

Dr. Walter Eichendorf: Vision Zero

1. A vision evolves

Although it is sometimes referred to as a philosophy or vision, "Vision Zero" is in fact a strategy. This strategy, which has gone by the name of "Vision Zero" for a few decades now, originates from different continents and epochs but ultimately has its roots in the chemical industry.

The oldest known origin goes back to Éleuthère Irénée du Pont de Nemours (1771 - 1834), who is more generally known by the abbreviated form of his name, E.I. du Pont. In 1802, E.I. du Pont acquired a property on Brandywine River near Wilmington/Delaware (U.S.A.) and established E. I. du Pont de Nemours and Company, a gunpowder mill, at what thus became the founding site of the DuPont group of companies. During its initial years of operation, a number of severe occupational accidents occurred in connection with violent explosions at the plant; at one later point, as much as three waggonloads of gunpowder blew up right in the centre of Wilmington while being transported through the town. The accident left several people dead and destroyed numerous buildings.

In response to such severe occupational accidents, du Pont established the first safety rules as early as in 1811, placing the responsibility for safety within the company specifically on the management's shoulders. This went so far as to require managers to reside centrally on the company's premises, along with their families. In this way, the management was to demonstrate its responsibility for the life and health of the company's employees, as well as its confidence in the level of labour safety achieved.

Every accident is avoidable – this conviction turned out to be an effective driver and incentive for accident prevention. From these early days until today, it found its expression in the principle that all accidents and near-accidents need to be documented and analysed quickly and thoroughly. To this day, the DuPont group is considered a global leader in matters of employee safety and health. One key element of this DuPont safety culture has been, and continues to be, the creation of an error-forgiving workplace environment, which has by now evolved into a key constituent of "Vision Zero" as well.

In Europe, the "zero accident" concept gained currency in the 1990s in the development of political strategies addressing road traffic safety. In Sweden, where chemical industry risks were intensely debated in the wake of the Seveso and Bhopal disasters – to the point of considering, albeit

briefly, a total ban on all chemical industry -, the Ministry of Transport officially applied the basic tenets of the zero-accident philosophy to the field of road traffic safety and became the first to employ the term "Vision Zero" for this approach. "Vision Zero is a view of a future in which nobody, while participating in road traffic, is killed or sustains injuries resulting in lifelong impairment", read a publication by "Vägverket", the Swedish Central Road Traffic Administration. And this definition of Vision Zero has indeed remained valid to this day.

The joint responsibility of public traffic spaces, vehicles and road users is clearly described for the first time here: "Road traffic safety work, within the meaning of Vision Zero, implies that roads and vehicles must be adapted more effectively to human preconditions, and that all those designing and using the road traffic system must share the responsibility for this safety."

Since 1997, when "Vision Zero" was passed into law by Swedish parliament, it has been forming the basis of Swedish road traffic policy.

2. What does Vision Zero mean?

Vision Zero is based on four fundamental principles:

First: Life is non-negotiable.

No other asset can be important enough to be reckoned up against human life. For the sake of a mental experiment, let us transport E.I. du Pont from 1802 into the present, and let us further assume that the motor car had not yet been invented. Imagine that Mr. du Pont now got up to inform political administrators, the media and the public that he, having perfected the manufacture of gunpowder, had devised an altogether new technology – individually steerable motor vehicles that would put our personal mobility on an entirely new footing. However, it was to be anticipated (so we picture him saying) that the launch of this technology would produce a new accident type, namely traffic accidents. In Germany, for instance, these would cause about 10 fatalities per day in his estimate.

Clearly enough, this new technology would never be introduced, and the inventor's proposal would meet with rejection if not outrage. Who could bear the responsibility for a technology causing 10 fatal accidents per day? Our political circles, society and the media would unanimously reject the idea.

The right to life and physical integrity is centrally enshrined in the German Basic Law and in the constitutions of many other states worldwide – and this is just what Vision Zero demands.

Protecting this right is the obligation of the state organs. Although no specific individual measure can be derived from it, the legislative and executive branches of government are called upon to do everything to safeguard this constitutionally protected right. Given the manifold possibilities at our disposal and the levels of road traffic safety and occupational safety achievable today, it may well be questioned critically whether the right to life and physical integrity is indeed protected by all available means in many EU member states having constitutional provisions to that effect.

Second: Humans are fallible

Vision Zero is based on the empirical fact that errors in road traffic cannot be fully avoided, much like they cannot be entirely avoided at the workplace (and oftentimes, the road is the workplace). Evolutionally, man is built to move at speeds not exceeding 20 - 30 km/h. For thousands of years, this has been the range to which human locomotion has been confined. Throughout the millennia, people's motor system and coordination – and their perception and information processing functions as well – have been oriented towards this top speed. Scientific research on human sensorimotor functions has revealed how limited our capacities actually are when it comes to absorbing key data from our environment, processing it, and collating it with information already stored. It is evident that in the speed ranges in which we predominantly participate in motor vehicle traffic, human error tends to be the norm rather than the exception.

To this one must add all the human errors caused by emotional, motivational or stress-related processes. It therefore comes as no surprise, at a first glance, that research into workplace and traffic accidents clearly shows human error to account for most of all accident causes. But this is also where flawed reasoning comes in. If humans – with their evolutionally developed motor system, coordination, perception and information processing abilities – are typically unable to cope with today's road traffic situations without erring, then we cannot blame them for many of the errors made. To put it differently, even if we exercise the very best of our knowledge and belief, the specific error rate at any given time is just a matter of probability. At high speeds and/or in complex traffic situations, this error rate will be high. The same applies to excessively rapid or complex occupational workflows. There is always a certain probability, however low, that an accident will occur. Conversely, this also means that in nearly every traffic accident and in many occupational accidents, we can expect human error to play a role at many points in the accident causation chain.

This being so, the decisive question is for which errors we can blame humans at all. Especially our modern-day road traffic system is much too rarely adapted to the error-proneness of humans. At the workplace, this adaptation has been achieved more successfully in most cases. Worldwide, throughout the EU and on a national scale in Germany, road users die every day because of

mistakes made by themselves or others. Most often, these mistakes are committed thousands of times over but remain without consequences in the majority of cases because of the low accident probability involved. However, in a special constellation of environmental and road conditions or following a particular interaction with other road users, an error made thousands of times may suddenly result in death or severe injury.

"Errors must never carry a penalty of death" is therefore an important element of the Vision Zero concept.

Third: Tolerable limits are defined by human physical resistance

Especially if one assumes that people make mistakes, it must be ensured that the resulting accidents will not give rise to severe personal injury. "No-one will get killed, everybody will get to his destination" is the formula adopted by the German Road Safety Council (DVR) when it resolved to make Vision Zero its action strategy. The yardstick and criterion for the design of a traffic system is man's biological tolerance or, in somewhat more colloquial terms, how much a person can bear. Accident research has yielded a number of scientifically confirmed limit values in this respect. Most people (being not inside a vehicle themselves) can survive a collision with a vehicle travelling no faster than 30 km/h. Additional optimization in vehicle design and, possibly, the use of exterior air bags will make it possible to raise this figure further. At today's state of passive safety engineering, a passenger car provides adequate occupant protection in a head-on crash at up to 70 km/h or thereabouts; in a lateral collision, the critical speed is currently at approx. 50 km/h. These values can still be raised by improvements in passive safety systems. Moreover, active safety features such as automatically triggered emergency braking will increasingly make it possible to bring speeds down to below the critical level by the time the accident occurs.

However, these figures do not take into account individual differences. Older people, for instance, are more at risk because their physical resistance is often lower and injuries will heal less readily. For children, too, different conditions apply in part since different motion sequences - depending on body height - will take place in the event of, e.g., a collision between a pedestrian and a passenger car.

Since we are unable, in view of the long evolutionary cycles we have completed, to increase human withstand capabilities within just a few decades, the conclusion is clear: the entire road transport system must be adapted to human needs, not vice versa. The aim is to prevent serious personal injury in accidents – which still need to be viewed as inevitable.

Fourth: People are entitled to safe transport and safe workplaces

The citizens by themselves can create neither a safe transport system nor safe workplaces. It is the duty of state governments and corporations to get involved in this task, or rather to shape it. However, this does not relieve the individual of his/her own responsibility. Quite the opposite is true – each of us must be aware of the risks he or she produces for others through his/her own acts or omissions. In Sweden, this is referred to as "shared responsibility." The individual has the responsibility to observe laws and regulations, whereas the system designers must ensure that the system as a whole is safe. The system designers mainly include the public authorities in charge of building and maintaining the road, the vehicle manufacturers and commercial companies moving goods and people, but also politicians, legislators, administrators of justice, and the police. At the workplace, this responsibility rests mainly on the employer.

This systematic view of Vision Zero probably constitutes the most important change from the view still widely prevalent today. In road traffic law, for instance, it is primarily the individual road user who is held liable - the responsibility of the system designer, on the other hand, is marginal at best. Claes Tingvall, Head of the Department of Traffic Safety in the Swedish Central Road Traffic Administration, who is considered to be one of the fathers of Vision Zero, once explained the revised approach by drawing an interesting comparison. "As road traffic administrators we certainly never killed people with intent, but safety was never our main target. A few hundred years ago it was accepted wisdom that people got ill because of their immoral ways and their failure to live by God's will. When it comes to traffic accidents, we still come across pretty much the same attitude today. We have understood that we get sick because of bacteria and viruses. But when an accident occurs, we still blame the victims for their stupidity and irresponsibility."

3. Vision Zero gains acceptance

After the turn of the millennium, the new Vision Zero approach was picked up in numerous other countries, e.g., in Denmark, Norway, Finland, Switzerland, the Netherlands, Germany and Great Britain.

Concerns and objections against Vision Zero often originated in the question: why don't we just continue to do things the way we always did? After all, we were successful! As an example, one might consider the current road traffic safety situation in Germany, which has improved quite indisputably. From 21,300 traffic deaths in 1970 to 3,657 in 2010, we have come a long and definitely successful way in these past 40 years, and many institutions and organizations have contributed greatly to this progress.

Still, although Germany's re-unification has made it a bigger country and road traffic has intensified vastly, the low figure of 3,657 traffic deaths and the present numbers of severely injured accident victims are in no way acceptable, and neither is the damage to the national economy. According to data made available by the German Federal Highway Research Institute, the cost of road traffic accidents to the national economy must be put at well over 30 million euros per year.

Critics occasionally call Vision Zero unrealistic or accuse it of reflecting a one-sided ideological attitude. However, Vision Zero merely defines an objective and the associated strategy. It is not so much a quantitative target but rather a qualitative one. And we all know the truism that in order to get the optimum, one must aspire to the seemingly impossible. Quantitative targets, such as a 50% reduction in accident fatalities within a decade, can only be set as a consequence of the strategy. Vision Zero does not aim, by its definition, to prevent all accidents. Its objective – to quote „Vägverket“, the Swedish Central Road Traffic Administration, once again – is „the image of a future in which nobody, while participating in road traffic, is killed or sustains injuries resulting in lifelong impairment.“

The critics of Vision Zero should be confronted, first and foremost, with the strategy's successful implementation in other transport modes. In both air and rail transport, Vision Zero has long been the gold standard and indeed, has very largely been achieved. But here again, our customarily disparate forms of thinking become evident: Who would still board an aircraft, for instance, if air accidents caused 3,000 fatalities each year? Who would ever entrust his life to an airline quoting a number 'x' as their annual fatalities target – even if the number were in the low three-digit range? The same holds true as we board a train. It is taken socially for granted that train travel will cause neither death nor severe injuries. Accordingly, in the rare cases of severe railway accidents, the media outcry will be enormous and in-depth investigations will be carried out to ensure that such an accident can never reoccur. On the other hand, getting into a car or a bus, we waste no time thinking about the fact that we are putting our lives in the hands of a transport system which, even today, is responsible for over 3,600 fatalities and more than 60,000 severe injuries each year. We have simply gotten used to this.

An argument which cannot be so readily refuted, on the other hand, is that the implementation of Vision Zero will make mobility more costly. However, this is true only at the first glance. To be sure, safety cannot be had for free. But prevention does pay off – the effects of accidents are disproportionately more expensive. In Sweden it has been found that roads are less costly to build or rebuild after a Vision Zero audit because more careful planning will be used – quite apart from

the fact that a safer road will be obtained. If we consider the damage caused to the German economy by road traffic accidents each year (the current figure is EUR 30 billion), we get a fairly clear idea of the financial savings potential which can be realized by investing in prevention in general and by consistently implementing Vision Zero in particular.