google Maps shows alternative routes, including safety information, so that users can easily select the safest route. If the SafetiPin app is open, it immediately alerts the user when a location that has been rated as unsafe by other users, is entered. The user can choose to invite family members or friends to track the users' location until the user reaches their destination or a safe area. Additionally, emergency calls to previously defined emergency contacts can be made. In each city, a local NGO was a partner in the data collection and a minimum of 800 audits were conducted to provide enough data for analysis.

Currently, SafetiPin is collecting data in 28 cities across 10 countries, such as India, Indonesia, the Philippines, Colombia and Kenya and is available in five languages – English, Hindi, Spanish, Mandarin and Bahasa.

Local context

Many Indian cities are struggling with high urban crime rates. Brutal acts of violence like rapes, molestation or kidnapping take place in Indian cities. Especially, women and children are exposed to crimes and the threat of crime.

INNOVATIVE ASPECTS

#DATA CROWDSOURCING FOR SAFETY
#IMPROVEMENTS
#LARGE-SCALE DATA COLLECTION
#SAFE ROUTING
#SAFETY SCORE
#SAFETY PARAMETERS

HARASSMENTS
SAFETY ISSUES HIGH LEVEL OF
DIGITISATION CRIME AGAINST
WOMEN

SIMILAR EXAMPLES

Safety Apps India:
- SOS – Stay Safe!
- Eyewatch Women
- VithU
- iFollow-Ladies safety

Crowdsourcing Apps:
- GObd India
- Ma3route Kenya
- WhereIsMyTransport South Africa

The fear of violence in public spaces in Indian cities restricts the free movement of people, primarily of women. It affects the everyday lives in restricting the freedom to move, to study, to work and to enjoy leisure time. As more and more women are migrating to India's cities seeking job opportunities, the safety of women in urban areas has become an increased concern in India over the last few years.

Lessons learned

- SafetiPin is an excellent example that addresses safety issues in urban areas. By providing a platform for safety data crowdsourcing, they collect data from their users and utilise that data to provide safety information via smartphone. Its measurement system, including parameters and an algorithm, generates a security scoring for public spaces. In combination with the digital applications of route planning and GPS tracking, SafetiPin enhances the safety and the sense of well-being in Indian cities.

- SafetiPin enhances the last mile connectivity. With audits at 15 metro stations in Delhi, SafetiPin colltects data on safety in a radius of 500m. This data in turn is used to develop measures to improve the safety of those stations, thereby reducing the barriers to using public transport.

- The large-scale data and information collection enables urban planners, police and transportation authorities to use the data for urban security improvements: Urban planning is using the data for constructional developments like lightning, openness and visibility of public places. Transport authorities utilize the data for safety upgrades of their stations and vehicles. Based on the data, local police determine where more patrolling is needed.

- Using open data like Google Maps and collaborating with local authorities and transport operators such as public transport companies or taxi companies, extends the data collection and facilitates further safety features, such as safe route planning and safe taxi trips. However, this process needs careful observation and assessment by the public or an advisory board to control the use of personal data collected by private companies.
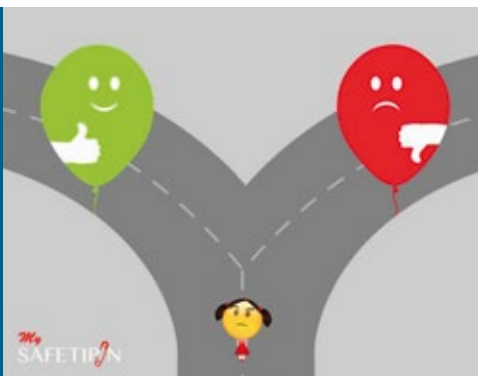
"SafetiPin is not just an emergency app like many other available safety apps. Our entry point was women's safety, but now we promote inclusive and safe public spaces for everyone. We want people to get on the street and to feel well there. Our combination of safety scoring, safe routing, tracking and crowdsourcing enables the prevention of unsafe situations."

Kalpana Viswanath – co-founder and CEO of SafetiPin

Similar examples from developing and emerging countries

Due to the importance of safety issues in Indian cities, there are several safety apps available in India.

Crowdsourcing apps are also used for real time information on transportation. Based on collected and analysed data, those apps provide real-time public transport data or information on traffic conditions like traffic jams or accidents. Examples are GObd in India, Ma3route in Kenya and WhereisMyTransport in South Africa.

Relevance for German Cities

Many German cities are also facing security challenges in public spaces and public transport stations. Especially during night hours, many people have a subjective sense of insecurity. A crowdsourced data platform like SafetiPin can offer inspiration for German cities:

▸ Safety parameters and the algorithm are a great approach for an assessment of the quality of public spaces. It can help planners create urban places and public transportation in which people feel more safe and comfortable.

▸ Data crowdsourcing is an easy and cost-effective way to provide (safety) information on urban spaces. It can serve as a feedback platform to draw attention to unsafe locations, as a data basis for city planning measures and as an option to measure the impact of previously conducted measures. Moreover, the data can be used by companies like transport providers to improve the security at stations or within vehicles and thereby make their services more attractive to customers.

▸ The idea of crowdsourcing data can also be extended to collect data on the quality of public transport or the accessibility of public spaces for the elderly or people with disabilities.

GOGORO
SMARTSCOOTER
TAIWAN

Electric urban vehicle

Gogoro is a Taiwanese start-up offering high-level electric smartscooters that run on swappable batteries. The Scooters are designed for urban areas, equipped with smart sensory systems as well as smart phone inter-connection and are easy to handle.

▸ https://www.gogoro.com
▸ https://joincoup.com

⊙ *Taiwan*

Description

Gogoro's smartscooters are powered by an electric motor that runs on swappable lithium ion batteries. Instead of plug-in charging, users simply swap batteries at "GoStations" – charging kiosks that are placed around the city and all over Taiwan. Users can locate nearby stations and reserve batteries for up to ten minutes through a Gogoro mobile application. The two used removable batteries, placed underneath the seat, must be slid into a slot at the kiosk. The machine identifies the user, based on an unique battery ID and ejects a charged-up set of batteries. The kiosk also gives possible warnings for problems that have been recorded and offers associated service options. The whole swapping process can be finished within half a minute.

Further design features include: all-LED headlights, taillights with programmable action sequences, a circular white fob and download-able sounds, turn signals. Its efficient engine enables sharp speed and an average range of 95 km per single charge. An integrated sensor continuously collects information such as speed, battery level, electric energy consumption rate, system failures and scooter falls. Information will be offered to the driver on how to drive more energy efficiently. An always-on Bluetooth connection links into the Gogoro smartphone application and displays information to the user. The business strategy is precise: selling the smartscooter at the same cost as a premium gasoline model by removing very expensive cells and offering battery swapping and GoStations through a subscription plan. Users are charged for completed battery swaps monthly. GoStations cost around $10,000 dollar each and are owned by Gogoro.

The company, founded in 2011, is planning its expansion to other countries, mainly focused on South-East Asia, where Gogoro can benefit from an infrastructure that is still in development. Besides that, Gogoro Scooters are already used on roads in San Francisco and Berlin.

Coup, a Berlin e-scooter-sharing start-up integrated Gogoro Scooters into their sharing scheme. Starting operations in 2016 with 200 scooters, Coup works in a similar way to conventional bike- or car-sharing services. Registered users can locate nearby scooters and rent them via an application.

INNOVATIVE ASPECTS

#EASY BATTERY RECHARGING
#INTERCONNECTION OF SCOOTER AND APP
#BUSINESS AND OPERATIONAL MODEL

SIMILAR EXAMPLES

▶ Soleckshaw India
▶ E-Rickshaw India
▶ E-Trikes Philippines
▶ SUDACA Argentina
▶ LSEVs and Micro Cars China
▶ Mahindra e2o India

Local context

South-East Asia is a region characterised by extreme air pollution caused by rapid industrialisation, lax environmental regulations and lack of functioning public transport systems. It is a region that depends on two-wheeled transportation in a way that hardly any other region in the world ever had. South-East Asian metropolises like Jakarta, Bangkok and Ho Chi Minh City are crammed with thousands of scooters. Most of them are technically outdated with pollutant emission values that by far exceed that of modern mid-range vehicles. To combat air pollution and make cities more liveable, efficient and sustainable solutions for urban two-wheeled vehicles are urgently needed.

Lessons learned

▶ As the first smartscooter worldwide, the Gogoro scooter has caught regional and international attention. It offers a time-saving and easy to handle charging process through battery swapping.

▶ With the shared use of batteries, Gogoro tries to use batteries to capacity and recycle them afterwards in order to allow a "second life" for thousands of cells.

▶ The smart features facilitate a steady optimisation of services. The interconnection of scooter, user phones and stations enable information feedback loops and allow for better planning and allocation of stations.

▶ Battery swapping itself is not an innovation. But an improved technology of easily removable light-weight batteries in combination with the business and operational model of Gogoro represents an innovative approach for scooters. A dense network of stations owned by the company and a pricing scheme ensures that operational costs are covered.

▶ A dense network of GoStations is essential for the success and spread of Gogoro scooters. With its range of 95 km and its dependency on battery-swapping stations, it is an urban vehicle not suited for cross-country rides. To guarantee a dense network, Gogoro aims at offering at least one station per mile within their cities of operation.

"The Gogoro eScooter combines extreme user friendliness, a sharing optimised charging model and a unique design. For COUP eScooter-Sharing service, an easy and self-explaining handling, a safe drivability and swappable battery charging was crucial. The Gogoro scooter meets the demand of our services."

Claudia Weyandt – Chief Marketing Officer (CMO) COUP Mobility GmbH

NEED OF SUSTAINABLE
URBAN VEHICLES
TWO-WHEELER AIR POLLUTION
TRANSPORTATION

▶ The Gogoro scooter is a sustainable solution, characterised by user friendliness and a standout design. It supplies the demand for urban mobility of middle-class people, who are ecology-minded and attracted to digital trends.

▶ With its easy handling, swappable batteries and its smart phone interconnection, the Gogoro scooter perfectly suits sharing schemes.

Similar examples from developing and emerging countries

Recently, several developing and emerging countries retrofit their conventional vehicles, such as motorcycles, rickshaws or trikes. India has new generations of electric or solar-electric rickshaws, called Soleckshaw. Manufacturers in the Philippines have started to produce electric tricycles (e-Trikes) to combat urban air pollution. Argentina produces an electric urban motorcycle that enables ultralight, combustion-free riding. Other solutions for cleaner urban vehicles include Low Speed Electric Vehicles (LSEVs) or Micro Cars from China or India.

Relevance for German Cities

In Germany, motorcycles are less prevalent than in other countries. Although weather conditions and regulations on driving licences, registration processes, safety gear and parking policies make the use more complicated, electric motorcycles have a potential for future urban mobility in Germany. Recent trends in cities like Berlin confirm that. Examples like the Gogoro Smartscooter provide inspirational insights:

▶ The easy handling, an attractive design and the smart integration of electric scooter, charging infrastructure and smartphone may be attractive for German markets.

▶ Electric scooters can serve different purposes in urban mobility: as a private vehicle, integrated into sharing schemes like Coup, or it could function for urban logistics. Deliveries, courier services or commercial service providers such as craftsmen, chimney sweeps, nurses or repairmen would be a promising target group for electric scooters.

▶ Electric scooters can supplement the German electromobility strategy and fill the gap between bicycles and pedelecs on the one hand and electric (car-sharing) cars on the other hand.

RAAHGIRI DAY
INDIA

Car-free campaigns

Along the lines of 'giving the streets back to people', the Indian Raahgiri Day is a weekly car-free street event for people to celebrate their city, streets and public spaces.

▸ http://raahgiriday.com

◎ *India*

Description

In Gurgaon, a city with 800,000 inhabitants, Raahgiri Day was established as India's first sustained car-free citizen initiative in 2013. Every Sunday, motorised transport is cordoned off on selected streets so that they are set aside for people to come together, interact and use the streets for activities and recreation that promotes health, well-being, fitness and solidarity.

The event is supported by the local and national government. In addition, companies like Nagarro, Genpact and Conscient sponsor the event. Overall, it has more than 250 partners. Raahgiri Day cooperates with road safety officers, political leaders, councillors, industry leaders and the media. With this framework of partners, the event is intensely promoted on social media, print media, radio and television. It is planned and implemented by the Raahgiri Foundation and scaled at national level with support from WRI India. The Raahgiri Foundation is an institution consisting of local inhabitants from five organisations. Cities can request the branding for an event and the foundation decides whether the event follows the spirit of the Raahgiri foundation.

Raahgiri day was inspired by the Colombian "Ciclovia", a weekly car-free event on Sundays (see "similar examples"). Based on the experiences and learnings from Ciclovia, Raahgiri Day developed its own spirit and is more focused on physical activity and improving health. Raahgiri day also promotes sustainable transport. In its four years of existence, the event has grown tremendously. It started with a participation of 10,000 people in Gurgaon in 2013 and reached 25,000 people in January 2014. The event has spread to other cities in India, including the 22 million metropolis New Delhi.

Local context

Nearly one third of India's population lives in cities. With an increasing population and growing income, motorisation is rising as well. In Gurgaon for instance, 106 cars are added to the vehicle population every day. Consequences are high air pollution and a rising number of accidents. Close to 140,000 people die annually in India because of road traffic accidents; 79 % of them are pedestrians and cyclists (WRI 2014). The lack of cycling and pedestrian infrastructure makes it unsafe for people to walk or cycle, which means outdoor activities are reduced to a minimum. Only around 20 % of existing sidewalks are actually usable. However, due to less developed public transport, walking and cycling are nonetheless important means of mobility for short distances in India. Therefore, Raahgiri Day is a way to demonstrate the importance of these sustainable transport modes and to promote them as part of an (active and car-free) lifestyle. Physical inactivity also caused by a car-oriented and sedentary lifestyle is a big problem in India. Studies show that a large percentage of people in India are inactive with fewer than 10 % engaging in recreational physical activity, especially in urban areas (NCBI 2014).

URBANISATION
MOTORISATION
AIR POLLUTION
ROAD ACCIDENTS
BAD INFRASTRUCTURE
PHYSICAL INACTIVITY

Lastly, social disparities in communities induced by income, social classes or disabilities result in fragmented and grouped community structures. Raahgiri day is an approach to galvanise citizens to participate in a shared vision that strengthens inclusive community development.

SIMILAR EXAMPLES

▸ Ciclovia, Colombia
▸ Nairobi Placemaking Week, Kenya

Lessons learned

Car-free events like Raahgiri support the promotion of active mobility and therefore contribute to more sustainable and liveable cities. Supportive factors in the Indian example include multiple stakeholder engagement, governmental support, extensive promotion, the unique spirit of the event and local conditions that further boost the event:

▸ Evaluations prove the positive impacts of Raahgiri Day for road safety, air quality, noise reduction, community development and for local business. Moreover, walking and cycling have become more popular for short trips causing a shift in modal share. A rise in bicycle purchases was also registered. After initial resistance regarding aggravated travelling caused by road closures and concerns of businesses that customers would stay away, people realised that their concerns were unfounded. Quite the opposite happened and business registered a noticeable increase in customers. While 80 % of business owners were sceptical before the launch of Raahgiri Day, nearly the same amount was in favour after the event took place in 2013.

▸ With the diversity of stakeholders, from schools to environmental agencies, government and the media, the event attracts a wide range of people and addresses diverse urban issues. The support of multiple stakeholders ensures funding as well as promotion. Road Safety Officers use the day to offer road safety workshops and inform people about safety issues (e.g. through don't-drink-and-drive campaigns). Policy makers utilise the event for participative city planning. Raahgiri offers a perfect platform to demonstrate the needs of all people (children, elderly and disabled people) and translate them into policy suggestions.

"It is not that people do not want to walk or cycle. It is just unsafe. That is why Raahgiri wants to demonstrate the willingness and enthusiasm of people to use the road and that a safe environment is fundamental. Moreover, there is a huge amount of people in India that are not familiar with the concept of sustainable transport, so there is a need to engage and inform people. Raahgiri Day is the perfect platform to do so."

Amit Bhatt – Director Integrated Urban Transport, WRI India Sustainable Cities

▶ Due to safe conditions and the community spirit of the event, people are motivated to enjoy active mobility and common outdoor activities, like yoga, zumba or aerobics, instead of relaxing at home. The weekly event in combination with common activities strengthens the local community. Special editions of the event like "Inclusive Raahgiri" focus on the integration of the needs of disabled people in urban mobility.

Similar examples from developing and emerging countries

In addition to Raahgiri Day, there are several other events in India that promote active mobility. Raahgiri Day was inspired by the Colombian event "Ciclovia", also called Sunday Streets, on which more than 70 miles of Bogota's city streets are closed for cars. This event dates back to the cycling movement in the 1970's and became a Colombian tradition. It is not just a car ban, but also a great example of reusing the streets for recreation, sports and fun. Bikes and pedestrians take over the city. It became the world's largest car-free weekly event, covering the entire city and was even extended to an entire car- and motorcycle-free week. The idea has spread around the world: to South America (Argentina, Brazil, Chile, Peru, Mexico, Ecuador and Costa Rica) as well as to the US (Los Angeles), Australia, New Zealand and India.

Another example for reclaiming streets and public spaces for cyclists and pedestrian is Nairobi's Placemaking Week. During that week, people celebrate public spaces and community-led activities. It is a combination of social activities, including sports, art, culture and city planning workshops.

INNOVATIVE ASPECTS

#WEEKLY EVENT
#COHERENT APPROACH
#RAISE ATTENTION TO PEDESTRIANS & CYCLISTS
#COMMUNITY DEVELOPMENT
#PUBLIC PARTICIPATION
#MULTI-STAKEHOLDERS

Relevance for German Cities

Germany has a number of active mobility events, like skating nights or critical mass and its own historical link to car-free Sundays: in 1973, due to the oil crisis more than 40 years ago, the German government imposed four car-free Sundays in a row. Aside from that, a few car-free days have also taken place in different cities or on certain parts of inter-urban highways. But there is hardly any consistency and regulations are very strict.

▶ A similar regular event with a coherent approach would be a platform to raise awareness to pedestrians and cyclists and to support urban planning through public suggestions and feedback.

▶ A people-centred participative approach, which combines physical activities, social activities, citizen information and knowledge acquisition for urban planning is crucial for success.

▶ Complemented by multi-stakeholder engagement and extensive media coverage, a similar event could also be an important milestone for awareness-raising of sustainable transport in German cities.

MPESA
KENYA

Mobile Payments for Transport Services

MPESA is a mobile money transfer system that enables users to deposit, send and withdraw money by using their mobile phone without having a conventional bank account. It is also a way of cashless payments for urban transportation.

▸ https://www.safaricom.co.ke/personal/m-pesa
▸ https://vodacom.co.tz/#mpesa-

⊚ *Kenya*

Description

"Pesa" is the Swahili word for money and "M" implies mobile. Launched in 2007 by Safaricom, which is the country's largest mobile network operator and part of the Vodaphone Group, MPESA experienced rapid growth. Customers just need a Safaricom SIM card and a valid ID to activate MPESA services. People can deposit money at widespread MPESA agents and use it to transfer money to pay bills, to purchase airtime credit, to pay for their groceries or to pay for urban transportation, all with their mobile phone. UBER or taxi rides can be paid with MPESA directly through mobile transactions. Matatus, privately owned minibuses that function as shared taxis in Kenya, use a MPESA-linked prepaid card. This card can be topped up through MPESA, at no additional cost. To pay matatu fares, cardholders only have to tap their cards against a terminal installed in matatus.

In 2016, MPESA had around 25 million customers and 114,000 agents. It is thus considered as one of the most successful mobile phone based financial services in the developing world. In addition to the payment options, MPESA offers microloans to customers. Services are used by people of every age, independent of income and location. Registration and deposits are free. Most of the other transactions are priced with only small commission fees to allow even the poorest customers to use MPESA. Typically, MPESA is used for smaller transactions in the range of USD 5-30. To make the transactions safe, people get an individual PIN and, for withdrawing money, they have to show their ID. With its success in Kenya, MPESA has already been launched in other countries, including Tanzania, Afghanistan, India and even in Europe in Romania.

Local context

In the past, it was observed that people were spontaneously using mobile phone airtime credits as a way of transferring money to relatives. After a similar project (M-Cel) started in Mozambique in 2004, MPESA was initiated as a pilot project in Kenya. Less than 30% of the Kenyan population have a conventional bank account and even less have a credit card, but nearly 90% have a mobile phone (CA Kenya 2017). Most of the people do not fulfil entry requirements (e.g. a regular income) to access the traditional banking system. Thus, money was often transferred through personal trips, causing the inconvenience of taking money in person with a high risk of robbery. Due to MPESA, people have a convenient and safe method to store and send money to their relatives.

Moreover, Kenya's transport system is infamous for chaos, corruption and robbery. Pilfering of money from passengers as well as from on-board fare collectors is common. Estimates suggest that matatu companies lose a third of their revenue to theft and extortion. Therefore, the government announced ambitious plans to promote cashless payments for public transportation and moving towards cashless transport systems protecting passengers and staff (Mulupi 2015).

INNOVATIVE ASPECTS

**#MOBILE
  TRANSACTIONS
#CASHLESS PAYMENT
  FOR TRANSPORT
#BUSINESS MODEL
#MARKETING
  CAMPAIGN
#EXPERIMENTATION
#SOCIAL DIFFUSION**

Kenya benefitted from leapfrogging the age of fixed-line infrastructure and invested in mobile infrastructure. That is why Kenya has a well-developed mobile infrastructure, which boosts the use of mobile phones. Initially, MPESA was created to facilitate the application of money transfer and payments of microfinance loans. It started with limited resources and applications to learn about the technology and user needs. After reaching a 'tipping point' of users, the widespread connectivity enabled other services to be added, reinforced the value and attracted more customers. MPESA collaborates with the Central Bank of Kenya (CBK) that supports MPESA and manages the regulatory environment. They encourage the approach to "experiment first, then regulate" within a framework of basic regulations.

Lessons learned

▸ With MPESA, Safaricom is offering a banking system for the traditionally unbanked.

▸ Kenya is moving towards cashless public transport systems. MPESA as the most common mobile payment system in Kenya is an important facilitator. People can pay matatus, taxis or UBER without having to carry cash in person. In addition, taxi drivers, UBER drivers and matatu fare collectors do not have to carry much cash. It makes urban trips more convenient and reduces the danger of theft.

▸ MPESA also has positive impacts on businesses: by reducing efforts for money transfer like personal trips and queuing, productivity has increased and it has become easier to do business. There is evidence that household incomes have been raised and more start-ups launched in Kenya.

▸ After ten years of experience with a new product in a new market, MPESA overcame difficulties, such as cases of tricksters and hacker attacks. In cooperation with CBK, MPESA steadily improved security features and raised public awareness through marketing campaigns. Service problems, like delays in reaching customer hotlines and errors in transaction, were tackled by improving services and a customer friendly strategy.

"Safaricom has a truly good network reception, optimally distributed MPESA agents and good customer care services available for their customers. As long as there is Safaricom, mobile reception and MPESA agents, people will use MPESA to cater for various needs. It is convenient, easy to use and reliable."

*Carol Mutiso – Technical Assistant at GIZ Kenya: Transport Climate Strategies*

▶ Supporting factors include a social network effect that facilitates the diffusion of MPESA through personal relationships and word-of-mouth. Moreover, understanding local needs, the business strategy, the mobile infrastructure, building an extensive channel of retail agents, pricing and creating awareness and trust through branding, made MPESA as successful as it is today. The less restrictive environment and the approach of "experiment first, then regulate" enabled MPESA to shape its operations based on customer feedback and experimental trials.

Similar examples from developing and emerging countries

There are other mobile providers in Kenya that offer mobile payments, such as Telcom and Airtel, however they do not have the dense network Safaricom has. Other mobile payment systems can be found in Mozambique (MCel), South Africa (Mobi Moola) and in the Philippines (SmartMoney and G-Cash). Extending the view to Asia, there are many innovative smart payment systems like WeChat Pay or the cross-border payment system AliPay. For instance, WeChat Pay is commonly used for bike-sharing Services (MoBike), on-demand transport services (Didi Chuxing) and Taxis.

Other considerable payment options, especially for public transport, are integrated smart cards like the Octopus Card in Hong Kong or the Beijing Transportation Smart Card. Another innovative development is HopOn in Israel, a smart mobile ticket app for public transit. It allows passengers just to board and pay fares through their cell phones. They use ultrasonic sound waves to validate passenger fares with payments made by the user's credit card, registered to the app during the signup process.

LACK OF CONVENTIONAL (ONLINE) BANKING

LESS RESTRICTIVE ENVIRONMENT IN BANKING SECTOR

HIGH CRIME RATE

WELL-DEVELOPED MOBILE INFRASTRUCTURE
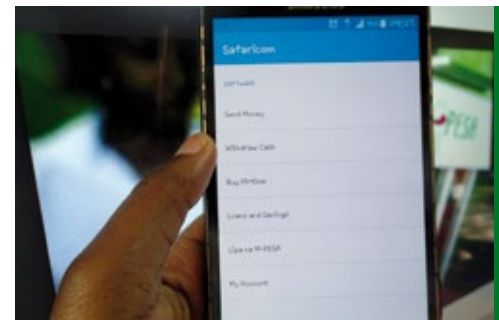
Relevance for German Cities

It is obvious that Germany has significantly different framework conditions: nearly every resident has a bank account linked to online banking and credit cards. German people are more careful about their sensitive banking data and regulations on banking business are stricter. Nonetheless, some features as well as the business strategy could be inspirational for Germany:

▶ Mobile payment options could be a great advantage for visitors from abroad to pay for transport.

▶ Especially for public transport, it would be an opportunity to reinforce cashless payments and to enable integrated, mobile ticketing. That is a requirement for integrated mobility solutions (mobility as a service) and would make the use of public transport more convenient.

PERSONAL MOBILITY DEVICES
SINGAPORE

Active Mobility

Personal Mobility Devices (PMDs) such as electric kickboards or monocycles are becoming an increasingly popular means of active mobility for the first and last mile in Singapore. Hence, the country has, among other things, passed legislation, elaborated codes of conduct and worked on public education to introduce PMDs into Singapore's mobility system.

▸ https://www.lta.gov.sg/apps/news/default.
aspx?scr=yes&keyword=Personal%20Mobility%20Devices%20
(PMDs)

◉ *Singapore*

Description

PMD is an umbrella term including e-bikes, skateboards, monocycles, hover boards, e-scooters and folding bikes. They typically carry a single person, are lightweight and travel up to 25 km/h. Singapore, a city with a population of nearly 5.5 million people, counts around 30,000 PMD owners and 2,000 PMD commuters per day. Singaporeans perceive the potential of PMDs as an environmentally friendly solution for short distances. Being a PMD-pioneer, Singapore faced challenges arising that had been unregulated up until then. To allow the integration of PMDs into Singapore's mobility system, the government constituted an advisory board on active mobility, passed legislation, elaborated codes of conduct, worked on public education, infrastructure development and enforcement measures.

The 'Active Mobility Advisory Panel' comprises representatives from different stakeholder groups. It was constituted to develop recommendations for rules and codes of conduct for road users, so various users can share public spaces safely. The recommendations were guided by an extensive public consultation. In 2017, the Land Transport Authority (LTA) put these recommendations into effect by passing the 'Active Mobility Bill'. Beside rules and codes of conduct for cycling and the use of PMDs, it comprises a penalty framework for reckless riding behaviour and illegal device modification. It further categorises PMDs and sets criteria for types of devices to be allowed in public spaces as well as clear rules for PMDs on footpaths, shared paths and cycling paths.

In cooperation with bus and rail operators, the LTA started a six-month trial in 2016 to allow commuters to carry PMDs on public transport at all hours of the day. The upgrade of vehicle fleets to provide more space for PMDs during peak hours by using foldable seats has also been given consideration.

In June 2017, two PMD sharing services started operating in selected business districts of Singapore. The dockless sharing systems work similarly to bike-sharing systems. They are especially designed for commuters to complete the first and last mile between public transport and work.

INNOVATIVE ASPECTS

#PMD LEGISLATION
#PMD SHARING SERVICE
#PROMOTE ACTIVE MOBILITY
#INTEGRATED AND COHERENT APPROACH
#CODE OF CONDUCT
#ADVISORY BOARD
#PUBLIC CONSULTATION
#PUBLIC EDUCATION
#ENFORCEMENT

"PMDs are the perfect solution to cover the "public transport unfriendly distance" which is a distance between walking distance and public transport distances. People in Singapore love fancy bikes or PMDs and they are proud to use them. The legislation and infrastructure improvements here in Singapore definitively promote further the use of PMDs."

Arimbi Jinca – Research Associate at TUM CREATE Singapore and previous transport advisor for the Sustainable Urban Transport Improvement Project (SUTIP) in Jakarta and Palembang, Indonesia.

URBANISATION

WELL-KEPT INFRASTRUCTURE

CAR-LITE CITY APPROACH

PDM EMBEDDED IN ACTIVE MOBILITY POLICIES

TRENDS IN YOUNGER GENERATIONS

Local context

Singapore experienced rapid growth in recent years. It leapfrogged stages of development and came up with high-tech solutions. One great benefit is the state-of-the-art infrastructure. Singapore's footpaths and cycling paths are well kept: smooth surfaces, separated paths, connected networks with further extension plans make it convenient to use PMDs.

Singapore is a tropical, compact and dense city with an excellent public transport network. In this context, PMDs satisfy the need to overcome the first and last mile connection to public transport and to reduce the physical exertion and the issue of sweating. PMDs can cover distances that lie in between walking distances and public-transport-friendly distances.

From a political perspective, Singapore is regarded as at the leading edge of sustainability (Guardian 2012). With its comprehensive policy mix of regulations, financial incentives, demonstration programmes, capacity building and consumer education, Singapore is addressing the challenges of a growing city. It aims at a transition to car-lite mobility, centred on public transport and active mobility. Therefore, they pursue rigorous car reducing policies that particularly promote public transport and active mobility. Besides that, their green image is purposefully used as a marketing tool. In addition, there is a supportive bottom-up dynamic in younger generations. People love 'fancy' devices and bikes and they are proud to ride them in public. Therefore, people are attracted to personal mobility devices because they function as new status symbols.

Lessons learned

▸ As the new generation of personal mobility devices comes with electric drives and higher average speeds, they implicate a higher risk of accidents. But instead of just banning PMDs, Singapore's transport authorities attempt to address the challenges. They try to regulate the use of PMDs to ensure the safety and well-being of all road users.

▸ An integrated approach to involve the public, to seek expert advice, to build up a legal framework, to foster public education and enforcement and to improve overall conditions led to the success of PMDs in Singapore.

▸ The procedure in Singapore can be regarded as a constant learning process. PMDs are a new and dynamic issue and their management requires instant action. Temporary acts, like six-months' permission of PMDs on public transport, are an exemplary instant policy measure.

▸ For the future, Singapore hopes to further promote the integration of PMDs into urban mobility systems and to develop associated measures, such as specially designed PMD infrastructure.

▸ The handling and active promotion of PMDs in Singapore is unique and is embedded in a multitude of policies promoting active mobility. This includes other remarkable measures like the Walk2Ride Programme, Car-Free Sunday and Streets For People or the Green Man+ Programme, which gives elderly and disabled pedestrians more green man time at crossings

Relevance for German Cities

▸ In Germany, PMDs are still rare, which might be linked to restrictive regulations. For example, hoverboards are not permitted by law in road traffic. Singapore is an exemplary case to tap the full potential of PMDs by facilitating the necessary regulatory environment and by promoting the usage of those devices.

▸ PMDs are considered as a viable alternative to driving, especially for short trips within residential areas and first- and last-mile connections to public transport. As a means of active mobility, they contribute to a more pleasant, liveable and sustainable urban environment.

▸ The institutional framework, such as the Active Mobility Advisory Panel, as well as legislation and the coherent promotion approach could inspire German cities to introduce and manage PMDs.

Lessons learned for Germany

The ten examples show the enormous potential of developing and emerging countries to provide innovative solutions that shape sustainable urban mobility. To realise UBA's vision of Tomorrow's Cities being compact, green, functionally mixed, low-noise and nearly free from air pollution, urban planning in Germany can benefit from extending its view to developing and emerging countries. Taking into account UBA's ten suggested bundles of measures, the brochure has shown that innovative examples can be found for each of them:

REVERSE INNOVATION FOR TOMORROW'S CITIES

Compact and multifunctional Cities
Permanent Parklet Programme

Urban green and public spaces
Raahgiri Day, Safeti Pin

Noise mitigation
E-buses, Gogoro Scooter

Expand networks supporting active mobility
PMDs, SafetiPin

Promote integrated mobility services and electromobility
MoBike, E-Bus, Gogoro Scooter

Improve the quality of public transport
E-Buses

Green commercial transport
Go-Jek, Gogoro Scooter

Manage demand for motorised transport
Raahgiri Day, Permanent Parklets

Digitalise in an eco-friendly way
Raye7, Go-Jek, MPESA, Gogoro Scooter, MoBike

Participative, cooperative planning and implementation
Raahgiri Day, Permanent Parklets, SafetiPin

Local problems related to the environment, health and safety, have forced many developing countries to find quick and efficient solutions for the challenges posed by urban growth. The dynamic in emerging markets is unprecedented. Leapfrogging of development stages sometimes even provide emerging countries with margins in state of the art technology and infrastructure.

Innovations are diverse

Urban mobility innovations come from all over the world and cover a wide range of topics including public transport, active mobility, individual transport, public space and logistics. Sometimes cities are implementing new technologies, such as electric buses in China, but the innovative aspect in many cases is not the technology used but rather the approach behind it: the business model, partnering, funding, awareness-raising, public participation, a legislative or implementation approach. In summary, mobility innovations can be classified into five types:

1. **Technological innovations** (Gogoro Smartscooter, e-buses)

2. **Regulatory innovations** (PMD regulation, Permanent Parklet Programme, e-bus subsidies)

3. **Service innovations** (Go-Jek, SafetiPin, MPESA, Raye7)

4. **Social innovations** (Raahgiri Day, Carpooling like Raye 7)

5. **Business model innovations** (MoBike, SafetiPin)

Focus on innovative features

Bike-sharing itself is not an innovation. But the business model, the implementation or the combination with new technological features can be an innovative and inspirational aspect. In search of mobility solutions, the understanding of innovation is expanded to specific innovative aspects. It is rarely possible to transfer an innovation from one country to another in its entirety. Countries have different legal frameworks, mentalities, industries, political systems, weather conditions and infrastructures – even more, when they are located in different regions. However, sometimes specific new features can make a big difference and can create a new transformative dynamic.

Seize the potential of difference

These differences however should be seen as a unique opportunity: different contexts lead to different solutions for challenges in urban transport. Hence, it can be rewarding for German cities to not only export valuable national solutions but also enter into a dialogue with cities from developing and emerging countries. The examples collected in this brochure prove that it is worth looking at the different innovative solutions and ideas developed abroad. While research-intensive technologies (e.g. electromobility) often emerge in countries like Singapore, Taiwan, China or Brazil, less developed countries in Africa can contribute social and regulatory innovations. South-east Asian cities, with widespread informal transport networks, retrofit their vehicles and services providing innovative solutions like Go-Jek in Indonesia.

Learn globally about digitisation

In general, innovative ideas facilitated by digitisation, such as new smartphone applications and smart payments, equally originate from cities in developing and emerging countries. New applications and start-ups are set up with each passing minute. New markets are opened, others are extended or optimised and others disappear. Therefore, those markets are an excellent place to generate impulses for Germany

to realise the vision of Tomorrow's Cities. Today, cities are global actors, well networked and in many ways more flexible than regions or countries. In fact, they can jointly solve urban mobility challenges. A differentiation of the development status between developing countries and developed countries is therefore often no longer appropriate with regard to their cities.

Create opportunities for exchange

Exchange and co-operation will enable cities worldwide to better cope with (global) challenges in urban mobility. So far, however, knowledge transfer has focused on exchanges between industries, for example in Europe it is often understood as a 'one-way street' from 'north to south'. The potential for transferring ideas from emerging countries to Germany has not yet been fully tapped. To this end, this brochure of UBA and GIZ aims at fostering dialogue between Germany and developing and emerging countries in the field of urban transport. Among others, European Mobility Week (UBA) and global projects (GIZ) facilitate the exchange of experiences and knowledge on an international level. However, new forums for global learning may be explored in the coming years. Therefore, it is necessary to involve a broad range of stakeholders on both sides from vehicle manufactures, to start-ups, citizens and government officials.

Abbreviations

BMUB	German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
BMZ	German Federal Ministry for Economic Cooperation and Development
BRT	Bus Rapid Transit
CBK	Central Bank of Kenya
CEO	Chief Executive Officer
CMO	Chief Marketing Officer
CNY	Chinese Yuan
dB	decibel
EU	European Union
EV	Electric Vehicle
e-	Electric-
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GPS	Global Positioning System
km/h	kilometre per hour
LSEVs	Low Speed Electric Vehicles
LTA	Land Transport Authority Singapore
MPH	miles per hour
NUA	New Urban Agenda
NGO	non-governmental organisation
PMDs	Personal Mobility Devices
SDGs	Sustainable Development Goals
SUTIP	Sustainable Urban Transport Improvement Project
UBA	Umweltbundesamt (German Environment Agency)
UN	United Nations
WRI	World Resources Institute

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