CENTRO RODOFERROVIÁRIO PORTUGUÊS

“Vision Zero 2030: Road Safety Strategy for the construction of a Safe System”

Safe System approach: a promising approach for reducing the number of road casualties considerably

With the support of

Grupo Brisa
Abre caminho

Prof. Fred Wegman, TU Delft, the Netherlands

With the Coordinationof ANSR

Tokyo Haneda Airport runway collision, 2 January 2024

2024 Tokyo Haneda Airport runway collision

Haneda collision: A timeline

Time	Speaker	Transcript	Background
Jan. 2, 5:43:02 p.m.	Japan Airlines Flight 516	Tokyo tower JAL516 spot 18.	The Japan Airlines flight is told to continue its approach to runway 34R at Haneda Airport, which is also known as runway C.
	Control tower	JAL516 Tokyo tower good evening, runway 34R continue approach, wind 320/7, we have departure	
5:43:12 p.m.	Flight 516	JAL516 continue approach 34R	
5:44:56 p.m.	Control tower	JAL516 runway 34R cleared to land, wind 310/8	The JAL flight gets final approval to land, and its pilot confirms the order.
5:45:01 p.m.	Flight 516	Cleared to land runway 34R JAL516	
5:45:11 p.m.	JA722A (coast guard aircraft)	Tower JA722A C.	The coast guard aircraft receives an order to move to a holding position short of the runway, and its pilot confirms the order.
	Control tower	JA722A Tokyo tower good evening No. 1. Taxi to holding point C5.	
5:45:19 p.m.	JA722A	Taxi to holding point C5, JA722A. No. 1. Thank you.	At 5:47 p.m., the planes collide.

JAPAN TIMES GRAPHIC

The cause(s)?

The facts primes us to believe the pilot of the Coast Guard plane was to blame:

- I predict an official investigation will be carried out and will ‘prove’ that this collision was completely preventable and the Coast Guard plane pilot was ‘exclusively’ responsible

However, we know that humans are fallible and errors are to be expected

Errors are seen as consequences rather than causes, having their origins not so much in the perversity of human nature, but in “upstream” systemic factors

‘Upstream’ risk landscape to identify possible causal factors and prevention options

- 1) installing multiple layers of prevention
- 2) redundant safety systems and
- 3) a pro-active safety culture

Person approach vs. System approach

Prof. James Reason (University of Manchester) wrote a book titled “Human error” (1990). He introduced two approaches to prevent human error as accident causation:

Person approach: errors of individuals because of forgetfullness, inattention, moral weakness, poor motivation, carelessness, recklessness, negligence, braking the law

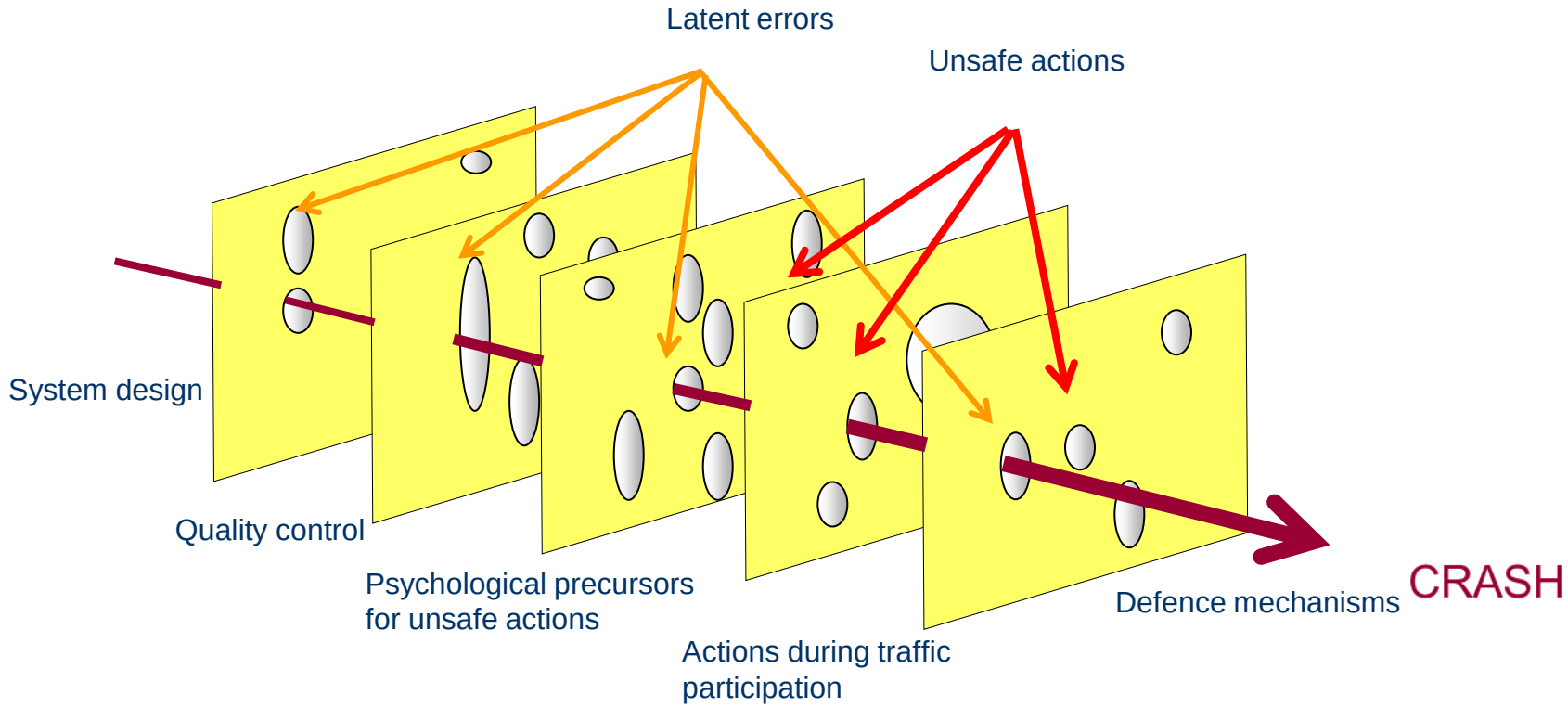
System approach: avert errors (or mitigate their effects) by defences, barriers, and safeguards

For prevention of accidents, the system approach is to be preferred and is being used widely: the oil and gas industry, chemical plants, power plants, aviation, railways, medical sector etc.

We call this approach in road transport: The Safe System approach

Humans are fallible and errors are to be expected: **basis for the first design principle**

The Swiss Cheese Model (from Reason, adapted by Wegman/Aarts)



Tolerance of the human body in a road crash

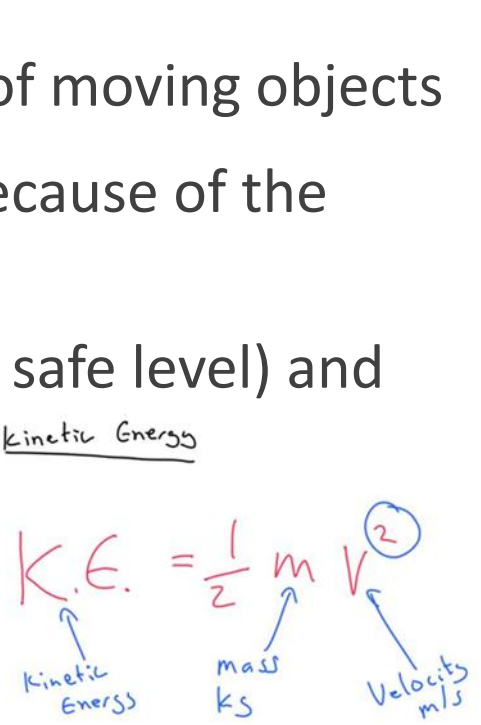
Basis for the second design principle

If crashes occur, levels of kinetic energy cause (serious) injuries

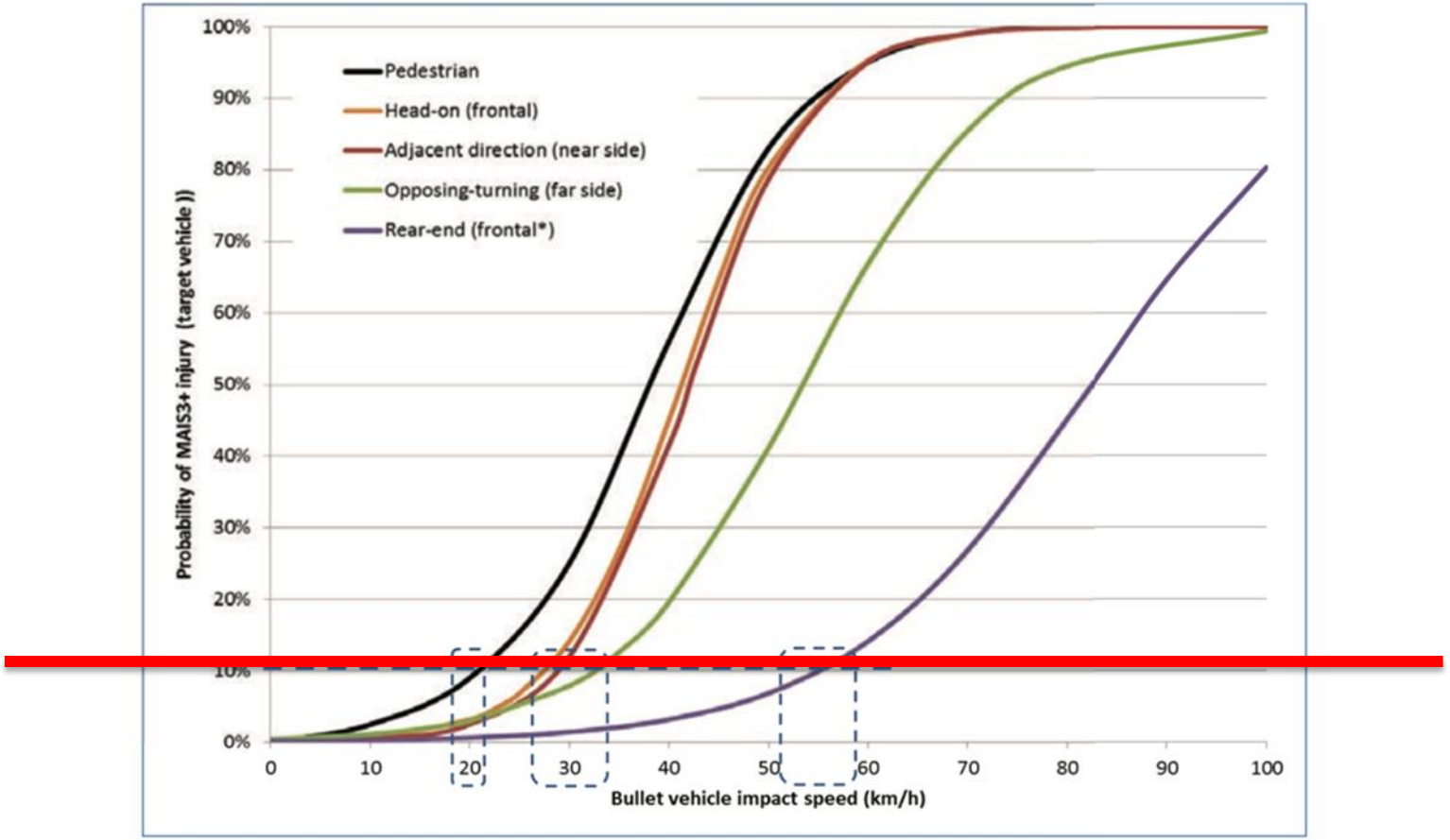
Kinetic energy is a matter of impact speed(s) and masses of moving objects

If protection is not enough, an impact results in injuries because of the vulnerability of the body

From a Safe System perspective: speed management (to a safe level) and protection (vehicles, crash helmets, child restraints, etc.)



Relationship between impact speed and probability of serious injury (cumulative distribution)

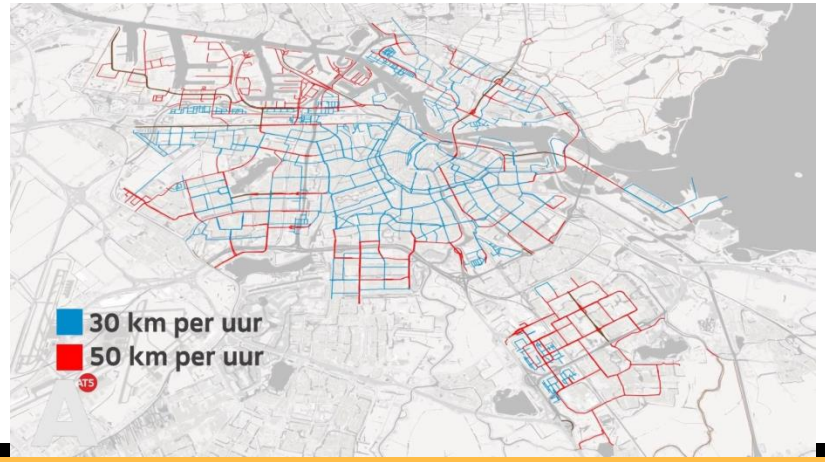


Design of a Safe System

Deals with the ‘environment’ of the road user: road, vehicle, technology, regulation/legislation, etc.

Its aim is to eliminate or at least substantially reduce dangerous behaviour resulting in crashes

Basically tries to retrofit the existing environment, and to design new, inherently safe environments



Road safety management and Safe System approach

Basis for management principles

Not reactive (‘waiting for crashes, analyze and act’), but proactive (’based on available evidence’)

Not isolated interventions, but a holistic or system-wide approach, because ‘crashes can occur everywhere, always and to everybody’. Think in networks!

Not blaming the individual (in a crash), but a shared responsibility of owners of the system/system components and individual road users

These management principles are country specific

Comparison of the Traditional and the Safe System approach (OECD/ITF, 2016)

	Traditional	Safe System
Road safety problem	All crashes	All casualties
Policy goal	Reduce numbers	Zero
Planning approach	Reactive/incremental	Proactive/systematic
Causes of crashes?	Non-compliant users	Mismatch user-system
Responsibility?	Individual road user	Shared responsibility
Working ingredients	Isolated interventions	Holistic approach

Safe System in Portuguese road safety strategy (I)

Allow me to propose some recommendations for infrastructure planning and design (captured in Safe System design manuals)

Translate human error principle and human tolerance principle to Safe System design principles for Portugal:

- Road classification (functional) of the whole Portuguese network (incl. all road authorities)
- Homogeneity: Safe speeds for different road types and crash types
- Predictability: reduce human errors and risks by offering predictability; increase recognizability by consistency and continuity in road design
- Forgivingness: if a crash cannot be a avoided, let the environment (road sides) be forgiving for errors

Safe System in Portuguese road safety strategy (II)

Develop the *Shared responsibility concept*: all designers/operators of the system and the road user and cooperate and strengthen each other

Integrated/holistic approach: Integrates man, vehicle and road into a Safe System; covers the whole network, all vehicles, all road users,

Align with other policy areas: infrastructure, town planning, health, ('other Sustainable Development Goals') etc.

Act proactively: There is no need to wait for crashes before to act; 'we' have enough knowledge to be applied; adapt knowledge to local conditions

Safe System implementation: develop your own implementation strategy: use pilot projects, step-by-step implementation, look beyond road safety funding

To conclude

Strong political support and sustained government commitment at the highest level is essential for improving road safety considerably and implementing a Safe System approach successfully

Portugal can look to strategies tried and tested elsewhere and design and implement its own version of Safe System

Two critical elements of a successful strategy:

- The ‘right’ interventions fitting in a Safe System approach: safe roads and streets, safe vehicles, safe human behaviour, safe speeds, trauma care
- A road safety management system to measure performances and progress (against targets; e.g. UN: 50% less casualties 2020-2030) + ‘actions’

Obrigado pela atenção

f.c.m.wegman@tudelft.nl