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This issue of World Transport Policy and Practice marks the migration of the journal and its associated web site to a new location. The new web site address is:

<http://worldtransportjournal.com>

The new site will also contain information from our US partners, Transportation Choices for Sustainable Communities Research & Policy Institute and occasional announcements about new books and resources that will assist the global community seeking to accelerate the transition to a genuinely sustainable transport future. This transition is now more urgently needed than ever and future issues of the journal will try very hard to communicate the urgency and practicality of this transition to those who make the decisions.

It is now abundantly clear that a world locked into non-sustainable transport (the current paradigm) is unaffordable in cash terms, unethical and directly contrary to public health and climate change policy objectives. Recent developments in the UK with over £15 billion allocated to new road building projects, £16 billion to "Crossrail", a major London east-west rail project and up to £70 billion for HS2 and HS3 (high speed rail projects) make the very eloquent point that moving large numbers of people around very fast and over very long distances is expensive and unaffordable and ultimately self-defeating. The ethics of transport policy globally are seriously faulty with over 3000 people dying on the roads every day and millions suffering death and disease as a result of air pollution.

The journal will continue to point out the detail of what can be done to "right the wrong" of non-sustainable transport and shift the whole trajectory of spending, policy and priorities in an ethical and sustainable direction but this this will need a much bigger effort on our part to communicate the importance of the three zeros. Unless and until we achieve zero deaths and serious injuries in the road traffic environment, zero carbon and zero air pollution, we will not solve the problem. The whole superstructure and dialogue around electric vehicles, driverless vehicles, high speed rail, new roads and airport expansion

is wrong-headed and has to be replaced by the three zeros.

We have already shown how zero carbon land transport can be achieved (Vallack et al, 2014). We have shown how the Swedish Vision Zero road safety policy can be generalised and widely implemented (Haq and Whitelegg, 2014) and we have shown through numerous articles on walking and cycling how it is possible to remove a substantial proportion of health damaging air pollution from our cities by prioritising accessibility and human powered mobility.

We have not yet shown how it is possible to change mind-sets and overthrow paradigms and we invite as many authors, politicians, decision-takers and social innovators to submit ideas and assessments of how we could go about releasing the virtuous virus of social change.

We are aware of two things that have significant potential to bring about a paradigm shift. The first is the new English translation of a book originally published in German by Helmut Holzapfel. The English translation is "Urbanism and Transport. Building blocks for Architects and City and Transport Planners" and it is published by Routledge in 2015 (ISBN 978-1-138-79818-2). In this book Holzapfel ranges over a huge landscape of history, geography, politics, architecture, transport planning and sociology to point out that a city can function very well indeed with many positive benefits at much lower levels of traffic and traffic speed and with much more social life centred on the street. He says on page 98 "a new beginning must be made with the street". He shows how people-centred geometries can deliver 30% less automobiles and requires "no limitations, artificial measures or reconstruction of streets". Speed reduction and pedestrian friendly measures are "fully sufficient to achieve this effect". Holzapfel links all this to greater equality, the lack of importance of the longer distance trip and the over-riding importance of the locality where people actually live. He argues for the end of "chopping up cities with expressway systems and bypasses".

This is a remarkable contribution to a debate that is often technocratic and dominated by traffic engineers and Holzapfel very successfully shows that a much better city is on offer; it is cheaper to run, more equal and more diverse with more social interaction and we can rediscover this spirit and purpose if we focus on the street. He says:

“The city must make it possible for all its participants and inhabitants to actively take part and exchange with one another. This also means that special privileges, the exclusion of certain persons or groups, or the payment of fees for the use of public spaces are not effective measures; rather they are precisely the opposite, producing only an appearance of urbanity”.

Holzapfel’s insights will surprise and alarm some readers but this is an intrinsic part of paradigm shift. He argues that growth figures for increased use of public transport “can therefore not be viewed entirely positively”. If the volume of public transport trips is only increasing because people cannot organise their daily lives without travelling more, this is not a favourable development”. This is correct and links strongly to the enormous costs associated with rail projects, metro schemes and tram routes that are not organised around locally intensive interactions.

Holzapfel describes the “French Quarter” in Tübingen as a very good example of how cities can function effectively for the benefit of everyone. Only 10% of the trips from home are by car, 47% are by bike, 31% on foot and 13% by bus. This is a desirable place to live and it is not alone. In the pages of this journal we have frequently carried material on Freiburg-im-Breisgau, also in Germany, and its overwhelmingly attractive urban character as a place that attracts people and rewards those who already live there.

Holzapfel shows that a paradigm shift is possible, desirable and has already started and that is a hugely helpful contribution to the task of accelerating a more general system change. His final sentence is worth repeating as many times as possible in as many decision-taking fora as possible:

“Each new pedestrian crossing a street, each tree growing where a car was once parked, each place where children can once again play safely on a city street

is important- more important to be sure than any new air connection from New York to Rome or elsewhere”

Holzapfel’s insights and messages are clear, direct and linked to things we can do to improve urban living way beyond the technocratic imagination. This now needs to be linked to a broadly based, social movement to deliver the Swedish Vision Zero road safety policy. It is an abomination that the world largely accepts over 3000 dead citizens every day because of some perverse relationship between metal, mass, speed, energy and the ability of human beings to cope with massive force. We should accept nothing less than an absolute commitment to zero deaths and zero serious injuries in the road traffic environment and do everything possible to “get there” even if “getting there” appears difficult or “unrealistic”.

A new national campaign group has been launched in the UK to bring about widespread acceptance of Vision Zero. It is new and still formulating its strategy but it exists and it will link with cities, communities, interest groups and others to inject a strong ethical dimension into the jaded world of road safety. A zero death world reinforces Holzapfel’s vision of a kind of new urbanism and feeds intensive social interaction and Tübingen levels of modal split and engages with a wider public. Vision Zero has instinctive appeal to ordinary citizens going about an ordinary life in a city. Citizens can get behind the Vision Zero concept and put pressure on decision takers at the same time as professionals get behind the new urbanism described by Holzapfel and a twin track approach to transformation is always better than a one track approach.

A wider and deeper commitment to paradigm shift and social change requires the intellectual power and simplicity of the Holzapfel analysis linked to a wider engagement with citizens and the ways citizens can shape a desirable future. Vision Zero is far more than a newish road safety intervention. It is a totally different approach to the world in which we all live and one that can be grasped immediately by both genders and all age groups. Given a choice between a world with a high risk of death and injury and an unpleasant pedestrian environment on the one hand and

a world organised around Vision Zero how many citizens will opt for the dirty, dangerous, unpleasant option?

The UK Vision Zero campaign welcomes questions, comments and expressions of support and these can be sent to:

[johnwhitelegg@phonecoop.coop](mailto:johnwhitelegg@phonecoop.coop)

This issue of the journal returns to some familiar themes all of which require constant reinforcement to produce an overwhelmingly strong evidence base in favour of the alternative paradigm we are advocating.

Dennis and Pullen draw attention to an important subject we have touched on in previous issues which is the strong link between transport, health and accessibility especially for emergency medical care in Africa South of the Sahara (SSA). Gao, Kenworthy and Newman deal with the Chinese car manufacturing industry, Honorato on a human rights approach to road safety and Julia King and her colleagues focus on disability and road safety in developing countries. Finally Melia deals with some under-researched issues around methodology, smarter choices and modal shift.

All 5 articles make significant contributions to the urgently needed transformation of transport policy and spending so that it can become fully ethical and sustainable. The focus on road safety as a human rights issue takes accepted norms to task and explores the legal and ethical framework within which death and injury in the traffic environment should be located. The emphasis on health care in SSA and disability in developing countries very clearly demonstrate that transport is a much bigger subject that delivers or does not deliver high quality ethical standards in the way people live and do not cope with the many disbenefits of traditional transport policy.

The Gao article on China gives a much fuller picture than hitherto available on the ways in which car manufacturing has come to dominate a wide range of economic, social and environmental policy areas in that country. There are also signs of a more balanced approach to controlling car ownership and use in that country and these reveal lessons for European and North America.

Melia tackles a methodological problem that is of much wider relevance than sustainable transport. We have covered smarter choices and modal change in other issues of this journal but Melia's insights give us a strong methodological framework for intervening in these areas in the future.

John Whitelegg  
Editor

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**Improving Access to Emergency Healthcare in Sub Saharan Africa**

*RA Dennis, K R Pullen*

**Abstract:**

Lack of affordable transport is a major constraint on access to emergency health-care in rural areas of Sub Saharan Africa and one of the main barriers to achieving Millennium Development Goals 4 and 5 in these countries. Conventional ambulances are expensive to acquire and operate and this paper argues that there is a strong case for introducing lower-cost versions. The paper describes the successful trials of a motorcycle-ambulance trailer (MAT) in Zambia and discusses the implications of the findings in regard to setting up an emergency transport service based on low-cost ambulances.

**Keywords:** Emergency transport service; rural Africa; motorcycle ambulance-trailer; performance data; operating costs; sustainability

**A Human rights Approach to Road Safety**

*Cássio Mattos Honorato*

**Abstract:**

This paper explores the nature of Road Safety and its juridical value based on a Human Right approach. As a right and a duty of all individuals and States, Road Safety constitutes a Human Right of Second Dimension. This dimension relates to actions that need to be acknowledged and incorporated into national constitutions as an instrument of protecting life, respecting the fundamental rights related to the social and collective use of the roads, and increasing freedom from fear of road danger.

**Keywords:** Human Rights; Road Traffic Law; Road Safety; Drink-Driving Crimes; Decade of Action for Road Safety; Road Traffic Injuries.

**Growth of a Giant: A Historical and Current Perspective on the Chinese Automobile Industry**

*Yuan Gao, Jeffrey Kenworthy and Peter Newman*

**Abstract:**

The automobile industry in China has marched into its 5th decade since 1956 and in 2009 surpassed the USA as the giant of global automobile production and consumption. Rapidly increasing motorization in China exerts unprecedented economic, social and environmental effects at home and abroad. This paper aims to provide a synoptic overview of the Chinese automobile industry, classifying it into four distinct phases, which are characterized by the prevailing institutional environments. These are the Start-up Phase from 1956 to 1978, Growing Phase from 1979 to 2001, Prosperity Phase from 2002 to 2010 and finally the Stationary Phase from 2011 until the present day. It analyses China's national political, economic, trade, international relations and other factors and how these affected the development of the overall Chinese automobile industry, with a specific emphasis on the formulated and applied automobile industry policies. The dramatic growth in the automobile industry currently faces a potential period of decline as China's latest industrial policies focus on alleviating the ownership and use of private vehicles, especially in its major cities due to severe congestion and other impacts. Thus China has entered an era similar to other developed nations and cities, though it has made such economic changes at a speed and scale unparalleled in history.

**Keywords:** Automobile Industry; Industrial Policy; New China; Open-up and Reform Policy; WTO; Private Vehicle Ownership and Use; Transportation Demand Management (TDM); Urban Public Transport (UPT).

## **Disability Due to Road Traffic Crashes and the Management of Road Safety in Developing Countries**

*Julie A. King, Mark J. King, Sara A. Hair*

### **Abstract:**

Injury as a result of road traffic crashes is one of the most significant public health problems in developing countries. It intersects with disability as a development issue because a substantial proportion of people injured in road traffic crashes experience disability, both short term and long term. While there have been significant steps towards better management of road safety globally, especially in developing countries, the implications for road safety policy and practice of disability due road traffic crashes is not fully appreciated. In particular, qualitative information on the lived experience people with a long term disability as a result of a road traffic crash can inform better road safety policy and practice, as demonstrated in a case study from Thailand. The benefits of better policies and practices are likely to accrue to a wide range of road users, and to contribute to the achievement of sustainable development.

**Keywords:** Disability; Road safety; Developing countries; Management; Lived experience; Road traffic crash.

## **Randomised Controlled Trials, Evidence Hierarchies and Smarter Choices**

*Steve Melia*

### **Abstract:**

A growing body of literature aimed at policymakers as well as researchers criticises the quality of much transport research and advocates a methodological hierarchy with randomised controlled trials at the top as the solution. This article critically analyses the justification for such hierarchies, in the context of voluntary travel behaviour change programmes, whose effectiveness has been called into question. It proposes 5 criteria for the valid application of experimental methods, which suggest that such methods are only relevant to a limited range of transport research questions. It finds no valid justification for a methodological hierarchy and concludes that attempting to apply such a hierarchy

would generate misleading advice for policy makers.

**Keywords:** Randomised controlled trials; Voluntary travel behaviour change; Smarter choices; Modal shift; Methodological hierarchies.

## Improving Access to Emergency Healthcare in Sub Saharan Africa

RA Dennis, K R Pullen

### 1. Introduction

Two key goals in improving health care in developing countries are reducing maternal and new-borne mortality rates (MDGs 5 and 4 respectively). A number of publications over the past few years have reviewed methods for achieving this and progress made (for example References 1 to 6). The general conclusion is that good progress has been made in some regions but it is still very slow in sub-Saharan Africa where much more needs to be done. There is also general agreement that the priority aim to achieve these goals is to increase the number of births which take place with a skilled birth attendant (SBA) present. In general this requires attendance at a clinic with basic EMOC (Emergency Obstetric Care) facilities. The literature identifies three main barriers to this, based on the 'three delays model' (Thaddeus & Main, 1994), as summarised in Table 1.

Barrier	Factors
1 Decision of prospective mothers to attend	Husband and family influences; family commitments and time away from family; traditional beliefs; getting to the clinic; perceived effectiveness of treatment; having a carer to travel with them
2 Access to clinic	Distance; accessibility of roads and tracks; availability of suitable and affordable transport
3 Effectiveness of treatment	Trained staff ; necessary equipment and medicines; attitudes of staff; cost of treatment

**Table 1: Barriers to attendance at healthcare facility**

The availability of appropriate and affordable transport is therefore an essential component in efforts to reduce maternity and new-borne mortality not only in improving access to health facilities but also in encouraging prospective mothers to attend by making travel more convenient, timely and comfortable. It is likely that this would also be of general benefit to rural communities in improving access to health facilities for all emergency illnesses and accidents.

Conventional ambulances such as the Toyota Landcruiser are costly to purchase and operate. There is a great need for more

affordable emergency transport services (ETS) and there have been a number of innovations to provide low-cost options. These include bicycle ambulances ( Forster et al, 2009), the e-Ranger motorcycle-sidecar ambulance ( Hofman et al, 2008) and contracts with transport service operators ( Mwebaze et al, 2013 and Silva, 2011). All have provided a useful service but little information is available yet on their long-term sustainability.

Options for low-cost ambulances have been discussed by Krasovec (Krasovec, 2004) who suggests that they need to provide the following features:

- A significant reduction in travel time to healthcare
- Satisfy cultural concerns about privacy
- Provide capacity to carry a carer or guardian to accompany the patient

He suggests that some form of motorised transport is most likely to be acceptable and effective. He also suggests that since most obstetric emergencies occur in the home the priority role of ambulanc-

es should be to collect patients from the home to the first level of healthcare.

Motorcycles are the fastest growing form of motorised transport in Sub Saharan Africa and have played a significant role in improving rural mobility in some countries through 'boda-boda' services in which one or two passengers are carried on the pillion seat. However, there are concerns for comfort and safety for less physically able passengers such as pregnant women, the seriously ill or disabled and the elderly (Amleset Tewodros, 2014). It is therefore considered there is a considerable potential for motorcycle-based vehicles that im-



prove comfort, carrying capacity and safety. This paper describes the development and trials of a motorcycle ambulance-trailer (MAT) that meets these criteria.

## 2. Design and development of a MAT

The following specifications were considered for a low-cost ambulance:

- To carry a patient on a stretcher in a reclined or semi-reclined position and also a carer to look after the patient
- To be able to transport the patient to a health facility within 2 hours
- To provide a comfortable and convenient ride on typical rural earth roads

The need to carry a carer prompted the choice of a trailer-ambulance rather than the more widely used sidecar. Although there has been little use of trailers with motorcycles, they are quite widely used in a few countries such as Cambodia and Vietnam for carrying people and goods and this provided the backing for their choice as an ambulance. Initial testing to investigate the effects of the trailer on control of the motorcycle indicated that the best position for the hitch was directly above the rear axle and that braking of the trailer was desirable. A prototype, see Figure 1, was

then trialled in a project in Mtwara, Tanzania, transporting emergency patients from a rural clinic to Mtwara hospital, a distance of 48km (IT Transport, 2001). The prototype was also used as a general transport service to subsidise the ambulance service, carrying up to 6 people and their goods. It completed over 10,000km over a period of 9 months without any safety problems.

The performance of the MAT concept having showed considerable promise, an improved version was developed by Developing Technologies, see Figure 2, and two prototypes have been extensively tested in Lundazi District, Eastern Province, Zambia, within the Africa Community Access Programme ([www.afcap.org](http://www.afcap.org)). The two prototypes were locally manufactured in Lusaka by the Disacare Wheelchair Centre. The main features of this prototype are:

- Wheels from a small car with leaf-spring suspension
- Removeable lightweight stretcher
- Seating for up to two carers
- Automatic braking through a pivoting hitch pin
- Ball and socket hitch directly above rear axle.



**Figure 1: Prototype MAT in Mtwara, Tanzania**



**Figure 2: Improved MAT tested in Zambia**

One MAT was towed by a Honda XR125 and the other a Yamaha AG200 to assess the effect of motorcycle power and weight on towing performance. The Honda in fact proved very adequate in towing the MAT. Ideally an “agricultural” type motorcycle with low speed and high traction torque is needed with a capacity of 125 to 200cc.

### 3. Trials of MAT in Zambia

#### 3.1 Organisation of the trials

Following discussions with a number of health authorities it was decided to locate the trials in Lundazi District where there was a particular need to improve access to health facilities to complement other mother-care programmes. The District Health Authority was keen to collaborate and located the MAT at two clinics, Mwase-Lundazi and Kanyanga (see map in Figure 3). These are first level centres for maternity patients with basic obstetric care serving their own catchment areas plus a number of Health Centres and referring more serious emergencies to the district hospital. Details are shown in Table 2.

Mwase-Lundazi clinic was already served by 3 Landcruiser ambulances, 2 old and 1 new, and Kanyanga clinic by 2 Landcruisers, both old. These were used pri-

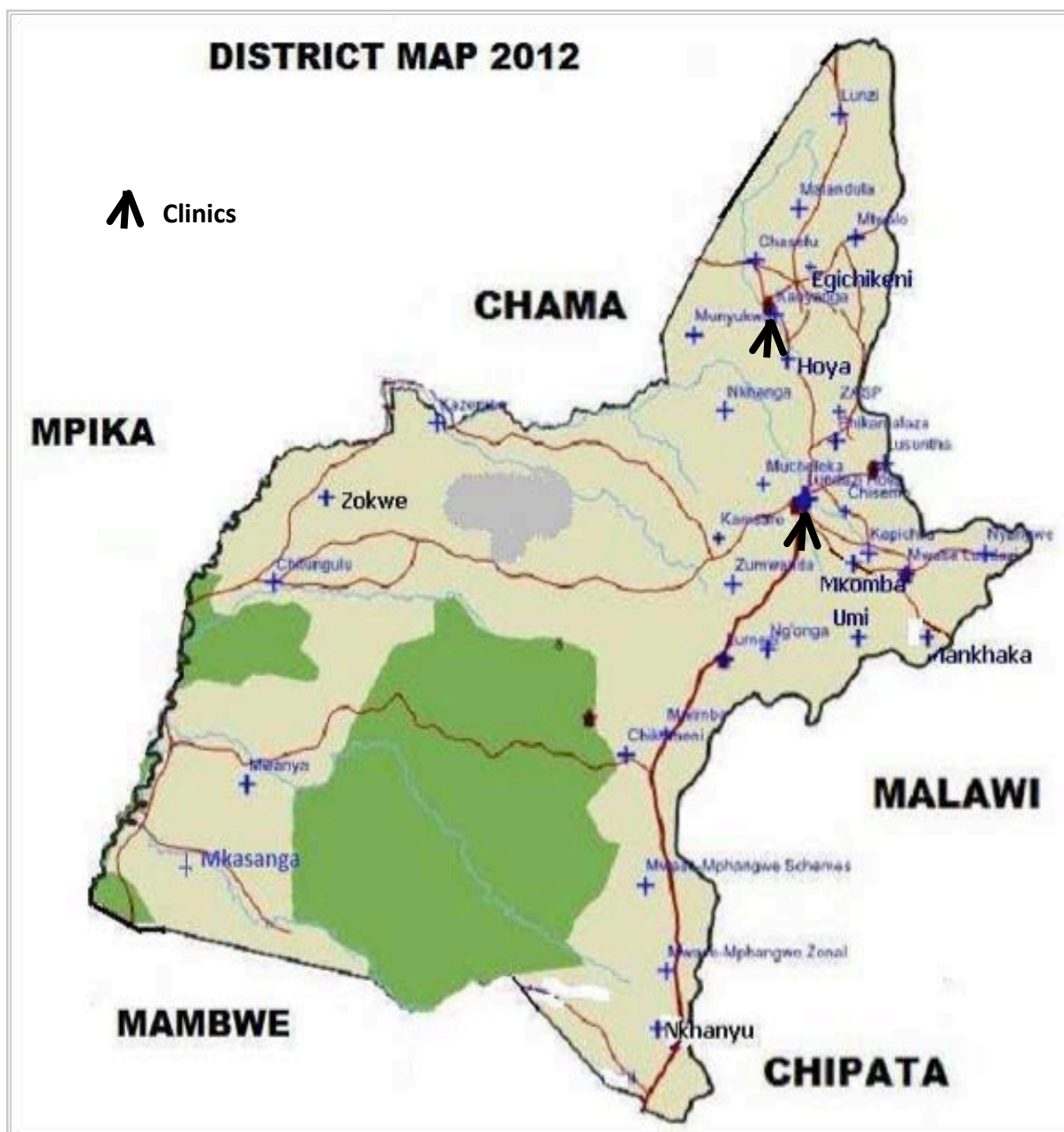
marily for transferring referred patients to the district hospital. The old ambulances were unreliable and often out of service. The MATs were placed with the clinics who decided how they could be most effectively used to benefit their health services. In Mwase-Lundazi it was decided that it would be used primarily to collect emergency patients from villages in their catchment area, whilst in Kanyanga it was decided that their MAT would be used to collect emergency patients from both villages and also HCs. Both clinics served villages over an average radius of around 8km and up to a maximum distance of around 20km. The distance of HCs from Kanyanga clinic ranged from 10 to 20km.

The MAT operators were selected by the clinics from their staff, two at each clinic to provide a 24 hour service. The operators had other duties but operating the MAT was their first priority and they were required to be able to answer a call within 20 minutes. They were given a one week training course in good riding habits, preventative maintenance and handling of the MAT by Riders for Health, Zambia, an NGO specialising in rider training, and provided with protective clothing. Riders for Health was also contracted to provide technical support to the trials, organising fuel sup-

Clinic	Catchment population	Health Centres served	Population served by HCs	Distance to district hospital, km
Mwase-Lundazi	19,124	5 (1)	26,994	31
Kanyanga	13,946	7	59,096	35

**Table 2: Details of clinics where MAT were located**

Note 1: these HCs in fact generally referred emergency patients directly to the district hospital as facilities at the clinic were little better than at the HCs.



**Figure 3: Map of Lundazi District**

ply and providing maintenance and repair as required. This worked very effectively with minimal downtime of the MATs allowing the maximum output from the trials.

### 3.2 Results from trials

Table 3 shows a summary of emergency trips made by the MATs over 16 months of the funded trials. Since the end of the project in December 2013 they have continued to be operated by the clinics with government funding at an average level of 25 trips per month at Mwase-Lundazi and

about half this at Kanyanga. All trips were classified as 'emergency' but unfortunately further details were not collected, and all patients were accompanied by at least one carer. The most heavily used MAT, that at Mwase-Lundazi, collected patients from over 50 villages.

Total trips	Total km	% Trips for various medical conditions			
		Maternity	Malaria	Other	Accident
383	15,500	65.7	18.5	15.0	0.8

**Table 3: Summary of MAT trips**

### 3.3 Assessment of MAT performance

The trials were accompanied by an extensive monitoring programme which included - a logbook of trips for each MAT; monitoring of other ambulance services in the district, namely bicycle ambulances and Landcruisers; data on attendances and referrals at the clinics and a selection of HCs; and collection of feedback from key informants and MAT users on the impact of the MATs. The findings are summarised in the following sections.

#### 3.3.1 Control, safety

The operators reported that it took a few trips to get used to the handling of the motorcycle with the MAT attached but once they had this experience they were comfortable with the towing of the MAT. The main issue was the extra strain on the arms which limited comfortable continuous operation to about one hour. The main risks tend to be for the rider which encourages responsible operation and no safety issues were reported in over 15,000km of operation.

#### 3.3.2 Accessibility

Lundazi district is fairly flat with few significant hills. The rural roads are earth and gravel of varying quality. The trials were run over both dry and wet seasons with no significant difference in the number of trips per month. The main problem found

with accessibility of the MAT was skidding due to lack of grip on very wet and also sandy roads. This limited access on a few roads particularly in the wet season but where this occurred the operator made arrangements for the patient to be collected from the nearest accessible location so no cases were reported where patients could not be collected.

#### 3.3.3 Timeliness of service

Figure 4 shows the relationship between the distance to the village and the time from receiving a request call for the MAT to reach the patient and also to deliver the patient at the clinic. This shows that the MATs generally met the target of getting the patient to medical care within 2 hours up to distances of 20km from the clinics. The average trip velocity is around 25km/hr.

#### 3.3.4 Impact on access to healthcare

Figure 5 shows records of attendance at clinics and a selection of HCs in Lundazi district over a 9 month period. At both clinics monthly attendance for non-maternity cases is many times higher than MAT trips and transport would be primarily by walking, bicycle or ox-cart. It is clear that in this area the main impact of the MAT would be in getting critical emergency cases that are too sick to travel by the above means to healthcare in time for effective

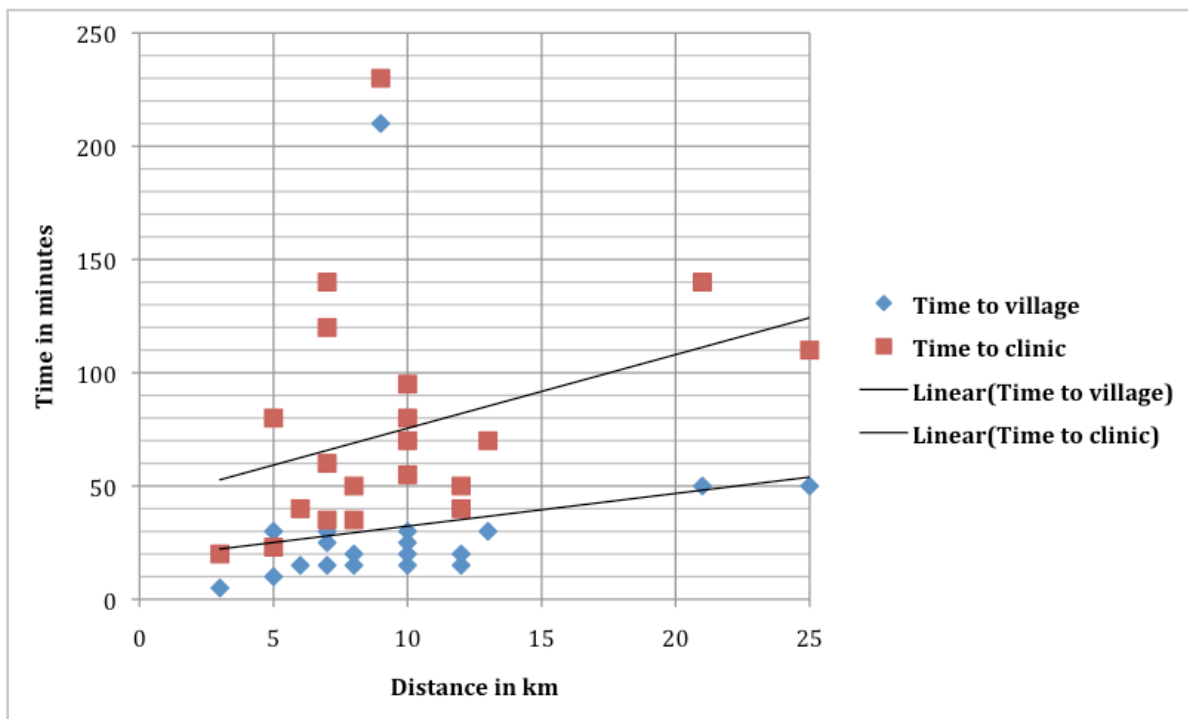
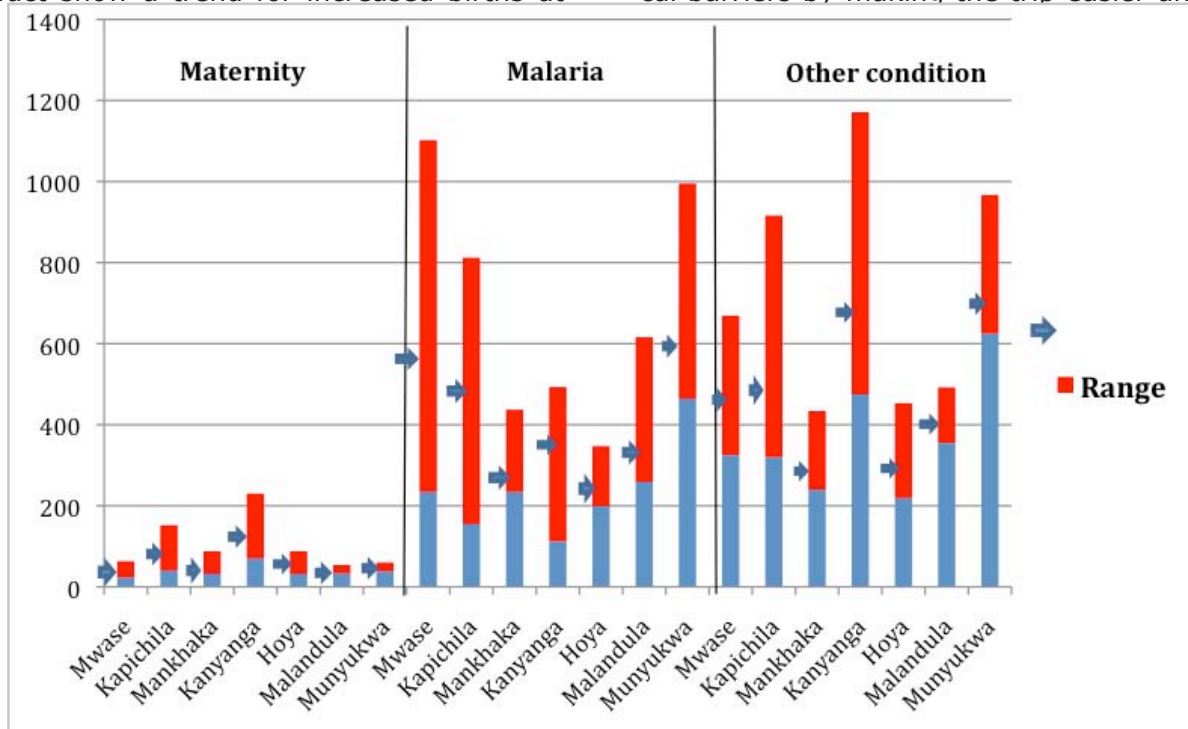


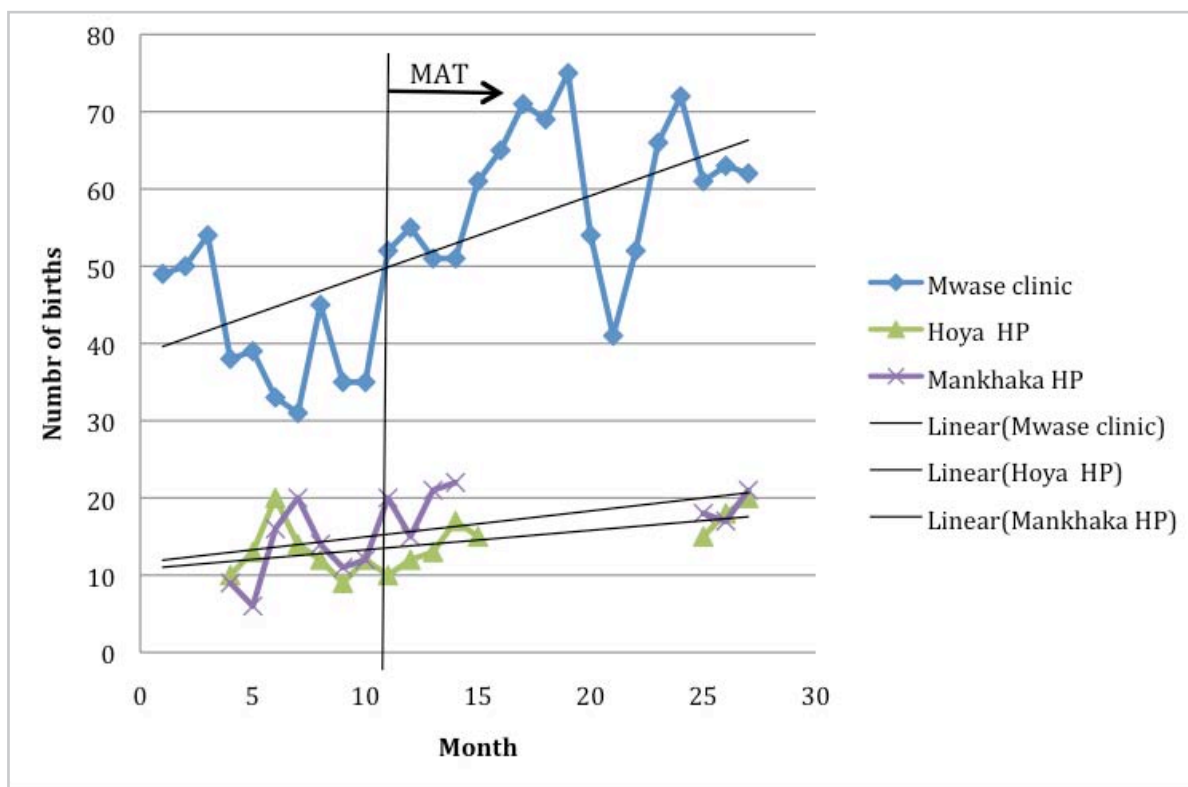
Figure 4: Timeliness of MAT service

treatment and therefore in saving lives. However, at Mwase-Lundazi clinic MAT trips are a significant proportion, around 40%, of maternity attendance and might therefore be expected to show some impact of the MAT on attendance. Figure 6, which shows births at the clinic, does in fact show a trend for increased births at

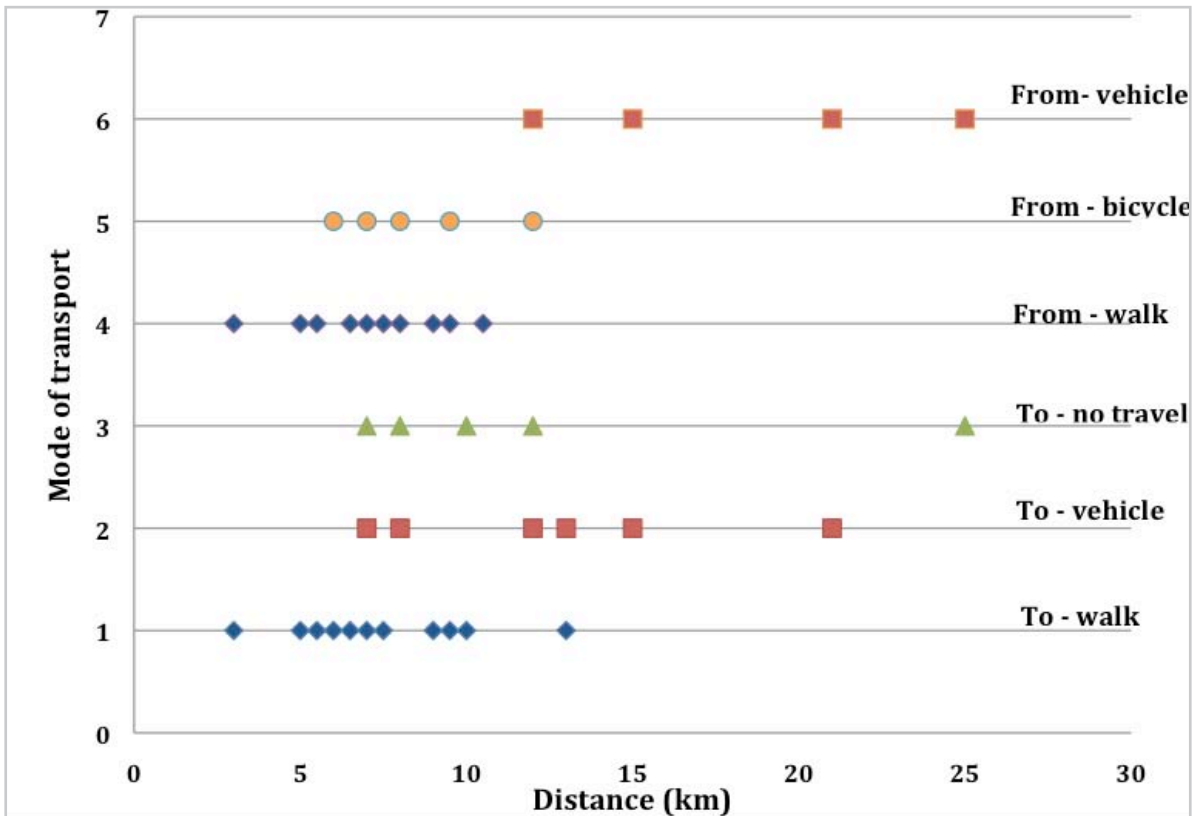
the clinic since the introduction of the MAT compared to other health facilities, clearly indicating an impact on increasing access to the clinic. It seems likely that the MATs have not only reduced the physical barrier to attending the clinics by providing convenient transport, but also the psychological barriers by making the trip easier and



**Figure 5: Average monthly attendance at clinics and HCs**



**Figure 6: Impact of MAT on monthly births at Mwase-Lundazi clinic**



**Figure 7: Modes of travel to the clinic without the availability of the MAT**

less of a burden.

Some indication of people's views on travel to the clinic is provided in Figure 7 which shows two sets of data from interviews with MAT users:

- Lines 1,2,3 show replies to a question would they have travelled to the clinic if the MAT was not available and the mode of transport they would have used
- Lines 4,5,6 show the mode of transport used for the return journey from the clinic to their home when they had to find their own transport

This data is for maternity cases and suggests that women are prepared to walk up to around 8km but above this will consider using a vehicle or not travelling to the clinic. The vehicle cost was reported as around \$3 for a bus and up to \$5 for a taxi or oxcart.

### 3.3.5 Feed-back from medical staff and MAT users

The introduction of the MATs has been welcomed by both medical staff and users as indicated in the feed-back in boxes 1 to 4 below.

#### **BOX 1: Clinic in-charge– Mwase-Lundazi**

*'The coming of the MAT to the selected clinics has cheered many especially the medical staff. This is because of transport challenges the health care system has for a long time been facing.*

*We have not experienced any problems with it except for the stretcher which was not very tight and caused some discomfort to patients. That had been sorted out .We thought of inserting a mattress which was more comfortable.*

*The other thing is some of our roads are narrow and during the rainy season they become impassable by the MAT.*

*At night, we are particularly concerned with the security of the operator and theft of bike when going to collect the patients. We thought it were possible to hiring a security personnel to ensure the security of both the MAT and the operator.'*

*'When going to collect a maternal case, it is advisable to be accompanied by a qualified staff just in case of abnormality.'*

### **BOX 2: Sister-in-charge, Kanyanga clinic**

*'It was on when we received a call from Chasefu that there was an anaemic emergency. The MAT without wasting time was on its way. The condition of the patient was critical as the blood level was only 3grams. Quickly the MAT started off for Lundazi and met the ambulance on the way which carried the patient to the hospital. Had it not been for the MAT, life would have been lost'*

### **BOX 3: Maternity patient**

*'I live at Chilola village (6km from clinic) in Mwase chiefdom. I want to share with you how the MAT rescued my life. My labour pains started during the day but for unknown reasons, I was delayed to be taken to the clinic. At about mid-night my condition grew worse. My husband looked for transport but could not find it. I could not sit on the bicycle. When the condition grew from bad to worse, one of my in-law went to the nearby village to get the contact number for the MAT operator. The next thing I saw was that I was in the labour room where I was assisted to deliver by trained medical personnel.'*

### **BOX 4: Malaria patient**

*'I was unconscious was taken to clinic. It was the following day when I was told what had happened. This service has saved my life. At the time I was referred, my wife was already in tears. Today here I am testifying the critical role the MAT is playing. I wish to urge the service providers to continue delivering this saving life service'.*

A total of 24 users were interviewed. All commented that the service was simple to request (see below), arrived quickly and that the trip was comfortable. Many also commented that a major advantage was that the service was free. The Government of Zambia has decreed that all medical care should be free and therefore it was not considered possible to test out how the imposition of a user fee would affect usage. This is a crucial issue for long-term sustainability since government health services will generally have limited funds, particularly for ETS, and therefore some level of support may be needed. In Lundazi the clinics are continuing to operate the MATs supplying fuel and operators. However, it is not clear if support extends to maintenance and repairs if the MATs break down and it is often these factors which are the main barriers to introducing innovations on a sustainable basis.

### **3.4 Communication**

Efficient communication is an essential component of an effective emergency transport system when the ambulance is centrally located. Although radios are still in use, communication is increasingly by mobile phones as ownership increases rapidly in Sub Saharan Africa. A survey in 2010 (Montez, 2010) estimated that subscribers to mobile phone services in Zambia increased from around 400,000 to over

4 million in the period 2004 to 2009, and in 2009 was 34.1% of the population. This was about average for African countries, being rated at 18th out of 36 countries. Although ownership was initially concentrated in urban areas it has increased rapidly in rural areas over the past few years. It was therefore decided this would be an effective and relatively low-cost means of communication.

Different systems were investigated at the two clinics:

1. At one, calls were directed to the MAT operator who then informed clinic duty staff. This is the most direct with less risk of miscommunication and delays but requires the operator to have sufficient medical knowledge to make judgements on whether an ambulance is required.
2. At the other, calls were directed to the clinic staff who then passed on the request to the operator. This is less direct but possibly allows better judgement on the need for an ambulance.

Both systems in fact seemed to work effectively with no reports of delays or misuse of the service. As part of a sensitisation activity to introduce the MATs, health workers located in the villages were provided with the phone numbers to call for the MAT service and it seems that these numbers quickly became fairly well known

by phone owners. It was estimated that ownership was about 30 to 50 % of families with overall access up to 75% through neighbours or health workers. Montez (ibid) indicates that the situation would be similar in many other locations in Sub Saharan Africa suggesting that mobile phones will generally provide an effective means of communication for ETS.

**4. Discussion of findings in relation to design of ETS**

An ETS has to be designed to meet the local situation and conditions and the findings of this project may not match the situation in other locations. However, there are a number of common considerations for an ETS and this section discusses the findings of the project in relation to these.

**4.1 Organisation of ETS**

As funding for ETS is likely to be limited it is important to make the most cost-effective use of existing resources and those that need to be introduced to improve local healthcare. If there are already suitable vehicles in the local communities it may be possible to incorporate these in an ETS (Mwebaze et al, 2013 and A.L. Silva, 2011). If new vehicles need to be intro-

duced they need to used cost-effectively. Should they be used for transporting emergency patients from villages to the first level of healthcare, patients referred from first level to second level, or both? In Lundazi district the average total referrals was 1.3% of attendance and for maternity cases just under 2% and there were Landcruiser ambulances and also taxis that could largely cope with these transfers. It was therefore decided by the clinics that the most effective role of the MAT to improve healthcare was to collect emergency patients from the villages where the average distance to healthcare was around 8km, a severe problem for emergency patients without appropriate transport. However, the MATs were also used occasionally to transport referred patients when the Landcruisers were not available. In another project run by a partner in Malawi where the average distance to first level care was 3km, the level of referrals around 7% and the distance from clinic to referral hospital 11km with no ambulance, it was decided the most effective role of a MAT was in transporting referred patients. It is therefore important to assess the local priority need.

Where ETS are used for transport to first-

Ambulance type	Average speed km/hr	Carrying capacity	Characteristics
Landcruiser	60	At least 2 patients plus carers	Can operate on most road conditions and safer in mixed traffic. Width is a constraint for narrow tracks
Motorcycle-trailer	25	Patient + carer Carer rides in trailer and has direct contact with patient	Needs experience to build operating confidence. Difficult to operate on very sandy and wet roads where motorcycles have problems. Flexible, motorcycle is easily unhitched for other use.  Can be locally manufactured with readily available materials and used with any motorcycle
Motorcycle-sidecar	25	Patient + carer Carer rides on motorcycle pillion and has less contact with patient	More stable and easier to control than MAT but extra loading on motorcycle from sidecar may increase maintenance costs, particularly for wheels and suspension  They are an integral unit less suited to local manufacture so availability of spare parts may be a problem until numbers are large enough to support local stocking of parts
Bicycle ambulance	10	Patient only	High human effort needed restricts it to relatively flat areas. Carer travelling with patient can be a problem. Less comfortable than other options

**Table 4: Options for low-cost ambulances**



level care they may be community or facility based. Community-based provides the most direct route to care but also limits usage and level of technical support. With their low cost and simple technology bicycle ambulances are appropriate for this role in suitable areas with relatively level, firm tracks but to be cost-effective more costly motorised ambulances need to be facility-based where they can serve a larger population.

#### 4.2 Options for low-cost ambulance service

The characteristics of options that have been tried out as low-cost ambulances are presented in Table 4 and compared with a conventional Landcruiser ambulance. [3-wheeler (trikes) motorcycle ambulances are also available from China but no information has been found on the performance of these.]

Indicative costs from monitoring programmes for these options are shown in Table 5. This shows that around 10 MBA can be obtained at the same cost as a Landcruiser ambulance and running costs

are only 1/3 to 1/2 of the conventional ambulance. Since they give good access, good comfort and a reasonable speed, in many cases they will provide a more cost-effective ETS, particularly from village to clinic.

#### 4.3 Funding and sustainability of ETS

Although MBA are much cheaper to run than conventional ambulances, trip costs at around \$0.40 per km, taking into account a two-way journey and not including operator costs, would still be unaffordable to a large proportion of rural families and user-pay schemes would likely exclude many poorer families. For instance, one of the major benefits mentioned by users of the MAT service was that it was free. A MBA service covering 10,000 km per year and serving a population of around 20,000 would require operational funding of about \$2,000 per year (\$3,000 if replacement cost is included) plus operator costs. Providing this funding is the major barrier to introducing motorised ETS on a sustainable basis. Some of the options include:

*Government funded – Krasovec (Krasovec,*

Ambulance Type	Initial cost	Running costs/km				Depreciat'n/km (4)	Total operating cost/km
		Fuel used km/l	Fuel cost/km (1)	Repair and maint'ce	Total		
Landcruiser (2)	60,000	6.5	0.26	0.32	0.58	0.26	0.84
MAT with 125cc m/c (2)	5,500	28	0.06	0.12	0.18	0.08	0.26
eRanger (3)	6,000 + freight cost	17	0.10	0.17	0.27	0.08	0.35
Bicycle + ambulance (2)	700	0	0	0.016	0.016	0.16	0.18

**Table 5: Comparative costs of ambulances**

Notes

1. Based on fuel price of \$1.7/litre;
2. Costs from Zambia project
3. Cost from project in Malawi – eRanger is a sidecar ambulance produced in S Africa and there may be extra freight costs
4. This is the annual replacement cost based on 4% inflation and assuming –
  - (i) Landcruiser - 25,000km/yr and total life 300,000km
  - (ii) MAT and eRanger – 10,000km/yr and total life 80,000km
  - (iii) Bicycle ambulance – 500km/yr and total life 4000km
5. Other costs may include annual road tax and insurance (depending on Government requirements), operator costs and protective clothing for riders

2004) reports some examples of government funded ETS but with no details of long-term sustainability. Hofman (Hofman et al., 2008) reports on the introduction of three 'eRanger' ambulances by Government clinics in Malawi and mentions problems of downtime due to unavailability of fuel or an operator. The paper only covers the first 12 months or so of operation before the onset of any major repair costs and therefore the response to these is not known. In the authors' project in Zambia the two clinics have continued to fund fuel and operator costs for the MATs over 6 months since the end of the project but no maintenance has been carried out and it is not known whether they will be able to cover repair costs when they occur. In government funded schemes it is often the response to repair and maintenance needs that are the main barriers to reliable and sustainable services due both to inadequate funding and the lack of effective procedures.

*Community supported ETS* – these are usually based on bicycle ambulances which are cheap to run and can be maintained by the community. The feedback on these is mixed. In Lundazi district 8 bicycle trailers had been introduced together with grain grinders to generate income to support the ambulances. Although a good concept in theory the scheme relied too much on community health workers with too little support from the community for sustainability. It is clear from the successful introduction of bicycle ambulances within the MAMaZ programme in other districts of Zambia (Green et al, 2014) that full involvement and support of the community is essential to the success of community-based ETS. However, it is not considered that community-based schemes are suitable for motorised ETS because of the higher costs and skills needed.

*Community-based insurance schemes* – in the MAMaZ programme mentioned above, funding for operation of the bicycle ambulances was provided from community savings. The use of community insurance schemes to fund healthcare has been tried with varying success in a number of countries where free healthcare is not provided by government. A review of schemes in a number of SSA countries (Obeyemi,

2014) indicates that some success has been achieved but in general take-up has been low, particularly by the poorest who find flat-rate subscriptions difficult to pay. One of the most successful schemes is in Rwanda (Shimeles, 2010) where a take-up of 85% has been achieved with an annual subscription rate of \$2 per person. Formal schemes are generally aimed at reducing the financial shock of emergency healthcare but informal, community run schemes may be set up to cover more general emergencies and seem to have had more success. For example an NGO run scheme in Samburu district in Kenya was set up specifically to fund transport for emergency referral trips to the district hospital (Macintyre and Hotchkiss, 1999). The annual subscription was around \$0.5 per person and the take-up about 30% of the community. The authors indicate that a critical factor in achieving success of this type of scheme is building trust and collaboration between the communities and the service providers, with communities needing to be convinced they will obtain reliable benefits from the scheme.

The above discussion suggests that community-based insurance schemes could be a viable approach to funding motorised ETS but will need to be accompanied by an effective maintenance and repair scheme to minimise downtime and provide reliable operation of the vehicles. For an MBA based on an annual operating cost of \$3,000, including replacement cost, and serving a community of 20,000 the annual subscription assuming a 50% take-up would be \$0.3 per person or \$1.50 for an average size family which is considered acceptable. In some cases the scheme might only have to fund part of the service to support the district health authority. For instance, it might only have to support maintenance and repair costs in which case annual subscriptions could be reduced to \$0.15 per person. It is suggested that this type of scheme might best be organised at village level, working closely with village chiefs and building on any existing emergency savings schemes.

## **Conclusions**

The paper reports the successful trials of two motorcycle ambulance-trailers in Lundazi district, Zambia. It shows that mo-

torcycle-based ambulances are a viable option for providing low-cost ETS in rural areas of Africa, providing good accessibility at an effective speed. In particular they improve access to health facilities for maternity cases and reduce psychological barriers to attendance, key factors in reducing maternal mortality rates. Although they are far more affordable than conventional ambulances, there will still be many cases where health authorities do not have sufficient resources to operate them on a sustainable basis. It is suggested that supplementary support might be obtained from community-based insurance schemes run at village level. A key factor in achieving sustainability is to establish an effective scheme for maintenance and repair of vehicles to ensure prolonged operation with minimum downtime.

### **Glossary:**

The following abbreviations are used in the text:

AFCAP - Africa Community Access Programme funded by the UK Government Department for International Development

ETS - Emergency transport service

HC - Health centre

MAMaz - Mobilising access to maternal health services in Zambia

MAT - Motorcycle ambulance-trailer

MBA - Motorcycle-based ambulance

NGO - Non-government organisation

SSA - Sub Saharan Africa

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## **A Human rights Approach to Road Safety**

*Cássio Mattos Honorato*

“The health of all peoples is fundamental to the attainment of peace and security and is dependent upon the fullest co-operation of individuals and States.”  
(Constitution of the World Health Organization - 1946)

### **1. Introduction**

The great Revolutions of the eighteenth century assured that all people are equal and endowed by the creator of unalienable rights that can identify them as human beings, and that Governments are instituted to secure these rights.

After more than two centuries, the traffic phenomenon has brought together (and sometimes injures or puts an end to) some of these Human Rights. This imposes upon all (individuals and States) a set of duties that must be acknowledged and met continuously for the complete fulfilling of Road Safety as an indispensable instrument aimed at protecting life and integrity of all traffic participants.

Road Traffic is not the exercise of individual rights or freedoms. Road Safety, as collective duties resulting from the merger of Freedom of Movement and the duty of the State to provide Public Safety, constitutes a Human Right of the Second Dimension. Therefore, it requires effective actions of the State and safer behaviours from the road partners in order to protect life and avoid road traffic injuries (RTIs).

Based on the inalienable rights to security and freedom from fear, some of the challenges imposed by the traffic phenomenon during the global Decade of Action for Road Safety 2011 2020 can be highlighted.

### **2. A Decade of Challenges for Road Safety**

Challenges are posed for those who really want to contribute to the fulfilment of the Decade of Action for Road Safety (proclaimed by the United Nations General Assembly (Res A/64/255) in 2010): recognizing Road Safety as a Human Right of Second Dimension, that is provided at the constitutional level as an essential guarantee to the protection of life and to physical safety of all road users; that must be

promoted by the States, declaring not only Freedom of Movement (such as an individual right) but mainly Road Safety as a set of collective duties imposed on everyone, based on ‘just demands of the general welfare, in a democratic society’ (as stated in article 32 of the American Convention on Human Rights), in order to ensure Road Safety and protect traffic participants.

Unlike previously stated by great philosophers of our time (in particular Bobbio), Road Safety has not yet been incorporated into the culture and the way Low- and Middle-Income Countries face the traffic phenomenon. Therefore, it is necessary, firstly, to recognize the existence and the nature (the essence) of this Human Right in order to avoid misinterpretation and hasty conclusions. The challenge of those who responded to the summons of the UN General Assembly (and want to be protagonists during the Decade as promoters of actions for Road Safety) is greater than the challenges imposed in other areas, since many fields (as the Rights of the Child, 1959) have already been recognized and declared as essential to the human dignity; allowing its defenders to develop to the stages of internationalization and specification of these rights.

Regarding the traffic phenomenon, the first challenge is to acknowledge (on a personal level) and then to reveal (to third parties) Road Safety as a Fundamental Right of Second Dimension, and thereafter, to educate the States of their duty to ‘protect all human rights and freedoms’ (UN 1993, Vienna Declaration and Program of Actions, Sec. I, par. 5), in order to promote actions aiming at the effective achievement of Road Safety.

There are, therefore, three challenges to the traffic phenomenon at the national level, during this Decade of Action: to acknowledge (internalizing deeply in the soul and heart of the peoples of the world) the seriousness and the essence of Road Traffic (not only as individual rights, but mainly as a set of social and collective duties); to reveal to the States their function as Enforcement and, in this way, the duty of the States to promote good practices aimed at ensuring all the rights inherent to human beings and the fulfilment of movement in traffic in safe conditions.

As can be observed, starting from the recognition of the global road safety crisis, the UN revealed a new paradigm related to the traffic phenomenon that, very soon, will lead to the specification of Road Safety as a Human Right, essential to the protection of life and health of road users throughout all the land [to remind us of the words recorded on the first line of The Liberty Bell], in every continent around the world.

In the hope of experiencing a more humane and safe road traffic, let's justify the above statements.

### 3. The Dimensions of Human Rights

One of the greatest philosophers of the twentieth century, the Italian Norberto Bobbio (1996, p. 12) stated that:

The problem we are faced with is not, in fact, philosophical but legal and, in a wider sense, political. It is not a matter of knowing which and how many of these rights there are, what their nature is and on what foundation they are based, whether they are natural or historical, absolute or relative; it is a question of finding the surest method for guaranteeing rights, and preventing their continuing violation in spite of all the solemn declarations.

Although this statement does not apply fully to the traffic phenomenon (which still needs to be recognized and affirmed by the solemn declarations of rights), it is necessary to know and distinguish the different generations, or rather dimensions of Human Rights, their origins, motives and objectives, and then realize the long path to be taken in this Decade of Action.

Regarding origins, 'human rights are historical rights which emerge gradually from the battles which human beings fight for their own emancipation and the transformations in living conditions which these struggles produce'. The Christian ideal of equality between all men, as 'brothers in as much as they were children of God', the Greek democracy and the famous Magna Charta Libertatum (from 1215, imposed by the English Barons to King John) are safe references to the first stage of the historic affirmation of Human Rights, under the slogan: 'All men are born free and equal in dignity and rights' (Bobbio 1996, p. 18). Human Rights are 'rights common to all mankind, to every person as human

being, which, therefore, are the result of its own nature, not mere political creations' (Comparato 2003, p. 20).

Under the banner of Freedom (considered 'one of the main (if not the main) requirement of human dignity' (Sarlet 1998, p. 46), in the eighteenth century, have arisen two great revolutions (the American, 1776, and the French, 1789) that have brought the First Dimension of Human Rights, known as Civil Liberties and 'considered the core of the defence strategy against arbitrary use of power by government' (Tomuschat 2010, p. 28).

#### A. First dimension: Civil Liberties

The recognition of Human Rights in solemn declarations and constitutions reflects the certainty of existence and necessity 'that these rights will be performed according to the law' (Bobbio 1995, p. 17), as:

the great antidote against arbitrary government, because, as Euripides wrote in the play *The Suppliants* (verses 434-7), 'written laws, however, give this equal treatment to all, rich and poor. If a poor man is insulted by a rich one, than that poor man has every right to use the same words against that rich man. The poor can win against the rich if justice is on his side' (Comparato 2003, pp. 12-13).

The first statements (built by the 'good people of Virginia', on 12 June 1776, and by the French Declaration of the Rights of Man and of the Citizen, from 1789) 'were principally demands for freedom from the church and state', aiming to 'place limitations on oppressive power ... for reducing their jurisdiction to a minimum and expanding the area of individual liberty' (Bobbio 1996, p. 54). This freedom was defined as the right to be able to do anything which does not harm others and it only could be achieved by the non-intervention of the State. From this has emerged the Minimal State, also called Liberal or Non-Interventionist State.

The Article 4 of the Declaration of the Rights of Man and of the Citizen (1789) highlights the importance of individual freedom:

Article 4. Liberty consists in the freedom to do everything which injures no one else; hence the exercise of the natural rights of each man has no limits

except those which assure to the other members of the society the enjoyment of the same rights. These limits can only be determined by law.

The liberal revolutions of the eighteenth century only implemented one of the ideals of the French Revolution: Liberty (forgetting Equality and Fraternity, or Solidarity), and brought along the recognition of the First Dimension of Human Rights, the so-called Civil Liberties under the motto *laissez faire, laissez passer* ('let do, let pass' (Encyclopaedia Britannica 1952, vol. XXIX, p. 335)).

Human Rights of First Dimension, due to its characteristics (it means, Civil Liberties, consisting of a set of individual rights and freedoms, 'marking a zone of non-intervention and a sphere of individual autonomy'), are "presented as rights of 'negative' nature, because they are directed to an abstention, and not an action by public authorities" (Sarlet 1998, p. 48). To Bonavides, 'the State is the armour of defence and protection of freedom ... Its essence is running out on a mission of complete alienation and lack of social initiative.' Hence this model is called Minimal State or Non-Interventionist State because 'the less palpable is the presence of the State in the acts of human life, the broader and more generous will be the sphere of freedom granted to the individual. [Thus,] people would decide what to do or not to do as they pleased' (Bonavides 1972, p. 4).

The economic results of the Non-Interventionist State's model were quickly felt, with the establishment of the capitalistic system of production and a 'brutal impoverishment of the proletarian masses, as early as in the first half of the nineteenth century' (Comparato 2003, pp. 51-52). The gravity of the situation came to a head with the 1917 Russian Revolution, the Declaration of the Rights of the Toiling and Exploited People (1918), and the establishment of the Social States (by the Mexican Constitution, 1917, and the German post-war Constitution, known as the Weimar Constitution, 1919), which recognized the existence of a Second Dimension of Human Rights (the Social Rights) and has begun to guarantee them.

Unlike what happened with the economic results, not all social effects (which have arisen from Non-Interventionist State)

were immediately perceptible. Even today, as a consequence of the broad freedom and the profound individualism embodied by the capitalist system, it has been difficult to understand some of these Social Rights.

The individualism and the disregard for traffic regulations and safety rules are very characteristic examples of this influence and they must be demystified urgently, if, in fact, the goal of the Decade of Action for Road Safety is 'to stabilize and then reduce the forecast level of road traffic fatalities around the world' (UN 2010, Res. A/64/255).

#### B. Misleading interpretation and prejudice jeopardizing Road Safety

Sociologist Roberto da Matta in his suggestive work entitled *Faith in God and Foot on Board* (or how and why the traffic in Brazil became crazy) explains how 'we accede to the individualization', why we violate the principle of equality of all before the law, and also try to justify our 'aristocratic-fascist style of driving'. According to the author:

everyone, deep in their consciences, feel special and superior, endowed with privileges and priorities. Carelessness, neglect and the most shocking and unrecognizable Brazilian incivility in traffic are caused by the lack of an egalitarian view of the world, exactly in a space inevitably marked and designed for absolute equality among its participants, as it occurs in the streets, avenues, roads and overpasses (Matta et al 2010, p. 64).

And here come some major problems related to the traffic phenomenon: at the routes open for the public circulation, where everyone is equal and the law should be equal for all, the 'egalitarian space of the street becomes hierarchical' (Matta et al 2010, pp. 8-9) and people while road users (with rare exceptions) adopt an individualistic view of this activity, based on private concepts as private property, freedom of movement and (the false notion that comes with an expression used in the Brazilian Traffic Code:) the right to drive.

Driving is 'not an inherent right'. According to Norman (1962, p. 11), it is 'a privilege that can and should be withdrawn if it is shown that it may endanger others'. But

the expression right to drive has emerged from a misleading interpretation in some countries. Borowy (2013, p. 112), for example, highlighted that:

Motorist interest groups fought their negative image. They portrayed drivers as a persecuted minority deserving protection and succeeded in redefining the issue away from one of injuries and death to one of freedom. Any restriction of the use of the car was constructed as inhibiting the people's rights to choose their preferred means of transport and of street use.

The prevalence of these private interests certain will, as Rousseau (2004, p. 19) has advised, 'bring about the ruin of the body politic' and the common good.

The individualistic view (as it maintains the 'supremacy of the individual' (Dallari 2000, p. 198)), arising from the Non-Interventionist State model, has produced effects in the Brazilian Constitution (of 1988), in which is explicitly stated (Article 5, item XV) the Freedom of Movement within the national territory: 'the circulation in the national territory in peacetime is free'. Thus, the Brazilian Constitution has declared and recognized a kind of Civil Liberty (considered a Human Right of First Dimension) directly related to the traffic phenomenon. The road traffic was therefore recognized, in the constitutional level, as a right of negative nature, which means an individual right that could be exercised without any State intervention.

Freedom of Movement may be considered 'the ability to move freely anywhere in the country' (Cano Campos 1999, p. 243). But in what condition must the movement of people, vehicles and animals in the roads of the national territory be done? And yet, what are the limits that should be tolerated or regulated during the exercise of this freedom, due to the possibility of causing damages to the fundamental rights of other citizens?

To answer these questions, the Brazilian Constitution also has consecrated (in a much less explicit way, it is true!), along with Articles 6 and 144, the duty of the State to promote Public Safety, and to 'preserve public order and the safety of persons and property' of all, here included the traffic participants. After all, 'what is the objective of any political association?

It is the protection and the prosperity of its members' (Rousseau 2004, p. 99), so 'Governments have a responsibility for the health of their peoples which can be fulfilled only by the provision of adequate health and social measures' (WHO 1946).

The duty to provide Public Safety focuses on all activities carried out on national territory, including the traffic phenomenon. Therefore, the State 'is the guarantor of human rights' (Tomuschat 2010, p. 8) and must provide traffic in safe conditions. The concept of Road Safety is developed by Gómes Pavon (1993, p. 95) as follows:

We can therefore say that traffic safety is the set of conditions guaranteed by law in its entirety, in order that the movement of automotive vehicles on public roads does not present higher risks than the allowed ones.

The weak articulation of these two concepts (Freedom of Movement and Public Safety), in the Brazilian Constitution, has jeopardized the understanding of Road Safety as a Human Right, allowing that 'drivers follow always and predictably towards ignoring or disregarding the rules, due to some singularity, context or personal circumstances' (Matta et al 2010, p. 47) and giving the road traffic an image of no man's land, as a battlefield without rules or State intervention. Therefore, it is required from the State that the Freedom of Movement must be done in safe conditions, in order to guarantee Public Safety.

i. Not only by freedom do we live in traffic! By classifying the rights provided by the Constitution, Piovesan (2004, p. 81) identifies three distinct groups: a) the rights expressed in the Constitution; b) the rights expressed in international treaties, and c) the implicit rights, which means rights that are understood in the rules of guarantees and rights deriving from the regime and the principles adopted by the Constitution. Road Safety (formed by the fusion of Freedom of Movement and the duty of the State to provide Public Safety, which acts as an adjective to describe how a Democratic State intends that the use of road routes be carried out) is revealed as an Implied Constitutional Right, inherent to the system and the principles adopted by the Brazilian Constitution.



At the international level, Safety has been recognized as a fundamental right, which 'is essential for the attainment of health, peace, justice and well-being', thus 'All States shall respect and protect the right to safety. Accordingly all States shall formulate injury prevention and safety promotion policies' (Montreal Declaration 2002, Article 11).

The security essential to the exercise of Freedom of Movement in safe conditions becomes the cornerstone of the regulatory activity of the States, aiming at protecting life and physical integrity of citizens who make use of the roads. According to Cano Campos (1999, pp 237-238):

The exercise of rights, including freedom of movement, cannot put at risk the safety and freedom of the other ... As a result, the right to circulate with automotive vehicles must be submitted to a series of standards with the aim at making possible the safe exercise of itself, so that lives and physical integrity of drivers and other road users do not suffer any damage. The relevance and importance of these rights for the traffic phenomenon is crucial ... So, the so-called road safety, which is intended to protect such rights, has priority and essential goal of all traffic regulatory standards, even moving into the background the freedom of movement.

Road Traffic, as we can see, is not the exercise of individual rights or freedoms. The attentive reading of the name assigned by the Constituent Legislator to Chapter I of Title II of the Brazilian Constitution ('Individual and collective rights and duties') associated with the duty of the State to provide public safety to all traffic participants on the national territory, this gives the exact notion of Road Safety as 'duty of the State, right and responsibility of all', as it is described in Article 144 of the Brazilian Constitution. Precisely in that line of reasoning, the Brazilian Traffic Code states on Article 1, paragraph 2, an expressed reference to the principle of Traffic in Safe Conditions: 'The Traffic in safe conditions, it is a right of all and duty of bodies and entities of the National Traffic System. Each component, within their respective competences, must adopt measures to ensure this right.'

From the law's words we can see that the legislator of the Brazilian Traffic Code was conservative and could (in fact should), based on Constitutional Rights (provided in Article 5, item XV, and Articles 6 and 144 of the Brazilian Constitution), have defined Road Safety as a set of collective obligations imposed to everyone, because in the modern concept of State all of us integrate the human element of our political society, which is essential to the existence of the State.

The complete fulfilling of Road Safety, therefore, consists of right and duty of each person and everyone of us!

## ii. Individualistic view onto the concept of Traffic

The traffic legislation has also contributed to distort the image and to hamper the understanding of Road Safety, (first) when the Traffic Code provides an individualistic concept of road traffic, and (second) when it describes one of the penalties imposed on the offenders as 'suspension of the right to drive'; when, in fact, there has been the suspension of the driving licence, as administrative penalty that falls on an administrative act, and not on an individual and absolute right (as many people still imagine, unfortunately!).

The misleading concept of road traffic is inserted in Article 1, item 1, of the Brazilian Traffic Code: 'Traffic is the use of roads by people, vehicles and animals, singly or in groups, conducted or not, for the purposes of circulation, stopping, parking, loading or unloading operation.'

The use of something, in an individualistic view, can be understood as the right or opportunity to 'make use of something' (Oxford 2007, p. 1689) and it brings the idea of getting an advantage. It means that the definition stated in the Brazilian Law is moving away from the concepts of fraternity and solidarity 'make useful, employ with utility' (Ferreira 1985, p. 1719), as partners of the traffic phenomenon. There is, here, a dangerous combination of individual freedom, private property and the right of making use of the roads; and, according to Rousseau (2004, p. 77), 'nothing is more dangerous in public affairs than the influence of private interests'.

Road Safety, as collective duty arising from the need to 'defend the State and demo-

cratic institutions' (as stated at the Title V, of the Brazilian Constitution), imposes a new way to understand and perform the Freedom of Movement on roads. This

new philosophy consists in changing attitudes, incorporating safer and more committed behaviours to this ideal. These changes are not supposed to be imposed vertically, but they will be achieved with the externalizing of new more appropriate and safe actions, so as to encourage others, horizontally. Traffic in safe conditions is not a vertical philosophy imposed by a sovereign to the subjects, rather behaviours of citizens, such as partners of the roads (Honorato 2009a, p. 8),

sharing the same public space, on equal terms and with respect to the general rules of traffic movement and road security. In addition, Azetsop (2010, p. 120) remembers that "The claim of justice comes from the fact that every human being is, in him/herself, a certain 'ought' with respect to his or her fellow human being".

As a conclusion, it can be asserted that the collective space of Road Safety cannot cede to individualism, nor can be subordinated to absolute rights or to an 'aristocratic-fascist style of driving' (Matta et al 2010, p. 36). Individuals and States have to pursue the accomplishment of the principle of equality and the achievement of Road Safety for all participants of the traffic phenomenon.

### iii. The driving licence is not an individual right

As mentioned above, the driving licence is not an individual right, but rather a favourable administrative act, named licence, that will be granted to any person who satisfies the legal requirements, performs successfully all stages of the qualification procedure and submits to the compliance with the general rules of traffic movement and safety requirements provided by traffic legislation.

On the characteristics of the licence, Bandeira de Mello (2001, p. 391) teaches that it is an 'administrative and unilateral act, by which the Administration provides to someone the exercise of an activity, once demonstrated the completion of the legal requirements.'

The expression (or label) set out in Article 256, item III of the Brazilian Traffic Code, in order to identify the penalty of 'suspension of the right to drive', is an:

erroneous heritage because it comes misleadingly from Article 96 of Law n. 5,108/66 (which established the third and former Brazilian Traffic Code), to refer to the penalty resulting from the seizure of the driving licence. It is understood that the most appropriate expression to designate this administrative penalty is suspension of the driving licence (Honorato 2004, p. 115).

Allowing the association of the concepts of private property, freedom of movement and the false notion that comes with the expression right to drive is a serious prejudice, which is able to jeopardize Road Safety and to promote the individualistic view onto the traffic participants.

### iv. Necessity of a new technical term to replace accident

To complete the dangerous list of misconceptions and individualistic interpretations on road traffic, it is necessary to remember that the term used to identify the serious facts that occurs daily on the roads, and that have caused approximately 1.260.000 road fatalities only in the year of 2000 (UN 2003b, Res. A/58/228), still is traffic accident.

The replacement of this term is a necessity already acknowledged by scholars from different fields of knowledge. According to Günther (2009, pp. 24-25):

the characterization of the event as an accident, as by chance, as inevitable, gives rise to excuses and justifications such as 'I did not know', 'I did not want to', 'it was someone else'; something that only increases the suffering of the innocent and relieves the conscience of those who behaves in a harmful manner.

Still under the psychological aspect, Hoffmann et al (2007, p. 380) holds that:

the accident was always associated with an image of bad luck, of spontaneous generation and the implied oversight in its own definition ... Both, the unrealistic optimism and the fatalistic acceptance contribute dangerously to the non-adoption of the means to

avoid the likelihood of engaging in an accident.

Discoursing about the 'misunderstanding of the word accident', the suggestion offered by Espíndula (2005, p. 149) turns to the use of the term 'traffic occurrence', to prevent prejudices and prior judgments of experts who, sometimes, are called to 'attend to a traffic accident which, in reality, after the experts have examined the site, is found that it was an intentional murder and in other cases a suicide. Thus, the experts have already adopted the procedure of reaching a place of traffic occurrence without any prejudgment of the facts.'

According to Borowy (2003, p. 127), "the prestigious British Medical Journal (BMJ) ... in its self-proclaimed position as 'a leading communicator in medicine' with a responsibility 'to establish or follow standards in language' banned the 'inappropriate use of accident' in its pages".

The term traffic accident needs to be revised and replaced urgently, in order to avoid 'the false notion of mere fatality, and to assign to the person who caused the relevant event the due degree of responsibility' (Honorato 2009a, p. 9); because, as noted by Wilde (2005, p. 239), the term accident carries the notion of forgiveness.

Considering 'Road Safety is no accident' (UN 2004, Res. A/58/289), States should avoid the use of the term traffic accident and adopt another term that implies the due responsibility in their official documents and reports, because 'RTIs resulted from preventable causes rather than fate and thereby contradicted a view of RTIs as inevitable consequences of development' and preventing RTIs is 'considered everybody's responsibility' (Borowy 2013, p. 127).

In this way, and in the absence of a more suitable name in Portuguese, the doctrine advocates the "use of the term 'road traffic event' until new concepts would be scientifically developed" (Honorato 2009a, p. 9).

From the above considerations, it is possible to realize that the excessive individualism of the Declarations of the eighteenth century still produces severe and negative effects to Road Traffic. Removing some of these prejudices (in particular, the individualistic concept of traffic and the false notion of driving licence as an individual

right) and replacing the expression traffic accident are considered the first good practices to be developed (during the Decade of Action for Road Safety) for those who understand the traffic phenomenon as a set of collective duties, and Road Safety as a Human Right of Second Dimension.

### C. Social rights (as human rights of second dimension) and the duties of the States

The social crisis in the early twentieth century demanded (social and economic) deep changes and the recognition of a new Human Rights dimension (without excluding Civil Liberty already established). The Human Rights of Second Dimension consist of positive rights, in the sense of requiring effective actions of the States in order to guarantee the equality of all before the law and the consolidation of the democratic principle.

This complex transformation (from the Liberal State to the Social State) has given rise to the Maximum, Social or Interventionist State, which was settled in several countries, including in Brazil (with the Constitution of 1934), in the first half of the twentieth century.

The Social State seeks to devote two of the essential elements of the democratic triad of the French Revolution: Liberty and Equality, gathering in a constitutional level the Civil Liberties (already established in the First Dimension) and the Social Rights, which require actions of the States that left the passive condition (of *laissez faire*, *laissez passer*) and undertook the commitment to promote good practices aimed at the implementation of these Constitutional Rights.

A second kind of Human Rights has been recognized and established in Constitutional level. As a consequence:

the protection of these social rights requires active intervention from the state which is not required for the protection of libertarian rights ... While libertarian rights originate from the excessive power of the state and therefore limit its power, social rights require practical implementation. Thus their transition from a purely verbal declaration to their effective protection involves an increase in the powers of the state (Bobbio 1996, p. 51).

That is the reason why it is called Maximum or Interventionist State, in which the 'human dignity is both, limit and task of State Powers' (Sarlet 2002, p. 47).

The following social rights are listed and granted by Article 6 of the Brazilian Constitution (of 1988): education, health, work, housing, leisure, security, social security, maternity and childhood protection, assistance to the helpless. In this noble list of Fundamental Rights to be continuously defended and guaranteed, it is necessary to highlight the Right to Security which, in relation to the use of roads in the national territory, becomes Road Safety as duty of the State, and right and responsibility of all citizens.

i. Road Safety as a constitutional guarantee

In a Democratic State, the traffic phenomenon should be seen not only as the exercise of individual freedoms, because 'where there is no respect for life and physical and moral integrity of the human being ... there will be no space for human dignity' (Sarlet 2002, p. 61).

Thus, just the Freedom of Movement is not enough. It is necessary that road traffic be carried out in safe conditions through the subjection of all road participants to the traffic regulations and safety roads requirements. So, as Azetsop (2010, p. 121) reminds, 'every human being has a right to safety, including road safety (Montreal Declaration, 2002)'.

As a Human Right of Second Dimension, Road Safety requires that the State (through the legislative representatives) creates rules regulating the social use of roads, aiming at making useful and employ with utility the collective space. It requires that the State (through the bodies and entities of the National Traffic System) supervises and enforces the traffic laws; and demands for all citizens (as partners of the traffic phenomenon) the faithful compliance of traffic regulations and safety rules. The 'government cannot eliminate all road traffic risks, but, it can, at least, control these risks in order to promote public safety' (Azetsop 2010, p. 121) and to offer to the people 'the highest possible level of health' (WHO 1946) and security, because 'the loss of human life and health is unacceptable' (Whitelegg & Haq

2006, p. 11). Even when a road user fails to obey the traffic rules, it is a duty of the State 'to take necessary steps to counteract people being killed or seriously injured' (Haq & Whitelegg 2014, p. 119).

Here are the roles of the Social State to achieve Road Safety: regulate the use of roads, perform the surveillance and enforcement of regulations continuously (mainly with police presence), and promote public policy and good practices aiming at protecting all Human Rights related to the traffic phenomenon.

ii. Constitutional right or guarantee?

The use of roads involves a large number of constitutional rights, in which life, physical integrity, property, and freedom of movement are emphasized.

To ensure the social use of these routes (in the sense of making useful and employ with utility the collective space), as well as to provide security for the fundamental rights which are exposed to risk of harm during the exercise of this activity, Road Safety arises as an instrument of defence of these rights and freedoms. In accordance to Gómez Pavón (1993, p. 90), 'undoubtedly the reason for protecting the security of traffic is, ultimately, the protection of life, body integrity, and both private and community assets that may be damaged'.

The distinction between rights and guarantees (as Constitutional Law institutes) was performed by Barbosa (1978, p. 124), who explains that:

in the text of the Constitution, there are provisions merely declaratory, which give the legal existence to the granted rights; and others that are ensure provisions, which act in the defence of rights or limiting the power of the State. Those establish the rights; the later ones establish the guarantees.

The constitutional guarantees, therefore, 'ensure the individual with the ability to require from public authorities respect to the right' (Mendes et al 2007, p. 258).

From these lessons, it is easy to understand why Road Safety (as Human Right of Second Dimension, implicit and arising from the fusion of Freedom of Movement and duty to guarantee security to all traffic participants) takes on the characteristic

of constitutional guarantee, acting as security and defence system of fundamental rights (as life, physical integrity and property) that are exposed to risk of damage during the use of the roads.

From the duty of the States to create and structure ensure provisions to guarantee the rights related to the use of the roads, emerges the duty of the traffic legislation to establish a set of rules (called general rules of traffic movement and road security) and sanctions to its violators, to avoid excesses and 'assure to other members of the society the enjoyment of the same rights' (as stated at Article 4 of the French Declaration of the Rights of Man and of the Citizen).

Road Safety consists of Constitutional Guarantee, which purpose is to ensure security and to protect the fundamental rights to life and physical integrity that are exposed to risk in the traffic phenomenon.

### iii. The social concept of Road Traffic

Road Traffic, when performed by fellow citizens in a Democratic State, cannot be regarded (or be seen) as the single use of the collective space. It is, in fact, the correct employment of the roads of the whole territory, in order to make them useful and safe for everyone.

Thus, Traffic should be considered the social and collective use of roads by people, vehicles and animals, singly or in groups, conducted or not, for the purpose of circulation, stopping, parking, loading or unloading operation, through faithful compliance with the general rules of traffic movement and road security, ensuring all participants accessibility, security and respect for life.

The fellow citizens who want to make use of the collective traffic space have to acknowledge the limits to their freedom of movement, obeying the general rules of traffic and road security, and fulfilling their duties to avoid risks to the fundamental rights of other members of the society.

### iv. The controversial interpretation of the rules on drink-driving

The current legal concern turns to the interpretation of the rules related to the Drink-Driving Law, in particular to the Traffic Crimes described in Article 306 of the

Brazilian Traffic Code, which was added by the Law 11,705/2008 (known as Dry Law) and Law 12,760/2012.

Two distinct doctrinal guidelines were structured in the years of 2008 and 2009, creating two opposed jurisprudential currents in the Courts, highlighting the decisions of Fifth and Sixth Groups of Ministers-Judges of the Brazilian Superior Court of Justice (STJ).

The first doctrinal guidance was exposed by Gomes (2008), who has defended the absence of the Drink-Driving Crime whenever the driver refuses to do the alcohol tests (for example, blood laboratory test and breathalyzer test), based on Article 8, item 2, letter g, of the American Convention on Human Rights (from 1969):

Article 8. Right to a Fair Trial ... 2. Every person accused of a criminal offense has the right to be presumed innocent so long as his guilt has not been proven according to law. During the proceedings, every person is entitled, with full equality, to the following minimum guarantees: ... g. the right not to be compelled to be a witness against himself or to plead guilty.

According to the mentioned lawyer (Gomes 2008, p. 31), 'On the evidence of drunkenness there is, however, a basic premise to be observed: no one is obliged to provide evidence against himself (the privilege against self-incrimination) ... The subject is not obliged to submit his body or part of it to prove (against himself)'.

During the second semester of 2008, this first guidance came to the Brazilian Superior Court of Justice and led the Sixth Group of Ministers-Judges to adopt an individualist view onto the traffic phenomenon (exclusively focusing on Personal Liberties and forgetting the Public Good), which culminate by stating that the drink-driving case only will be accepted to criminal trial 'if is evidenced the objective quantum of the alcohol concentration in the blood, which cannot be assumed' (Brazilian Superior Court of Justice (STJ) 2010a).

Interesting to note that, since 1969, in the same American Convention on Human Rights in which the privilege against self-incrimination was highlighted, there were two other rules, provided in Article 32, which reveal the impossibility of individual rights and freedoms to be considered ab-

solute values, because some social duties are also imposed on all those who live in a Democratic State:

Article 32. Relationship between Duties and Rights: 1. Every person has responsibilities to his family, his community, and mankind. 2. The rights of each person are limited by the rights of others, by the security of all, and by the just demands of the general welfare, in a democratic society.

Similar duties are described at Articles 6 and 8 of the Asean Human Rights Declaration (ADHR), from November 2012. Regarding those duties, Doyle (2013, p. 18) has promoted criticism and has maintained standard that:

The use of the phrase 'just requirements' in the second sentence of Article 8 appears to subject the realization of human rights and fundamental freedoms in the ASEAN [Association of Southeast Asian Nations] region to an indeterminate and potentially wide class of ex post justifications for derogation.

Doyle's opinion, however, deserves to be dismissed because the ADHR duties are not arbitrary or despotic "derogations" of human rights. In fact, 'the enjoyment of human rights and fundamental freedoms must be balanced with the performance of corresponding duties as every person has responsibilities to all other individuals, the community and the society where one lives' (ADHR 2012, Article 6) and, for sure, the exercise of individual rights

shall be subject only to such limitations as are determined by law solely for the purpose of securing due recognition for the human rights and fundamental freedoms of others, and to meet the just requirements of national security, public order, public health, public safety, public morality, as well as the general welfare of the peoples in a democratic society (ADHR 2012, Article 8).

These Human Rights rules express the necessary balance between individual rights and collective duties aiming at the protection of individuals and the whole society.

This relationship between duties and rights recognizes, once again, the existence of different Human Rights Dimensions and reveals that, in the collective

space of road traffic, the exercise of individual rights must be regulated by the State through rules and enforcement in defence of a minimum level of road security. In other words, these rules act as constitutional guarantees to shelter other citizen's rights.

Fortunately, a second doctrinal guidance was defended and published at the beginning of 2009, revealing 'the need for harmonization between the exercise of an individual right and the collective duty to road safety' (Honorato 2009b, p. 348). From the legal nature of the driving licence and the balance between individual freedoms, and the duties imposed by the State (in order to ensure Road Safety), the constitutionality of the rules introduced by the Brazilian Dry-Law remain consecrated. It is interesting to highlight the safer guidance:

It is true that those who exercise a fundamental right (in this case, the right to remain silent and the privilege against self-incrimination, ensured in the American Convention on Human Rights and incorporated by Brazilian State at the constitutional level) cannot be subject to police sanctions or to penalties of criminal nature. So, there is no need to talk about the crime of disobedience (Article 330 of Penal Code) or administrative violation (as one can see at Article 195 of Brazilian Traffic Code) ... On the other hand, the principle of traffic in safe conditions (stated in Article 1, paragraph 2 of the Brazilian Traffic Code) and the duty of the State to guarantee public safety and preserve life and health integrity of the people (Articles 6 and 144, of the Brazilian Constitution) require actions to prevent that violators of traffic rules continue to generate risk of damage to other participants of the roads. In this context of collision (or conflict) between individual rights and the collective constitutional rights to safety and physical integrity, it is necessary to consider the constitutionality of the rule introduced in Article 277, paragraph 3 of the Brazilian Traffic Code, which makes it possible to the traffic authorities to impose 'to the driver who refuses to submit to any' alcohol tests, a kind of rescission of favourable

administrative act sanction, that falls onto the driving licence.

According to Andrade (1987, p. 220), 'there will be a collision or conflict [between rights or among rights and values stated by constitutional law or principles] whenever it should be understood that the Constitution protects simultaneously two values or goods into concrete contradiction'. This conflict, thus 'requires the balance of all applicable constitutional values, so that none of them can be ignored and the Constitution would be preserved to the greatest extent possible'.

The balance of this conflict between constitutional rights (individual and collective), associated with the legal nature of the driving licence and its possible suspension (as a sort of rescission of favourable administrative act sanction), leading to the affirmation of the constitutionality of the penalty prescribed in Article 277, paragraph 3 of the Brazilian Traffic Code. The refusal to be subjected to the alcohol tests needs to be interpreted through the light of the constitutional guarantee principles, avoiding illegal arrests and, at the same time, providing effectiveness to the safety rules of the traffic legislation. Once the legal nature of the driving licence (as a type of favourable administrative act) is revealed, and being possible its suspension or the withdrawal of this administrative act (in accordance with the constitutional principles, in particular the principles of legality and due process of law), it can be affirmed that the rule proposed in Article 277, paragraph 3 of the Brazilian Traffic Code, conforms to the Constitution. So, whenever the driver refuses to do the alcohol tests there is an offense and the sanction prescribed in law is the suspension of the driving licence (Honorato 2009b, pp. 350-352).

Likewise, a new judicial guidance flourished among the Ministers-Judges of the Fifth Group of the Brazilian Superior Court of Justice, culminating by interpreting the American Convention on Human Rights 'in the best manner possible' (Roberts 2011, p. 84) and by stating that:

The absence of alcohol test does not induce a disqualification of the action as an offense to the Article 306 of Law 9,503/97 (the Brazilian Traffic Code),

if the drunkenness of the driver can be proved otherwise ... The proof of driving under the influence should be done preferably by means of expertise (alcohol tests), but this can be supplied (if impossible to be carried out at the time or in case of the refusal of the citizen), by clinical examination and, even, by the testimonial proof, this in exceptional cases, for example, when the intoxication is evident and the misconduct while driving the vehicle demonstrates the potential danger to public safety (Brazilian Superior Court of Justice (STJ) 2009 and 2010b).

The present moment (from the beginning of the Decade of Action for Road Safety) is of great expectation, because there are two distinct doctrinal guidelines and two opposing judicial guidelines in relation to the crimes described in Article 306 of the Brazilian Traffic Code. Much effort has gone into revealing the existence of two Drink-Driving Crimes:

one based on the blood alcohol concentration (BAC), in which the law presumes the incapacity whenever the rate is equal to or over to 6dg/L; and another when external drunkenness' signs reveal that the driver is under the influence of any psychoactive substance (including the alcohol) and thus, with affected psychomotor capacity (Honorato 2013, p. 207).

It has been pleaded that individualism (over which the first guidance was created) should decrease in favour of Road Safety and give preference to the guidance which favours the collective aspect of traffic in safe conditions. Road traffic laws' interpretation cannot be made exclusively based on individual aspects of the Civil Liberties (or First Dimension of Human Rights). It is vital that the State, through every Organ and Democratic Institutions (including the Courts of Justice and the Public Ministry, which is in charge of Criminal Prosecutions in Brazil), promote Road Safety according to the Articles 6 and 144 of the Brazilian Constitution, as a Human Right of Second Dimension.

Revealing to the Members of Judiciary Power and other democratic institutions essential to Justice their role as members of the Enforcement (to ensure Road Safety) also constitutes a challenge and a mis-

sion to be promoted during the Decade of Action for Road Safety.

#### **4. Freedom from Fear Arising from Road Traffic Insecurity**

During the World War II, in a speech on 6 January 1941, Roosevelt assures the existence of Four Freedoms essential to the human race: freedom of speech and expression; freedom of every person to worship God in his own way; freedom from want or misery, and freedom from fear; as well as the need to secure the cooperation among free Countries, working together in a friendly, civilized society.

During that period of the history of Mankind, the Human Rights concerning to the freedom from fear, certainly, were related to the hardship resulting from the war (such as lack of food) and the fear from external military aggressions (promoted by neighbouring countries or across the Atlantic).

Times changed and, in earlier years of the twenty-first century, the fears turn to internal enemies (no more external) and are directly related to Public Safety: fear from urban violence and fear from the consequences (physical, patrimonial and legal) resulting from road traffic events. The perception of the traffic phenomenon as a space for conflicts and wars is also shown by Tabasso (1997, p. 179):

From all the human activities, the only ones that by their nature exclude the safety ... are the felony and the war. However, if traffic is not organized and is not working properly under a set of technical and legal instruments related to the concept of security, it would gather the characteristics of both, equal to a virtual war among the people who would fight on roads in order to steal from each other space and time.

The current wars in Low- and Middle-Income Countries are fought in land routes, as if citizens change into enemies fighting in battlefields: drivers versus drivers, and everyone against the pedestrians and other vulnerable road users. We are talking about a nonsense war, with tragic consequences and no winners, which only few of us realize. According to journalist Correa (2009, p. 14):

In Brazil, a country which experienced significant development in the last

decades, but without safety culture or, specifically, traffic safety, it is not surprising that we testify to these traffic accident rates. We do not feel even more ashamed because we do not care much about the reported figures. Actually, we do not believe in these figures at all. A considerable portion of the society has not yet realized that we face an absurd war and that it is necessary to react.

Among the many needs afflicting citizens of all nations, the freedom from fear deserves to be highlighted; especially the freedom from traffic insecurity and from witnessing our loved ones join the statistics of fatalities and injuries on the roads. In fact, since 1962 RTIs were declared 'a public health problem of the first magnitude' (Norman 1962, p. 17), which require global attention because they 'remain a major public health problem and leading cause of death, injury and disability around the world' (UN 2010, Res. A/64/255).

In 2000, it was estimated that traffic phenomenon consumes more than one million of lives every year worldwide (UN 2003b, Res. A/58/228). This global road safety crisis was perceived by the UN (Res. A/57/309) and recognized by Res. A/58/289 from the General Assembly (2004), and the Report of the Secretary-General (UN 2005a, Res. A/60/181), proposing measures for Improving Road Safety in the World. Among the measures are: the invitation to WHO to 'coordinate road safety issues in the United Nations system' (UN 2004, Res. A/58/289), promoting meetings and reports; the creation of an UN Road Safety Collaboration; the World Bank's commitment to create a fund to support road safety, as well as the publication of the World Report on Road Traffic Injury Prevention (WHO 2004), which identified the five main risk factors: inappropriate and excessive speed, drink-driving, non-wearing safety belts, not using child restraints, and not wearing motorcycles helmets (UN 2003b, Res. A/58/228, and WHO 2009).

Here are the two points that led the UN to shift the paradigm from Road Traffic to search Road Safety: (first) international traffic no longer is considered only as the freedom of movement on roads of different territories. It has come to be understood as a serious security problem, and



was acknowledge as Global Road Safety Crisis. (Second) The invitation made to WHO, 'to act as a coordinator on road safety issues within the UN system' (UN 2004, Res. A/58/289), has given new focus on the issue as a public health concern, away from the idea of road traffic as solely an economic factor to be seen as an instrument for the promotion of life, by reducing road traffic injuries and fatalities resulting. In this new context, the UN has recognized a global security crisis, directly related to the traffic phenomenon, and has stressed 'the importance of the improvement in the legal road traffic safety norms', inviting all Member States 'to implement the recommendations of the World Report on Road Traffic Injury Prevention' (UN 2005c, Res. A/60/5) and to promote educational campaigns. Based on the Moscow Declaration 2009, the UN proclaimed 'the period 2011-2020 as the Decade of Action for Road Safety, with a goal to stabilize and then reduce the forecast level of road fatalities around the world by increasing activities conducted at the national, regional and global levels' (UN 2010, Res. A/64/255).

There is a short period of ten years to acknowledge Road Safety at the international level as a Human Right, and to identify its essence as Constitutional Guarantee of the fundamental rights related to the traffic phenomenon, and to specify through international treaties or conventions Road Safety as a duty of States, right and co-responsibility of all road users. Fulfilling these measures we will be able to reduce the rate of RTIs and deaths, so as to provide freedom from fear and the achievement of peace among all traffic participants throughout all the land.

## 5. Conclusion

Road Safety is a Human Right, nobody doubts it! What only few had noticed is its constitutional nature as fundamental guarantee and indispensable instrument aimed at protecting life, health and physical integrity of all road users.

In its essence, Road Safety is intended to ensure the different dimensions of fundamental human rights that are put at risk daily in the public traffic space. This guarantee must be recognized and required daily by the States through good practices that promote the attainment of Freedom

of Movement in safe condition, and provide social peace and freedom from fear (related to insecurity in traffic). Road Safety is thus a tool to promote life and to ensure in the future a more humane and safe road traffic.

From the merger between Freedom of Movement and the duty of the State to provide Road Security can be extracted the actual content (or meaning) of Road Safety, as a Human Right of Second Dimension which takes in a democratic State the function of a constitutional guarantee in order to ensure traffic in safe conditions and to protect life and physical integrity of all traffic participants.

Undoubtedly, the awakening of the UN to the severe global road safety crisis and the invitation to WHO to coordinate UN activities on Road Safety accounted for significant changes in the way of treating the traffic phenomenon at the international level. A new paradigm was proposed on 2003: to provide road safety as an instrument for the promotion of life.

The paradigm shift (from the individualist view to the social and collective use of roads) imposes on individuals and States three major challenges: to acknowledge the seriousness and the essence of Road Safety (as a set of social and collective duties); to reveal to the States their function of Enforcement, and to promote actions aiming at the effective achievement of Road Safety.

Therefore, the period 2011-2020 was proclaimed the Decade of Action for Road Safety, a period in which the States should take their role as guarantor of Human Rights and ensure, through actions, the Social Right to Security and freedom from traffic fear to all traffic participants. The message looks crystal clear: the Freedom from Fear arising from road traffic insecurity only can be reached through actions aimed at achieving Road Safety.

The question is then: what is the role of each fellow citizen in this decade of challenges? Mere spectators and critics, or promoters of actions aimed at achieving Road Safety?

May God enlighten our choices, allowing us to acknowledge our co-responsibility, but also the right to require effective actions from the States, in order to protect life and avoid road traffic injuries and,

thus, shall He grant that we celebrate the good fruits of our good practices in 2020!

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The texts originally published in Portuguese or in Spanish were freely translated and the mistakes are mine.

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### **Appendix: Glossary of terms**

**DUTY** (noun) an act flowing from a legal responsibility. In the Text, Road Safety is a duty of the State because the Brazilian Constitution states, along with Articles 6 and 144, the responsibility of the State to provide Public Safety to all road traffic participants on the national territory.

**HUMAN RIGHTS** (Notion). According to Bobbio (1996, p. 18), 'human rights are historical rights which emerge gradually from the battles which human being fight for their own emancipation and the transformations in living conditions which these struggles produce'. Human Rights are 'rights common to all mankind, to every person as human being, which, therefore, are the result of its own nature, not mere political creations' (Comparato 2003, p. 20).

Sarlet (1998, p. 32) points out that when Human Rights are 'recognized or granted and protected by the constitutional law of each State' they are called Fundamental Rights.

It is very common, when reading or talking about the History of Human Rights, to stumble across the expressions generations or dimensions of Human Rights. Five different dimensions are cited by authors, and these dimensions of Human Rights constitute a set of rights, freedoms, safeguards and duties inherent and indispensable to human beings, whose aim is the fulfilling of the human dignity.

### **GENERATIONS OR DIMENSIONS OF HUMAN RIGHTS?**

Some authors do not make this distinction. Others, like Tomuschat, recognize that these are different concepts, but continue using the term generation. According to the author (2010, p. 26), "It is because of this terminological inadequacy that proposals have been made to introduce different concepts. Some of these proposals sound perfectly reasonable. Thus, Eibel Riedel suggests that one should speak of different 'dimensions' of human rights."

There is, however, consistent guidance to replace the term generation to dimensions, in order to avoid 'a false impression of the gradual replacement of one generation by another'. According to Sarlet (1998, p. 32), "The criticisms that have been directed against the very term 'generations' by the alien and national doctrine ... the use of the term 'generations' can also give rise to a false impression of the gradual replacement of one generation by another, which is why some people prefer the term 'dimensions' of fundamental rights, which has here been adopted in the wake of the most modern doctrine."

That is the reason why, in the Text, the term Dimensions of Human Rights have been used.

### **HUMAN RIGHTS OF FIRST DIMENSION: CIVIL LIBERTIES**

The First Dimension of Human Rights, also known as Civil Liberties, consists of a set of rights and freedoms guaranteed to all human beings against illegalities and abuses of the State and the Church. The French Declaration from 1789 expresses some of these Human Rights, highlighting the importance of individual freedom: Liberty.

## HUMAN RIGHTS OF SECOND DIMENSION: SOCIAL RIGHTS

Social rights are considered the main object of the Human Rights of Second Dimension. In order to achieve the ideal of Equality (from the French Revolution), a second dimension of Human Rights has flourished, during the first quarter of twentieth century, by requiring effective actions of the States. Therefore, the State has become 'the guarantor of human rights' (Tomuschat 2010, p. 8).

The following Social Rights are listed and granted by Article 6 of the Brazilian Constitution (of 1988): education, health, work, housing, leisure, security, social security, maternity and childhood protection, and assistance to the helpless.

From the Social Right of Public Safety emerges the duty of the State to provide Road Safety to all traffic participants, in order to protect life and avoid road traffic injuries. Thus, Road Safety is a type of Human Right of Second Dimension.

## OTHER DIMENSIONS OF HUMAN RIGHTS:

To protect the rights of solidarity and fraternity, a third dimension of Human Rights arises regarding the fulfilling of rights of collective and diffuse ownership. 'Among the fundamental rights of the third dimension, consensually most cited, it is vital to refer to the right to peace, to self-determination of the people, to the development of the environment and quality of life, as well as the preservation and use of historical and cultural patrimony and the right of communication' (Sarlet 1998, pp. 50-51).

From the right to peace, Bonavides (2001, p. 349) supports that the Democracy constitutes "a right of distinct quality" that claims to be a Human Right of the Fourth Dimension, which requires "two basic conditions: first a tenacious faith in its values and, second, a continuous exercise" (Bonavides 2001, p. 193). It is interesting to notice that the Democracy was acknowledged by the United Nations (UN 2005b, Res. A/60/1, par. 135) as a universal value.

Finally, the Fifth Dimension of Human Rights brings the concepts of bioethics and human values to the juridical system, which means 'the understanding of the legal phenomenon as practical knowledge

vitality committed to the promotion of human life' (Silva 2003, p. 70). According to Whitelegg (2007, p. 8), "the process of rethinking road safety and dealing with expectations and anomalies has already begun in Sweden with its 'Vision Zero' road safety policy", which 'puts road safety in an ethical context rather than an economic or engineering context and in effect says that the only acceptable level of deaths and injuries in the road traffic environment is zero.' Interesting to notice that "Vision Zero is based on the ethical imperative that (Tingvall & Haworth 1999): 'it can never be ethically acceptable that people are killed or seriously injured when moving within the road system'" (Whitelegg & Haq 2006, p. 8).

Interestingly, all dimensions of Human Rights are present in the traffic phenomenon. Road Safety, as a set of social and collective duties, ensures Freedom of Movement in safe conditions (First and Second Dimensions) providing freedom from fear arising from road traffic insecurity (Third Dimension). Road Safety is a Human Right of Second Dimension that arises as an indispensable instrument for the promotion of life (Fifth Dimension), which takes in a Democratic State (Fourth Dimension) the function of a constitutional guarantee.

LICENCE (noun) a favourable administrative act, 'by which the Administration provides to someone the exercise of an activity, once the completion of the legal requirements is demonstrated' (Bandeira de Mello 2001, p. 391). It is also considered an 'official document which allows someone to do something or to use something; permission given by someone to another person to do something which would otherwise be illegal' (Collin 2000, p. 215).

DRIVING LICENCE (noun) official document that provides to a person the privilege of driving a motor vehicle on public roads; but also submits the driver to the compliance with the general rules of traffic movement and safety requirements provided by traffic legislation.

RESPONSIBILITY (noun) something that a person or entity is responsible for doing, 'to deal with or take care of somebody/something, so that you may be blamed if something goes wrong' (Oxford 2007,

p. 1294). The term Responsibility is very close in meaning to Duty; however the Duties run from the Constitution or the Law, while Responsibilities have larger sources as moral accountability, contractual obligations, kinship or social coexistence. Regarding Road Safety, the Brazilian Constitution guarantees this Human Right of Second Dimension as well as defines it as a set of duties of the State and all individuals, based on 'just demands of the general welfare, in a democratic society' (as stated in article 32 of the American Convention on Human Rights).

STATE (noun) 'a country considered as an organized political community controlled by one government' (Oxford 2007, p. 1497). The modern State is defined by Oliveira (2001, p. 18) 'as the legal sovereign organization of political society, in a delimited territory', and consists of four essential elements: people, territory, sovereignty and purposes (Silva 2002, p. 98). As one can see, the people is the 'personal element to the creation and existence of the State, since without people it is not possible to have a State and it is to people that the State is formed' (Dallari 2000, p. 9).

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## **Growth of a Giant: A Historical and Current Perspective on the Chinese Automobile Industry**

*Yuan Gao, Jeffrey Kenworthy and Peter Newman*

### **1. Introduction and Context of Chinese Motorisation**

Development patterns at national and international levels not only depend on relations between society and economy within and across regions, but also on the ecosystem capacity of other regions (Folke et al., 1998). As a result, the majority of developed cities around the world have gained useful social, economic and especially, environmental returns from their recent mitigation of vehicle overuse (Puentes and Tomer, 2009; Newman and Kenworthy, 2011). However, cities in most emerging economies are undergoing rapid motorization such that it is imperative to explore the current status and negative impacts of this growing motorization in these countries. China is particularly important in this regard since it is now widely acknowledged as the world's largest car market and is the focus of most major car manufacturers, selling products from basic cars up to luxury models. In 2010 China overtook Japan as the second largest economy behind the United States. Cities in developed countries have stepped into an era of declining car use, which some are terming "peak car use" (Newman and Kenworthy, 2011). The Chinese cities, on the contrary, are in a stage of flourishing development with a prosperous automobile industry supporting it. Undoubtedly, social and economic benefits from increasing motorization cannot be ignored. Nonetheless, this comes at the cost of scarce natural resources, serious environmental impacts and large cultural changes expressed partly in the way that urban public spaces are being turned over to roads and parking and the old walking fabrics previously reliant on pedestrian and bike traffic are often transformed into congested, noisy and polluted places (Mao and Chen, 2009).

Based on Petty-Clark's Law and Kuznets Theory<sup>1</sup>, China has experienced an upgrade of its industrial structure along with

<sup>1</sup> They refer to the transformation of industrial structure from labor-intensive to capital-intensive and finally to technology-intensive with the process of economic development.

an advanced economy. The automotive industry partly pushed forward the process. The mounting desire for motor vehicles is deemed as a vital driving force for boosting domestic demand and energizing economic growth. The contribution of the auto sector to GDP in China is reported to have risen from 0.97% (1999) to 2.29% (2009). Furthermore, global automobile focus has shifted eastwards to China. The International Organization of Motor Vehicle Manufacturers (or Organisation Internationale des Constructeurs d'Automobiles/OICA) reported that U.S. auto sales experienced a precipitous tumble to 13.49 million vehicles or an 18% decline in 2008, the worst performance since 1992, strongly affected by the 2008 Global Financial Crisis (GFC). Chinese auto sales rocketed in 2009 by 46% and China overtook the U.S. as the major car consumer worldwide (notwithstanding this was at a time when global auto sales were at a depressed level).

Nevertheless, current levels of private motorized transport worldwide are unsustainable. The International Energy Agency (IEA) in 2010 recognised that the production of conventional crude oil had peaked in 2006 and that from here on only expensive and vulnerable oil sources remained (World Energy Outlook 2010). About 14% of all oil is consumed by road transportation (World Development Indicators 2012). The 2011 CO<sub>2</sub> emissions by transport around the world accounted for 22% of the total. Road transportation, as the fastest-growing sector, contributed 52% of that in 1990, but some 75% in 2011 (CO<sub>2</sub> Emissions From Fuel Combustion Highlights 2013). The other pertinent costs from road transportation include noise pollution, infrastructure costs, congestion costs, and costs from community severance and destruction of the public realm of cities (Newman and Kenworthy, 1999). Transport in general, and urban transport in particular, is broadly recognized as the major contributor to energy vulnerability, climate change and these issues grow daily in significance on the world stage.

China, whose proportion of global energy consumption has risen to 18.5% in 2009 (Global Energy Statistical Yearbook 2013), has overhauled the U.S.A as the largest energy consumer (Kennedy, 2011). The dramatic growth of motor vehicles is one of the most rapidly rising drivers of Chi-



na's increasing oil demand, accounting for roughly 32% in the national context in 2002 (He et al., 2005). In regard to globally serious environmental deterioration, China achieved a worrying status in 2006. Its fossil fuel CO<sub>2</sub> emissions were 24% worse than the United States level and China became the world's largest emitter of CO<sub>2</sub> (Yan and Crookes, 2009), stoking the increasingly severe global warming problem (Photo 1). The road transport-related CO<sub>2</sub> emissions in China were 280.47 Mt, accounting for 57.5% of the transport-related CO<sub>2</sub> emissions and 4.6% of the total CO<sub>2</sub> emissions in China (Reducing Transport Greenhouse Gas Emissions Trends and Data 2010).



**Photo 1:** China's rapid increase in private motorised transport is fuelling increased CO<sub>2</sub> emissions

*Source: Yuan Gao*

This paper begins with an overview of the Chinese auto-industry from its trial establishment, tortuous development, tremendous prosperity to sound planning. It then retrospectively discusses the driving factors that resulted in the prosperous development and unparalleled influence of the Chinese automobile industry. It examines economic growth, rising disposable income, high savings rates, population explosion, urban sprawl, shifting land use practices and traditional culture, with a focus on the formulated and applied industry policies from the Chinese government. With industrial policies shifting towards managing transportation demand and improving urban public transport (UPT), it also discusses several on-going incentives including New Energy Vehicles (NEVs) and rail transport. In light of the expanding clout of this industrial giant worldwide, appropriate development of the Chinese

automobile industry will be an important focus for sustainable development that can stimulate economic growth as well as social and environmental well-being both nationally and internationally.

## **2. History of the Automobile Industry in China**

The "Preparatory Group of the Auto-Industry" under the Ministry of Heavy Industry was set up in 1950 shortly after the People's Republic of China (PRC) was established in 1949 (Liu, 2000). The Chinese automobile industry, which was originally designated to meet military and transportation need, was more oriented to freight vehicles. The Automotive Industrial Policy (AIP) enacted in 1994 and the Tenth Five-Year Plan (FYP) (2001-2005) successively encouraged individuals and families to purchase passenger vehicles. Passenger vehicles, which reflect higher technologies and more profitability, have therefore gradually been developed. Faced with integration into the global automobile community through entry into the World Trade Organization (WTO) in 2001, the Chinese auto industry strategically shifted its development focus from expanding its production scale to enhancing its industrial structure. After these early developments, which helped pave the way for the Chinese automobile industry, the next step was the "Plan on Automobile Industry Restructuring and Revitalization" (2009). This report stated that the auto-industry would play a crucial role in Chinese economic growth and social development.

The automobile industry in China, which has now marched into its 5th decade, went from a situation where not a single vehicle had been produced before 1956, to one where in the space of just over 50 years, it has grown to be the largest auto producer and consumer on a global scale since 2009 (Ferrazzi and Goldstein, 2011). What makes the achievement even more extraordinary is that for much of this 50-year period China was a centrally planned, communist economy, not functioning with the capitalist principles that gave birth to the world's other major auto manufacturing countries, such as Japan, the USA and Germany. It is therefore important to understand some of the detailed history behind this astonishing achievement. The following sections divide the development

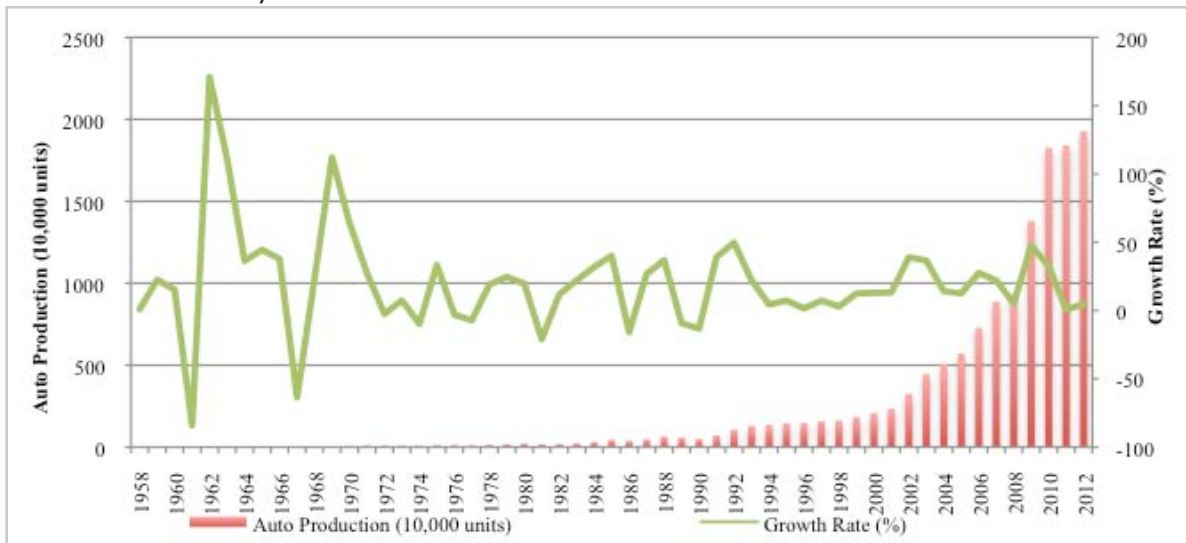
of the Chinese auto industry into four distinct phases:

- Start-up Phase from 1956 to 1978;
- Growing Phase from 1979 to 2000;
- Prosperity Phase from 2001 to 2010; and
- Stationary Phase from 2011 until the present day.

### 2.1 Start-up Phase (1956-1978)

In an attempt to transform China from an agricultural country to an industrial power, (the so called "New China"), the "Common Program of the Chinese People's Political Consultative Conference" (1949) stipulated that nationally concentrated efforts

From then on, at least until China's 1978 "Reform and Opening-up Policy," the country groped forward with a dramatically fluctuating growth trend in its vehicle production rate (see Figure 1). Even after 1978, growth rates were very variable, but not of the same order as the "roller coaster" levels that characterised the period between 1958 and 1978. The 1955, 1956 and 1957 data are also available but are even more intensely volatile as would be expected with the small numbers being compared. For example, the auto production of 1955 (61 Units) is 2611 times less than the 1956 level (1,654 units). Hence, these three earliest years are omitted from the time-series dataset.



**Figure 1:** 1958-2012 Auto Production (10,000 Units) and Growth Rate (%) in China  
*Source: Compiled based on China Automotive Industry Yearbook and National Data (National Bureau of Statistics of China)*

should focus preferentially on revitalization and development of heavy industry. The automobile industry was accordingly included in China's first Five-Year Plan (1953-1957) under Mao Tse-tung and throughout all China's national planning since then, right up until the latest Five-Year Plan (2011-2015), China's twelfth such plan since the communist revolution. The First Automobile Works (FAW), which was established in 1953, within the framework of a technology collaboration program between China and the former Soviet Union, was geared towards heavy vehicles production for defence demand (Gan, 2003). The Chinese auto-industry formally broke ground in 1956 when the first group of heavy-duty trucks rolled off the production line (Zhou and Nie, 2007).

In the time of the Cold War when China was antagonistic towards the U.S., the full acceptance of Soviet-style technology undoubtedly sped up the process of industrialization. But it also caused the Chinese auto-industry to become isolated from real economic conditions, and it built up institutional obstacles to self-developed products (Holweg, et al., 2009). Thus, the kind of administrative management and economic frameworks in which Chinese vehicle production operated thwarted innovation. Vehicle production in China was run by the government rather than through the market economy and it mainly served to develop the mechanized means of freight transport to satisfy economic construction. The central government held a monopoly on automobile supply in China. Vehicles

manufactured from the FAW accumulated up to 150,000 units until 1965, representing 88.2 per cent of the national total (Hu, 2002). Auto-enterprises were deficient in intrinsic motivation under the mandatory plan in strict compliance with China's Planned Economy and therefore lacked the necessary innovation processes for a progressive, modernising auto industry.

In spite of this general situation, some national strategies emerged that, although being recognized as going against the 'law' of Chinese development, nevertheless somewhat helped to facilitate the Chinese automotive industry. Mao's Great Leap Forward (1958-1960) is an example. It aimed to emulate and surpass the United Kingdom in the field of major industrial products output within 15 years. Consequently, more than one hundred minor local automotive factories were quickly formed and the entire vehicle production in 1958 almost doubled the 1957 level (China Automotive Industry Yearbook 2002). The resulting proliferation promoted four more automobile production sites built in the cities of Nanjing, Shanghai, Beijing and Jinan. Similarly, the Cultural Revolution (1966-1976) caused nationwide upheaval but improved the localization of the automotive industry with the decentralization of central government power. The Second Auto Works (SAW), established in 1969, has been recognised as becoming basically technologically independent in auto-manufacturing (Sit and Liu, 2000). Its location and products also reflected Chinese conditions. Since the Sino-Soviet split in 1960, China felt threatened by both the U.S. and the former Soviet Union. The SAW was therefore placed in a mountainous region and mainly supplied military crossover vehicles and trucks designed to help prepare China against a possible foreign attack (Harwit, 1995).

The Chinese auto-industry, which started out with imported international technology and national financial support, featured weak autonomy and rigid administration practices under a centrally planned economy. Under no circumstances can private auto-enterprises enter into the automobile market, or existing ones retreat from the auto market, when a national government erects such strong industrial barriers. Such practices generate inefficiencies and uncompetitive production systems. The

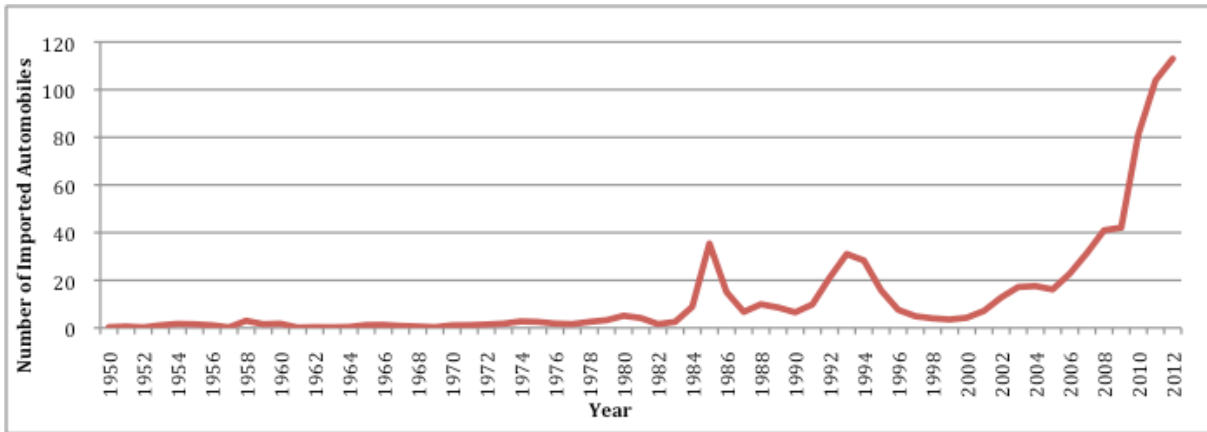
cumulative output of automobiles in China in the 22 years from 1955 until 1977 was 1,252,527, about equivalent to the monthly production in 2009 (China Automotive Industry Yearbook 2010).

## 2.2 Growing Phase (1979-2000)

The 1978 institutional reform from a state-controlled economy to a market-oriented one had a remarkable influence on everyday aspects of social, economic and cultural life (Qian, 2000). As far as the automobile sector was concerned, the commercialisation of motor vehicles was not initiated until 1983 when the government relinquished a 10 per cent share of self-marketing to auto-manufacturers themselves (Zhang, 2004). As explained earlier, the automotive industry in China in its formative years was regarded as a producer of freight vehicles and this generated a shortage of light vehicles. With respect to the passenger car that was trial-produced by the FAW in 1958, it remained in a state of slow development until 1978. In that year its production reached a low of 2,640 units, accounting for just 1.7 per cent of China's entire automotive products. It was at this time actually the "Chinese Truck Industry" rather than the "Chinese Automobile Industry".

A large transformation occurred in China in 1984 when the purchase of private vehicles was explicitly acknowledged as legal at the national policy level (Provisions on Individual or Corporate Farmers Purchase Motor Vehicles, Vessels and Tractors for Transportation Business). The Chinese government then adopted an even more positive stance towards ownership of private vehicles in the AIP (1994) and entrenched the concept of "Encouraging Passenger Cars into Family" into the Tenth Five-Year Plan in 2001. The demand for automobiles in China, which had been dominated by government cars, subsequently transformed to private ownership of vehicles, which was even forbidden before 1979 (Liu, 2008).

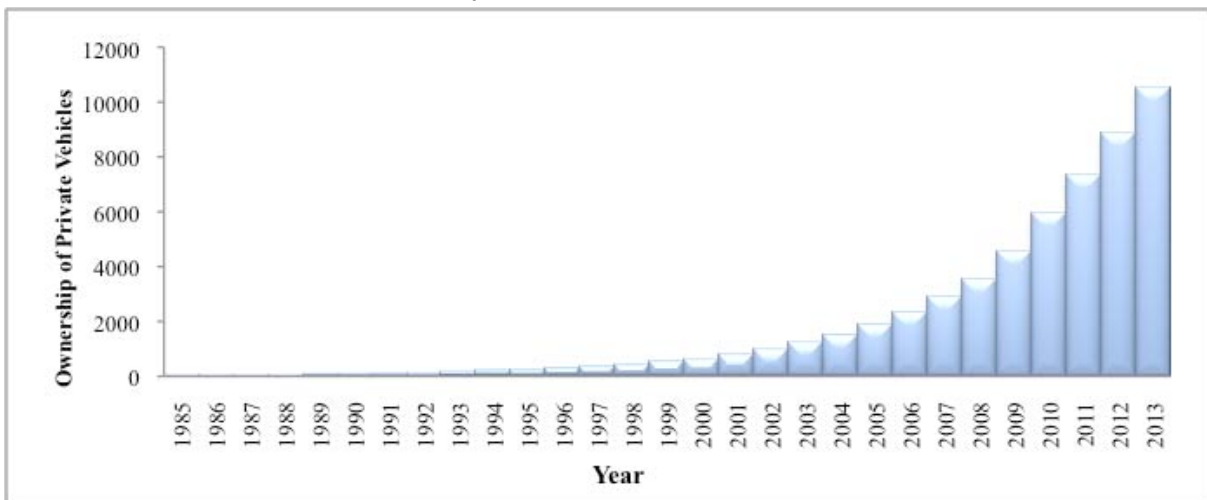
Consequently, the surging imbalance between a rapidly inflated demand for automobiles and limited domestic production triggered an import binge (see Figure 2). Imported-automobiles poured into China, both legally and illegally. The amount of imported automobiles from 1978 to 2012



**Figure 2:** Number of Imported Automobiles in China (1950-2012) (10,000 Units)  
*Source: Compiled based on China Automotive Industry Yearbook (2010) and China Association of Automobile Manufacturers/CAAM*

occupied up to 93 per cent of China’s gross imports of all types of vehicles. The share of foreign imports of automobiles to the domestic market hit a peak of 44.5% in 1985 (Ministry of Commerce/MOC, 2009). For the purpose of mitigating the exacerbated drain on China’s foreign exchange, the central government resolved to tighten macro-regulatory conditions and cultivate its own national car-industry instead. More specifically, starting in 1985, high tariffs were levied on car-imports in order to protect the infant Chinese car industry. Such

mobile production up to 15% per annum from 1992 to 2002, which was ten times more than the global level (CAAM, 2002). The proportion of light-, mid-sized- and heavy-vehicles was adjusted to 78.5%, 17.8% and 3.7%, respectively in 1998. The amount of imported cars accordingly reduced throughout the 1990s and bottomed out in 1998 (18,016 Units), whereas the ownership of private vehicles rose from 284,900 Units in 1985 to 4,236,500 Units in 1998, an almost 14 times increase in just 13 years (see Figure 3).



**Figure 3:** Ownership of Private Vehicles (10,000 Units) from 1985 to 2013  
*Source: Compiled based on National Data (National Bureau of Statistics of China)*

tariffs reached up to 220 per cent in 1992 according to Notice on Cancelling Import Adjustment Tax (China Customs General Administration/CCGA, 1992). On the other hand, Sino-foreign joint ventures under the “Market for Technology Strategy” that was approved in 1984, promoted the integration of the Chinese auto-industry into the world. Promulgation of incentives boosted the average growth rate of Chinese auto-

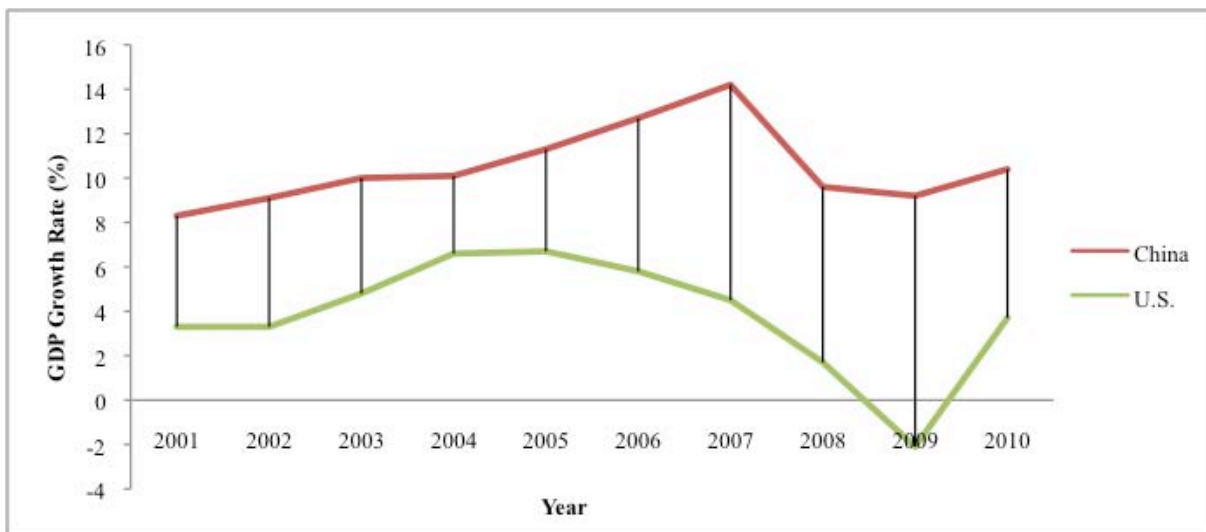
### 2.3 Prosperity Phase (2001-2010)

Following from the previous period, China came under the gaze of the WTO and China itself also recognized the value of being admitted to the WTO. As a result an agreement was struck between China and the WTO, that the import tariff on an assembled car would in 2001 be reduced to 80 per cent where the size of the engine

is less than or equal to three-litres, or 110 per cent where the size of the engine is bigger than three-litres and to 25 per cent by July 1, 2006 (Tianjin Economic-Technological Development Area Automotive Industry Development Research Report). These significantly decreased tariffs, as well as deregulation of non-tariff barriers (such as easing restrictions on car-import permits), made China's entry into the WTO in 2001 the major new thrust in the development of the Chinese car industry.

In the meantime, in the face of the accelerated pace of globalization, China made significant economic progress from 2001 onwards. Its real per-capita Gross Domestic Products (GDP) stayed on an annual 8 per cent high-growth trajectory, whilst the American economy went into a downturn (see Figure 4). Personal income, which is recognized as the principal economic stimulus to vehicle ownership (Dargay et al., 2007), remained for the most part in double-digit<sup>2</sup> annual growth, along with national economic development during the same period.

to over 10 million in 2010 (Shenzhen Statistical Yearbook 2013). The National Urban System Planning (2010-2020) (Draft) selected Shenzhen, which was basically a fishing village, as the central city of southern China since 2010. This unprecedented demographic leap forward on such a huge scale in China has caused people to gradually move away from the central cities to suburban areas to avoid daunting housing prices and other serious urban problems. However, the central districts of Chinese cities have continued to serve as the sites for the main political, economic and recreational functions, due to the deficiency of ancillary facilities in peripheral regions (Song, 2013). The resulting commuting times rise rapidly with such mono-centric urban forms and expanding urban sprawl, albeit at considerably higher densities than in other sprawling cities such as Atlanta, Houston or Sydney (Newman and Kenworthy, 1999). This phenomenon, together with an element of the car being a symbol of social status, meant that the ownership of private vehicles in China ac-



**Figure 4:** Trend of GDP Growth Rate between China and USA (2001-2010)  
*Source: Compiled based on World Bank and Bureau of Economics Analysis (BEA)*

Furthermore, Chinese urbanization has been experiencing a continuous increase from 39.1% in 2002, up to 51.3% in 2011, with an average annual growth rate of 1.35% (China National Human Development Report 2013). This means that nearly 188 million rural dwellers have relocated to urban areas in China over that 9-year period. Shenzhen is a clear example, growing from 314,100 residents in 1979

celerated dramatically in the 2000s (Gan, 2003).

The rising purchasing power and increasing distances of daily commuting trips have generated huge demand for motorised travel, especially individual motorised transport. Cars owned by private individuals are reported to outweigh those by public authorities, accounting for 74.4 per cent of the Chinese market in the year 2006 (Statistical Bulletin on National Eco-

<sup>2</sup> Personal income growth was actually 8.8% in 2009.

nomics and Social Development in 2006). By 2010, ownership of private vehicles had reached 59.39 million, with a 25 per cent annual growth rate, 7.7 times more than the 2001 level in China (see Figure 3). China officially entered into the era of rapid motorization, driven by surging private vehicle ownership. It took thirty-six years from 1956 to 1992 for China to achieve its first million in auto production. The pace since Chinese accession to the WTO has accelerated to exceed millions of automobiles each year since 2003 (see Table 1).

Year	1992	2000	2002	2003	2004	2005*	2006	2007	2008	2009	2010
Duration (years)	36	8	2	1	1	1	1	1	1	1	1
Yield (10,000 units)	100	200	300	400	500	600	700	800	900	1400	1800

**Table 1:** Year and Duration of Automobile Production Exceeding Given Amount

Source: Compiled based on *China Automotive Industry Yearbook (2011)*

\* The actual auto production in 2005 was 5,707,688, which is less than the data shown in Table 1. It is rounded to 6 million in the paper for simplicity.

Both the opportunities and challenges that the Chinese auto-industry has faced are extraordinary since its entry into the WTO. China's CR3 of "Big Three" auto-manufacturing bases<sup>3</sup> produced 75% of the country's cars in 2002, which reveals the high industrial concentration in a few sites, dictated by administrative intervention. The urgency for China is to transform from 'reactive protection' characterised by government interference towards 'proactive protection' featuring global competitive advantages. According to WTO commitments, tariff protection and non-tariff barriers to cars should be gradually phased out within a five-year transitional period to buffer the stress from market liberalization. Fostering self-developed capacity and optimizing industrial structure are the long-run solutions for the future of the Chinese automotive industry.

In light of China's out-dated manufacturing system and incomplete component enterprises, the "Bring in" strategy has been

<sup>3</sup> The state council officially sanctioned the FAW, SAIC and Shanghai-VW as China's three major car-manufacturing bases in 1987. One year later, three small car assemblers in Beijing, Tianjin and Guangzhou were approved. It is the well-known "Big Three and Small Three" strategy. The SAIC has been officially renamed as Dongfeng Motor Corporation in 1992.

in force since 1978 to introduce foreign investment and technology. In practice, however, China has become essentially one big assembly plant for the global giant carmakers. The AIP (1994) has prohibited imported technology through the Semi-Knocked Down (SKD) or Completely Knocked Down (CKD) approach to car manufacture, to protect the import substitution rate. But all requirements relating to the legal and institutionalised protection of China's car industry should be cancelled, as required by the WTO. External factors, including government intervention are

still overemphasised in China compared to pure market mechanisms or the management of the enterprise itself. This has stifled the innovation ability of Chinese car manufacturing enterprises (MOC, 2004). To better confront the realities of the global environment with respect to cars, featuring a well-developed competition system and powerful multinational automakers, China adopted the integration of imported technology with independent innovation to avoid "Technology Hollowing-out" and to establish its national brand.

The Swedish auto company Volvo was ranked 232 of "The World's 500 Most Influential Brands", compiled by the World Brand Lab in 2006 based on its advantageous Share of Market, Brand Loyalty and Global Leadership. However, in the GFC of 2008 its auto sales fell by 18.3% to 374,297 Units worldwide compared to 2007. In 2010 the Chinese-owned Geely Automobile Holding company saw the opportunity for a takeover and made an agreement with the Ford Motor Company on acquisition of 100% stakes in Volvo and related assets, especially its intellectual property regarding technology. The Volvo Car Group subsequently announced its 2013 global sales increased by 1.4%, with a 46% surge in China (Volvo Car Group,

Global Newsroom). Geely also transformed its operation from lower level cars towards more upscale models by way of Volvo's technology combined with Chinese market conditions.

The production capacity utilization of Chinese car manufacturing businesses was 72.5% in 2005. This means that there is potentially a structural overcapacity problem if things remain on a business-as-usual basis (National Development and Reform Concession/NDRC, 2006). The Tenth Five-Year Plan (2001-2005) enacted in 2001 accordingly suggested improving and updating product structure. The Automobile Industry Development Policy (2004), which listed Structural Adjustment as one chapter and the special policy called Notice on Opinions of Automobile Industry Structural Adjustment approved in 2006, both stressed the urgency of the above situation. The Plan on Automobile Industry Restructuring and Revitalization (2009) implied an acceleration of China's industrial restructuring in proper response to the 2008 GFC. Rightly or wrongly, depending on the perspective one takes, China has thus become the ray of hope for the global car market.

#### 2.4 Stationary Phase (2011 until Present Day)

In 2014 the global automobile industry stepped into its 128th year since the first automobile was introduced in 1886 (Ruiz, 1985). China surpassed the U.S. as the giant of global automobile production and consumption in 2009 and has been the major contributor to global automobile industry growth since then (Market Analysis Report: China's Automotive Industry), even though it came into being seven decades later.

After the extraordinary growth rates of auto production and auto sales in 2009 (48.3%; 45.5% respectively) and 2010 (32.4%; 32.4% respectively), the Chinese auto-industry uncommonly underperformed in 2011 (0.8%; 2.45%) (OICA, 2009-2011). This has ushered in a new 'stationary phase' of Chinese automobile industry development, partly affected by the implemented policies including Transportation Demand Management (TDM) and prioritising public transport development. This change has in turn been brought about by crippling levels of congestion in

many Chinese cities, dangerous levels of air pollution, growing traffic fatalities and injuries and other serious impacts from the introduction of such huge numbers of motor vehicles into Chinese cities in such a short space of time (Pucher et al., 2007). Photo 2 shows how the public spaces of Chinese cities are being taken over by motor vehicles.



**Photo 2:** Colonisation of footpaths by motorcycles in Shanghai

Source: Yuan Gao

However, before this period, The Chinese government formulated three pro-auto policies aiming to rebound from the 2008 GFC comprising "Purchases Duty Preferential" (Notice on Reduction in Vehicle Purchase Duty for 1.6-liter or less Passenger Cars, 2009), "Bring Auto into Countryside" (Plan on Automobile Industry Restructuring and Revitalization, 2009) and "Car-Scrapping" (Implemented Measures on Car-Scrapping, 2009) These are summarised in Table 2. The Purchase Duty Preferential, which stimulated sales of cars of 1.6 litres or less by 71% in 2009, was very influential in boosting the total auto sales in China (CAAM, 2010). However, these preferential policies and subsidy plans for auto purchases were required to terminate from 2011(MOF, 2011a, b, c). China began to free up in order to build a more resource-saving and environment-friendly society as per the Twelfth Five-Year Plan (2011-2015), in which the New Energy Vehicle<sup>4</sup> (NEV) is listed as one of the nation's strategic emerging industries (SEI).

4 It consists of HEV (Hybrid Electric Vehicles), BEV (Battery Electric Vehicles, including Solar-Powered Autos), Fuel Cell Electric Vehicles (FCEV), Hydrogen-Powered Vehicles and other New-Energy vehicles defined by the New-Energy Vehicles Manufacturing Enterprises and Products Access Management Rules from 2009.

Policy	Content	Extension
Purchase Duty Preferential	The duty will be temporarily levied at the half-reduced rate of 5% on passenger cars with engines of 1.6-liter or less purchased from January 20 to December 31, 2009.	In the end of 2009, the State Council approved its extension to December 31, 2010. The newly formulated purchase duty was increased to 7.5%.
Bringing Auto into Countryside	A financial subsidy amounting to five billion RMB will be granted to farmers who replace three-wheeled vehicles or low-speed trucks with light-duty trucks or 1.3-liter or less mini-cars from March 1 to December 31, 2009.	It was extended to the end of 2010.
Car-Scrapping	The subsidy will be offered to upgrade old or yellow-label vehicles in advance. This includes gasoline or diesel vehicles failing to meet the National Emission Standard. The compensation value varied from 3,000 to 6,000 RMB and functioned from June 1, 2009 until May 31, 2010.	Its validity was extended to December 31, 2010.

**Table 2:** Three Auto-Encouragement Policies Designed to Overcome the 2008 GFC

In contrast to this short-term response to the GFC, deeper issues have taken over and have set China into a new phase of restrictions on private vehicles, in order to reduce some of the major problems afflicting Chinese cities due to large numbers of vehicles (Photos 3 and 4). Strategies restricting purchase and use of private vehicles are now emerging in the megacities of China. For instance, the Beijing municipal government initiated the rationing of road space since the 2008 Olympics. Car



use in Beijing was curtailed according to the number on the license plates. Another example is limiting the quota of new car registrations in Beijing in an attempt to curb unsustainable levels of automobile ownership (Song, 2013). This has since been further tightened by 37.5% to only 150,000 new car registrations per year since 2014 (in a metropolitan population which will be approximately 22 million people by that time) (Notice on the Work Plan of Beijing Motor Vehicle Emission Pol-



**Photos 3 and 4:** The dense urban fabric of Chinese cities is increasingly filling with cars, which is leading to programmes to limit car ownership in cities.

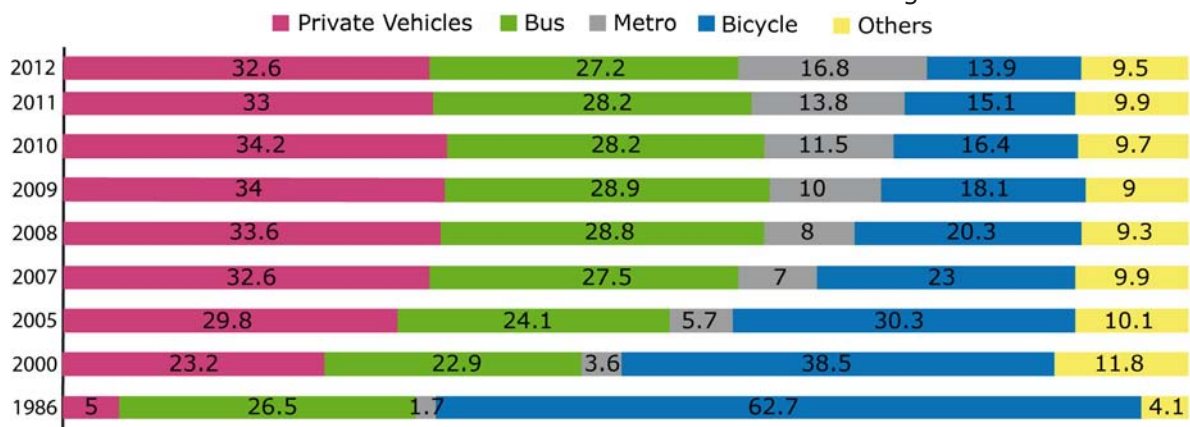
Source: Yuan Gao



lution Control 2013-2017). Up until the end of March 2014, Beijing, Shanghai, Guiyang, Guangzhou, Shijiazhuang, Tianjin and Guangzhou had already joined in similar efforts to restrain car ownership. There are two distinctive systems for new car registration around China: (1) an unpaid lottery system and (2) a paid bidding system. For instance, Beijing distributes the new car registration quota for free to the applicants through a lottery system. Conversely, Shanghai has adopted the Singapore-style Certificate of Entitlement

a 32.3% compound annual growth rate (2012-2013 China Urban Rail Transport Development Report). By the end of 2013, there were 87 urban rail lines in service among nineteen Chinese cities, with a total network length of 2,539 km (2013 Statistical Length of Chinese Operating Urban Rail Transport).

Rail transport is of critical importance in shifting trips away from cars and motorcycles. As shown in the modal splits for Beijing in Figure 5, the 465 km (2013) Beijing metro network length has had a dramatic



**Figure 5:** Travel Modes of Beijing Residents' Daily Trips (%) (Excluding Walking) (1986-2012)

Source: Compiled based on 2013 Beijing Transport Development Annual Report

for new car purchase, which means bidding at an auction for the right to buy a new car. Chen and Zhao (2012) and Zhao et al (2014) have analysed the respective merits of both these schemes.

Additionally, transport investment priority has now been transferred towards developing Urban Public Transport (UPT) at the national strategy level, especially Rapid Mass Transit (RMT) through the Twelfth Five-Year Plan. RMT, which includes Subway/Metro and Bus Rapid Transit (BRT) within cities, as well as inter-city High-Speed Rail (HSR), is now undergoing massive growth (Newman et al, 2013). The case of Chinese urban rail transport is illustrative of this new priority. The "metro" as a mode of transport first appeared in 1969 in Beijing, 106 years after the London Underground/Tube was first constructed in London (Strickfaden and Devlieger, 2011). Although developing urban rail transport was primarily embraced in the Tenth Five-Year Plan in China (2001-2005), Chinese investment in urban rail transport mushroomed from RMB 12 billion (2001) to RMB 260 billion (2012), with

effect on public transport modes. Beijing's subway is nationally the second longest, eclipsed only by Shanghai (577 km). The trips by metro in Beijing surged from 1.7% (1986) to 16.8% (2012). On the negative side there was a decimation of bicycle trips from 63% in 1986 to 13.9% in 2012. This was due primarily to a political move away from bikes as being "backwards" and the concomitant destruction of bicycle facilities in the city to make way for cars (Photo 5). It also became increasingly dif-



**Photo 5:** Cars parked in bike lane in Beijing  
Source: Yuan Gao

difficult to travel by bike due to the long trip lengths for many needs as the city spread (Yang et al, 2014). Finally, conditions for buses were not ideal either in Beijing, as reflected in the slow-growth of regular bus transit (RBT), which increased only from 26.5% to 27.2% during the same period.

### 3. Conclusions

China, as the largest rapidly developing country, accommodates 19 per cent of the global population (China Population Census, 2010) and contributes 9.4 per cent of global GDP (World Bank, 2010). It has become the object of widespread interest around the world. Its automotive industry has been facing a dilemma of risk and possibility throughout the institutional reforms of the decades since the end of the Second World War, including the New China Foundation in 1949, the Reform and Opening-up Policy in 1978, Entry into the WTO in 2002 and the New Era starting from 2011. This paper has documented China's automotive development history from a "Truck Industry" to a national pillar industry, from the global automobile giant of only a few years ago (a status which it still largely retains), to the current period of restricting car ownership in many cities and prioritising public transport within China's urban environments, especially through rapid development of rail transport.

The Chinese automotive industry, which mainly served military and economic construction needs due to strained international relations and a distinct command economy at the beginning of New China, overweighted its automotive production towards freight vehicles. The constantly changing national policies and excessive technology dependence resulted in an unproductive and uncompetitive automobile production system.

The 1978 open-door economic policy, which pushed towards the devolution to local economies, raised production motivation but intensified regional rivalry. Furthermore, permitting and encouraging the ownership of private vehicles along with enhancement of individual purchasing power, shifted the industrial emphasis specifically towards the manufacture of cars. The contradiction between ever-growing automobile demand and incompatibly low domestic automobile supply drove the thirst for auto imports in China, which

peaked in 1985. The Chinese auto industry attempted to achieve production-sales balance and then profitability through increasing its industrial concentration and importing foreign technology.

Being the 143rd member of the WTO has promoted the Chinese auto industry from an outlier towards a major contributor to the global automobile market. In contradistinction to mature automobile countries such as the USA, China's advantage in the car industry is having a huge base of new first time car buyers, rather than just updating requirements for cars. However, it has also suffered from the lack of internationally influential automobile products. Establishing and growing its car industry in a relatively protectionist environment, the Chinese auto industry has needed to upgrade its industrial structure and to develop self-owned intellectual products. On the downside, the car industry in China, especially in the dense and space-constrained Chinese cities, has generated very significant impacts in local communities (congestion, air pollution, increased traffic fatalities and degraded public environments to name a few impacts). Nationally and globally, the sheer size of the Chinese automotive industry brings many resource, environmental and other problems which reduce its positive economic aspects. This must be taken into account in any further efforts that China makes to become an automobile powerhouse of the world.

There is now evidence that China is beginning to see these bigger problems and is responding accordingly. An awareness is developing that it is not possible, wise nor even economically sensible to turn Chinese cities into automobile dependent cities. It is now possible to see the beginnings of a new focus on public transport and the regeneration of walking and cycling as important modes of urban transport. If continued, this will allow a diversity of modes, including cars and motorcycles, to co-exist better in Chinese cities. This does not spell any kind of "end" to automobiles in China, but rather it heralds a new realisation that Chinese cities will be better functioning, more environmentally attractive and better off economically to encourage a healthy balance of modes, in a similar way that many economically, environmentally and socially successful cities in Europe

have done (e.g. Copenhagen and Zurich). Chinese cities have more than enough capacity to head in such directions, and in a relatively short space of time, especially since they still have comparatively dense urban development patterns that support public transport, walking and cycling (Photos 6 and 7).



**Photo 6:** Bicycle parking outside a Beijing metro station  
*Source: Yuan Gao*



**Photo 7:** Chinese cities will increasingly look to extending good quality, green walking environments  
*Source: Yuan Gao*

Starting around 2011, we have now seen China quite aggressively pursuing TDM policies and vigorously advocating prioritising UPT. There has thus been a momentous shift in the Chinese automobile industry policy from 'stimulation to sustainability'. The Beijing Declaration (Wang, 1996) suggested that the primary objective of transportation systems is to realise the movement of freight and passengers rather than the movement of vehicles. Despite the significant achievements of the Chinese auto industry for the national economy, the liveability and sustainabil-

ity of Chinese cities cannot be realised if urban mobility is primarily oriented to private motorised travel modes (cars and motorcycles). An integrated and diverse urban transport system in China is now designated to satisfy the daily trip demand and mitigate environmental and social vulnerability.

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## **Disability Due to Road Traffic Crashes and the Management of Road Safety in Developing Countries**

*Julie A. King, Mark J. King, Sara A. Hair*

### **Introduction**

Prior to 2000, the global public health community had paid limited attention to road safety as among other public health issues (WHO, 2004). This situation changed in 2000 with a series of WHO initiatives that included publication in 2004 of the World Report on Road Traffic Injury Prevention (WHO, 2004), which provided a comparative picture of the contribution of road traffic crashes to the global burden of disease. This global focus on road safety has been sustained, with the 2013 Global Status Report (WHO, 2013) which cites estimates that about 1.24 million people are killed each year in road traffic crashes, while a further 20-50 million are injured. It was noted that 90% of the road traffic fatalities occur in developing countries, in spite of their lower levels of motorization. The Global Burden of Disease projections (WHO, nd) are that death as a result of road injury will be ranked 9th highest for 2015, rising to 7th in 2030, with the ranks being highest in developing countries. The population rate of death from road injury is also expected to increase, from 20 per 100,000 in 2015 to 22 per 100,000 in 2030.

In recent years there has been a new momentum behind efforts to highlight disability as a global issue. The World Report on Disability was released in 2011 (WHO, 2011b) and included updated estimates from the Global Burden of Disease study that 15.3% of the world's population in 2004 had moderate or severe disability. Developing countries had higher rates in all age groupings, and about 80% of people with disabilities live in developing countries (WHO, 2006) where disability is considered to be a significant barrier to development (WHO, 2011b).

The World Report also notes the contribution of road traffic crashes to disability, though it states that there is a lack of documentation about the scale and nature of the links between road traffic crashes and disability. It is the purpose of this paper to articulate how a better qualitative understanding of the long term disability impacts of road traffic crashes can contrib-

ute to better management of road safety. In order to this, the way that road safety management is approached requires explanation.

The public health approach to road safety expressed in the UN Global Plan for the Decade of Action for Road Safety

"Road safety" (meaning the safety of all aspects of road use, not just the safety of the road itself) has been evolving as an expression over several decades. It can be interpreted as an objective (making road use safe), as an area of policy and strategy, as a field of practice, as a field of applied research, and as a description of program activities and behaviours (both organizational and individual). A unifying characteristic of these diverse usages is a focus on the public health approaches of primary and secondary prevention: preventing the occurrence of road traffic crashes; and mitigating the resulting harm when they do occur. These approaches are broad in scope, being effectively directed at all drivers, all roads, all vehicles. Post crash factors are not neglected, but their role is limited. There is an emphasis on retrieval and emergency treatment to reduce the chances of death or more serious complications as a result of the injuries received in the crash; and aggregate information on the long term social and economic costs of road crashes are sometimes calculated (and more often estimated) to convey the scale of the problem.

While both long and short term disability can result from road traffic crashes, road safety researchers are typically interested in the patterns of injury rather than in the disability impact itself. Long term disability is not ignored, but tends to be allocated a limited role, a characteristic shared with other areas of public health approaches (Debas et al., 2006).

In May 2011 the UN released its Global Plan for the Decade of Action for Road Safety (WHO, 2011a). The Plan is intended to contribute to achieving the goal of the Decade of Action: "stabilizing and then reducing the forecasted level of road traffic fatalities around the world by increasing activities conducted at national, regional and global levels" (p. 7). Consistent with a public health approach, the main emphasis of the Plan is on prevention of road crashes, with limited attention to



post-crash factors. The Plan takes a “safe system” approach that views road crashes as being inevitable because human error will always occur, but sees road use as taking place in a system whose features can be designed or changed to minimize the incidence of human error and the consequences of a crash when it does occur. The consequences of the crash are often expressed in terms of energy exchange, since it is the exchange of energy in a crash that determines the level of injury. The intention is to manipulate the parameters of the system to reduce both the incidence of crashes (by eliminating the “system failure” aspects as much as possible) and the energy exchanged in the crash.

The Global Plan conceptualises the safe system as structured around five “pillars”: Road safety management; Safer roads and mobility; Safer vehicles; Safer road users; and Post-crash response (WHO, 2011a). The document depicts them in a kind of sequence (Figure 1), with Pillar 1 being the overarching road safety management structures and operations that should make the system safe (legislation, data systems, budgets, agencies), Pillars 2, 3 and 4 describing the standard categories of factors contributing to crashes (roads, vehicles and road users), and Pillar 5 dealing with the response once a crash has occurred (ambulance, immediate treatment).

<b>Pillar 1</b>	<b>Pillar 2</b>	<b>Pillar 3</b>	<b>Pillar 4</b>	<b>Pillar 5</b>
<b>Road safety management</b>	<b>Safer roads and mobility</b>	<b>Safer vehicles</b>	<b>Safer road users</b>	<b>Post-crash response</b>

**Figure 1:** The five pillars of the Global Plan safe system (WHO, 2011a)

These five pillars are not universal. The Australian safe system framework (ATC, 2011) features only four elements: Safe Roads, Safe Speeds, Safe Vehicles and Safe People. The Cambodia National Road Safety Action Plan includes the five pillars above and adds three more: law enforcement, vulnerable road users and driving licenses (Sann et al., 2013). However the five pillars in the Global Plan draw significance from their role in shaping the policies, plans and activities of countries around the world.

The first four Pillars have a strong focus on prevention of road traffic crashes and mitigation of energy exchange when a crash occurs. They are aimed at broad changes – influencing road safety management across all road safety domains, making all road infrastructure more conducive to safe travel, improving crashworthiness of all vehicles, improving behaviour of all road users. This is consistent with a public health approach, which focuses on prevention first and foremost, then on mitigation. Prevention approaches in road safety deal with all road users, who are all potentially at risk of being involved in a crash. The aim is to reduce the probability that a crash will occur by addressing risk factors such as behaviour (speeding, drink driving), road conditions (slippery surface, lack of road shoulders, poor visibility) and vehicle factors (brake maintenance, stability). Mitigation approaches deal with the subset of road users in the process of experiencing a crash, in order to reduce the probability of injury and/or the likely severity of injury. They usually address road factors (clearance of roadside obstacles, guardrails, frangible poles) or vehicle factors (airbags, ESC, restraints) though behavioural factors are involved as well (restraint use, helmet wearing).

The fifth pillar – post-crash response – appears in contrast to be far more specific, focusing only on crash victims in the event of a safe system failure: the crash has oc-

curred, and the mitigating factors during the crash have played their role. The text of the Plan mentions both “emergency treatment and longer term rehabilitation”. Most of the activities listed for countries to pursue deal with emergency response and immediate post-crash care, as might be expected. The two activities that deal indirectly with longer term disability concern the establishment of financial support for rehabilitation and creation of job opportunities.

There is a subtle but important issue here: the investigation of the crash is mentioned in terms of legal proceedings and settlements, but there appears to be no focus on collecting data on crash victims beyond the crash circumstances and their immediate treatment. In other words, the victims appear to be relevant to the first pillar (and by implication the second, third and fourth) only insofar as their numbers can be used to develop and evaluate the success of road safety programs and identify target groups and contributing factors.

### **Disability due to road traffic crashes and relationship to development**

Few studies have been conducted on long term disability after road traffic crashes, with the focus mostly being on short term impacts. For example, a cohort of French road traffic crash victims was split according to severity and followed up after a year (Hours et al., 2013). Even in the less severe category (MAIS <3), 44% reported some functional disability, while two-thirds of those in the higher severity category reported some functional disability. An important issue noted by the authors was that families were affected, not just the individuals themselves, more so in severe cases. Similarly, in a study conducted in Nigeria (Juillard et al., 2010), about one third of people who had been injured in a traffic crash in the previous year reported that it had led to a disability, with two-thirds of these people reporting that the disability left them unable to perform some activities of daily living, some losing their jobs and most suffering some income loss.

The Global Burden of Disease project (WHO, nd) takes another approach, using the concept of disability-adjusted life years (DALYs). Because they take long term disability into account, DALYs are a potentially useful way of appreciating the burden of long term disability, although there have been criticisms of the approach (WHO, 2011b). A detailed study in Thailand addressed some of these issues and found that the estimated years lost to disability as a result of non-fatal road traffic injuries was double that of the GBD estimates (Ditsuwan et al., 2011). Of the DALYs lost due to non-fatal road traffic injuries in this study, 95% were due to the long term im-

pacts. Using earlier data and the related concept of years lost through disability, a comparative study was undertaken in the Netherlands, Thailand and South Africa (Haagsma et al., 2012). Only 1-2% of injuries resulted in lifelong impairment (likely to be an underestimate – WHO, 2011b), but this accounted for 68-76% of all years lived with a disability.

The disabling impacts of road traffic crashes are significant for development progress as well (WHO, 2011b). A detailed study of 100 households (542 people) randomly sampled from road traffic crashes in a district near Phnom Penh, Cambodia (Ericson and Kim, 2011) reached the following conclusions about the impact on the Millennium Development Goals (MDGs):

- MDG1 (poverty): 21% income loss for the households overall, greater for the poorest households and where the injury was serious;
- MDG2 (education): drop-out rates were eight times the average for the province;
- MDG3 (gender): income gap became 28% worse, women in the household took up the additional burden of care in 88% of cases;
- MDG4 (child health): there was a 31% deterioration in child health;
- MDG5 (maternal health): there was a 24% deterioration in maternal health;
- MDG6 (priority diseases): rates twice the national average;
- MDG7 (environment): increased wood fuel use, and no improvement in access to water;
- MDG8 (global partnership): none to address the negative welfare impacts of injury.

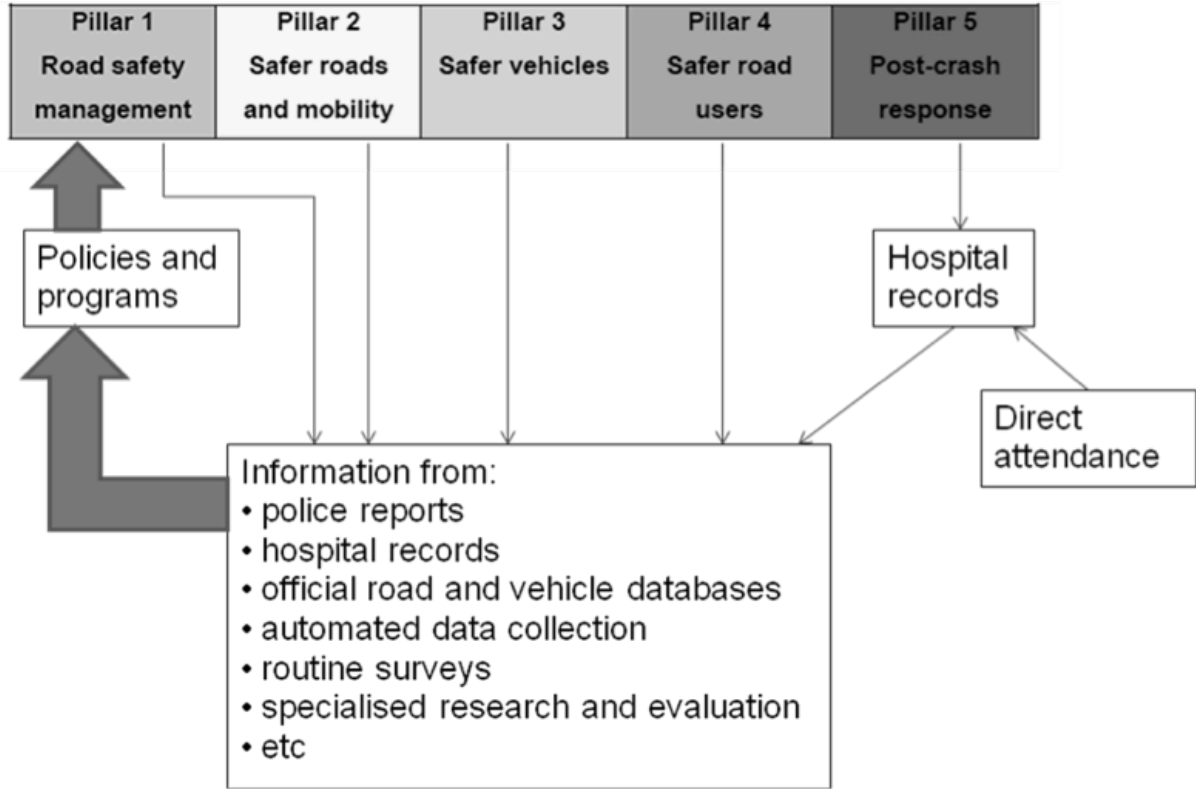
Clearly, the long term impacts of road traffic crashes are important, and are likely to be greatest in developing countries. While this is enough to justify a greater appreciation of the scale of the impacts of road traffic crashes, it will be argued that a case can also be made for the relevance of the experience of long term disability to road safety management.

**How disability due to road traffic crashes can inform road safety management**

Figure 2 presents schematic representations of information flows that inform the first pillar of the UN Decade of Action, road safety management (J. King et al., 2012). Typically post-crash response to address retrieval and treatment generates hospital data that is considered along other sources of data. The extent to which the impact of long term disability contributes to this information is quite variable, and often limited (WHO, 2011b). It was noted above that there has been some research quantifying the disability impacts of road traffic crashes, although there remain significant gaps. It is argued below that there is also an important role for research into the lived experience of disability following a road traffic crash.

management (J. King and M. King, 2014). While a range of different types of participant were involved, the main focus was on men with a spinal injury as the results of a road traffic crash, who had previously been a breadwinner for their family. Qualitative research was conducted in North-east Thailand, with the assistance of Khon Kaen University, Khon Kaen Hospital and Srinakirin Hospital, and the cooperation of staff in health centres in the region. The findings directly relevant to transport and road safety are summarized below.

Contrast in transport costs: As with most countries with low levels of motorization, the local transport options are generally buses or converted utilities (pickups) that rely on high volumes of passengers since the fares are low. At the time, a standard fare was 10Bt in Khon Kaen, which was only \$US0.25 (although to put it in con-



**Figure 2:** Current information flows to inform road safety management (J. King et al., 2012)

**How the lived experience of disability following a road traffic crash can inform road safety management**

Medical anthropological research has been conducted into long term disability in Thailand which illustrates how information from the experience of long term disability can contribute to road safety

text, a labourer earned only 100Bt per day, or \$US2.50). However, men with quadriplegia or paraplegia could not use these forms of transport as ordinary passengers, but had to hire the whole vehicle for an extended period, for a cost of 1,000Bt, i.e. about 10 full days’ pay for a labourer. The same fee applied in a case where the village had a communal vehicle. It is clearly impossible for many of these trips to be

made in a year, so that many people with long term disability simply stop attending health services and eventually disappear from their records.

**Unfriendly road environment:** Several participants had been given wheelchairs by charitable organizations. In most cases these were of very little use. Traditional Thai houses are raised, with a space underneath, and in many cases the surface is bare ground which is prone to rutting and saturation. Even when the space under the house is paved or enclosed, the area around is not. Adjoining roads often do not have footpaths, and if they do the surface is often uneven, broken or obstructed. There is a tendency at the policy level to neglect footpaths in favour of road construction, and to deal with road crossing needs by building overbridges which are completely inaccessible to people with disabilities.

**Attribution of crashes to kam (karma):** The interpretation of Buddhism shared by almost all non-biomedical participants (the men, their families, villagers, etc.) and some of the biomedical informants meant that severely injured victims of road crashes were at fault by definition: the scale of their injury meant that they must have done something very bad in a previous life. This means that road safety messages about safe road use behaviours were not given much credibility, since there was a sense of predetermination. Since some people had crashes while doing the right thing, and most people had experiences of travelling without incident while doing the wrong thing, their experience was consistent with this form of attribution.

**Lack of connection between ordinary people and experts:** The research included interviews with injury experts (especially doctors) who knew about local beliefs relating to kam (karma) as well as other animistic beliefs, but were certain that such beliefs were only found among older and uneducated people. The research found the opposite, that such beliefs were a common way of understanding road crashes and incidents of everyday life. This suggests that the understanding of Thai road user motivations and attitudes among experts is likely to be out of touch with the beliefs shared by ordinary Thais.

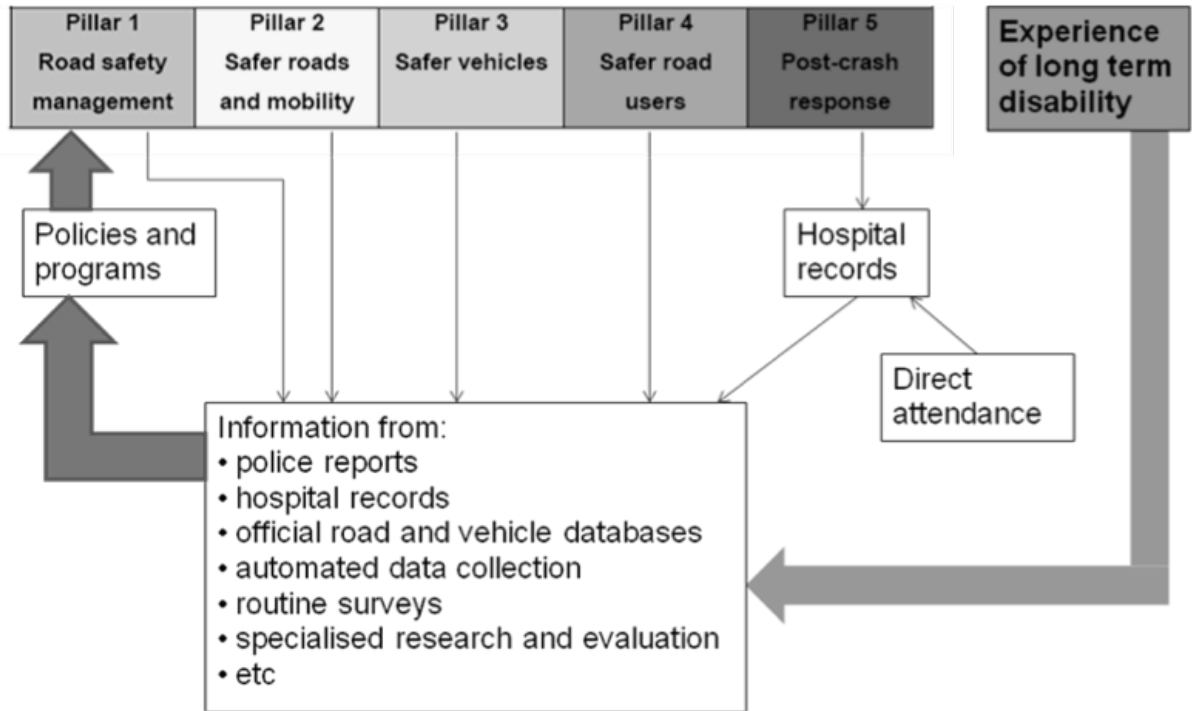
The Thai study has implications that can inform road safety management. First, the transport environment has shortcomings in accessibility that need to be addressed. It is acknowledged that the number of people with spinal injury in Thailand is not large, however there would be many other people with mobility restrictions (especially as the population ages) who would benefit from more accessible and affordable transport alternatives.

Second, the accessibility and safety of built environment for non-motorised road users needs to be addressed. In this case the problems experienced by the participants (unpaved roads, lack of footpaths, broken and blocked footpaths) are shared by all pedestrians. While they are directly relevant to accessibility, their safety implications are also clear: pedestrians are forced to walk on the road, and the lack of convenient crossings encourages illegal and unsafe crossings. Addressing the needs of people with disability in this way is an example of the "iceberg principle", where road safety measures introduced to meet the needs of a relatively small group with special needs can have knock-on effects that benefit a much wider range of road users (M. King, 2000).

Third, the credibility of messages about road safety, in particular the behaviours which will contribute to safer road use, is challenged by culturally-based attributions. This needs to be acknowledged and addressed. Fourth, the lack of concordance between the attitudes and motivations of ordinary Thais and experts indicates a need for decision makers and program developers to be informed by sound research that gives them a better understanding.

## **Discussion**

The case study above provides an illustration of how information from long term disability can better inform road safety management. It is worth noting that the Thai research was not designed for this purpose: it was designed as an exploration of the lived experience of disability in a cultural context. The fact that it still provides useful insights to transport and road safety management implies that more focused research into the long term impacts of road crashes can contribute even more useful information. Notably, similar



**Figure 3:** How experience of long term disability can contribute to information flows to inform road safety management (J. King et al., 2012)

research in Cambodia is revealing a very similar picture (Socheata Sann, 2014, personal communication).

In addition, the mobility constraints experienced by people with long term disability can point to systemic issues that might otherwise go unnoticed, for example low numbers of health service attendances by long term disabled crash victims may be interpreted as being due to good community care or recovery, but may in fact reflect an expensive and inadequate transport system. A better understanding of the lived experience of long term disability from traffic crashes therefore has the potential to provide a feedback loop from the impact of road traffic crashes to the management of road safety and transport, as demonstrated in Figure 3.

This paper demonstrates the need for further exploration of the application of research on long term impacts of road crashes to road safety management, in particular the non-economic impacts. In terms of the years of life spent with a disability as the result of a road crash, people with a long term disability, though relatively few in number, account for a large majority of this experience. Addressing the issues that they have with the transport system and road safety management will also provide benefits to a much wider range of road users.

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## **Randomised Controlled Trials, Evidence Hierarchies and Smarter Choices**

*Steve Melia*

### **Introduction**

The selection of research methodologies to inform policy is a contested area, amongst researchers policy advisers and policy makers. The debate revolves around two broad questions:

1. What are the most appropriate methods to address different research challenges?
2. How should the choice of methods (as well as their application) influence the assessment of research findings in meta-studies and literature views intended to inform policy?

The first of these questions primarily concerns researchers but the interventions of policy makers/advisors around the second question have implications for debate around the first one. The spectrum of perspectives on both questions can be characterised as a choice between two approaches. The first approach, favoured by most transport researchers and some policy makers/advisors (e.g. Tavistock Institute and AECOM, 2010) seeks to select the most appropriate method based on the nature of the research questions with no generalised preference for one method over others. The second approach favours a methodological hierarchy, usually with Randomised Controlled Trials (RCTs) at the top (the terminology is not always consistent in the literature but 'experimental methods' is often used as a synonym for RCTs). In response to the first question, this approach would recommend a method from the highest possible level in the hierarchy to address each research question. In response to question 2 it would attach greater weight to findings generated by methods at the higher levels of the hierarchy.

Methodological hierarchies (or 'evidence hierarchies' when applied to meta-studies) have become more influential in transport policy and research in recent years as academics and professionals from a health background have engaged more with transport issues (e.g. Graham-Rowe et al., 2011, Rowland et al., 2003). They have been advocated by policy advisers to some

governments in contexts which encompass transport, such as social policy in Australia (Leigh, 2009) and promoting physical activity amongst children in the UK (NICE, 2007). They have also influenced national policy in the UK on Voluntary Travel Behaviour Change programmes (VTBC – or 'smarter choices' in British terminology), as discussed below.

A substantial literature exists on the issues of research design and the choice of methodology for answering different research questions in different contexts: it is not the intention to address the breadth of that issue here. This article will briefly review the debate around one area where methodological hierarchies have been proposed as a solution to perceived shortcomings: the effectiveness of VTBC programmes.

The rest of the article will focus on a principal area of contention in this debate: the circumstances under which experimental methods can and should be used in transport research. Section 5 will propose 5 criteria (Table 4) for the application of experimental methods in circumstances where interventions must change human behaviour to be effective, and where those interventions must be generalisable to wider populations in order to inform policy. It will argue that the advantages of experimental methods, and the breadth of their applicability to transport research are not as great as advocates of methodological hierarchies claim. It will then consider the implications of this for evidence-based transport policy.

### **Evidence Based Policy and the Spectrum of Research Designs**

The principles of evidence-based policy have been central to transport studies since it emerged as distinct discipline, but the focus of evidence-gathering was, until fairly recently, rather narrow. Whilst government-commissioned studies examine issues such as traffic flow and road safety, as recently as 2000 Terry wrote, in a UK context:

In the case of research supported through universities and research councils, little of such work is, nor is intended to be relevant to policy. (Terry, 2000 p. 188)



Several factors have changed that situation since then. In academia, there has been a greater emphasis on achieving external impact, whilst governments have turned to academic and specialist research in pursuit of environmental and (particularly since the recession) macro-economic objectives.

Tavistock Institute and AECOM (2010) was commissioned by the Social Research and Evaluation unit of the UK Department for Transport to give guidance to public bodies evaluating transport interventions. It discusses the advantages and limitations of six different research approaches but does not suggest a hierarchy. It includes several flow charts suggesting the most appropriate approach depending on: the focus of the evaluation, nature of the intervention and feasibility of the approach. It provides a useful starting point for researchers and practitioners, but has some limitations. The study behind the report was written by consultants with input from academics in the field. The guidance draws on a mixture of theory and practical experience: it is not always clear where a recommendation is being made for theoretical, practical or cost reasons. Some of the criteria under the 'nature of intervention' heading are debatable, (Tavistock Institute and AECOM, 2010 Figure 6). For example, the requirement that causal pathways should be short and straightforward when using experimental methods cannot be demonstrated from first principles.

As discussed in Section 6, many of the bigger questions in transport research could clearly not be addressed by experimental methods. These include the impacts of major infrastructure projects, longer-term changes to the built environment and the impacts of interventions or programmes on national economies. As a result, the debate around methodological hierarchies in transport research has tended to focus around one area: VTBC, where there has been a vigorous debate about the reliability of evaluation studies.

### **Voluntary Travel Behaviour Change and Problems of Research Bias**

The terms VTBC and smarter choices have been used in different ways, but generally refer to interventions which seek to change travel behaviour by 'management and marketing rather than operations and

investment' (Sloman et al., 2010), though many VTBC programmes include or accompany elements of infrastructural change (e.g. new cycle routes). A principal aim of these measures is usually to reduce single occupancy vehicle driving. There have been many published evaluations of VTBC programmes, usually based on 'before and after' self-reported travel surveys, which are susceptible to several forms of bias, tending to overstate the effectiveness of interventions. These include: social approval bias (Bonsall, 2009), expectation bias or the 'good subject effect' (Morton and Mees, 2010 following Orne, 1970), non-response bias, where those with a positive story to tell are more likely to complete the 'after' surveys (Chatterjee, 2009). Some of the studies have been conducted by organisations or individuals with an interest in promoting VTBC, creating the risk of reporting or retrieval bias, where greater prominence is given to positive results (Möser and Bamberg, 2008).

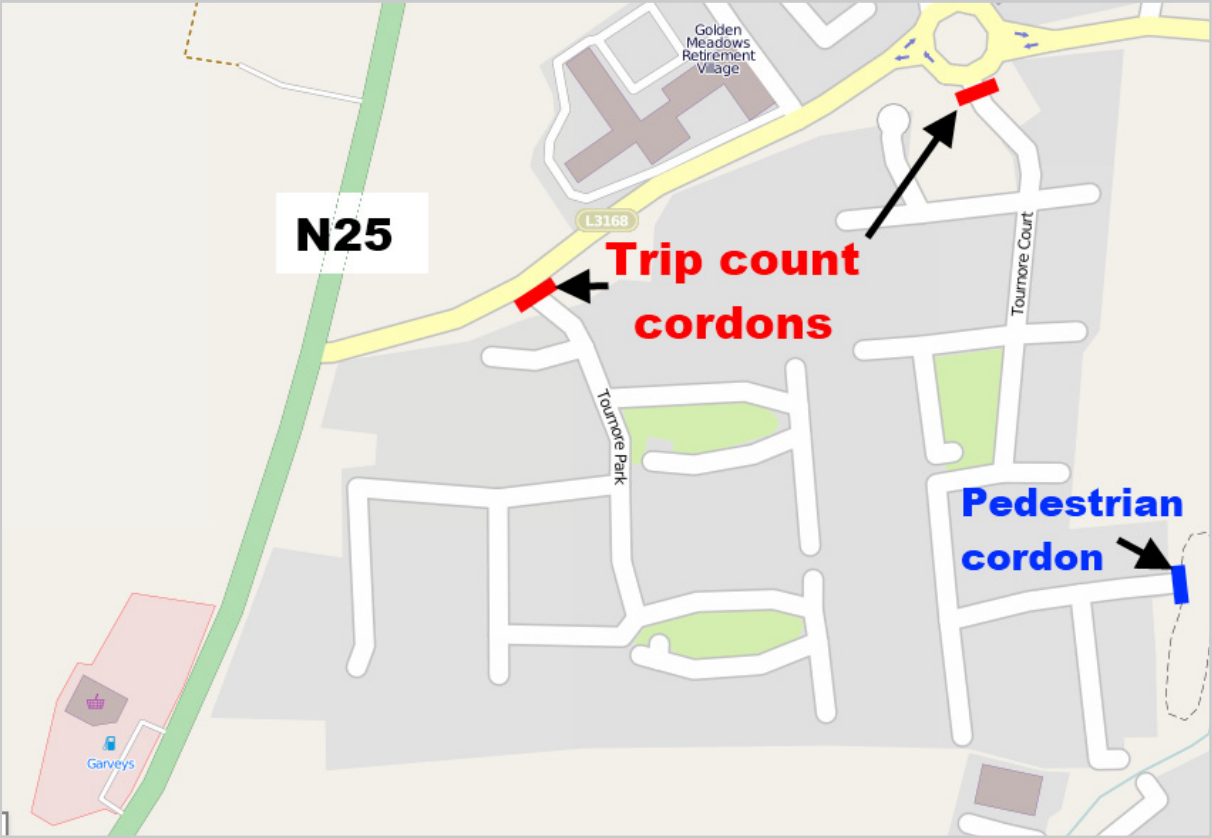
Many of these effects have been recognised in other fields for some time and whilst their influence on VTBC programmes is easy to identify in theory, there is little specific evidence of their importance in practice. Morton and Mees (2010) cite the evaluation of the Travelsmart programme in Alamein, Melbourne, as one example where these effects allegedly distorted the results. Ker (2011) defends the original evaluation and rejects Morton and Mees' criticisms. From the evidence presented in both papers (citing local factors, variations in weather etc.) it is not possible to determine whether the reported modal shift was overstated but there are reasons for believing that it might have been. The response rate of the 'after' survey was considerably lower than the 'before' survey and the self-reported travel in the after survey may have been susceptible to the good subject effect.

Although the reasons have not been studied, there are some examples which suggest that, depending on survey design, self-reported travel surveys may substantially distort findings in this area. Following a strategy to increase cycling, using both infrastructure improvements and marketing measures in York, UK, Harrison (2001) reported that cycling as the usual mode of travel to work had risen from 15% of working people in the 1991 Census

to 18.6% in a self-completed household survey conducted in 2000. The 2001 Census, published the following year, showed that the share of cycling had, in fact, fallen to 12% (ONS, 2009: Table CS121). In an evaluation of the UK's Cycling City and Towns programme, a face-to-face survey in 2009 appeared to show a substantial increase in physical inactivity, from 37% to 26% of respondents, compared to a baseline telephone survey, which asked the same question (Chatterjee and Hardin, 2011). The researchers ascribe this difference to respondents' greater honesty in face-to-face interviews than on the telephone. This explanation suggests that social approval bias influenced the baseline telephone survey; it also suggests that social disapproval of dishonesty outweighed any influence of the good subject effect in the final face-to-face survey.

There is an emerging consensus on some of the methodological measures which could help to address – though not entirely eradicate – these concerns. These have focussed particularly on the use of more objective data, such as traffic or pedestrian counts or GPS-based tracking (Bonsall, 2009, Chatterjee, 2009), and clear-

er separation of evaluation studies from the advocates and implementers of VTBC schemes (Morton and Mees, 2010). Passive observation measures such as traffic counts should solve problems of social approval bias, non-response bias and the good subject effect, but they introduce other problems, such as how to ensure that the counting points are representative of the wider area. GPS-based measures avoid reporting biases associated with reporting, but are not immune from the good subject effect, if participants' awareness of the survey purpose exerts an unconscious effect on actual behaviour. Some studies have sought to 'triangulate' self-reported travel data with objective measures of traffic volumes, for example (e.g. Sloman et al., 2010). These studies inevitably rely on interpretive judgements because general traffic levels are influenced by many external unmeasurable factors. Melia (2013) suggested a new method, which could help to provide a more objective basis for such judgements. This would involve trip counters on self-contained networks of residential streets, where all movements in and out can be measured and compared to self-



**Fig 1:** Network of self-contained streets in Dungarvan, Ireland (© Openstreetmap contributors)

reported data (including visitors and deliveries). Figure 1 shows an example of such a network in Dungarvan, one of the Irish sustainable travel towns.

The residents of these areas may not be typical of the whole study area, so other methods such as travel diaries may still be needed across the wider area. By measuring traffic volumes in circumstances where they can be precisely compared to self-reported data, this method would enable the researchers to quantify the effect of any self-reporting biases.

Three studies have recommended RCTs as the specific solution to these problems, in evaluating VTBC programmes in general (Graham-Rowe et al., 2011, Möser and Bamberg, 2008), and evaluating school travel plans in particular (Rowland et al., 2003). Möser and Bamberg (2008) use a methodological hierarchy in a meta-study assessing the effectiveness of VTBC programmes. They conclude that the mainly "weak quasi-experimental" evaluation studies they reviewed "may underestimate but more probably overestimate the true causal car reduction effect" of VTBC measures.

Graham-Rowe et al. (2011) reviewed 77 evaluations of transport interventions designed to reduce car use, most of which could be described as VTBC interventions. They classify the evaluations into five levels of research quality, which follow a methodological hierarchy rather than any assessment of how effectively the methods were applied. Those evaluations classified as high quality used 'rigorous experimental designs' (only five were RCTs). Those classified as 'low quality' used "weak designs without control groups, from which we cannot draw methodologically valid inferences." The authors recognise that "rigorous experimental designs are challenging in field studies". They suggest that 'weaker' research methods have tended to exaggerate the effectiveness of certain interventions but that valid evidence does support the effectiveness of some interventions. They make a plea for "more robust evaluation methods...and in particular that RCTs are adopted wherever possible"

Rowland et al. (2003) conducted a RCT of school travel plans, which found no significant modal shift in travel to schools in London. They go further than others in

arguing that positive evidence from RCTs should be a condition for continued public funding of school travel plans.

This debate has directly influenced national policy on VTBC in the UK. The UK Department for Transport (DfT, 2012) cites Möser and Bamberg (2008) in national guidance which had the effect of ascribing only limited potential benefits to VTBC programmes when appraising the cost-benefit ratios of transport projects seeking public funding.

### **Criteria for the Use of Experimental Methods to Inform Transport Policy**

Whatever their advantages and disadvantages, it seems the contribution of RCTs to knowledge in transport studies has been fairly limited, so far. There are two possible explanations for this: that transport researchers have been neglecting a method which could improve the quality of their work, as implied by Graham-Rowe et al., (2011) and Möser and Bamberg (2008) or that RCTs are of limited use in answering 'real world' transport questions. To assess those two possibilities, this section will consider the conditions under which RCTs can be used, with comparisons to other methods.

Table 1 lists five criteria for the application of experimental methods to assess interventions which seek to alter human behaviour, and where the intention is to apply 'successful' interventions more widely. Criterion 1 implies that existing knowledge must be sufficient to construct a hypothesis where the intervention is believed to affect a limited number of known and measurable outcomes. Another criterion from Tavistock Institute and AECOM (2010) suggests that experimental methods should only be used to measure interventions with "a single outcome goal" but there is no reason in principle why a RCT cannot measure more than one outcome. Similar considerations would apply to quantitative analysis of 'real world' data. Where the intention is to test and explain, a combined method, using both quantitative and qualitative methods is likely to be most appropriate.

Two elements of Criterion 2 could affect the generalisability of findings: the representativeness of the sample and the sample size. Similar challenges may affect other survey-based evaluations, but it

1. The main focus of the research is to test (but not explain) a hypothesised cause-effect relationship
2. A representative study population of a sufficient size can be obtained from the target population to whom the intervention would be applied
3. The intervention can be applied selectively to an experimental group within the study population
4. No other factors with a significant influence on the outcome would impact the experimental and control groups differently during the experiment
5. Wider application of the intervention would replicate the causal relationships which applied during the experiment

**Table 1:** Criteria for the use of experimental methods to inform policy (all must be satisfied)

may be more difficult to obtain volunteers for an experiment than respondents to a survey about something which was already happening.

Criterion 3 rules out using a RCT to assess something which has already been applied across the country. It effectively rules out measures which are introduced over specific geographic areas, unless the areas themselves become the unit of randomisation in a cluster RCT, in which case the second and fourth criteria would become much more onerous. Cluster trials applied to larger geographical areas, even where practically possible, could violate Criterion 4.

An analogous issue was considered by Sloman et al. (2010) in evaluating the Sustainable Travel Demonstration Towns, a three year VTBC programme in England. Although a RCT would not be possible (the towns were selected based on bids to government) the authors considered and rejected a quasi-experimental approach (comparing the demonstration towns to comparator towns) because the municipal leaders of comparator towns were likely to respond to the programme by making changes of their own. The existence of an experiment might also change the nature of interactions between external bodies, such as the national Department for Transport, and the two groups of towns: experimental and comparator.

Whether criterion No. 4 is satisfied or not would be difficult to prove in most situations: it would require a judgement on each occasion. The criteria proposed by Tavistock Institute and AECOM (2010) such as 'short timescales' and 'political

stability during the trial' may be considered judgements about the likely implications of such factors on this criterion.

As Goodwin (2011) has argued, the relationship between transport interventions and outcomes is generally characterised by synergies between measures, delayed and imperfectly reversible effects and feedback loops, both positive and negative. All of these factors affect Criterion number 5.

Circumstances where social norms or the actions of external bodies influence the behaviour under study would violate Criterion 5. Several studies have shown that perceived social norms do indeed influence modal choice in situations where VTBC might apply (e.g. Bamberg, 2003, Melia, In Press). Cluster trials might address this problem in some circumstances, but not all. To take the issue tested by Rowland et al. (2003) introducing travel plans in a handful of randomly distributed schools is unlikely to have the same effect on social norms around 'the school run' and active travel by children as a city-wide or national programme of school travel plans.

Criterion 5 will be more onerous where the experiment is used to estimate the quantitative impacts of an intervention. If an experiment demonstrates some change in behaviour, then it may be reasonable to draw conclusions about the likely direction of change from introducing similar measures as a wider policy: it would be less reasonable to estimate the magnitude of any change based on such findings.

One issue which illustrates these effects can be found in the literature on cycling

infrastructure. A number of studies of localised improvements in cycling infrastructure have found a limited, or no significant effect on overall cycling numbers, leading some to reject “the hypothesis that cycle use is suppressed by the absence of routes and networks” (Harland, 1993: a quasi-experimental before and after study, see also Brand et al., 2014). A meta-study based on 139 studies of infrastructure and policies designed to increase cycling found that cities which experienced large increases in cycling had all made substantial investments in cycling infrastructure, as well as a range of other policies (Pucher et al., 2010). The study concluded that infrastructure investment is an essential part of a “comprehensive approach”, enhanced by synergies. One of these synergies relates to the growth over time of ‘cycling cultures’. The relationship between pro-cycling municipal policies, infrastructure improvements and the cycling culture of a city would be possible to investigate but difficult, if not impossible, to accurately quantify. If the synergies are as important as Pucher et al. suggest, then RCTs which attempted to quantify individual effects would yield misleading results. Following the criteria in table 1, they would also be unsuitable for testing the strength of such synergies.

The same argument applies to overall transport policy at national or municipal levels. Several studies – mainly descriptive – have suggested synergies between different policies (e.g. on road network design, parking policy, public transport and cycling) have contributed to the success of cities such as Freiburg in reducing the modal share of driving at a time when it was rising elsewhere (e.g. Melia, 2006). For investigating these types of multi-faceted policy issues, observation studies are likely to be the most appropriate method (discussed further in Tavistock Institute and AECOM 2010).

Jadad and Murray (2007) list over 20 forms of bias that can, and sometimes do, affect RCTs. One of these is ‘choice-of-question bias’. Decisions over research objectives and questions may be influenced by vested interests, the personal agendas of researchers and/or constraints related to cost and convenience. This form of bias can affect any research project, but although RCTs are no more or less likely to

be affected, a methodological hierarchy, particularly where it is linked to public funding, is likely to exacerbate the problem. It would incentivise researchers to focus on narrow questions such as ‘how does the construction of a few cycle paths in area x affect rates of cycling?’ Evidence from such studies would then be given greater weight than the broader longer-term observation studies which suggest that networks of dedicated infrastructure can indeed increase rates of cycling.

## Conclusions

Table 1 sets out the criteria for the generation of reliable findings from a RCT. (The word ‘reliable’ is used here to mean ‘evidence which can be relied upon for policy’ rather than its more specific definition in research terminology). Where a RCT entirely satisfies all five criteria it can be demonstrated from first principles that it will generate more reliable findings than other research methods. The discussion and examples suggest that such circumstances are likely to be rare in transport research. Whether RCTs which partially satisfy the conditions in Table 1 produce more reliable results than other methods is an empirical question: it cannot be demonstrated from first principles nor deduced by comparing research designs, as required by methodological hierarchies. To test which method more accurately quantified the impact of an intervention would require comparisons between results generated by RCTs and by other methods, in a context where the ‘right answer’ was known. As it is difficult to conceive of such a circumstance applying to a practical transport question, researchers choosing an appropriate methodology, and policymakers/advisors interpreting research evidence, must fall back on what Flyvbjerg (2001) calls *phronesis*, or ‘practical wisdom’. Although it is not possible to demonstrate from first principles which method would generate more reliable findings, timescales of the cause-effect relationships, the importance of social and cultural influences on the target behaviour and similarities or differences between the experimental and policy target populations, are all relevant when assessing the relative advantages of experimental methods and non-experimental alternatives.

RCTs are likely to be more reliable in test-

ing whether a cause-effect relationship exists. The conditions required for generalising findings about the magnitude of such effects are more onerous. They are unlikely to apply in contexts where social and institutional influences on travel behaviour are significant, as in most VTBC programmes. Although the reasons for its recommendations are not always clear, Tavistock and AECOM (2010) provides a useful starting-point for researchers conducting transport impact assessments. They suggest that experimental methods are best suited to evaluating relatively straightforward small-scale interventions with a short time frame. This cannot be demonstrated from first principles but it is a reasonable response to the uncertainties discussed in this article.

What may seem a rather technical issue for researchers does have potentially important implications for transport policy. The UK national guidance on VTBC programmes in transport appraisals (DfT 2012) chose to follow a methodological hierarchy, giving greater weight to experimental findings. This effectively reduced public support for VTBC in the UK. As VTBC programmes are generally introduced in geographical areas or nationwide, the implication that experimental methods can more accurately quantify the impacts of VTBC programmes is, following the analysis in this article, misplaced.

This article has challenged the arguments in favour of evidence hierarchies and argued that the application of such hierarchies increases the risk of 'choice of question bias'. Several of the articles reviewed here assume but do not demonstrate that the RCTs they or others have conducted satisfy the criteria for generalisation. Some reasonable concerns have been expressed about the reliability of VTBC evaluations. Section 4 discussed some of the ways in which such concerns might be overcome, but ultimately all decisions about methodology and the implications of research findings rely on judgements. Evidence hierarchies create an incentive for researchers to make unwarranted assumptions about the generalisability of findings, creating an illusion of quantitative precision, misleading for policymakers.

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Announcement from:

**Transportation Choices for Sustainable Communities  
Research & Policy Institute**

In October 2014 TCSC published a San Francisco Modal Equity Study, which analyzed how public roadway space is allocated among modes in San Francisco, who uses it, and who pays for its maintenance. The study found that bicyclists, pedestrians and transit constitute over 50% of the modal split in the City, while only two percent of road space is prioritized for use by bicyclists and transit vehicles. Furthermore, contrary to many public assertions, general taxes, not vehicle user-fees, pay for most roadway maintenance in San Francisco.