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Barrierfree Mobility in Asia and Europe

Barrierefreie Mobilität als Planungsgegenstand
in Europa und Asien

Wulf-Holger Arndt (Hrsg.)

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Berlin, Dezember 2007

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Einleitung

Asien-Pazifik Wochen 2007 - Asia-Pacific Weeks 2007

Urban Sustainability Conference

Meeting „Urban Transport & Mobility“12.9.-13.9.07

Workshop II: Accessibility for all - Barrierfree Mobility 12.9.07

The Asia-Pacific Weeks (APW) have been taking place in Berlin for ten years. This year’s meetings are held from 10 to 23 September. The APW provide the opportunity to exchange knowledge and experiences between metropolises of these continents with a focus on creative industries and sustainability in urban infrastructure. Infrastructure is the main topic in the discussion about sustainable development of urban space.

The main objective of the workshop “Accessibility for all” is the similarity of aging societies in European and Asian countries. The workshop will be part of the Urban Sustainability Conference, meeting „Urban Transport & Mobility“and should serve as a starting point for new scientific co-operations.

Modern societies are characterized by an aging population as a result of the shrinking birth rate and the sagging fertility rate. This development requires new constructional, informational and technical standards regarding mobility. In Germany the percentage share of the elder generation (people older than 65 years) will grow to 30 percent in 2050[1] from 20 percent today. This process is typical for the whole European region, where the number of elder people will considerably grow between 2010 and 2030 (+ 37.4 percent). This development is comparable to the situation in Japan. The percentage share of elder people will be in Japan about 37 percent in the year 2050[2]. The Peoples Republic of China (PRC) is also increasingly confronted with an aging society due to the One-Child-Policy. The share of the population which is older than 65 years has grown by about 50 percent between 1964 and 2000. Today this is about 8 percent of China’s whole population.

These trends are visualized by the following figures that show the population development of Europe (Figure 1) and Asia (Figure 2).

1 Statistisches Bundesamt: Ergebnisse der 10. koordinierten Bevölkerungsvorausberechnung, Wiesbaden, 2003

2 EU-Kommission: Grünbuch „Angesichts des demographischen Wandels - eine neue Solidarität zwischen den Generationen“ KOM(2005) 94 16. 3. 2005, S. 5

Figure 1: Population development of Europe 2000: Total drop of birth rate since 15 years

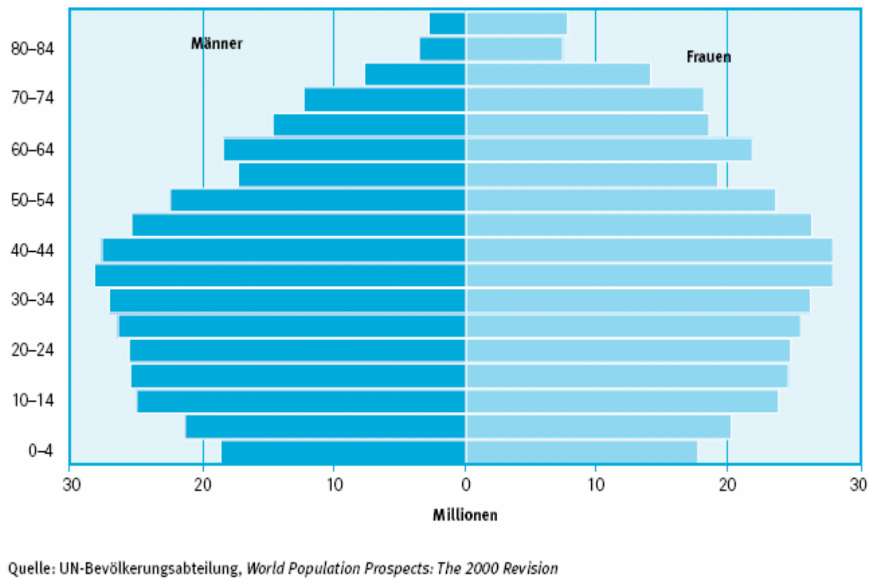
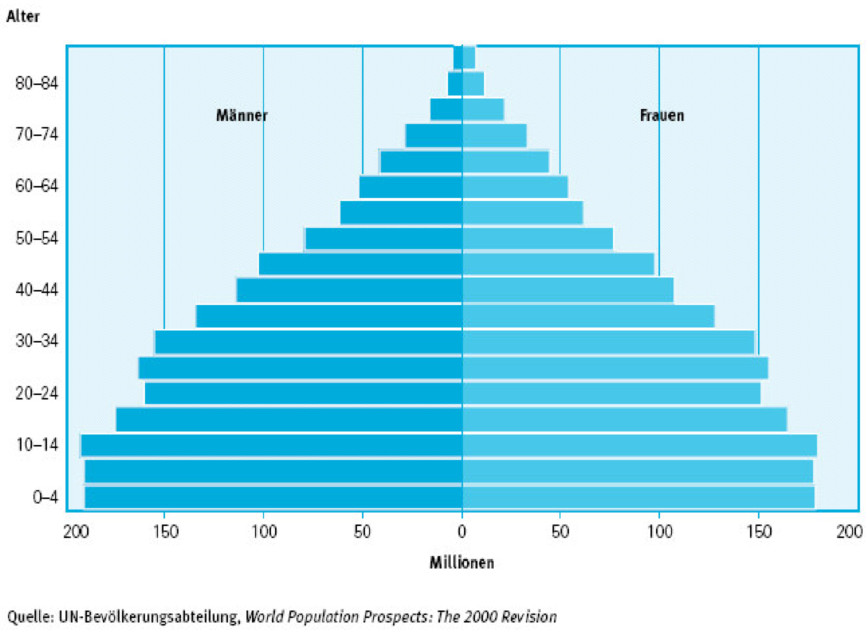


Figure 2: Population development of Asia 2000: First signs of a shrinking birth rate



Prognoses predict that beside the trend towards aging populations there will be a significant shrinkage of the spatial structure of settlement within the next decades. This process is not consistent in a regional and temporal way. Especially in prospering rural areas migration and aging exist in parallel. Immigration and certain socio-demographic effects (e.g. to start a family in a high age) may relieve the main trend of shrinkage. In particular, this effect is valid for metropolises. To provide mobility for everyone in a long term under these heterogeneous conditions is a new scientific and economic challenge.

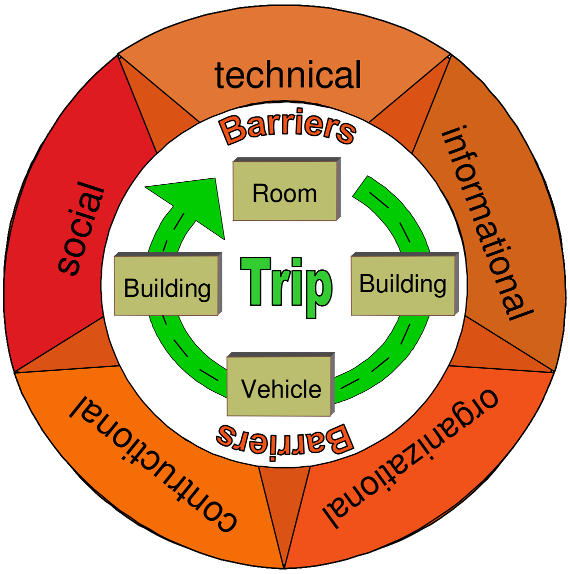
The social change of our society will also impact the mobility design in the future. Elder people will have a lower income. Wealth will not be described only by rate of consumption. This is also a chance for creation sustainable life styles.

Due to these developments the challenges for mobility design are versatile and complex. “Accessibility for all” or “Design for all” describes a new approach to ensure social inclusion of everyone under these conditions of changing society.

Existing instruments and scientific approaches of barrier-free mobility will be presented and discussed during the workshop „Accessibility for all”. The subject will be illustrated by using a travel chain as an example. This includes different aspects of a typical journey – (living-) room, building, vehicle and the connecting route. Not only the conventional barriers but also the “hidden” barriers between the single stages of a whole trip will be identified and eliminated by adequate solutions as a result of this approach.

The planning of the workshop includes some impulse presentations of following subjects:

Barrier-free information



The choice means of transportation, availability of transportation and its accessibility as well as the variety of adequate routes are the key issues of barrier-free mobility. Therefore adapted concepts for elderly and physically or psychologically disabled people are need. These persons need adequate information for different human senses (multi-senses-principle) before trip start (pre-trip) and information during a trip (on-trip). It is important to provide dynamic information.

Road users could be informed by means of moderated and versatile adapted information sources (World Wide Web, Mobile Telephone System) during the trip at each time. Thereby the usability, the recognizability and the comprehensibility of the information are the main points. The essential information during the trip should be given to the traveller by using acoustic, tactual and visual sensors or guide-systems. This applies especially to information-systems at interfaces or nodal points (crossings, rail stations, airports etc.). Barrier-free information should be offered for all means of transportation (public transportation, motorized individual traffic, cyclists, pedestrians etc.).

The usage of navigation systems makes it possible to get routing information in buildings or in the transport system by means of a navigation signal. This can be done in an acoustic, visual and even haptic way. Localisation of specific barriers makes the trip much safer Barrier-free vehicles.

Barrier-free vehicles

The access to transportation means and the use of transportation vehicles is connected with a lot of barriers. The entrance and the exit in vehicles should be as easy as possible. In vehicles an adequate space should be offered for passenger and luggage to ensure unrestricted movement and usability. Hence the ergonomic design of vehicles has to consider the interests of an aging society. This includes assistant systems in cars and high contrast designs of public transport means. Also barrier-free emergency and service facilities increase the safety and comfort of travelling.

Barrier-free buildings

Buildings also should allow barrier-free movement for everyone. An adequate arrangement of constructional appliances, information systems, emergency an rescue measures are need to give the users enough space for movement and clear orientation inside a building. This includes the adequate design of lifts and ramps, the modification of steps, floors and doors and the equipment of public buildings with enough baby-care rooms and toilets. A broad range of needs and possibilities are given in this field of barrier-free mobility.

The infrastructure has to be adapted in a way that equal opportunities for every one mobile are guaranteed. That’s why streets, pavements, cycle ways and parking areas should be designed in a respective way. Barrier-free mobility is not met before the whole journey chain is barrier-free. For that reason a change of the focus from the consideration of single barriers to the analysis of barriers during the whole journey seams to be meaningful and essential.

Schedule Workshop II 12.09.2007

Accessibility for all: Barrierfree Mobility

13:30 **Introduction & Moderation**

Barrierfree Mobility – Accessibility in Transportation Planning and Transport System

Wulf-Holger Arndt, Technical University of Berlin

14:00 **Japan – Aging society and change of mobility of metropolitan area**

Dr. Naohiko Hibino, Institute for Transport Policy Studies (ITPS, Japan)

14:30 **China – Multianalysis of Road Traffic Accident Research**

Prof. Wang Hongyan, Department of Automobile, Tongji University Shanghai, China

15:00 **Information – Public Transport Travel Information for Mobility Impaired People through VBB's Travel Plan**

Juergen Roß, Verkehrsverbund Berlin Brandenburg (VBB)

15:30 **Coffee Break**

16:00 **China – Transportation Management and Changing Society**

Feng Liguang, China Academy of Transportation Science (CATS)

16:30 **Vehicles – Barrierfree Accessibility to Vehicles of Local Public and Long Distance Traffic**

Prof. Manfred Rentzsch, Institut für Arbeits- und Sozialhygiene (IAS)

17:00 **Japan – The practice of universal design and transport**

Dr. Hiroshi Kitagawa, Hyogo Assistive, Technology Research and Design Institute, Japan

17:30 **Buildings – Barrierfree Accessibility and Movement in Buildings and Interfaces in Transport System**

Dr. Christa Kliemke, Technical University of Berlin, Kompetenzzentrum Barrierefreies Planen und Bauen

18:00 **Discussion & Conclusion**

Barrierfree Mobility – Accessibility in Transportation Planning and Transport System

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1 Barriers in mobility

Barrier-free living and mobility are key challenges in the future to guarantee social participation. Every citizen should have the possibility of full participation in social life. The aging of our society, the rising number of functionally limited citizens, and an increased social differentiation emphasises the role of a barrier-free organization of the transport system and a barrier-free design of public space in general.

A main condition for social participation and healthy living is free mobility. The model of "barrier-free mobility" includes more than the reduced focus on physical impairment. A self-determined live requires a foresighted planning system.

This article presents the features of barrier-free planning and building based on results of different studies (Technical University of Berlin-Berlin Transport Barriers, WHO survey LARES etc.). Some guidelines to create barrier-free transport or information systems will be outlined. The article shows the necessity to obtain more differentiated information about the conditions of barrier-free mobility and accessibility.

1.1 Definition

Usually we translate *mobility* in a *number of trips* only. But this definition of mobility is not suitable for understanding the problems of barriers. Mobility is also an assumption for social integration and participation of people in society. In that context we have to define *barrierfree mobility* as mobility of persons who can move without extraordinary personal help from anyone. In traffic system, *barrierfree mobility* means the free and independent use of traffic means.

> **Barrierfree mobility** is given if a considerable equal, self-determinate and safe use of traffic systems is possible by all persons, at each age, with different abilities and characteristics, with and without handicaps. (Arndt 2005)

For this *free and independent* use we find a lot of barriers in our society. At first physical obstacles belong to mobility barriers.

Some examples:

- Gaps or height differences between sidewalk and street
- Stairs and steps in the street or in houses and entrances
- Building sites
- Road crossings
- Obstacles at the footpath (advertising boards, bollard, traffic sign)

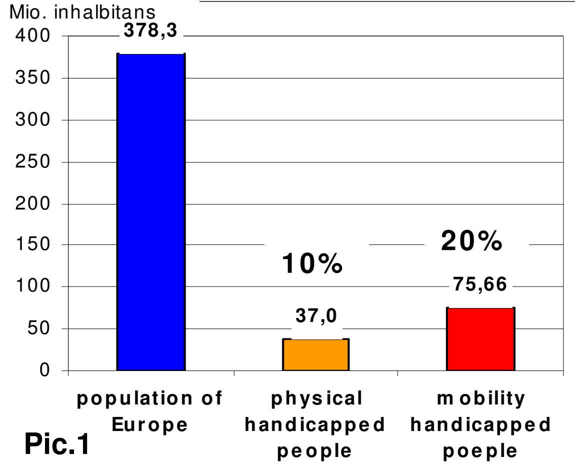
Beside those physical barriers there are many non-physical ones.

- Linguistic: e.g. references only in the national language without internationally understandable pictograms etc.,
- Informational: e.g. information not existing or not clear or not visible,
- Cultural: e.g. differences in habits and habits those to misunderstandings lead,
- Social: e.g. social selection and demarcation due to the origin/status and other.

1.2 "Mobility-handicapped" people and their mobility behaviour data

There is wide range of disabilities. It is needed to divide in disabilities in closer and wider sense consider to mobility issues.

Disabilities in closer sense	Disabilities in wider sense
☐ **Disabled person**	☐ **Disability**
■ Wheelchair user, missing limbs, paralyzed limbs	■ Old People, Children
☐ **Disability of sense**	☐ **Temporary disabilities**
■ Blindness, Poor sight, Deafness, Deaf and dumb, Partial deafness	■ People with baggage, baby carriage, bicycle, pregnant women, unknown places
☐ **Mental handicap**	
■ Delay of intellectual capacity Psychological disorder	



Pic.1
http://epp.eurostat.cec.eu.int 2005

"Mobility-handicapped" people are handicapped people in wider sense. Not only people with physical constraints get problems in case of mobility barriers, but also people with children, elderly and younger people, and small or tall passengers. Also, someone who is temporary ill or people with luggage can be mobility-handicapped. In Europe, ca. 37 million handicapped people (in a close sense) have been living in 2001, corresponding to around 10% of the population[1] (pic. 1). The real number of mobility-handicapped people is much higher. In German studies we find a number of around 20% until 1/3 of the population. The group of mobility-handicapped people is very heterogeneous. But in the macroscopic spatial structure we can't find any significant distribution. The trip rate per day is at this group with 2.15 less than generally (3.2 trips/day). Between 40 and 70% of interviewees of a survey of handicap groups report about problems to use traffic means. 50-70% of them want to use the public transport more frequently if it had less usability constraints.[2]

High age is the main reason for handicaps. Over 75% of handicapped people are older than 55 years. The number of elderly is rising. Therefore, in future the number of handicapped people will increase too. In Germany the percentage share of the elder generation (people older than 65 years) will grow to 30% in 2050[3] from 20% today. This process is typical for the whole European region, where the number of elder people will considerably grow between 2010 and 2030 (+ 37.4%).

[1] All figures Eurostat data, http://epp.eurostat.cec.eu.int

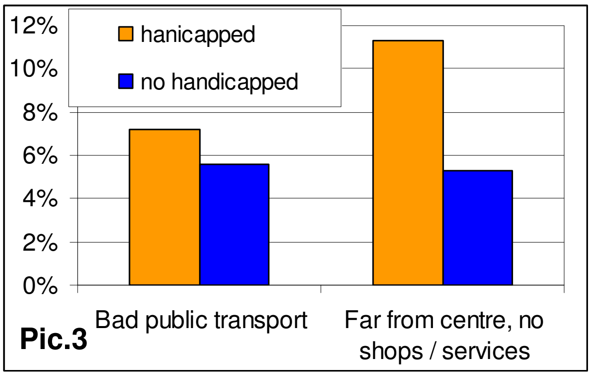
[2] All numbers for Germany: Study of the City of Nürnberg, Rhein-Consult, on behalf of German Transport Department

[3] Statistisches Bundesamt: Ergebnisse der 10. koordinierten Bevölkerungsvorausberechnung, Wiesbaden, 2003

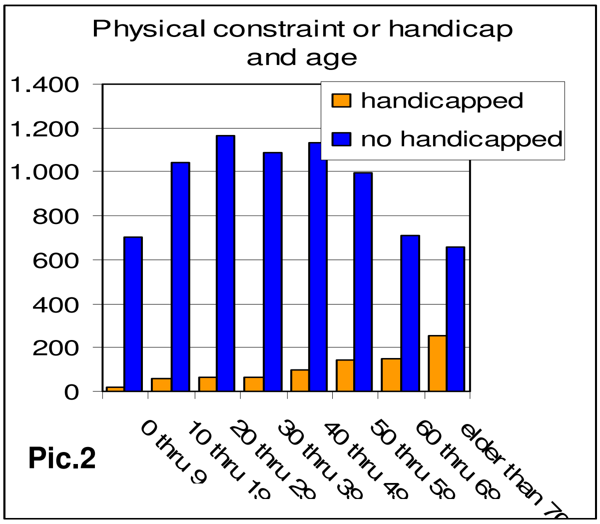
1.3 Mobility and handicaps

In data of the WHO European wide survey LARES 10.2% reported physical constraint or handicap. It corresponded with the Eurostat data to handicap people (in closer sense) very closed. Referring to the age, the ratio of handicapped person's increases (s. pic. 2):

- 4% of children (0-17 y.o.)
- 8.5% of adults (19-59 y.o.)
- 25% of elderly (>60 y.o.)



Pic.3

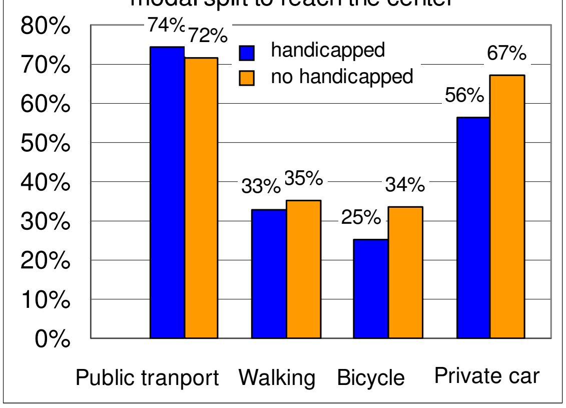


Pic.2

Only 26.5% of recorded buildings in the LARES study are accessible for handicapped people. Barriers in this case are mostly stairs and steps in front of the house.

Another valuable area of the LARES questionnaires is the qualitative data. The analysis shows that handicapped people have more problems to use public transport than not handicapped ones. The distance to the centre or shopping areas and other services are more criticized by handicapped (11.3%) than by non-handicapped residents (5.3%) (pic.3). This result is supported by other variables as reasons for satisfaction with the "immediate environment". In that case, less people with handicaps answered that they have good accessibility to services and central location than people without disabilities (17.2% and 19.3%). Handicapped people prefer more public transport and use less private cars or bicycles (The data in pic. 4 is based on multiresponse answers). But at the other side the Deutsche Bahn AG (German Railway) determine a huge need for action in barrierfree design of their stations. Around 2/3 of all stations were not barrierfree in 2002[4].

Pic.4 Physical contraint or handicap and modal split to reach the center



It is worthwhile to study especially how people with handicaps and health problems handle their mobility (for example choice of transport means). The degree of mobility is a yardstick for participation. In this context, barrierfree should be given the widest possible meaning: It concerns on the one hand the accessibility of public buildings and places, but also private housing and the usability of public transport.

For the evaluation of the residential environment, its accessibility forms an important criterion for people who are reduced in their mobility. Especially for people with handicaps the

[4] Becker, J. 2004: Josef Becker, Hans-Joachim Hollborn, Elke Schramm, Barrierefreie Stationen im Schienenverkehr, Internationales Verkehrswesen (56) 5/2004, S. 206ff

proximity for the centre of the city, to shopping and to other service facilities is very important.

2 Barrierfree traffic planning

The objective of barrierfree planning is the integration and participation of all people and especially of mobility-handicapped people. Barrierfree mobility means:

- independent using of ways
- independent finding and understanding of information
- independent using of traffic means
- safe and fearless staying in public space
- finding of relaxing places

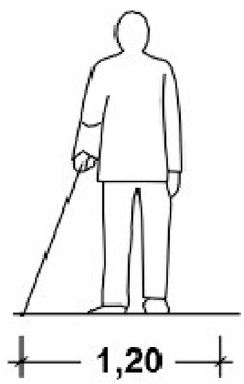
An important requirement for an integration of mobility-handicapped people is barrierfree design for the whole public space. For the design of infrastructure, vehicles and other technical facilities it is necessary to know exactly the capabilities of people with different handicaps. In the next chapter two examples for barrierfree transportation planning are described.

2.1 Roads planning

Typical problems in road planning are the pavements. They are too narrow for handicapped, people with baggage, groups etc. often. At pavements are situated some installations as advertising, street café gardens, showcases, traffic signs etc.

So far a sufficient width of pavement is important. In Germany 1.20 m are recommend (pic. 5[5]). Intelligent designs for pavements divide the space in functional zones. Two side zone for installations as traffic sign, advertising etc. and a middle walking path without any obstacles. The zones have different surfaces. Besides zone should have a rawer surface. That makes possible an orientation. Pedestrians could see and "feel" the border between the pavement parts.

Figure 5: (EAHV 1993)



2.2 Vehicles in public transport

One of the barriers in this subject is the gap between vehicles in public transport and the station platforms. This gap is not only uncomfortable for mobility handicapped people. It is also a danger for every passenger. Areas for wheelchair drivers, persons with luggage, bikes, children etc. are often missing in such vehicles. Other problems are e.g. bad light, door without contrast colours, no information about stops. To bridge the gap, flexible ramps could be used. Of course in better way should pay attention for this matter during vehicle construction already. Wide doors are needed in vehicles and a rich contrast door design. Information should be given by acoustic and optical signals

[5] Empfehlungen zur Anlage von Hauptverkehrstraßen (Recommendation for main roads design) (EAHV), Forschungsgesellschaft für Straßen- und Verkehresgesellschaft, Köln, Germany, 1993, S. 32

corresponding to the two-sense principle. A favourable height for door opener is 0.85 m. Adherence arrangements are need in different heights. Vehicles in public transport should have a multi-purpose area for wheelchair driver, persons with luggage, bikes etc.

3 Conclusion

The rate of handicapped people increases with age. Due to the aging of our western societies will be increasing the problems of mobility barriers as well. The organization of a barrier-free environment became an urgent task of action.

The percentage of human beings with functional restrictions will increase due to an aging society. But not only physical handicaps but also mental or occasional function restrictions show us ever more strongly existing barriers in our highly organized and complex society.

The next steps to reduce barriers in our society could be:

- More and better education in barrierfree/universal design
- Urban renewal-programs must include adaptations of the buildings and neighbourhood to the skills and abilities of the users
- Better information: Permanent centres for technical aids for self-help
- Barrierfree: a multi- and transdisciplinary task for sciences and policies

Barrierfree planning is not only for handicapped people. Barrierfree mobility is welfare for everyone, because we are all (a bit) „handicapped“, somewhere sometimes.

4 Further research

The investigations disclosed a lack of data consider to mobility barriers in residential environment. Further research is needed:

- More data about specific handicaps/abilities/skills.
- More information about barriers in dwellings in context of handicaps.
- Development of a methodology of barrier types.
- A discussion about how much independency and dependency for mobility handicapped people is needed.
- Barrierfree access to and design of transport means.
- Barrierfree access green areas/Design of parking areas.
- Quality of mobility information (Barrierfree access to information and information design).

Japan – Aging society and change of mobility of metropolitan area

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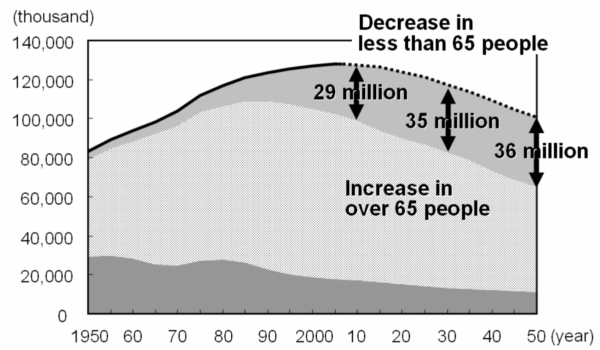
Figure 1:



Data Source: National Institute of Population and Social Security Research(2002)

Fig.1 Transition of Population in Japan in Three Major Age Grope

1 Background

In Japan, the total population is projected to decline from 2005. This population trend has raised societal concerns particularly on fiscal shortage of health insurance and pension systems. Moreover, considered a more imperative problem than the decreasing population is the changing population structure. Although the population of less than 65 years old has a decreasing trend, the population of over 65 years old has been fleetingly growing. Approximately one in three Japanese will be at least 65 years old by 2030 (Fig.1).

Another societal issue is the short transition period from aging society to aged society. The United Nation defines aging society and aged society as societies with 7% and 14% of the population belonging to age group over 65 years old, respectively. Japan became an aging society in 1970 and an aged society just after 24 years in 1994 (Fig.2). The length of the transition period in Japan is much shorter than in any other European and North American industrialized countries like the Germany, France, United Kingdom and United State of America. This rapid demographic change is one of main concerns Japanese policy makers nowadays and a main challenge in policy setting for the aging society. The two key reasons why Japan faces such rapid aging are higher life expectancies and historically low fertility rates.

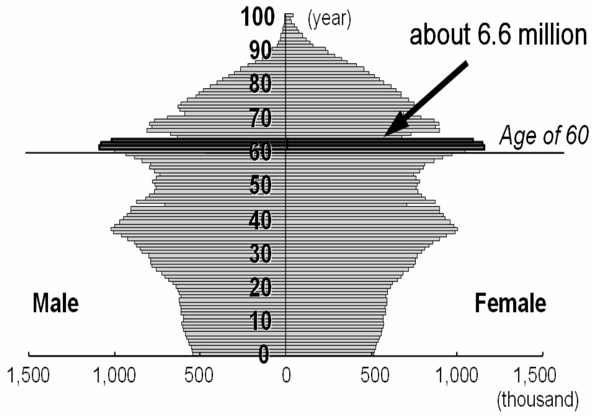
Figure 2:

Data Source: United Nations, World Population Prospects: The 2002 Revision Population Database

Fig.2 Trend in Share of Population over 65 in Selected Countries

2 Transportation Demand of Elderly Passengers

Figure 3:



Data Source: National Institute of Population and Social Security Research(2002)

Fig.3 Japan Age and Sex Population Structure, 2010

One of the pressing issues on the aged society of Japan is the so-called "2007 shock", which means that baby boomers that were born between 1947 and 1949 may be obligated to retire from their jobs because of the age-limit for retirement. After the World War II, baby boom period took place in Japan as well as in the United States. These baby boomers will start to reach the age-limit for retirement, 60 years old, from 2007 (Fig.3).

In this situation, it is very important to estimate transportation demand by trip purpose, sex and age in order to make effective public transport policies. We try to estimate the demand in Tokyo Metropolitan Area (TMA) in 2015 and to describe the issue on the periodic changes in the travel behaviour of elderly people. Almost baby boomer retires by 2015 and the peak of population in TMA is in 2015. We used the four-step estimation method to forecast the demand.

Figure 4:

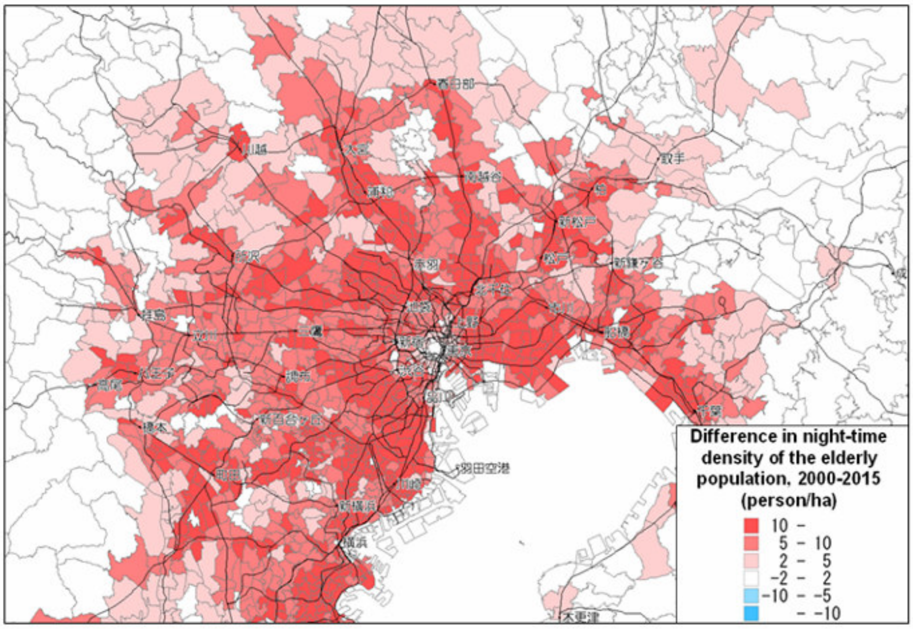


Fig.4 Difference between 2000 and 2015 Night-time Elderly Population Density

Some characteristics that are induced from the estimation results are shown below. Fig.4 shows the difference between 2000 and 2015 night-time elderly population density. Aged people increase all over the TMA. Blue zones, or area where elderly population density decreased, are virtually non-existent. In addition, the share of the elderly in all modes increases, especially for bus, where 1 in every 3 passengers will be over 65 years of age by 2015. Fig.5 shows the difference between 2000 and 2015 passenger flow for all purpose. The orange line means increases, and blue lines means decreases. In the centre and south-western area, most of the lines increase. On the other hand, in the north-eastern area, many lines also experienced decreases. Although the total number of railway demands increases, several lines will have weakening demand. Fig.6 shows percentage of elderly passenger flow for private purpose in 2015. All over the TMA, the share increases. Increase is forecasted in 30% of the railway lines.

Figure 5:

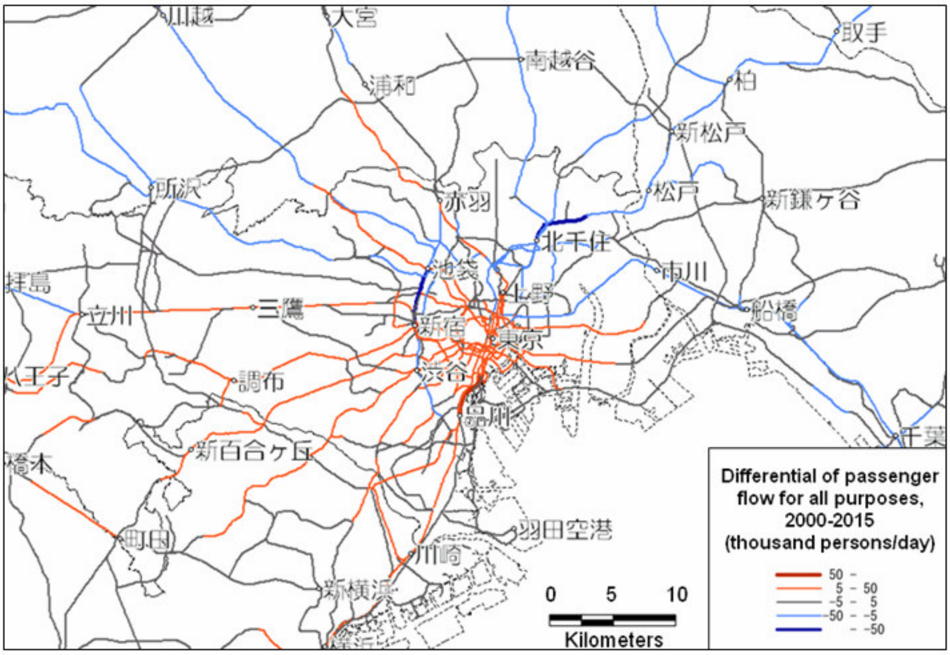


Fig.5 Difference between 2000 and 2015 Passenger Flow for All Purpose

Figure 6:

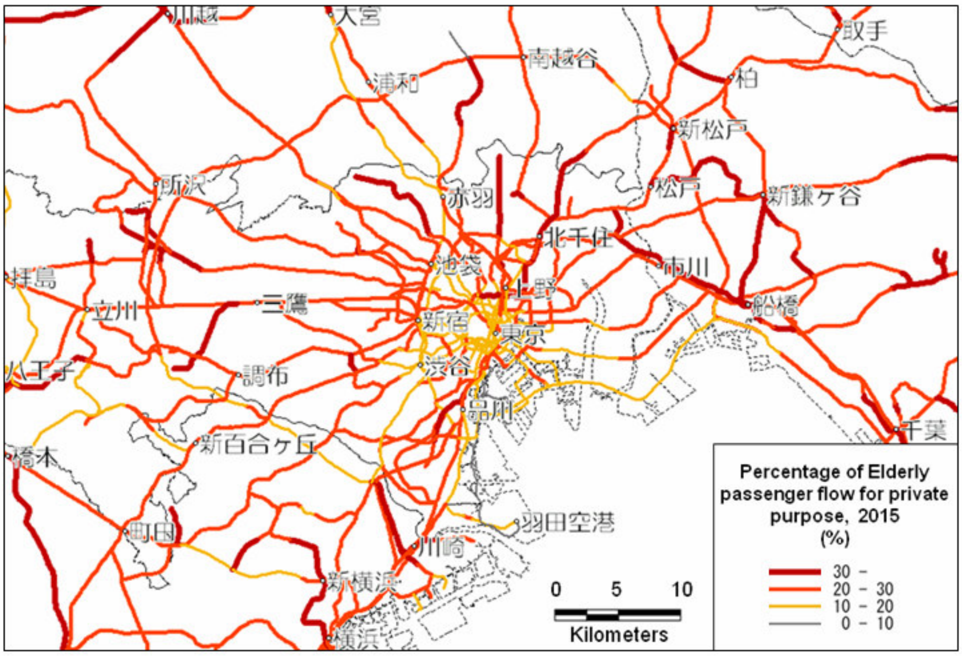


Fig.6 Percentage of Elderly Passenger Flow for Private Purpose, 2015 (%)

3 Barrier-free Laws in Japan

The fundamental laws on public transport accessibility for the aged and disabled were laid in the Accessible and Usable Building Law in 1994, and the Barrier-free Transport Law in 2000. These two laws were integrated last year in the amended Barrier-free Law. This law enacts basic policies, and design and structural standards for passenger facilities and buildings. It also calls for an integrated improvement of passengers' facilities, buildings, and its connections, with participation of the elderly and disabled people from planning to implementation phase, in specific improvement areas established by local government entities. Barrier-free facilities are being installed in many public spaces such as railway stations, commercial buildings, and hospitals.

4 Summary

In the TMA where an exceptionally high density public transport network exists, many elderly people are expected to use railway and bus after retirement. Ensuring accessibility and convenient movement of elderly passenger is very important. Government and transportation companies should prepare sustainable and dynamic urban transport policies for the aged society based on the results presented. Barrier-free Law is one of the important initial policy responses of the government on this issue. The transport demand trend of elderly passenger presented in this article may provide indication on the next policy directions.

China – Multianalysis of Road Traffic Accident Research

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1 Road Traffic Status in China

We must know about the traffic characteristic in China before the Chinese traffic sustainable development realized. At present about 90% population gather at the economical developed regions in the east China where the constructing level of roads is relative higher while that of the west China is not ideal. The roads in China are divided into six types according to administrative grades and five ranks according to the roads' width.

Most Chinese roads gather at the east China and in the west-middle regions there are many mountains and deserts where the natural condition is so bad that the roads' construction develops slowly. At the end of 2005, the total mileage of roads in China had reached 1,930,000 kilometers, among which 41,000 kilometers were expressways.

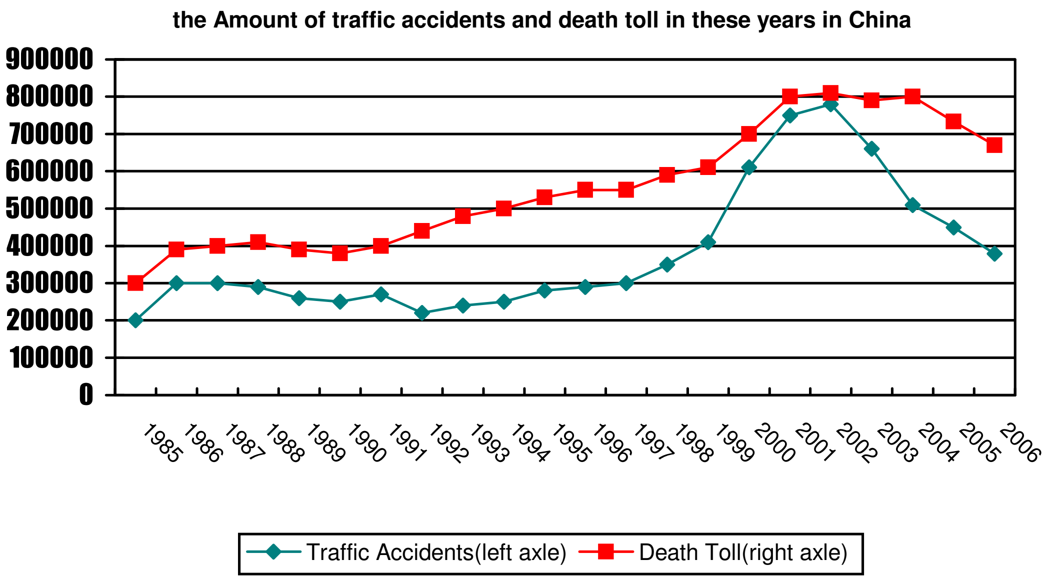
But especially in the last 20 years with quickly economic development, the sharp rise of the civil motor vehicles can't be compatible with the poor condition of the roads and that has made the road traffic safety a more and more serious problem. At the end of 2005, the total mileage of roads in China was 1,930,000 kilometers while the number in 1985 was 945,000 kilometers. During these 20 years, the amount of motor vehicles rose by 10 times but the total mileages of roads just rose by 2 times.

Crowded roads result in traffic jams and which further result that the drivers break the traffic rules. Then traffic accidents must deteriorate the traffic condition. So road traffic accidents become the biggest barrier of the Chinese traffic sustainable development.

2 Road Traffic Accidents Status in China

The amount of Chinese road traffic accidents and the death toll keep rising with the rise of motor vehicles since the quick economic development in China (Figure 1). But the two numbers began to decrease because more attention was paid for the road traffic safety and especially the execution of the law and the inspection were strengthened by public security after 2002.

Figure 1:



The death toll of road traffic accidents in China was 89,455 in the year of 2006. This has been the largest proportion of all the death cases in the field of national manufacturing, accounts for 79.29%, which was much worse than that of developed countries throughout the world.

3 Characteristic of Road Traffic Accidents in China

1．High Death Toll and High Death Ratio

The death rate of 10,000 vehicles of China in 2004 was 9.93, while the numbers were 1.79, 1.04 and 0.813 in America, Germany and Japan all which have very high amount of vehicles. The death rate of 10,000 vehicles of China is 5.5 times, 9.5 times and 12.2 times of America, Germany and Japan.

2．High Death Ratio of Pedestrians

Motorcycle and Bicycle Drivers in theaspect ofvehicles for fatalities, pedestrians, motorcycle and bicycle drivers, passengers all account for large proportions, which were 24.8%, 22.2%, 0.5%, 15.4% while the drivers of passenger cars and trucks, passengers of motorcycles respectively accounts for 4.9%, 3.6% and 4.4%. Compared to the other countries, the death toll of pedestrians and non-motor vehicles in China are obviously higher. Therefore protection for traffic participants outside vehicles is the highlight of Chinese road traffic safety.

3．Most Accidents on Rank II or Worse Roads

There were 244,079 traffic accidents on Rank II or worse roads. Those resulted in 66,489 death toll, 252,484 injuries, which respectively accounted for 47.1% 62.1% and 52.5% of all the road traffic accidents.

4．Serious Problem of Traffic Safety in Countries

When 4 traffic accidents happen, there is one happened on rural roads. When 4 people die from traffic accident, one occurs on countryside road. Accidents frequently happen on rural roads and cause group death and group injury. Farmers and workers from rural areas are the main people who bear the accidents.

5．High Death Rate in Expressway

The fatality rate of accidents happen on expressway is much higher than that on common roads. In 2005, 6407 people dead from accidents which happen on expressways. The high fatality rate of accidents resulted from the fast vehicles’ speed and traversing walkers.

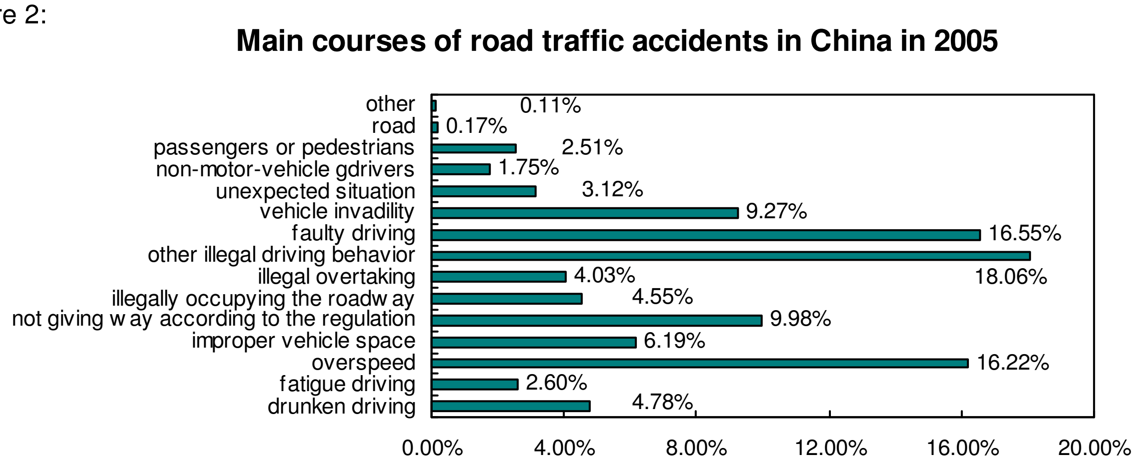
Table1:

Area	Road Rank	Death Toll	Proportion
Between cities	Expressway	6407	6.49%
	Rank I	9335	9.45%
	Rank II	27749	28.10%
	Rank III	19699	19.95%
	Rank IV	6967	7.06%
	Substandard	6532	6.62%
	Sum	76689	77.67%
Inside city	Fast way	1900	1.92%
	Main road	11895	12.05%
	Hypo road	2930	2.97%
	Spur Track	1510	1.53%
	Road inside factories	217	0.22%
	Other Road	3597	3.64%
	Sum	22049	22.33%
Total		98738	100.00%

In table 1, it shows us clearly the traffic accidents occur on each kind of road. 77.67% of the accidents occurred on the road connecting cities, fastening on 2-class and 3-class roads. The fatalities occurred inside city only account for 22.33% of the death toll. The main roads inside city are of high occurrence of accident. The fatalities occurred on these roads account for 12.05% of the death toll.

4 Main Cause of Road Traffic Accidents in China

Figure 2:



In figure 2, we can see that 93%of the accidents were caused by not obeying the traffic law. Over speed, faulty driving, vehicle invalidation, drunken driving, fatigue driving, not making way according to the regulation, illegally occupying the roadway and other illegal driving behaviors are the main causes for the traffic accidents. (Figure 2)

Figure 3:

Both the massive population and undeveloped economy in China cause that the two-wheeled vehicles account for a large amount of the traffic. In addition with the low awareness of the traffic law, there is always chaos of traffic order in the condition of mixed traffic. (Figure 3)

The fact that motor vehicles run at will, two-wheeled vehicles carry people and the pedestrians run red light always occur in cities. In villages, it always happens that the trucks are overloaded, tractors carry guests and motorcycles even carry the whole family. The extremely low awareness of the traffic participants causes a great amount of injury and damage. It is difficult to change the traffic habits of the citizens because of the traditional ideas and lack of education. It takes a longer time especially for the traffic participants in village area to improve the awareness of traffic safety.

In China, many motor vehicles are in disrepair and in bad condition which can not even guarantee the safety performance. The traffic accidents caused by the invalidation of the vehicles account for 9~10% of the total. These accidents always cause multi-casualty. In other countries, the traffic accidents caused by the vehicles’ designing defect account for about 3%. Which should be figured out is that, in China the automobiles account for 33% of motor vehicle. In other countries the proportion is bigger than 80%. If we take this factor into account, the situation reflected by the death toll of one vehicle is more sever than that of 10000 vehicles.

In China the low-class roads account for a large proportion. The roads below the second-class are about 84% including mountain roads, roads in village etc. There is lack of signs and infrastructures for traffic safety on many roads. Most of the traffic accidents occurred on the roads which are lack of traffic management. Furthermore, the accidents occurred on the roads without traffic control account for nearly 50%, which proves that the lower the road safety factor, the more the traffic accidents will occur.

There are too many traffic administrations in China with unscientific management. It is difficult to improve the awareness of traffic safety with more punishment than effective education and proagandism. In rural area, the lack of traffic management makes it impossible for people to have the basic knowledge of traffic law.

The main cause of the fatality of traffic accident is motor vehicles. The accidents of which the motor vehicles are responsible account for 94.7%. The passenger car drivers are 31.2%, the track drivers are 28.4%, the motorcycle drivers are 21.0% and the other motor-vehicle drivers are 14.2%.The fatalities of which the non-motor-vehicle drivers and pedestrians are responsible respectively account for 1.9% and 2.5% of the death toll.

Among the accidents caused by the motor vehicles, front-crash and side-crash are the main types of the traffic accident. The number of the casualty caused by side impact is higher than front impact.

5 Related Countermeasure and Research

The whole traffic structure consists of vehicle safety, infrastructure, law and regulation, behavior, accident research, safety education, rescue and treatment on scene.

Now in China some technical qualifications, for example whether the automobile performs well in the test get more attention are getting more attention. The fact that ‘human’ is a more important factor in the accident is ignored. We should put enough emphasis on the research of accidents, the behavior of the traffic participants and traffic safety education. Then the traffic safety can be effectively improved. But until now, the emergency treatment and medical care for the traffic accidents develop slowly in China, which deserve to be improved quickly.

Vehicles are not the only factor in the traffic system. It is a social combination of human, vehicle and road. Many traffic accidents are caused by the faulty driving behavior or the other traffic participants’ lack of self-safety awareness. Here we put forward a concept that the safety of vehicle is not equal to traffic safety. The research of traffic safety needs analysis, research and unification of multi-knowledge.

The traffic condition in China can become worse because of the undeveloped infrastructures, bad condition of vehicle safety, more and more personal vehicles and imported vehicles with the development of economy and non-professional drivers with no experience. In addition, there is lack of dependent and integrated traffic safety database in China which is the premises and guarantees to improve the traffic management. And it is also the base to establish the traffic safety object and measures.

So Tongji University and VW Company decided to develop the research on road traffic accident jointly with the aim to support the research on traffic safety in China with our analysis and database of traffic accident in China.

The project of research on road traffic accident in China began in 2005. We did measure, information collection and research on a large amount of traffic accident scene. In addition, we have held two seminars on international road traffic accident research to discuss the problems of traffic accident in China with the experts home and abroad. (Figure 4) With these communications we obtain a lot of knowledge and experience of traffic accident which is good for the further development of this project.

Figure 4:

Zusammenarbeit: VW rettet Fahrern in China das Leben

Unfallforschung in Fernost – Polizisten aus Shanghai in Wolfsburg

(bri). Weltpremiere in Shanghai: Volkswagen hat als erster Autohersteller in China ein Projekt zur Unfallforschung ins Leben gerufen. Partner ist die Tongji-Universität. Dieser Tage sind drei chinesische Experten in Wolfsburg und machen sich ein Bild vom deutschen Verkehr. Prof. Dr. Ing. Hongyan Wang hat das Hauptproblem in ihrem Land erkannt: „Bei uns hasten Autos, Fahrräder und Fußgänger durcheinander – und kaum jemand kennt sich im Verkehr aus."

Der Autoverkehr in China wächst explosionsartig. Mit furchtbaren Folgen, wie VW-Unfallforscher Dr. Robert Zobel weiß: „2002 gab es sieben Millionen Unfälle. Die Polizei zählte 562.000 Verletzte und 109.000 Tote. Das sind 152 Verkehrstote auf 10.000 Fahrzeuge – in Deutschland sind es 1,2."

Da gibt es viel zu tun. VW als Chinas wichtigster Autobauer nimmt seine Verantwortung ernst. „Wir wollen die Sicherheit durch bessere Abstimmung von Fahrzeugbau, Infrastruktur und Fahrverhalten erhöhen", sagt Dr. Zobel. Zu seinen Gästen in Wolfsburg zählen zwei Spitzenbeamte: Zing Bao leitet die Polizei in Shanghai, Weiguo Dai in Jiading.

Für den Aufbau einer eigenen chinesischen Unfallforschung sollen die Besucher in Wolfsburg die Grundlagen legen. Prof. Wang hat inzwischen schon viel gelernt: „In Deutschland sind Autos und Fußgänger getrennt. Das ist sehr gut."

VW möchte mit dem Projekt erreichen, dass in China eine Diskussion über die Verkehrssicherheit überhaupt erst beginnt. Dr. Zobel nennt das Ziel: „Unser erfolgreichstes Produkt in China ist der Santana. Der hat noch kein ESP. Wir wollen erreichen, dass die Chinesen freiwillig mehr Geld ausgeben für ihre Sicherheit."

Zusammenarbeit mit China für mehr Sicherheit: Dr. Robert Zobel (li.) und Michael Stanzel (re.) mit ihren Gästen. Foto: Rippert

The joint team put the emphasis on the research on accident, vehicle safety and the related traffic safety education. We have collected information of 350 accidents and established the database. The research accomplishments we have obtained provide the base of the research on free-obstacle traffic in China.

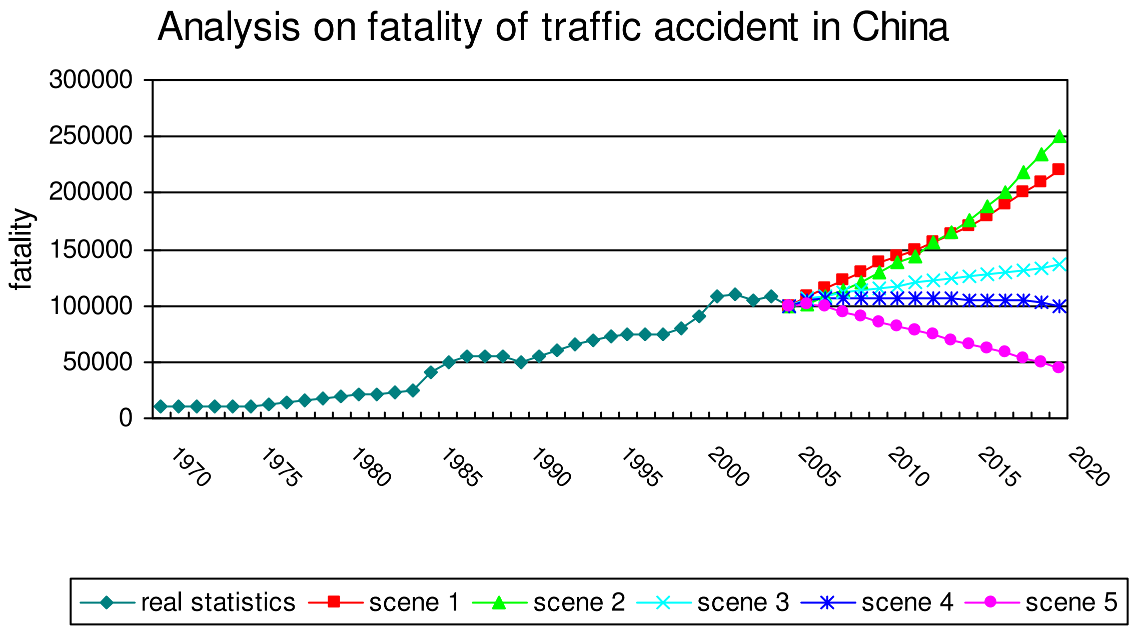
6 The Goal in China

Let us focus on the traffic future in China.

6.1. Motor vehicle population in China is increasing. The vehicle population for agriculture use will be stable in the future. Motorcycle population will be increasing rapidly before 2010, and slow down after 2010.Before 2020, the automobile population will be always increasing fast. Though the increase of motorcycle population will slow down after 2010, the motor vehicle will still increase steadily because of the rapid increase of automobile population.

6.2. According to the quality of traffic participants, road traffic condition, traffic management and its development rule, the number of traffic accident in China may increase during the next 10 years. The peak of the fatality will appear in 2010 sooner or later. According to the practical experience abroad, it takes about 3-5 years from taking active measurement to bring down the fatality steadily

Figure 5:



The rapid increase of motor vehicle population will be a burden on traffic safety. Please see the analysis. (Figure 5)

Scene 1: if the fatalities of 10000 vehicles in 2005 do not change in the following years, the number of fatality in traffic accident will increase with the rapid growth of automobile population.

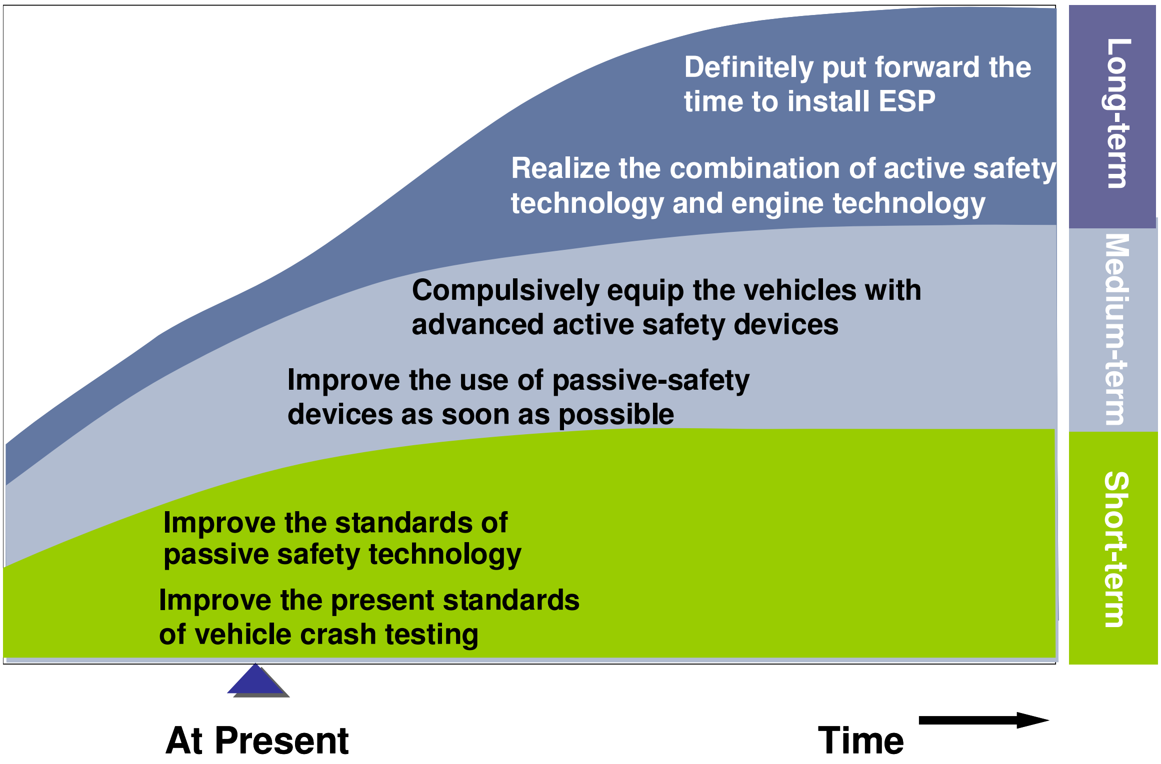
Scene 2: if the fatalities per 10000 vehicles of each kind do not change in the following years, the fatality of scene 2 will increase faster than that of scene 1 as automobiles will be the main reason of the increase of motor vehicles especially after 2010.

Scene 3: If the fatality per 10000 vehicles decreases by 3%compared with last year, which is close to the goal specified in the road safety policy of main European countries, the fatalities of traffic accidents will still increase dramatically.

Scene 4: If the fatality per 10000 vehicles decreases by 5%compared with last year, the fatality will increase but slower until 2010. It will begin to decrease since 2010. The number of fatalities in 2020 nearly equals to that in 2005.

Scene 5: If the fatality per 10000 vehicles decreases by 10%compared with last year, the fatality will fast decrease after 2010. The motor vehicle population and fatality of traffic accident in China at that time will close to that of today in U.S.A, but is still below the safety level at resent in Europe and Japan.

Figure 6



6.3. Vehicle safety in China should be improved.

In Figure 6 we illustrate both the goal for each phase and potential of development of vehicle safety.

At present, it is important to improve the standards of passive safety technology, compulsively equip the vehicles with seat belt reminders and Alco-locks, and improve the present standards of vehicle crash testing. In addition it is also important to improve the use of active safety devices (for example ESP) by giving financial assistance or tax reduction to these consumer who have bought these devices.

In the medium-term, on the base of improving the use of active safety devices, these should begin to be installed compulsively.

The point of long-term measures is to realize the combination of active safety technology and clear-energy engine technology. The time to install ESP should be definitely put forward in order to realize the transition from advanced passenger cars to passenger cars of medium- and low-level and the commercial vehicles.

China has just stepped into the automobile society with the rapid increase of motor vehicle population and road participants who lack awareness of road safety. If we do not enhance the infrastructure construction of traffic safety management, we will be confronted with a dim future.

Efforts should be made to improve the road traffic safety in China. Of course, we also need your help.

Information – Public Transport Travel Information for Mobility Impaired People through VBB‘s Travel Plan

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Improved Information Services in Public Transport for People with Reduced Mobility

Abstract

The German R&D project BAIM aims at supporting or enabling the active and independent participation of people with reduced mobility in public transportation by the provision of user group-oriented accessible information services on barrier-free travelling opportunities.

An information system is being developed to provide information services regarding the accessibility and usability of public transport systems in all stages of a journey, from planning to travel to actually travelling. This includes static and dynamic information, e.g. target departure times and delays, changing of vehicles and fares, always up to date. New dynamic information concerning transport service and infrastructure in combination with a special data management system will be a focal point of the BAIM project. On the basis of already existing route planning solutions and scheduling systems via the Internet, new services, for instance via mobile phones, and conversational systems based on natural language technologies will give special information for people with reduced mobility. An important prerequisite for the dynamic information is Automatic Vehicle Monitoring (AVM) which provides detailed real-time data of all vehicles and has already been introduced in Germany.

The innovative services will be tested in the regions of Frankfurt RheinMain (Rhein-Main-Verkehrsverbund) and Berlin-Brandenburg (Verkehrsverbund Berlin-Brandenburg).

Keywords

public transport, people with reduced mobility, information service, barrier-free travelling

1 Introduction

Demographical Background and Motivation

In the European Union about 25.3% of the population are “severely hampered” (9.3%) or “hampered to some extent” (16.0%) in daily activities by any physical or mental health problem, illness or disability [Eurostat]. It is estimated that disabilities and special circumstances reduce the mobility of about 20 to 25% of the population (depending on the definition of mobility reduction) temporarily or permanently when travelling on public transportation systems: physically disabled people, people with sensorial impairments, people with the reduced ability to produce or to understand spoken or written language, people suffering from mental disorders; but also people carrying heavy items such as suitcases, a baby carriage, or a bicycle. Their number is increasing due to the demographical development towards an aging society [VDV03].

There has been considerable improvement towards barrier-free design of railway and bus stations over the past 20 years in Germany. This includes better access to vehicles, the availability of visual and audible information, and guidance systems at station buildings. However there are still many facilities that have barriers for one or the other group of travellers.

Nevertheless, the situation of people with reduced mobility could be improved if they had information about actual barriers located on their potential travelling paths and if they were supported to find “barrier-free travelling chains”, e.g. from one city to another. A travelling chain means the whole sequence of buildings, vehicles, as well as logistic and informational infrastructure that the traveller visits and uses for a journey.

State of the Art

The existing information systems on public transportation differ with respect to the region, its content and the way of information provision, e.g. Internet/WAP or SMS. Sometimes their content is augmented with selected information for people with disabilities. Some specialised information systems focus on disabled tourists and their needs, but are very selective with respect to the area or means of travelling.

Some recent international research projects explore new ways of data integration and information provision by applying new technologies: The European ASK-IT project [ASK-IT] develops an ambient intelligent multi-agent system that provides information on transportation, tourism, and social activities for people with reduced mobility. The project Mobile Tourist Guide provides a broad spectrum of personalised information services for a European touristic market, based on GSM/GPRS and the Internet. In the project Capitals ITTS, an integrated travel and tourism service is being developed by inter-connecting the existing mobile service platforms of five European cities. The mobile information service of TramMate provides a route planner for public transportation, delivers additional real-time information, and supports the time scheduling of travelling. The intermodal interoperable travelling information system of the Vienna-SPIRIT project [Vienna] combines dynamic and location dependent information on various public transportation systems. The Open-SPIRIT project [Open] develops corresponding electronic information devices based on smart phones.

2 Approach

2.1 Goal of the BAIM Project

It is the goal of the German project BAIM (Barrierefreie ÖV-Information für mobilitätseingeschränkte Personen) to support or to enable the active and independent participation of people with reduced mobility in public transportation by developing an information system that provides its users with detailed information on the accessibility of public transportation facilities, including vehicles, buildings, available technical facilities, information devices, and special assistive features for people with disabilities.

The BAIM information services shall support the user when planning a journey at home (via an Internet based information platform or a telephone based speech information system), e.g. by searching for barrier-free transportation chains from any given starting point to any destination of the journey – according to the user's personal requirements profile, as well as during the journey (via an Internet/WAP service or a SMS service), e.g. by informing in "real-time" about unforeseen obstacles, for instance an elevator which is out of order at a station where the traveller intended to change trains.

2.2 Project Partners and User Participation

The project consortium consisting of

- Two public transport associations: the Rhine Main Transport Association (Rhein-Main-Verkehrsverbund – RMV, also coordinator of the project) covering a region with several big cities and a population of about 5 Mio. People; the Berlin-Brandenburg Transit Authority (Verkehrsverbund Berlin-Brandenburg – VBB) covering Berlin and the federal state Brandenburg with a total population of about 6 Mio. people;
- their corresponding traffic and information technology providers: IVU Traffic Technologies AG and Rhein-Main-Verkehrsverbund Servicegesellschaft mbH (RMS);
- the information service provider: HaCon Ingenieurgesellschaft mbH;
- the service provider of dialog based systems: SemanticEdge GmbH;

- the rehabilitation centre Evangelische Stiftung Volmarstein with its research institute for assistive technology (FTB)

will ensure that all stakeholders' needs will be taken into account and that the new information services will be embedded in the existing transportation system in Germany in a sustainable way after the project is completed.

Special emphasis is given to the participation of end-users during the whole project. Therefore the project partners are supported by users and user representatives with extensive experience and knowledge concerning the needs of disabled people and public transportation:

- the working group on barrier-free travelling including user representatives at RMV;
- an external expert group including several user associations;
- and the user focus groups at FTB, RMV, and VBB consisting of people with disabilities for user requirements analysis, user tests, and evaluation.

2.3 Project Phases

The project is scheduled to run from September 2005 to April 2008. After a detailed state-of-the-art analysis at the beginning of the project, the development work is done in three phases, each comprising the same steps:

- user requirements analysis,
- data management and data collection,
- realisation of the services,
- technical tests and user tests,
- Evaluation.

In phase 1 (until autumn 2006) regional information services based on plan data are developed. Phase 2 (until autumn 2007) will enhance the information services with dynamic (actual, real-time) data while phase 3 (until spring 2008) will focus on the extension towards a nation-wide information service.

2.4 Analysis of User Needs

The analysis of user needs during phase 1 was conducted with rehabilitation experts and representatives of various groups of disabled people, all of whom were well familiar with problems of disabled people in public transportation.

Based on an elaborated classification of target user groups, the users' requirements and their priorities were investigated [Bühler]. The user focus groups: people unable to walk, blind and deaf people have the strongest information needs and therefore the corresponding information provision is realised first. The importance of attributes of vehicles, buildings, information systems etc. prior to and during travelling was rated; and the relevance of the attributes for the user focus groups was evaluated.

With respect to information devices available to the end users, the PC is the primary medium for planning the journey while spoken information (telephone) is important before and during the trip. Mobile phones are applicable for speech or text information depending on the user group.

3 Realisation of the BAIM Information Service – Phase 1

3.1 Web-Based Information Services Timetable Information System

The most important information service in phase 1 is detailed timetable information. It is an extension of the already existing information systems www.vbb-fahrinfo.de and www.rmv.de which describes accessibility of stations and vehicles.

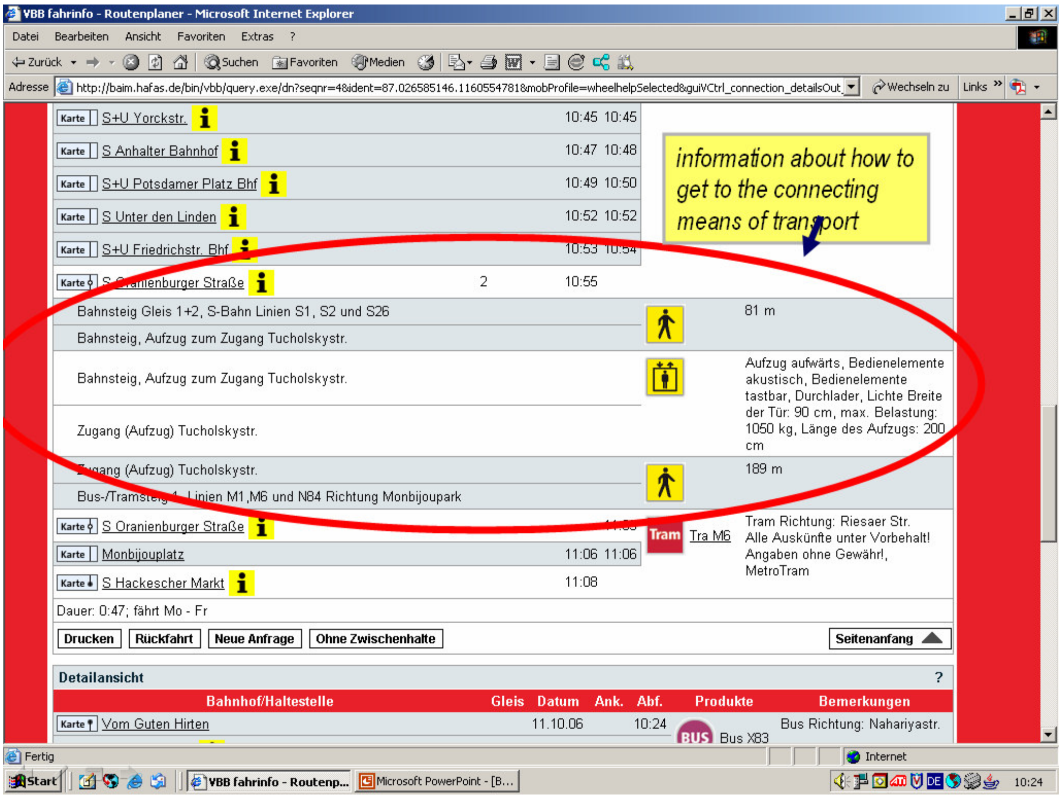
The information about connections is given according to the users' needs. Therefore the users have been separated into different groups. For example, wheelchair users get special information about connections that are accessible for the different kinds of wheelchairs. To achieve this, there are search criteria which are conditions for connections, e. g. gaps and steps, ramps, lifts. The variety of user needs leads to a large number of required attributes. Although very individual profiles would in principle yield the optimal search results of barrier-free travelling chains, it will not be practicable for most users to fill in long templates of parameter lists to generate their personal profile. The requirement for usability of the timetable information itself brings a clear need for user profiling. It is difficult to further categorize certain value ranges of attributes. A first attempt is shown in Table 1 and has to be evaluated by the users.

Table 1: Examples of attributes, value ranges and presets

Attribute	Choice / value range	Presetting for wheelchair user	Presetting for walking impaired user
Weight (incl. wheelchair)	≤ 120kg ≤ 250kg ≤ 300kg ≤ 350kg	≤ 250kg	–
I need a width for passages of...	> 70cm ≥ 80cm ≥ 90cm	≥ 90cm	≥ 80cm
I can use a ramp with a gradient of...	No ≤ 6% ≤12% ≤ 20%	≤ 6%	≤ 6%
Possible average speed ...	0,5 m/s 1,0 m/s, 1,5 m/s 2,0 m/s	1 m/s	1 m/s

The results of this route planning service are accessible connections with detailed information about footpaths (Fig. 3). Information about vehicles and stations are linked.

Figure 3: Connections accessible for wheelchair users



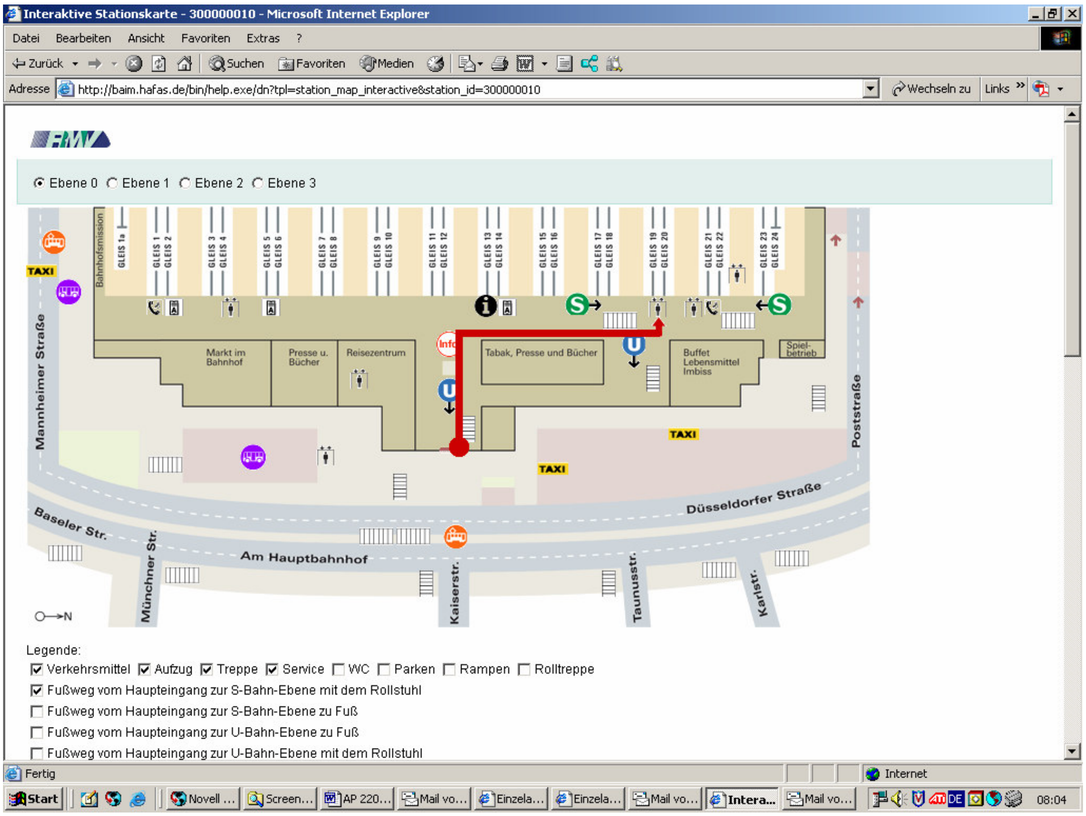
3.2 Station information

A second focal point of phase 1 of the BAIM project is information about stations and bus stops. In addition to already existing static station plans, new dynamic station plans have been developed. They are dynamic in two ways: Firstly, it is possible to choose which attributes should be shown; that render the plans to be more clearly arranged and easier to use. Secondly, dynamic footpaths show the right way according to the special user needs, e. g. wheelchair users can see their way starting at the entrance and leading to the correct platform, even on other levels of the station building. (Fig. 4)

For blind or visually impaired users, information about stations can be given in a text-only version. Therefore special textual station descriptions have been developed. In a first part of the description, an overview is given about the platforms, entrances and buildings and the links between them. In a second part, the most important footpaths are described, e. g. starting at the platform and leading to the bus stops or the city centre. These descriptions can be used by screen readers and will also be provided as audio-files.

Especially for small stations and bus stops, information is provided by lists of services and equipment.

Figure 4: Station plan with special footpath information for wheelchair users



3.3 Mobile Services

It is also intended to provide information about barrier-free travelling chains on mobile devices. The ideas the BAIM partners are working on, are described in this chapter.

With the mobile timetable information it is possible to calculate and download personal timetables and save them on a mobile device. The special needs of different user groups can be integrated according to the web-based services.

Figure 5: Time-table information via mobile phone

Additionally it is possible to download a surrounding map with three zoom levels. Once downloaded the map is available offline for pedestrian navigation. This helps for instance walking-impaired people to minimize the length of their footway.

A next step is the integration of realtime information: With the individually calculated timetable you can request current realtime information from the internet containing information about delays for several connections of trains. The information can be used to show problems and to compute alternatives. This is important, for example, for deaf people who cannot hear information given via loudspeakers but can get information about problems and alternative travelling options via mobile phone. Wheelchair users can find out which alternative options are accessible to them.

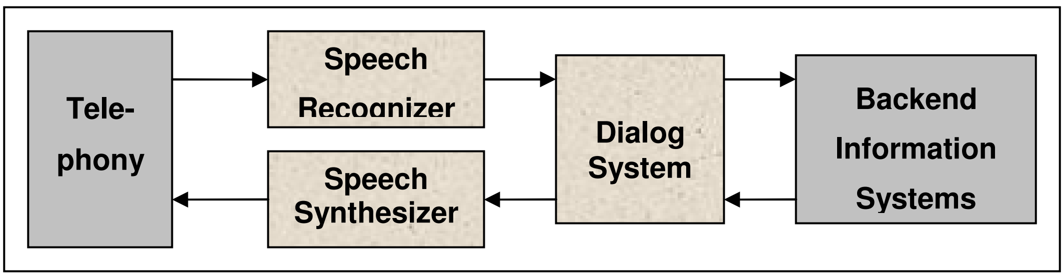
Figure 6: Real time timetable information

3.4 Speech-Based Information Service

People using public transport are continuously dependent on reliable and accessible information. A public transport information system which aims to support especially the needs of people with reduced language capabilities must be accessible not only via stationary, primarily visual devices such as the Internet or printed timetables but also via telephone, mobile phone or other mobile devices. Travel information via the telephone is usually only available during normal call centre operating hours which do not include nights and weekends and often a request for information cannot be handled because of busy lines.

Computer applications capable to sustain a conversation with humans have long been a challenging goal. Substantial improvement in speech recognition, dialog management and speech synthesis, which are the core components of a Spoken Dialog System, have led to the development of a new generation of dialog systems, which can be used conveniently by everyone who is able to speak and hear. Spoken Dialog Systems provide travel information without any limitations due to time of the day or limited human resources. Figure 7 shows the standard architecture of a standard Spoken Dialog System.

Figure 7: Usual structure of a spoken dialog system



Part of the BAIM project is the development of a Spoken Dialog System for regional travel information in the Berlin-Brandenburg area. Phase 1 focusses on the development of a speech interface for accessing the standard timetable information with special information about barrier-free connections and additional information about station facilities. After the caller has specified her place of departure, destination and travel time she can demand a barrier-free connection or ask for an exclusion of a vehicle type. If a station name or address is not unique or some recognition error occurs the dialog system aims for clarification. After obtaining a complete list of verified travel data the spoken dialog system connects to the travel information backend (HAFAS) to get suitable connections. These connections are given out to the caller using a Text-to-Speech-System (TTS). The caller can easily navigate through the Spoken Dialog System using normal speech, she can ask for clarification, repetition, start-over and earlier or later connections. In addition to suitable connections the system provides information about the structure and the facilities of train-, bus- and subway-stations in the Berlin-Brandenburg area. Table 2 shows a part of a typical user dialog using the BAIM speech interface.

Table 2: Example of a typical travel information dialog in the BAIM-system.

U:	...
S:	And when would you like to travel?
U:	Tomorrow, five p.m.
S:	Do you need a barrierfree connection?
U:	Yeah, I need a barrierfree connection.
S:	Do you want to exclude some vehicle type?
U:	Yes, bus and subway.
S:	You don’t want to use bus and subway. Is this correct?
U:	Yes.
S:	Okay. You want to travel tomorrow at 5 p.m. from “Ostbahnhof” to “Zoologischer Garten” in Berlin. Is this correct?
U:	Yes, that’s correct.
S:	Just a moment please. I found a barrierfree connection without change. You take ...

The focus in phase 2 is the incorporation of real-time information into the BAIM-System. Instead of standard timetable information the Spoken Dialog System will provide real-time information for controlled connections which are especially useful in cases of train delays, connection changes or sudden operating failures of station facilities. The speech interface will be developed in such a way that even active information of registered users about real-time events is possible (outbound calls).

4 Future Plans

The next step in the project is to evaluate the services of phase 1 with a bigger number of end users. This will implicitly be an evaluation of the first user requirements analysis. Consequences and requirements for further development of the services will be drawn up according to the users’ feedback.

In phase 2 the regional services in both regions (i.e. Berlin-Brandenburg and Frankfurt-Rhein-Main) will be upgraded, especially concerning additional user groups and real-time information. Dynamic information concerning local traffic (i. e. bus, tram, and subway) will be integrated in the information service; dynamic information regarding trains will be upgraded. Therefore Automatic Vehicle Monitoring Systems (AVM), which has already been introduced in the participating cities and regions, will be integrated. It provides detailed real-time data of all vehicles. Additionally the idea of a mobile navigation system will be explored. Such a system could give customers up-to-date real-time timetable information and helps to navigate along the whole travelling chain. The information can be used to identify problems and to compute alternatives. Active Push services, for example via email, are possible as well.

Phase 3 will focus on the planning of barrier-free supra-regional and nation-wide travel. At the end of the project the findings and experiences will be wrapped up in such a way that they can be transferred to other public transport associations.

Future R&D work, beyond the BAIM project, could focus on the integration of the BAIM information services with other information services and on the development of accessible mobile information devices for people with disabilities.

5 Acknowledgement

The project BAIM is co-funded by the German Federal Ministry for Economy and Technology (reference: 19 P 5025F).

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China – Transportation Management and Changing Society

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1 Background

The total population of China has amounted to 1.3 billion in 2006. Among them the disadvantaged population is 505 million, which includes the old people with age above 65, children younger than 14, the disabled and the poor group whose expenditure is less than 1$ per day. See figure 1. From figure1 we can see that the population of old people is stably increasing and takes 8 percentage of the total population. This means that China has become an old-aged society. And the old population is stably increasing in recent years and will keep increasing in the coming years. See figure 2.

Figure 1: Population structure in China, 2006

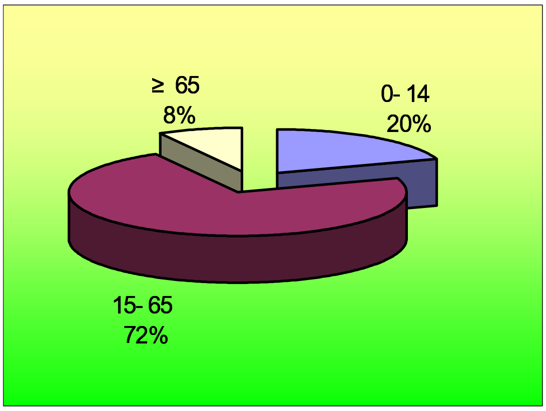
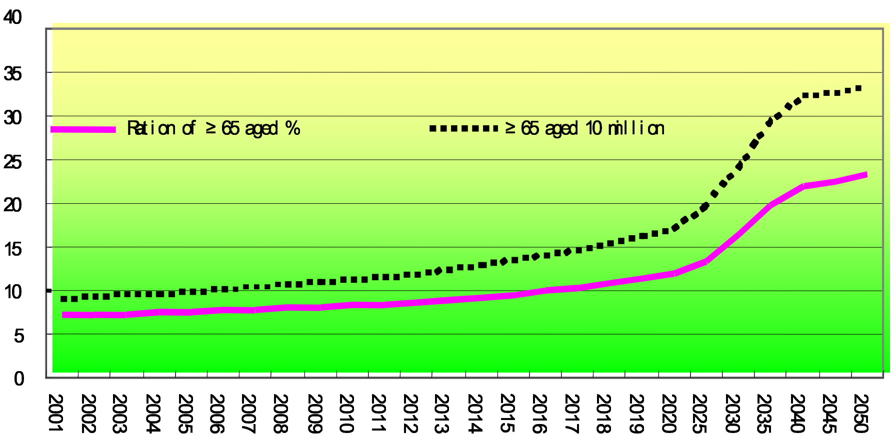
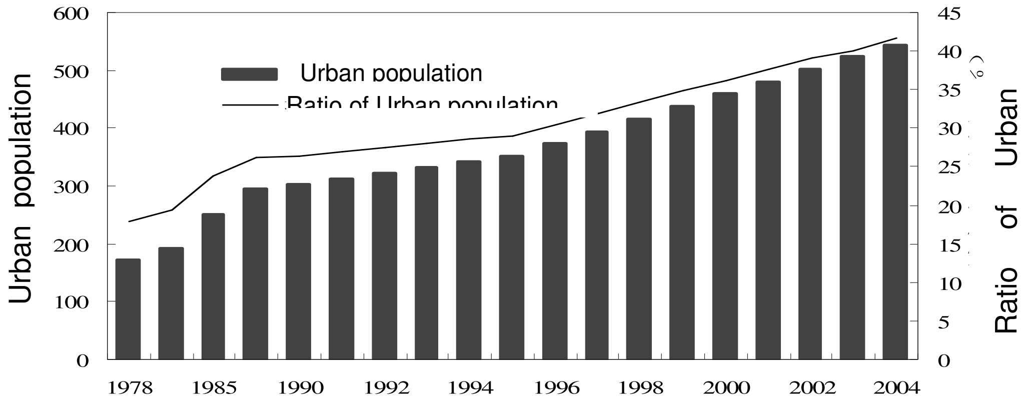


Figure 2: Developing trend of aged 65+ population



Currently , Chinese cities are facing the diplex pressure of fast urbanization and motorization. This has promoted the traffic demand to increase rapidly. Meanwhile, the travel quality requirement for convenience; comfort, reliability safety and efficiency are also improving rapidly. By 2006, 43% of Chinese population are living in cities, and for each year, nearly 10 million people move from countries to cities. See figure 3. With more and more people rush into cities, the city scale is expanding rapidly and people's travel distance is also increasing synchronously.

Figure 3:Urbanization Percentages in China



With economy development, motor vehicles are increasing rapidly in China with a total number of 152.8 million in June 2007. Take Beijing for example, It takes 48 years for motor vehicles to increase from 2 thousand to 1 million, and it takes only 6 years to increase from 1 million to 2 million, and for the third million, it takes only 3 and a half years. With the fast motorization and urbanization, the traffic congestion is becoming more and more serious, In Beijing, the average travel time in peak hour is 58min. and it is estimated that in Shanghai, the GDP reduction caused by traffic congestion has amounted to 10% in 2003.

Another problem resulted from traffic development is traffic safety. There is an outstanding characteristic of urban transportation in China called mixed-traffic, which means various traffic modes, such as cars, buses, bicycles and pedestrians mixed together on urban roads. Under this background, the cyclists and pedestrians are the most vulnerable victims. In recent years, the traffic accidents take away nearly 100,000 lives every year. Among them, the disadvantaged group such as non-motor vehicle drivers and pedestrians takes 40 percent. See figure 4.

Table 1 4 milestones of motor vehicles development in Beijing

	To	Years
2300 (in 1949)	1 million (in 1997)	48
1 million	2 million (in 2003)	6
2 million	3 million (May 2007)	3.5

Figure 4: Traffic fatalities in China

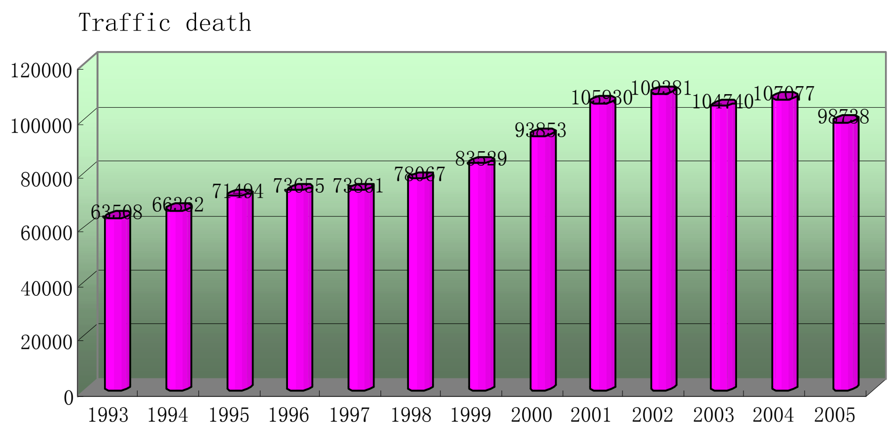
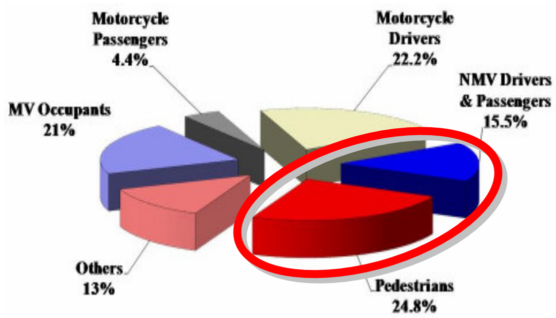


Figure 5: Traffic fatality structure in China

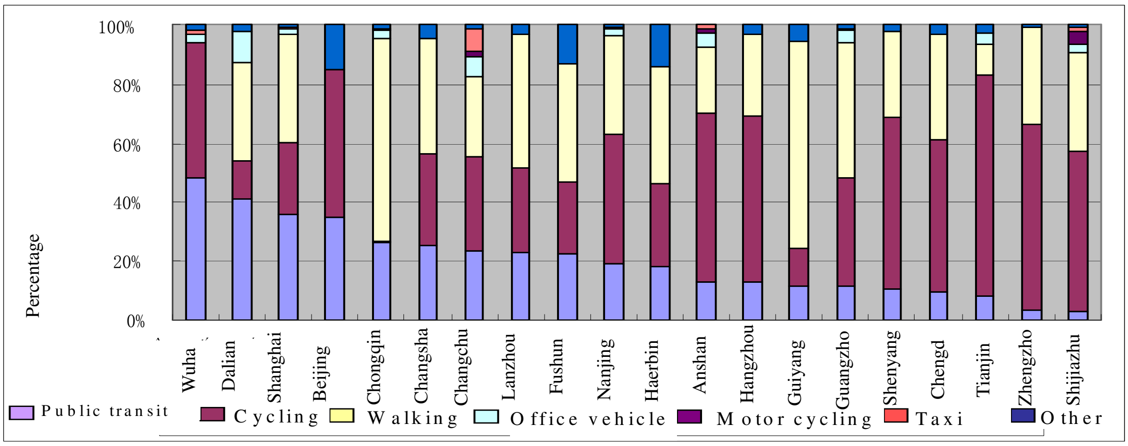


Entering the new era, the Chinese central government focus on building an economically prosperous and harmonious society of socialism, with aim to promote social fairness and ensure every citizen can share the achievements of economy and social development. Meanwhile, the Ministry of Construction has made a plan to establish 100 demonstration cities of barrier free construction through out the nation.

2 Current Status

China has a long history of “Bicycle Kingdom”. The total number of bicycles in China has amounted to 500 million. Currently in China, the majority of the population can’t afford to use cars, and most people use bicycles to travel. Cycling and walking are still the dominant travel mode in many Chinese cities. See figure 6.

Figure 6: Percentage of travel by different transportation modes in Chinese cities



Recently, the Ministry of Construction requires that all roads to be built in Chinese cities must have bicycle lanes. In Beijing, the Cycling Transport Planning was initiated in 2006, which defined cycling as the major transport mode, and set down 6 key measures to promote cycling development, including:

- ✓ Set up physical separation facilities on main roads
- ✓ Provide adequate bicycle parking near public transit stations
- ✓ Ban motor vehicle parking on bicycle lanes
- ✓ Build tour bicycle lanes in the suburbs and in historic downtown
- ✓ Formulate bicycle parking charge regulations
- ✓ Strengthen traffic management measures to ensure quality of bicycle lanes

The Ministry of Construction has published the "State city standard for barrier free construction in the 11th five year plan" to ensure the administration and the financial supply of barrier free construction. It formulates the outline requirement for urban roads and public buildings and infrastructure. The "Codes for design on accessibility of urban roads and buildings (JGJ---2001)" was published in 2001. It provides the detailed standards for barrier free design, includeing urban roads, buildings and residential areas .etc.

3 Challenges

Generally speaking, the development of barrier free mobility for disadvantaged group is just at its beginning stage in China. There are many factors that hinder the healthy development of barrie free mobility for disadvantaged group.

The first is the public transportation system. Currently in Chinese cities, the average travel share of public transport is only 10%, far behind the European and American cities, and the average bus speed is only 10 Km/h, just similar as bicycles. For a long period in China, the government payed more attention to meet the need of motor vehicle travel, while neglected cycling and pedestrian needs. This greatly deteriorated the cycling travel conditions, and the cycling travel share has dropped remarkably, coupled with rapid economic development. See figure 7. The bicycle users and pedestrians comprised 27.7% of traffic-related deaths in Beijing in 2002, and the electric bicycle is forbidden in some cities, such as Guangzhou, Haikou, Fuzhou, etc.

The illegal driving and parking are very common in China. And the non-motor vechcle lanes are often invaded by cars. The footways and the blind ways are often occupied, and the utilities for crossing streets are very poor. Figure 8 can show us the challenging travel conditions for disadvantaged group in Chinese cities.

Figure 7: Travel share changing in Beijing

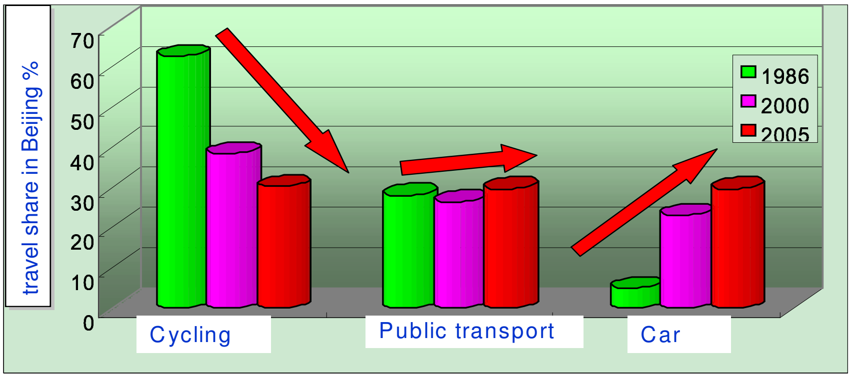


Figure 8: Deteriorating mobility environment for the disadvantaged group in China

4 Policy Options

The first 20 years of the 21 century is a crucial stage for Chinese transport development, so effective measures should be taken to guarantee the sustainable development and to realize the goal of transportation for all.

Establish managing regulations from the state level

The central transport administration department should take active measures to formulate mobility protecting regulations for the disadvantaged group from the state level. Some indicators such as the cycling and blind lanes ratio and the modal share of cycling and public transport should be included into the governance appraising system. In this way, the conception of local government officials can be greatly innovated and they will get more motivation to promote the cycling development.

Strengthen barrier free transport mobility planning is also very important

Special cycling and blind lanes should be built to separate motorised and non-motorised vehicles, and to provide a continuous and safe travel environment for bicycles and pedestrians, Including the blind Meanwhile, the barrier free mobility construction should be included into the city overall planning to ensure harmony development between them.

To promote integration of cycling and public transport

In order to encourage cycling travel, we should take effective measures to promote the integration of cycling and public transport, such as: to provide adequate bicycle parking spaces at bus and subway stations; and to develop cycling lanes connecting public transport stations etc.

Strengthen supervision and management

The government should enforce barrier free mobility laws and regulations to reduce illegal occupancy of barrier free establishments.

Strengthen stakeholder participation through awareness campaigns and education

Great efforts should be taken to strengthen advocating and education, thus to enhance government attention to address the needs of disadvantaged group and to reduce illegal travel behaviour of the public. This can help to provide favourable environment for mobility development of the disadvantaged group in China.

Vehicles – Barrierfree Accessibility to Vehicles of Local Public and Long Distance Traffic

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1 Summary

At present it is very difficult for elderly and handicapped people to follow a barrier free travel chain from origin via interchanges to the final destination. It is only possible based on a big expenditure of time and of energy. Therefore the vehicles of the local public and long distance traffic have to be designed in such a way that they can be used from all the interested persons in the sense of a barrier free travel chain including elderly and handicapped people. This should be possible for physically impaired people including wheelchair users, for visually and hearing impaired people, persons of small stature, elderly persons and parents with baby carriages.
During three test phases' 67 experts from 6 countries have evaluated the Industrial Design mock-up based on a questionnaire. The test group covered persons from North (Denmark) to the South (Italy) and from the West (Spain) to the Middle of Europe (Germany). This is especially important for the generalization (harmonisation) of the results for all European countries. Based on the results specifications/ solutions for the ergonomic design of the access area, the acoustic, visual and tactile information, the emergency system and the service system were developed, related to the benefiting passenger groups (physically, hearing and visually impaired persons, persons of small stature, elderly persons and parents with baby carriages). Further on conclusions for standards and guidelines will be derived.

2 Introduction

This paper is an output of an European collaborative project financed by the European Commission in which experts of railway operators, manufacturers/ suppliers, associations of persons with disabilities and scientific institutions from six European countries take part. The objective of the project is to optimise the access, the entrance vestibule, information systems inside and outside the train, emergency facilities, toilet with all conveniences and the additional test arrangements regarding push buttons, steps and emergency equipment. as an important segment of a barrier free travel chain. For this reason physically, visually and hearing impaired people, persons of small stature, elderly people, parents with small children were included from the very beginning (Seliger & Rentzsch 2006).

3 Methods

Fig. 1 shows the basic structure of the methodology used in the project. The starting point of the investigation was to analyse the current access situation for disabled persons in passenger trains, considering the relevant regulations, standards, operation instructions as well as the large volume of research work already carried out at an international and national level. Based on the results a so-called EUPAX Mock-up was developed and tested by the test persons (s. Fig. 2).

Altogether 67 subjects (33 females and 34 males) with different handicaps took part at the tests. The mean age of the subjects was 53 years. Two persons were under 26 years and 3 persons over 85 years old. The body height reached values between 118 and 190 cm. The test duration was about 3 hours.

Figure 1: Basic structure of the methodology (Rentzsch 2005)

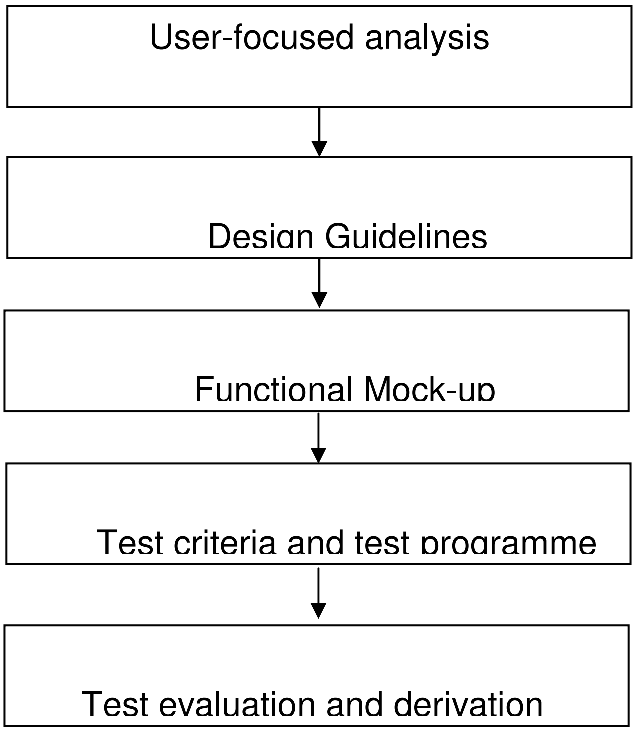
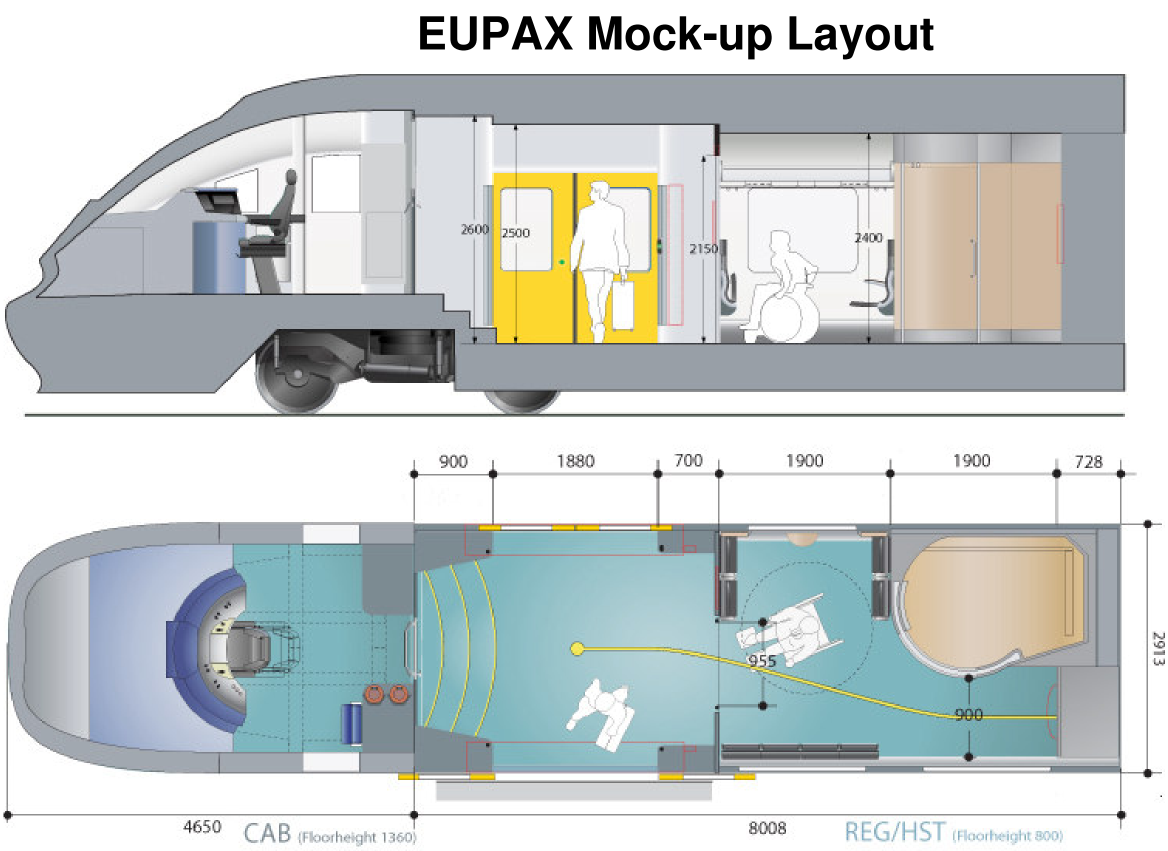


Figure 2: EUPAX Mock-up

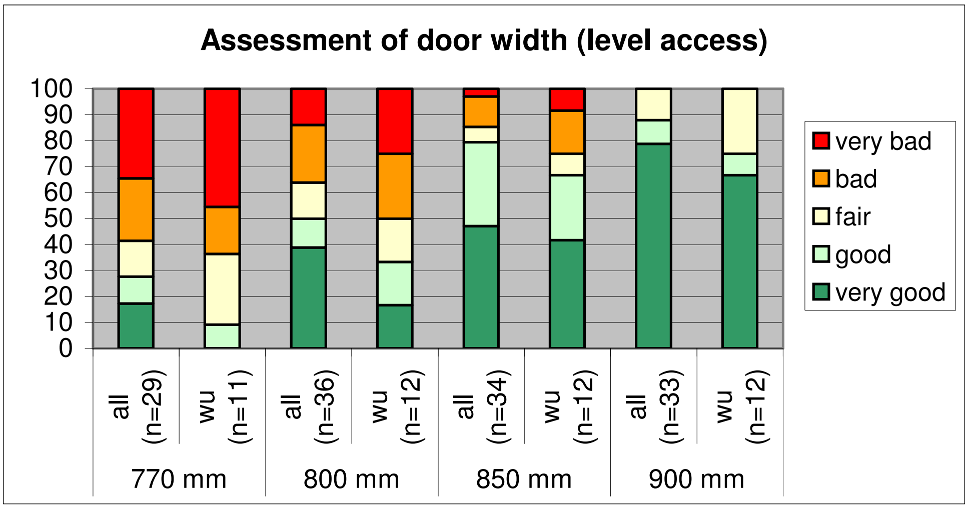


For this purpose a questionnaire was developed for the assessment of the EUPAX segment and the additional test arrangements. With the help of this questionnaire it was possible to execute a quantitative and qualitative evaluation.

4 Results

In the following selected test results concerning the barrier free design of the access, the entrance area and the passenger information system will be represented. The test of the clear throughway of access door is especially important for wheelchair users. The assessment of the different values of the width of the access door with level access that means without gap between platform and vehicle is shown in Fig. 3. Values smaller than 850 mm are rejected by the majority of wheelchair users, as 50 % evaluate the throughway of 800 mm with bad or very bad respectively 64 % the value of 770 mm (TSI recommendation 800 mm).

Figure 3: Clear throughway of the access door with level access (red – TSI recommendation) TSI - Technical Specification of Interoperability, wu - wheelchair user

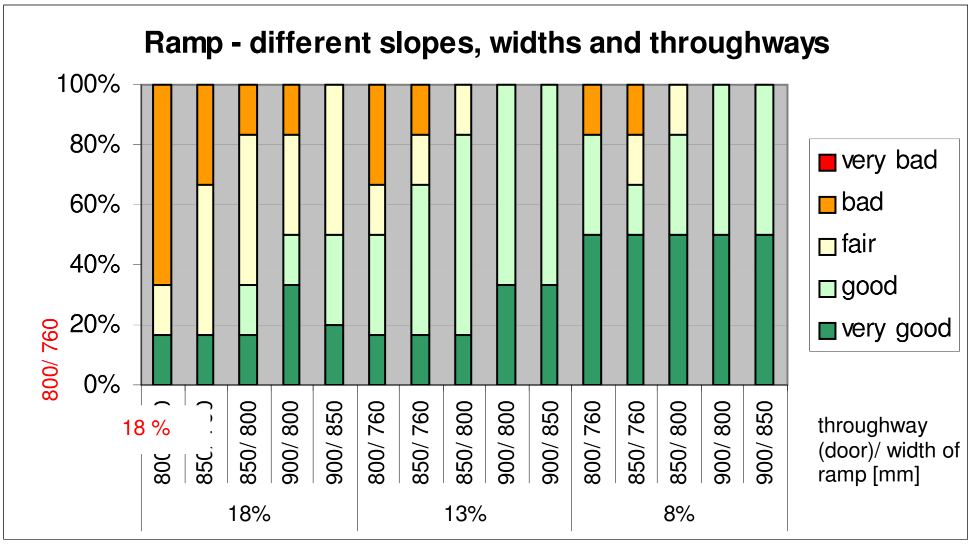


It can be stated that a clear throughway of the wheelchair accessible door (at least one per side of train) of 850 mm can be managed by most of the wheelchair users, also by the bigger electrical wheelchairs, which are used often when wheelchair users are travelling. The TSI recommendation of 800 mm is critical, especially if gaps have to be overcome, as wheelchair users prefer to board diagonally in such a case. Gaps between platform and train shall be as small as possible, as already 50 mm vertically and horizontally can not be managed by all wheelchair users on their own.

The tests with the ramps have been performed by 6 wheelchair users. The results shall therefore be seen as a trend. The critical value tested in this context was the slope of the ramp in combination with different throughways of the door and widths of the ramp.

Fig. 4 shows the assessments gets better the smaller the slope and the bigger the width of door and ramp becomes. The slope of 18 % seems to be too steep whereas 13 % in combination with an adequate value for width of door and ramp (850 mm and 800 mm) is manageable for the wheelchair users (length of ramp approximately 1 m).

Figure 4: Clear throughway of the access door, width and slope of the ramp (wheelchair users; n=6; red – TSI recommendation)

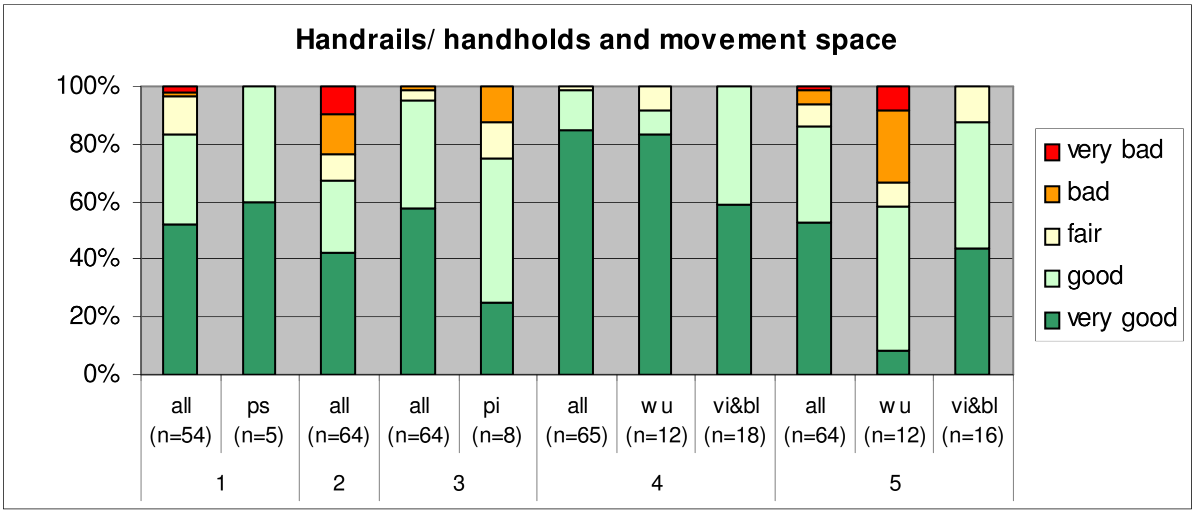


The entrance area of the Mock-up is characterized by a certain movement space supported by handrails and handholds (Fig. 5). As shown in Fig. 6 the questions regarding handrails, handholds and the movement space within the mock-up were assessed positively. 83 % of all test persons and all physically impaired people (including persons of small stature) assessed the height of the handrails at the steps positively (good or very good assessment). It is stated that it is good to have handrails in two different heights (i.e. 650 mm and 900 mm). Furthermore handrails on both sides of the steps are wished by a number of test persons.

Figure 5: Entrance area of the Mock-up

Another question for the vertical handholds in the access area was evaluated positively by 67 % of test persons. For some of the test persons the handholds behind the access door are located too far away from the door level and shall be positioned closer to the door. Another critical point was that there seems to be not sufficient space around these handholds for all persons. Especially visually impaired persons demand a higher contrast for the handholds.

Figure 6: Handrails/ handholds and movement space

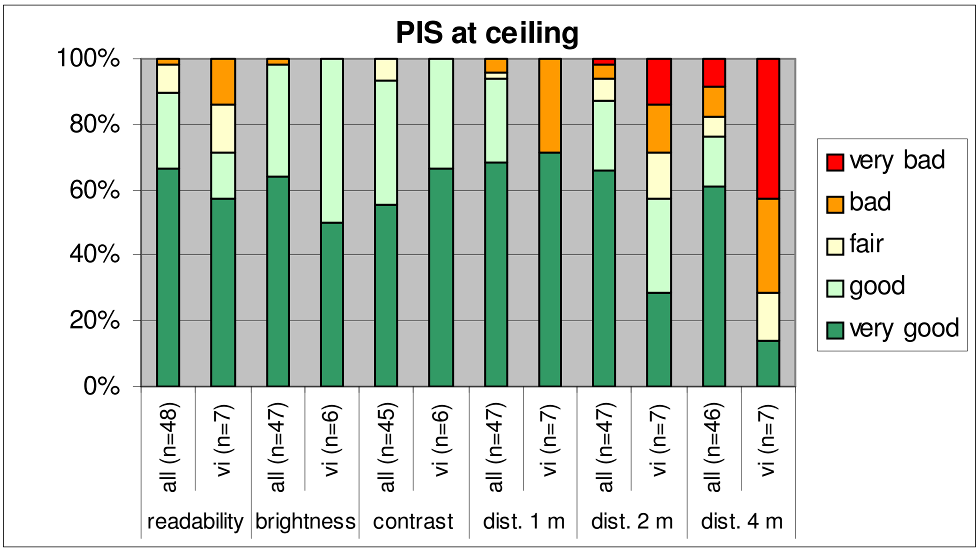


1. height of handrails at steps
2. vertical handholds in the access area
3. diameter of handholds
4. movement space in entrance vestibule
5. movement space in compartment area

ps persons of small stature
pi physically impaired people
vi visually impaired people
bl blind people

The internal Passenger Information System (PIS) at the ceiling of the Mock-up was assessed positively by the test persons (see Fig. 7). The readability, brightness, contrast and character size in a distance of 1 m were evaluated positively by the test persons with only minor constraints from the visually impaired persons. For example the reflections on the display (the glare) caused by the lights on the ceiling was disturbing for them. The moving text (ticker speed 25 cm/ sec.) shall be slower or if possible, static text shall be used as this facilitates the readability of the information especially for people with reduced visibility. As it can be seen in the Fig. 7, the readability of the information gets worse with raising distance to the display, especially for visually impaired persons. In a distance of 4 m, the character size of approximately 40 mm is not sufficient for more than 70 % of this group.

Figure 7: Readability, brightness, contrast and size in different distances of the internal PIS



For the font of this display different colours (white, green and yellow) were tested. Tab. 1 shows that white letters can be read best (mean=1,70; for all test persons). According to all test persons, the colours green and yellow receive approximately the same evaluation. The visually impaired persons (vi) do also prefer white letters (mean=2,00) but seem to prefer green to yellow in the 2nd position.

Table 1: Colour of font at PIS

Colour of font		N	Best mark	Worst mark	Mean mark
white	all	46	1,00	4,00	1,6957
	vi	7	1,00	4,00	2,0000
green	all	45	1,00	5,00	2,3111
	vi	7	1,00	5,00	2,5714
yellow	all	45	1,00	5,00	2,3333
	vi	7	2,00	4,00	3,0000

5 Conclusions

Approximately 63 % of all test persons evaluate the accessible design of the Mock-up with good or very good. It can be summarized that wheelchair users (55 % positive assessment) but especially blind persons (22 % positive assessment) see still some potential for improvements. For wheelchair users the access to the train is according to their evaluation of about 48 % clearly the crucial point regarding a barrier free design. The sensory disabled persons including blind, visually impaired, deaf and hearing impaired persons, see the highest priority in the perception of information (32 %). But again the access to the train with 29 % is also an important point for this group.

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Japan – The practice of universal design and transport System

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1 Introduction

In Japan, it had been started the management of barrier-free environment from the 1970s. This management was guided by each local government. It was started some municipal bylaws in large cities, and there were many regulation, manuals in all over Japanese urbanization area. Eventually, it has been associated with Transportation Accessibility Improvement Law in 2000. From this event, it is pushed to construct a barrier-free infrastructure in order to make adoptive environment for elderly and disabled people in Japan. As the reason, there are some backgrounds about rapidly aging population and increasing of the social participation opportunity for elderly and people with disabilities. The main policies in an aging society have taken an approach of social participation, a health promotion, community living, care prevention, etc. The role of barrier-free environmental management is much more important for these policies. It will be overcoming various restrictions and condition and it will make barrier-free environment in many areas. There are national standard and guidelines to promote barrier-free facilities in recent years. However, there are also some problems. It is introduced user participation structure in Transportation Accessibility Improvement Law, but the method of this system is not clear. Moreover, although many barrier-free devices are developed in each enterprise, it is not decided about most effective planning. In this presentation, it is introduced about the activity and the future perspective of the accessible environment in Japan.

2 Aging Society and accessible environment

In Japan, the total amount of population starts to decrease in last year, and aging population is rapidly increasing. It is estimated that one third of population will be occupied 65 or older people in 2025, and it must change a social scheme in the near future (Fig.1). It is possible that “fine elderly people makes a fine aging society” as one of the solution of this problem. Therefore, it is necessary to remove social and a physical barrier in a fine aging society, and to build the universal accessible environment which included elderly and disabled people with various needs. For the social participation of elderly people and a disabled person, it is necessary to consider for infrastructure provider as following:

1) Production of environment which increases capability and achievement as an individual,

2) Projects and practice for care-preventing, isolation-preventing and connecting with community,

3) Barrier-free of physical, social system and discrimination,

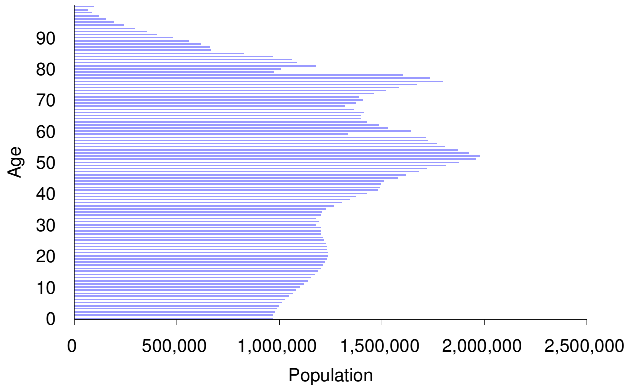
4) the principle of normalization, barrier-free, universal design and its practice,

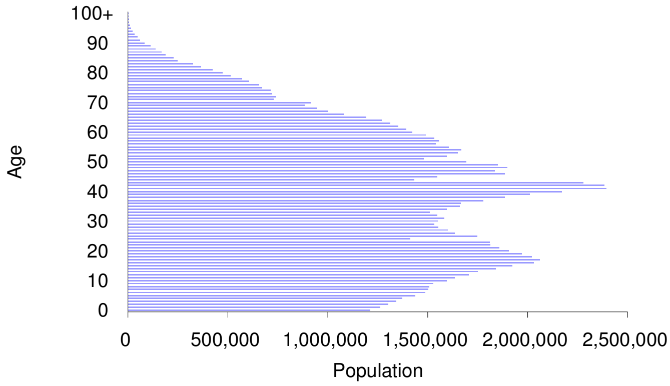
5) Development of Contents and devices for information disabilities,

6) To secure of elderly people's mobility (including driving own car and their traffic safety),

7) A strategy of transport planning for elderly and disabled persons in suburban or rural area.

Figure.1 Change of Population in Japan (2025: Left, 1990: Right) [Data Source: National Institute of Population and Social Security Research (2002)]





3 Transportation Accessibility Improvement Law

Enforcement of Transportation Accessibility Improvement Law in 2000 was the one of an opportunity. This law features to make it accessible under considering a pedestrian network to a station and the surrounding area (target year 2010), to make up a planning by user participation, and it is require that local government carries out adjustment with various transport providers. It was carried out the revised law in 2006. And it is created making the further user participation, built of a gradual and continuous spiral-up system, and city parks, buildings, and its circumference road into accessible as a new plan, and it is standardized not only a bus but the taxi. The characteristics of this law in 2000 as below;

1) To make a barrier-free basic plan targeting a railroad station and its surrounding area (as important maintenance area)

2) Local government (cities) draw up a barrier-free basic plan and their business plan

3) Each local government creates in cooperation with residents or transportation providers. Consequently, it is created 255 master plans (2006). And it is expanded concept in revised law in 2006;

1) A previous law and a accessible building law are integrated

2) It is extended a frame of disabilities

3) It is consider about the standard of an accessible taxi

4) An object area is a railroad station, vehicles, a road, a parking lot, a park, a public building and its surround

5) Promoting the participation from a planning stage and acceptance of a citizen proposal.

It is creating guidelines (facilities, road, park etc.) based on this law, and these guidelines is useful to manage accessible environmental. Furthermore, it is also created many industrial standards of devices which supports accessible environment (include tactless). And this law pushes the barrier-free of many Japanese regional areas, and it is predicted that the network of walking space (Fig.2) is also substantial.

4 What is good practice accessibility for all?

In Japan, there has been accumulated much knowledge about barrier-free design of an infrastructure in these seven years. It is introduced about Japanese effort and practice.

1) The essentials of barrier-free transportation

It is not only the production of physical “form”, but also is required the balance between hardware and software. It will not be able to be said to be barrier-free unless the “spiritual” of the citizen –without discrimination, with hospitality education-, even if there is an effective improvement in the hardware. While it is changed the technical level which responds to the needs of barrier-free, it is also changed with the continuous barrier-free “promotion”.

2) A plan of a road construction

It was required wide width of sidewalks (minimum 2 meter over) under the standard of Transportation Accessibility Improvement Law. The extension of a road is very hard in Japanese situation, even if wide sidewalk, it is overflowing with illegally parked bicycles. And it is claimed by users when it is hard to use also after constructing. Therefore, it is necessary to practice on a design, operation and construction.

3) A substantial barrier-free device

Since this law has been enforced, it has been changed in the barrier-free market in Japan. It is active developed with multi function toilet, platform door gate, level difference equipment, the road surface equipment and a mobility device for visually impaired persons. And they were connected to some industrial standardization (for example: a multifunctional toilet, tactiles, etc.). It is important that a system and law backed up these examples.

Figure 3: A substantial station institution

4) Structure of user participation

In Transportation Accessibility Improvement Law, it is had to be made basic plan with hearing the opinion of elderly people and a disabled person. Although continuous check system by users is not built in the present system, it is important to be barrier-free by user participation. There are width of disabilities and various ‘awareness’, it was actually evaluated by the relevant. It is expected that a collaborated type design with a citizen and administration will be brewed by this law. It is important the reservation of the active advisory user and a specialist from now on.

Figure 3: Town Watching and Workshop with citizens

5) Development and practical use of ICT technology

Various ICT technology systems are developing in Japan. There are some which were applied to barrier-free in a part of researches. Moreover, the barrier-free information on a station is released on a web, and there is also provided to the user. There are some leading projects about the mobility supporting system for elderly and physically handicapped persons. It is expected further application.

Figure 4: ICT Leading Project (MLIT, Japan)

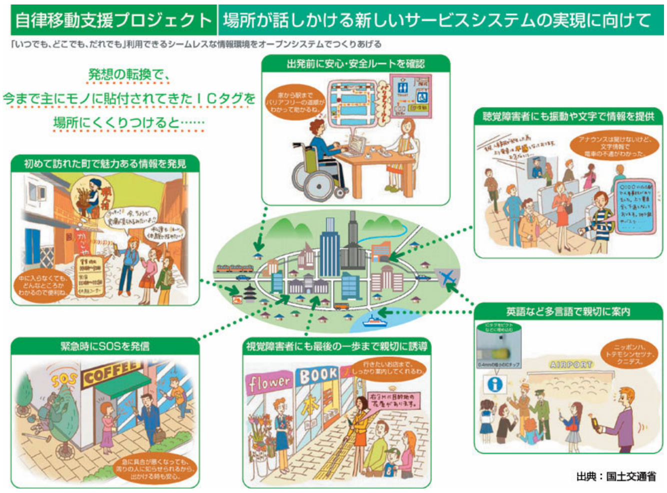
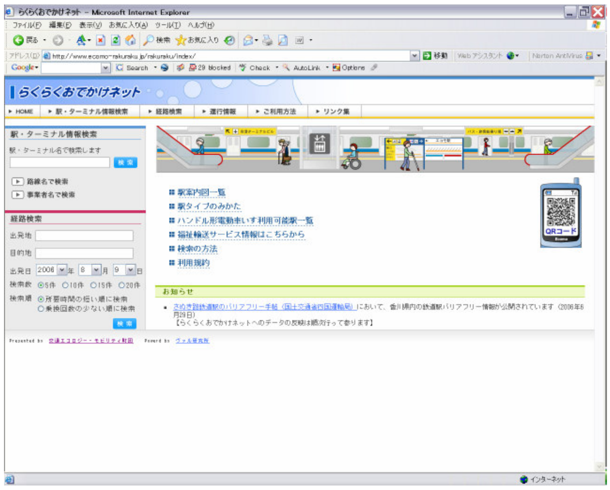


Figure 5: Going outinformation on WEB (EcoMo Foundation)



The followings subjects are below:

1) In Japan, the timing and the production of user participation are still finished, and it is needed to build technical, special, and a continuous organization.

2) Devices of visually impairment persons were diversified, and it had been difficult to select these equipments well-suited. On the other hand, there is a case that a local governor's person is not known the information about various devices.

3) Although the taxi system and bus system which complement a railroad are substantial in the city area, they are destructive in a local-area of Japan. It is necessary to carry out the breakthrough of these subjects from now on, it must be concentrated many people's wisdom and needs, and it must convert into “mobility for all” from “accessibility for all”. Therefore, it is necessary to edit various examples as good practice in Japan as further information.

5 In the future – new demand will be called more accessible environment

Now, the mobility restricted people can go out more safely and certainly by barrier-free. It will be connected to social participation and exchange of elderly people and a disabled person, and it will become the element which makes an active aging society in Japan. However, these activities still started. It is required for the system which builds accessible barrier-free environment. On the other hands, it has the production of new environment corresponding to new needs. Man can make the next demand, if one thing can be achieved. We have to accept also to cultural activity- for example, corresponding with tourism or playing a sport-. Although various disabilities make various needs, it is required to build the environment where it can respond to a new demand and accept to it.

Buildings – Barrierfree Accessibility and Movement in Buildings and Interfaces in Transport System

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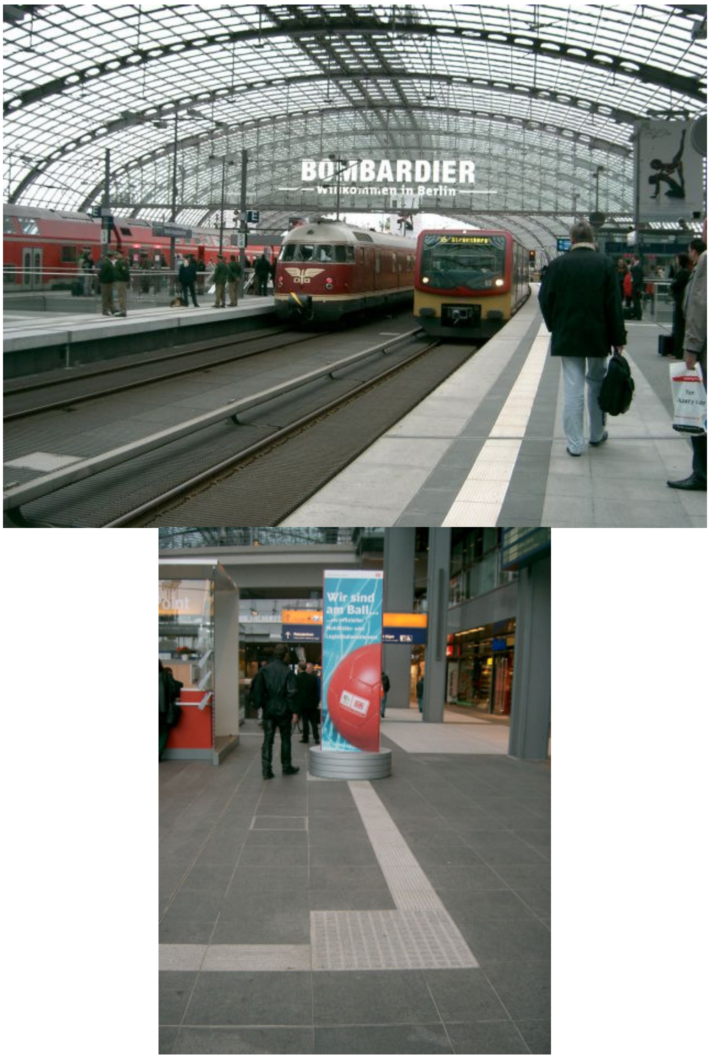
In society a contradiction exists concerning disabled persons. On the one hand, people with disabilities are supposed to be accepted as equals. On the other hand, they are disadvantaged and discriminated by people's behaviour and barriers in daily life. Many handicapped complain: "It’s not we who are disabled, but rather the environment disables us.". The federal law Behindertengleichstellungsgesetz (BGG) as reaction to frequent discriminations of these people became effective on 1. May 2002. This law has the goal of guaranteeing equal participation of disabled people in society and a self-determined life (§ 1 BGG). Hence it follows that an accessible environment should be provided, including a reduction of barriers of accessibility and usability of public passenger traffic. The railway station is of special importance, because it is the intersection point between different traffic systems. Motorized and non-motorized individual traffic, commuting traffic and intercity traffic are connected in these junctions. Smooth changing is important to all.

Figure. 1: Central Station Berlin.



An important aspect is the guarantee of completely accessible conveyor chains. Barriers can not be only mechanical such as steps, but also sensory and cognitive. The guiding and information system has to be without barriers as well.

The issue "accessibility" will be more important to our society, because already 12 percent of all Germans are recognized as heavily disabled[1] and the relative and absolute ageing will

[1] The absolute number of persons with disabilities is higher, because older persons with decreased ability to hear, see and move determined by age are not registered.

rise in future. Not only the above mentioned groups benefit from accessible facilities, but all people, for instance families with children or people with heavy baggage.

Beside the conveyor chain is important for a self-determined life for all:

- Accessible environment near the flat
- Healthy living conditions
- Mobility also with transport systems like bus, subway
- Accessible interfaces
- Social inclusion and participation

Figure 2: Accessible Environment.

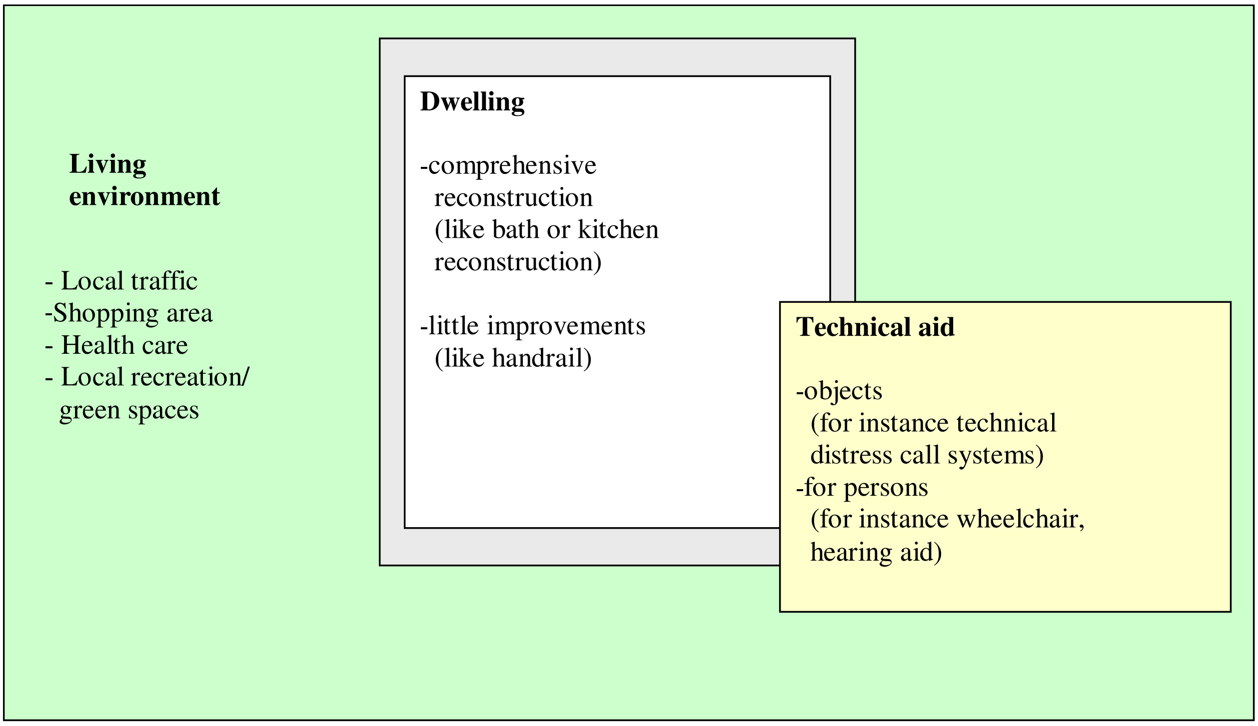


Figure 3: Ramp in Brück, a settlement in Brandenburg, Germany.

Refering to the fotos: Good technical standard is not all! More important is the comprehensive view! Don't follow blindly roles and norms, but think and be sensitive about the needs of the disabled persons.