NEUROSCIENCE BASED SAFETY-BEHAVIOUR CHANGE AT UNMANNED LEVEL CROSSINGS

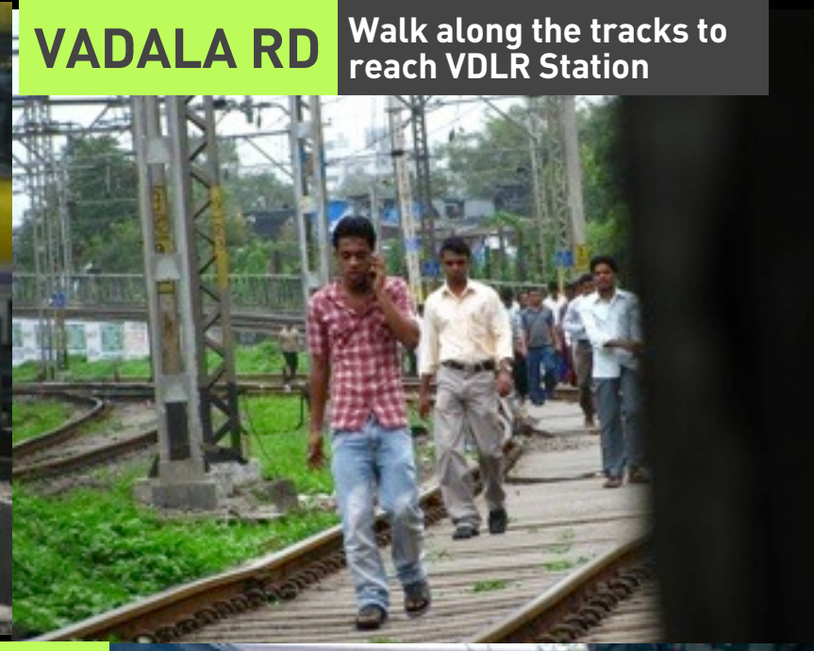
BIJU DOMINIC,
FinalMile Consulting,
Mumbai, India

Far too many problems in the world that beg for more

EFFECTIVE SOLUTIONS

DOMBIVILI Come to tracks to urinate

THAKURLI

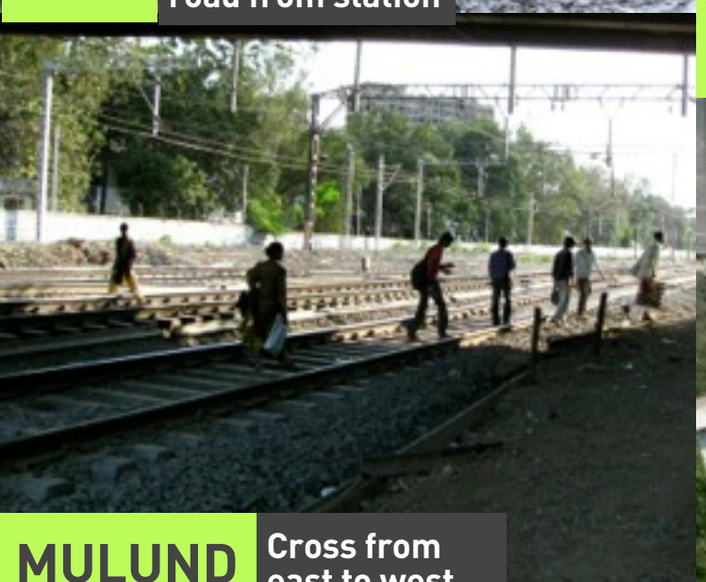


VADALA RD Walk along the tracks to reach VDLR Station

SION Faster exit to road from station

MANKHURD Daily route for school

GHATKOPAR



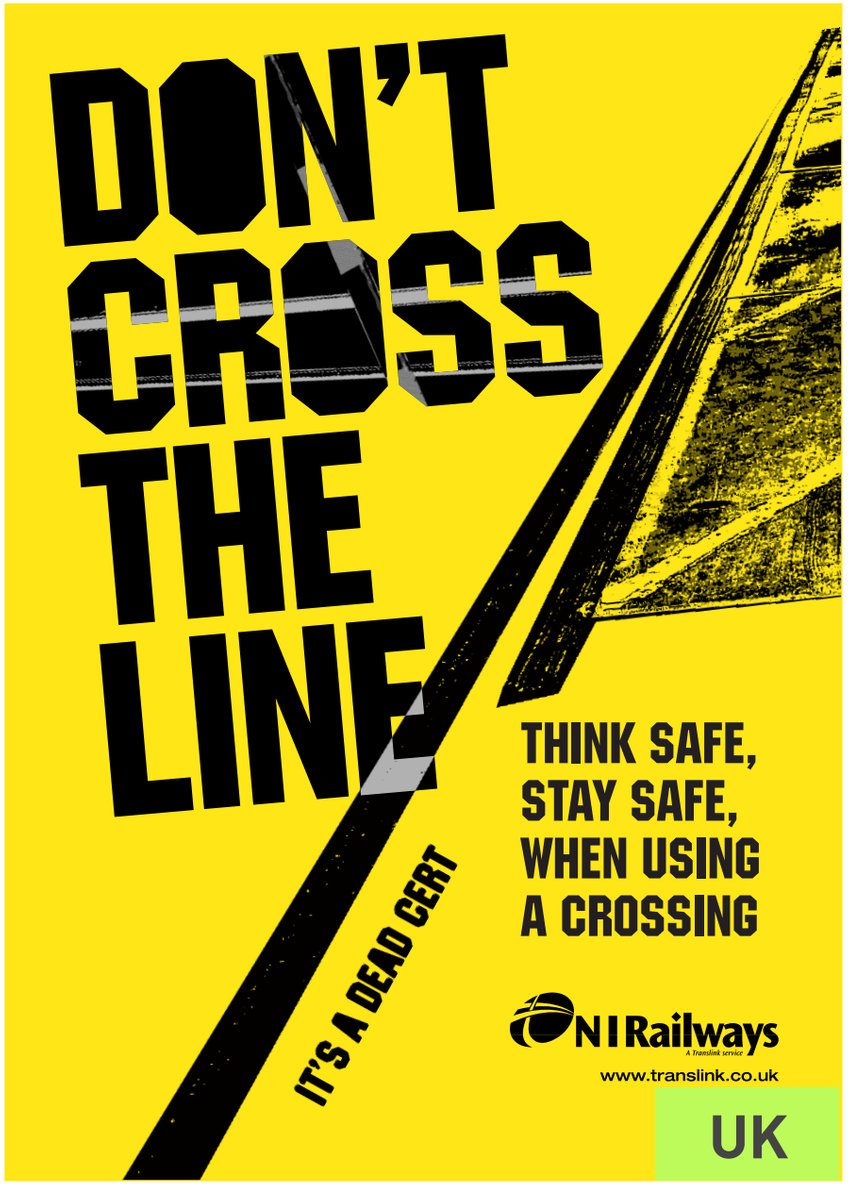
MULUND Cross from east to west

THANE Come from Kalva Stn to get transport in Thane W

CHEMBUR Cross from east to west

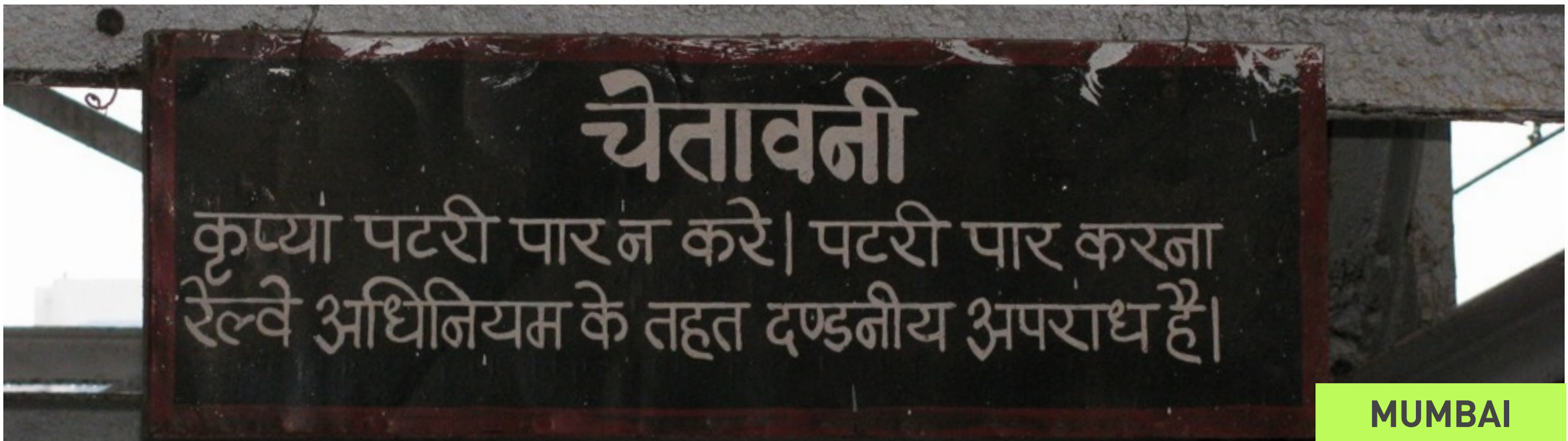
15 GETTING KILLED EVERYDAY

NEW YORK



UK

SWEDEN



MUMBAI

finalmile.

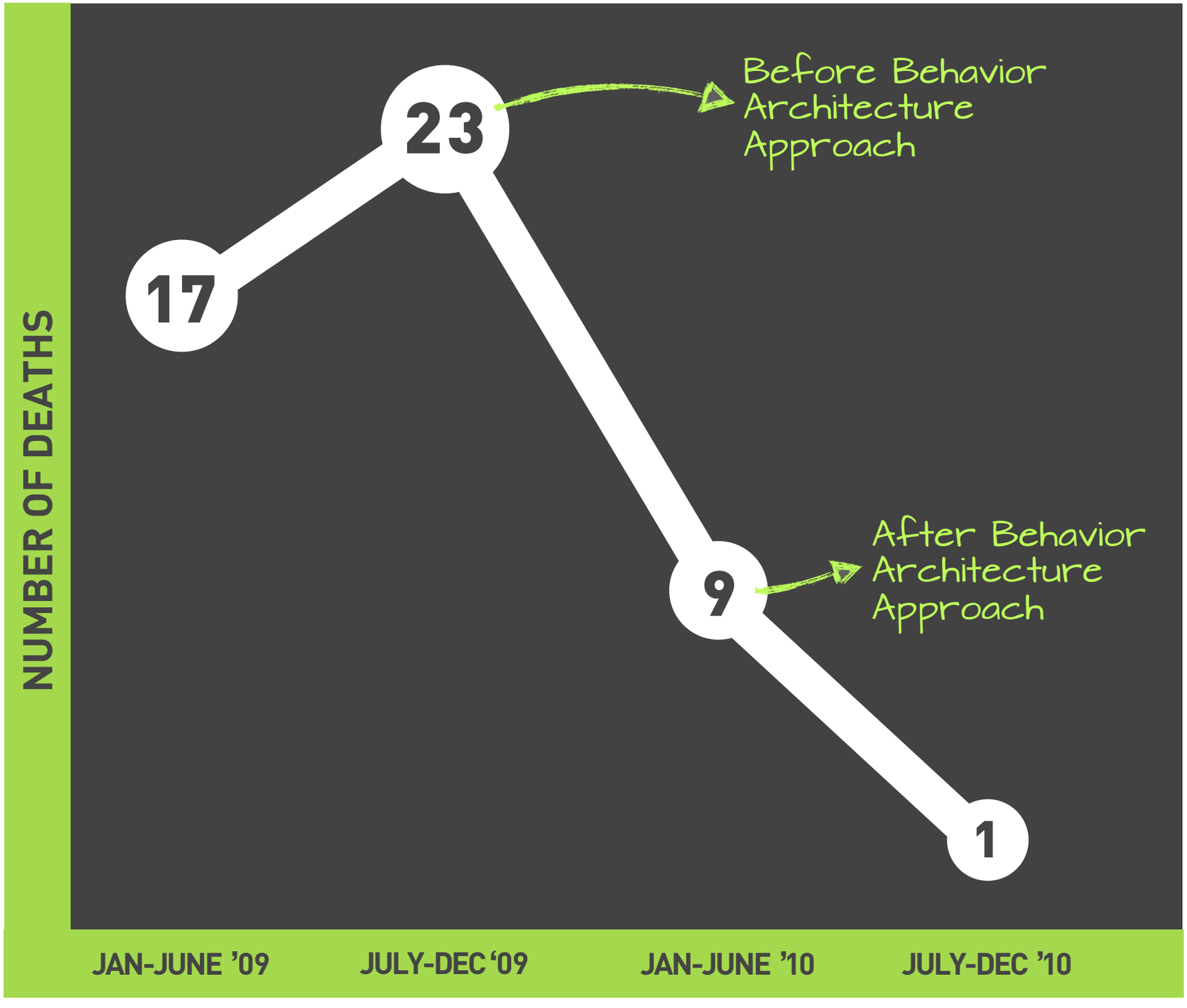
BEHAVIOR ARCHITECTURE™

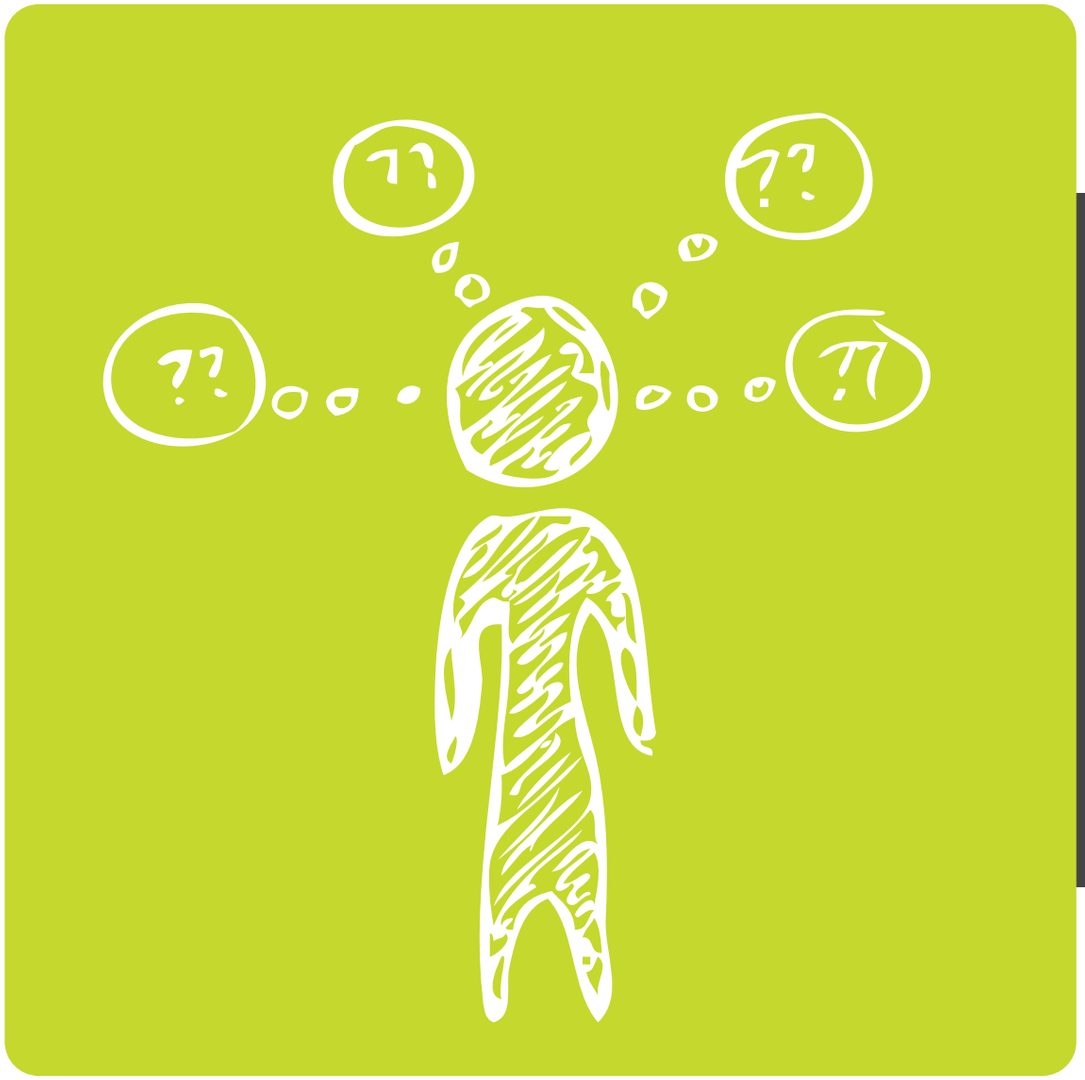
COGNITIVE NEUROSCIENCE

BEHAVIORAL ECONOMICS

CREATED A SPEED REFERENCE


RVJ
S-3


NUMBER OF DEATHS
23
17
9
1
Before Behavior Architecture Approach
After Behavior Architecture Approach
JAN-JUNE '09
JULY-DEC '09
JAN-JUNE '10
JULY-DEC '10

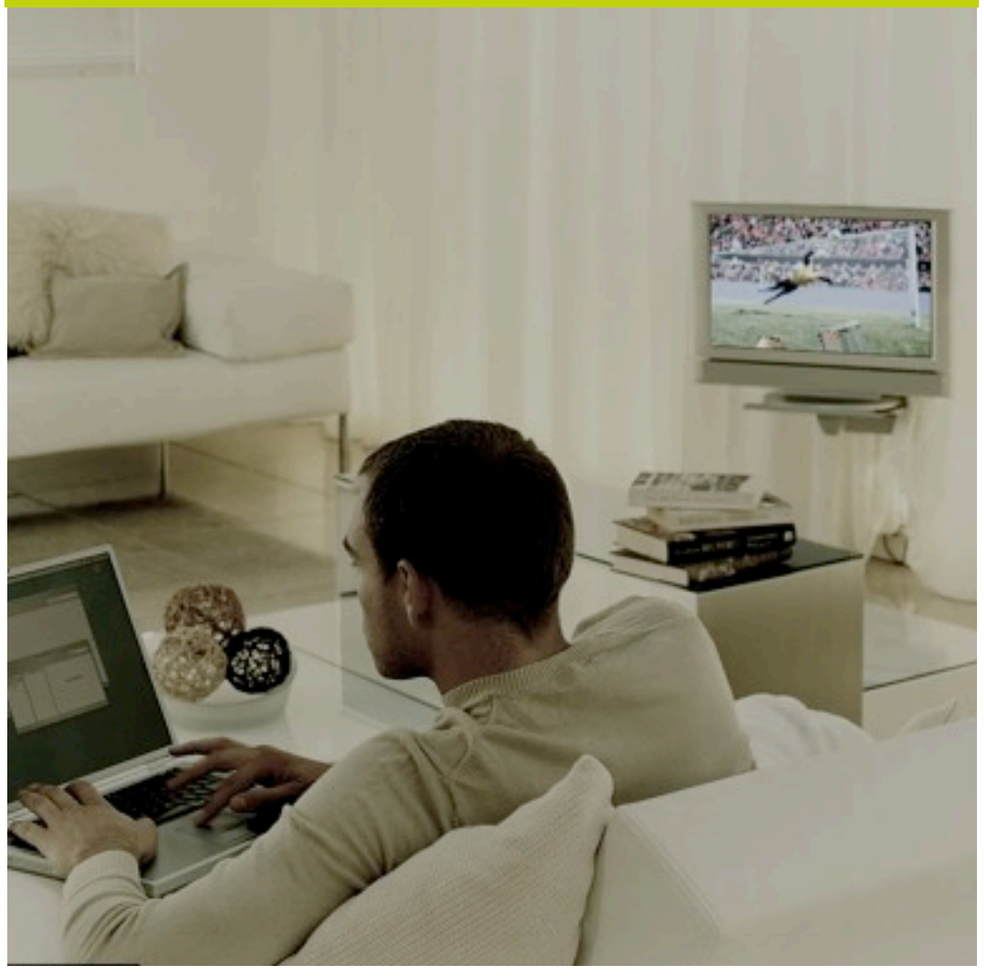


CONTEXT ALTERS DECISIONS & BEHAVIOR

RESEARCH AWAY FROM CONTEXT

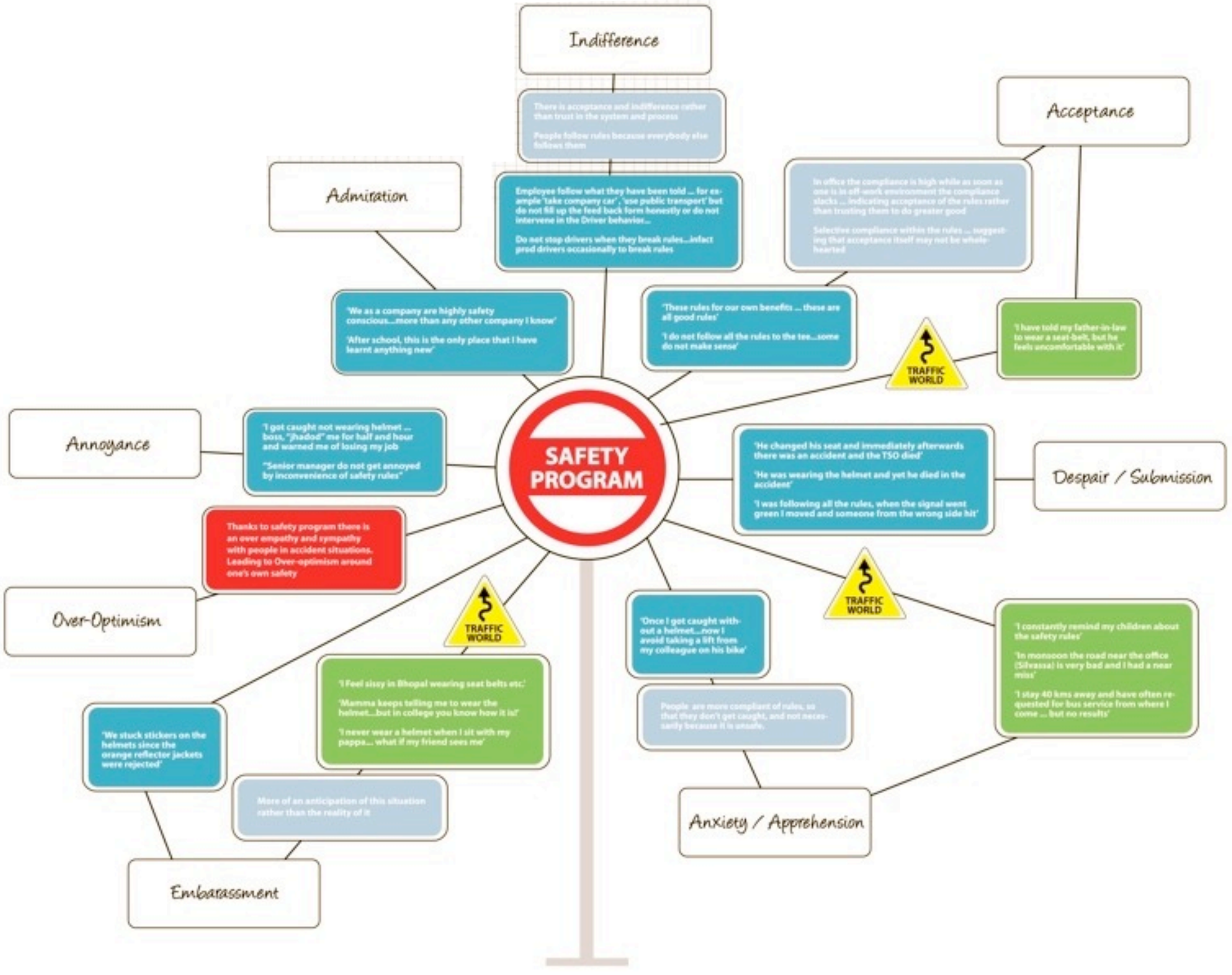
RESEARCH IN CONTEXT

COMMUNICATION AWAY FROM CONTEXT



COMMUNICATION IN CONTEXT

ALL DECISIONS ARE EMOTIONAL


Indifference
There is acceptance and indifference rather than trust in the system and process
People follow rules because everybody else follows them
Acceptance
Admiration
Employee follow what they have been told ... for example 'take company car', 'use public transport' but do not fill up the feed back form honestly or do not intervene in the Driver behavior...
Do not stop drivers when they break rules...infact prod drivers occasionally to break rules
In office the compliance is high while as soon as one is in off-work environment the compliance slacks ... indicating acceptance of the rules rather than trusting them to do greater good
Selective compliance within the rules ... suggesting that acceptance itself may not be wholehearted
'We as a company are highly safety conscious...more than any other company I know'
'After school, this is the only place that I have learnt anything new'
'These rules for our own benefits ... these are all good rules'
'I do not follow all the rules to the tee...some do not make sense'
TRAFFIC WORLD
'I have told my father-in-law to wear a seat-belt, but he feels uncomfortable with it'
Annoyance
'I got caught not wearing helmet ... boss, "jhadod" me for half and hour and warned me of losing my job
"Senior manager do not get annoyed by inconvenience of safety rules"
SAFETY PROGRAM
'He changed his seat and immediately afterwards there was an accident and the TSO died'
'He was wearing the helmet and yet he died in the accident'
'I was following all the rules, when the signal went green I moved and someone from the wrong side hit'
Despair / Submission
Thanks to safety program there is an over empathy and sympathy with people in accident situations. Leading to Over-optimism around one's own safety
Over-Optimism
TRAFFIC WORLD
'Once I get caught without a helmet...now I avoid taking a lift from my colleague on his bike'
TRAFFIC WORLD
'I constantly remind my children about the safety rules'
'In monsoon the road near the office (Silvassa) is very bad and I had a near miss'
'I stay 40 kms away and have often requested for bus service from where I come ... but no results'
'We stuck stickers on the helmets since the orange reflector jackets were rejected'
'I Feel sissy in Bhopal wearing seat belts etc.'
'Mamma keeps telling me to wear the helmet...but in college you know how it is!'
'I never wear a helmet when I sit with my pappa.... what if my friend sees me'
People are more compliant of rules, so that they don't get caught, and not necessarily because it is unsafe.
More of an anticipation of this situation rather than the reality of it
Anxiety / Apprehension
Embarassment

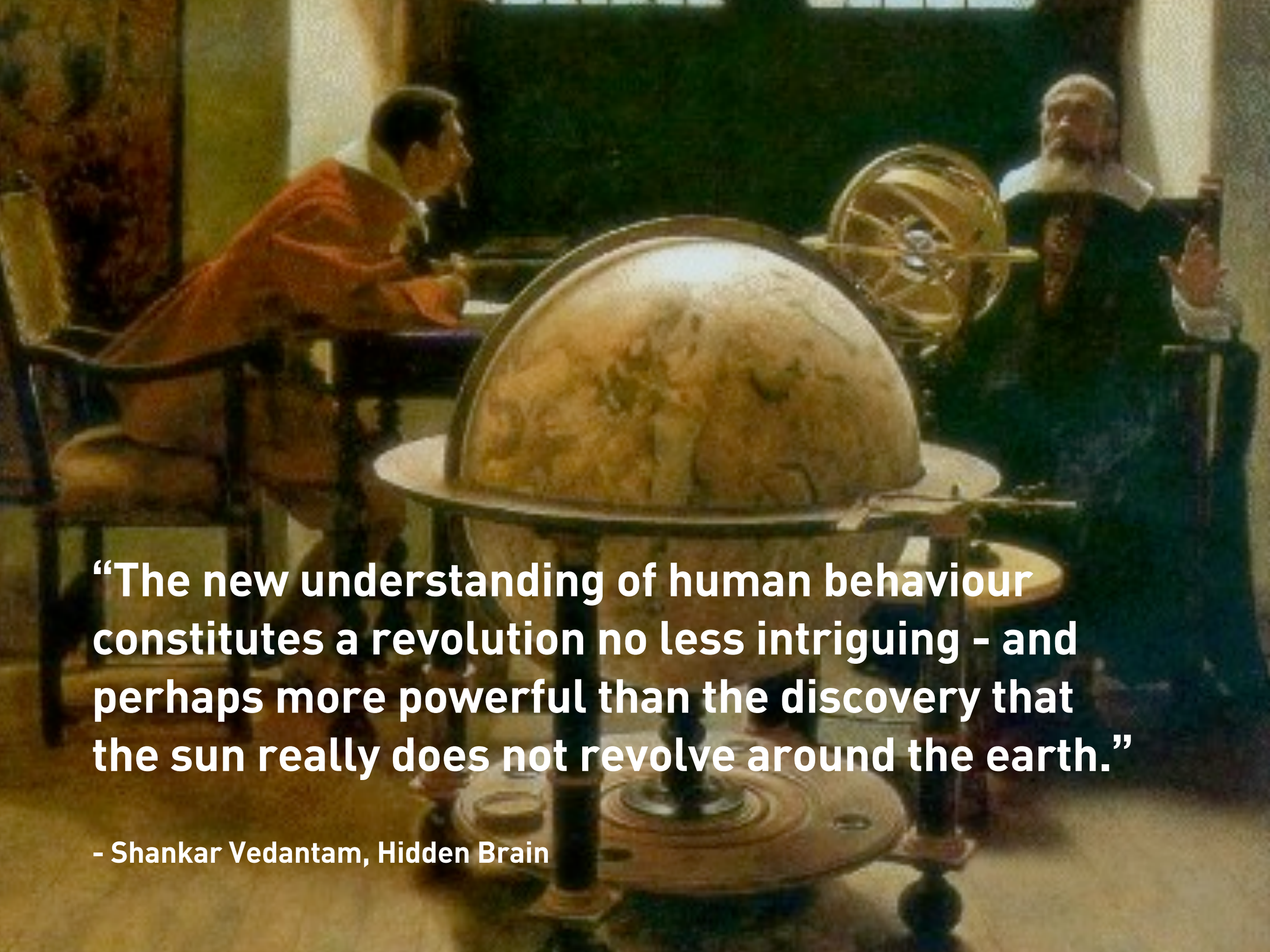
HEURISTICS ARE EFFICIENT SHORTCUTS

RECIPROCITY

95%

BEHAVIOR IS DRIVEN BY NON-CONSCIOUS


NON-
CONSCIOUS
95%
CONSCIOUS
5%

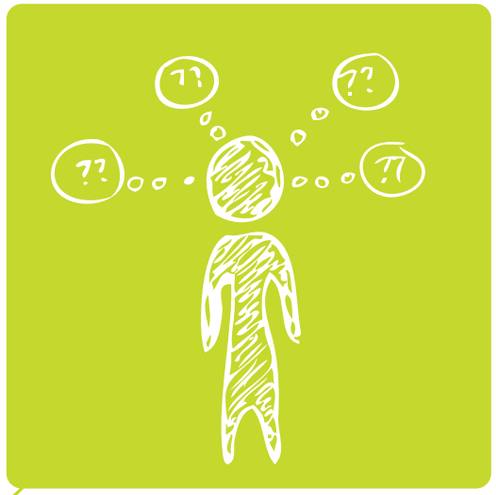


“The new understanding of human behaviour constitutes a revolution no less intriguing - and perhaps more powerful than the discovery that the sun really does not revolve around the earth.”

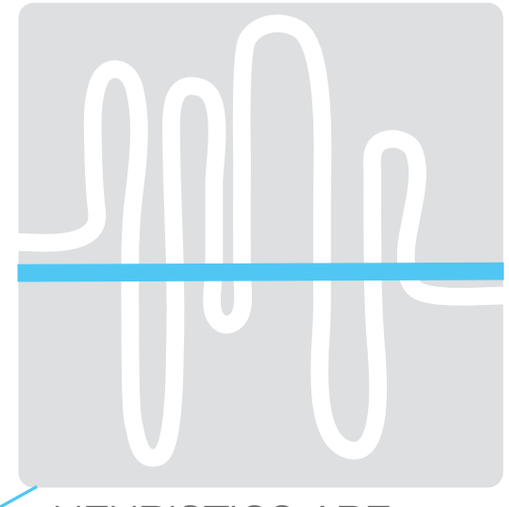
- Shankar Vedantam, Hidden Brain

ALL DECISIONS
ARE EMOTIONAL

BEHAVIOR IS
DRIVEN BY
NON-CONSCIOUS



CONTEXT ALTERS
DECISIONS &
BEHAVIOR



HEURISTICS ARE
EFFICIENT SHORTCUTS

RESEARCH

FRAMEWORKS
Explaining behavior

INTEVENTION
Design & Deployment

DIFFUSION

ethnolab™

UNMANNED
LEVEL CROSSINGS

Level Crossing 2010 TOKYO

CHRIS CAIRNS FOUNDATION

ILCAD

“Act safely at level crossings!”

INTERNATIONAL LEVEL CROSSING AWARENESS DAY (ILCAD)

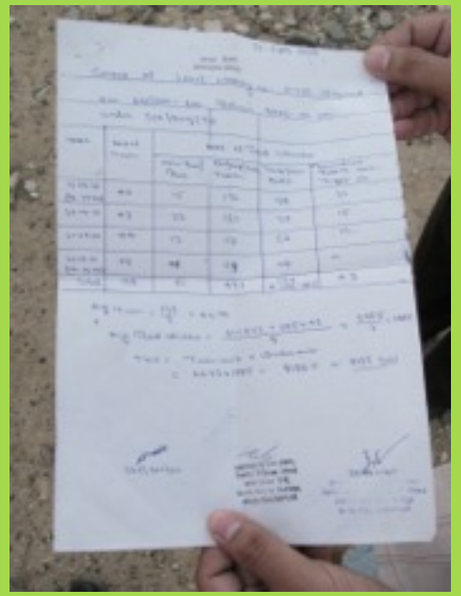
on 22 June 2010

Despite all the measures taken to indicate the presence of level crossings and make them safe, too many road users and pedestrians are killed or injured at such crossings each year right around the world. Almost all accidents at level crossing are due to road users failing to observe mandatory stop lights, signals and basic traffic safety rules. Contrary to what is generally thought most accidents involve “regulars”, in particular those living near and/or making regular use of a level-crossing, as familiarity habit makes them less careful or more reckless, which may prove fatal.

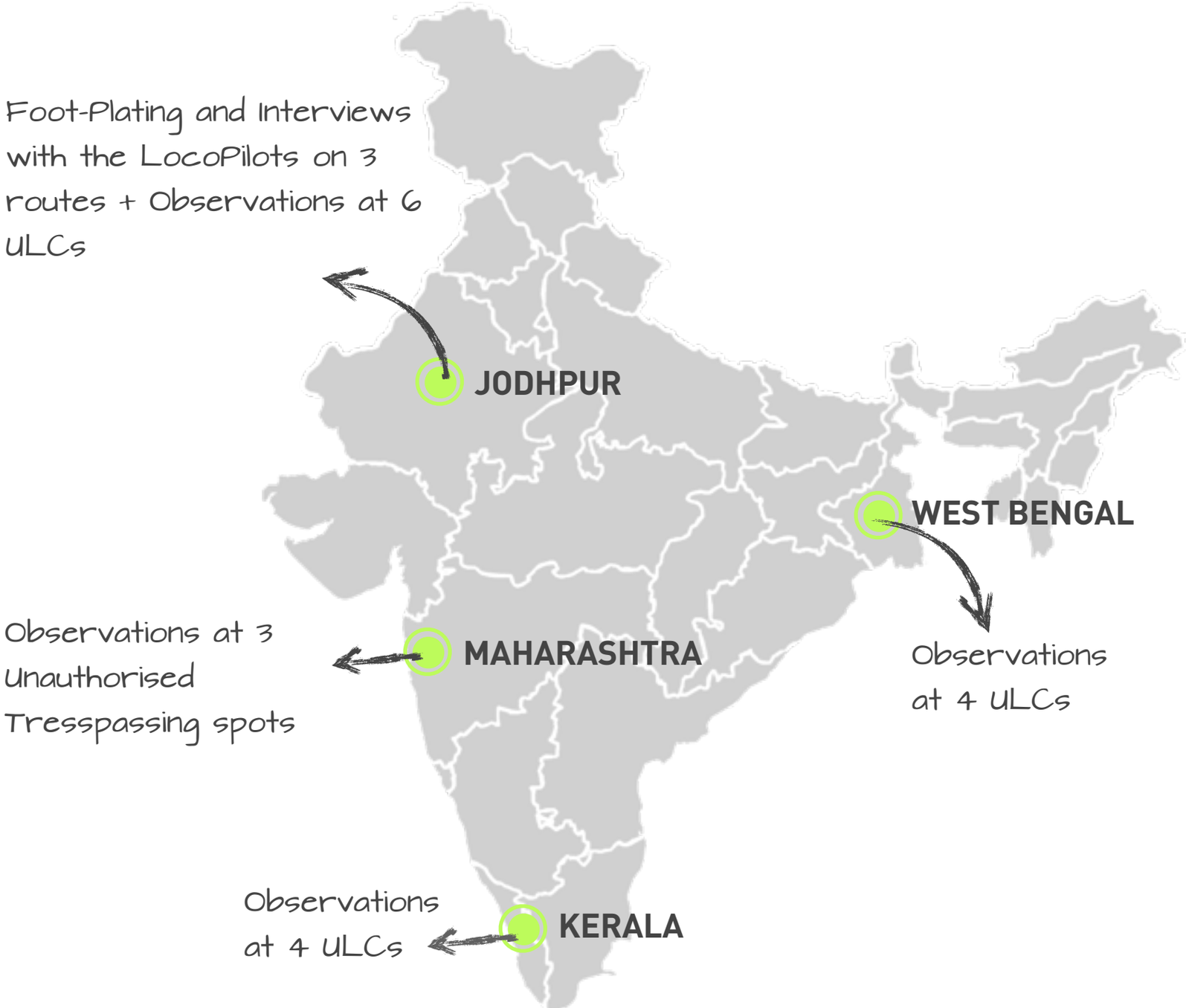
LEADING TO AWARENESS DRIVES

RESEARCH FOOTPRINT

Foot Plating around Jodhpur

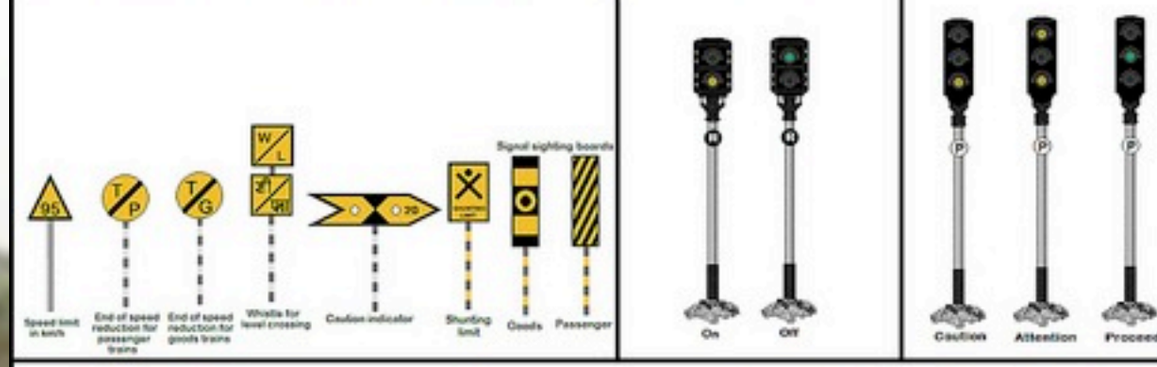


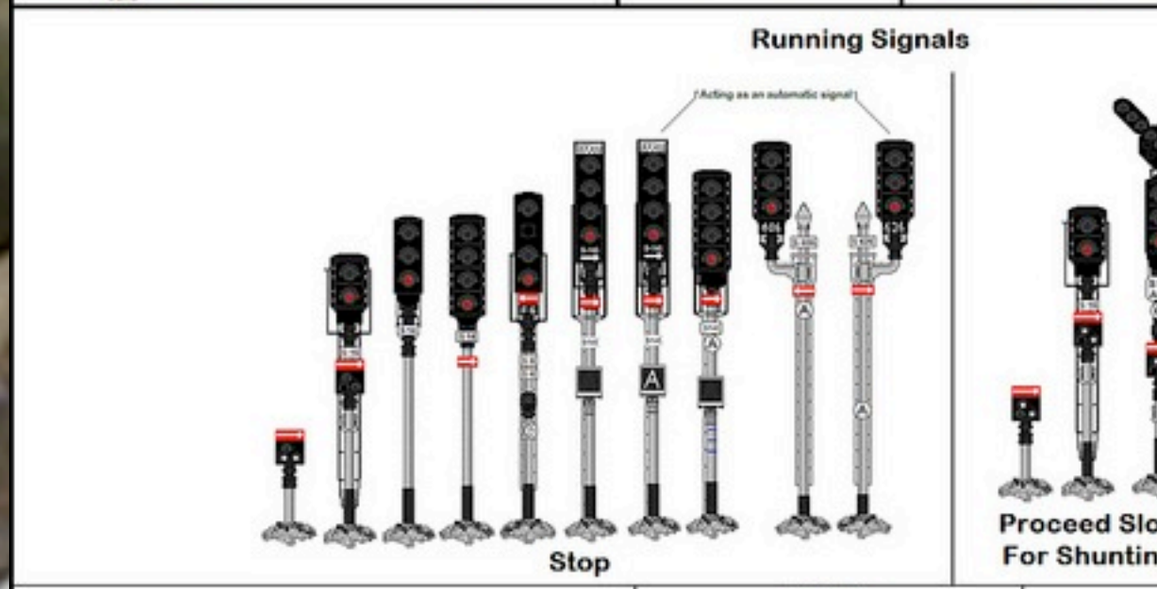
Detailed study of
the accident reports



KEY OBSERVATIONS

TRAIN IS DANGEROUS ...
ACKNOWLEDGED FACT





LOCOPILOTS ADHERE TO WARNING SYSTEMS

Poor Visibilty

ACCIDENTS HAPPEN MORE

WHERE THE VISIBILTY IS MORE

High Visibilty

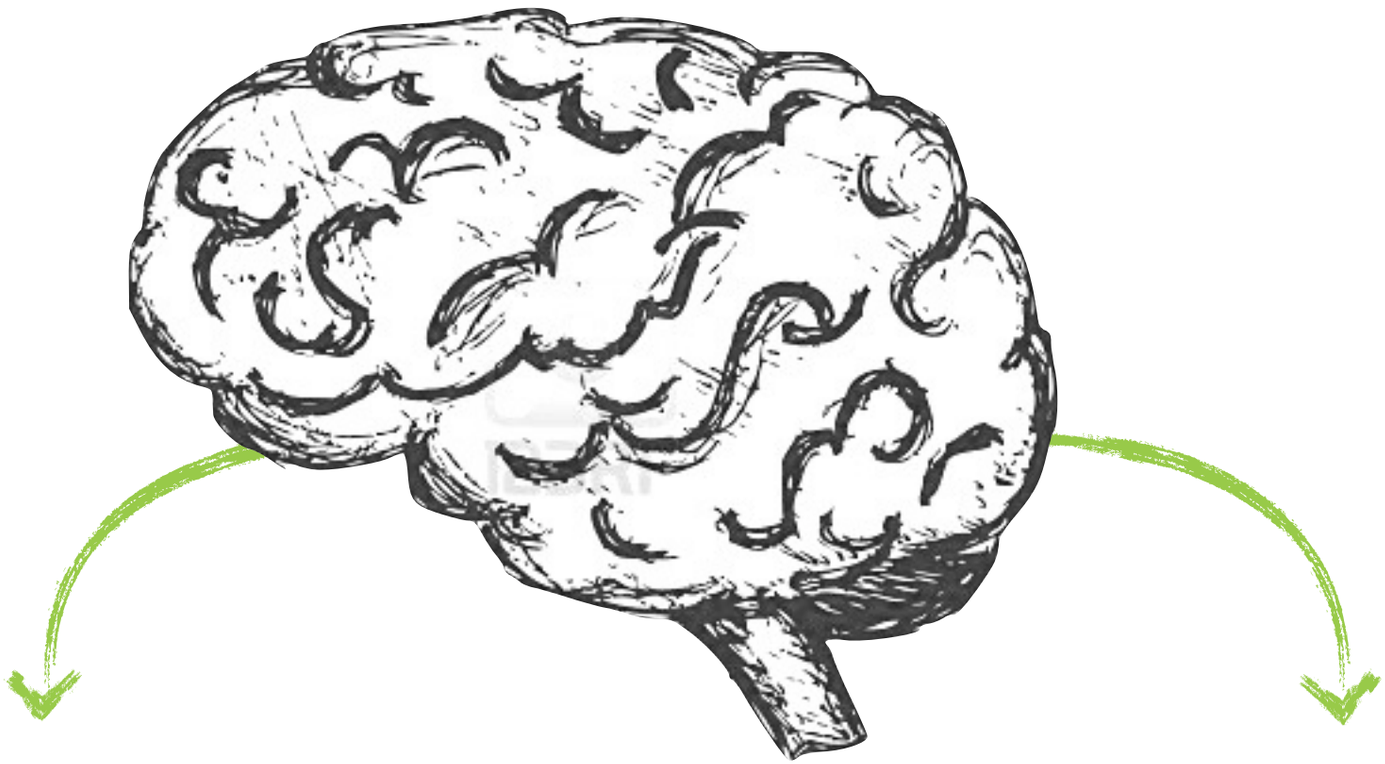
FAMILIARITY

Most people using the unmanned crossing are regulars since they live in nearby villages

THE PROBLEM HAS TO BE A PECULIAR ONE

DECIPHERING THE PROBLEM...

WHY DO ACCIDENTS HAPPEN?



COGNITIVE
SHORT CUTS

BIOLOGICAL
DEFICIENCIES

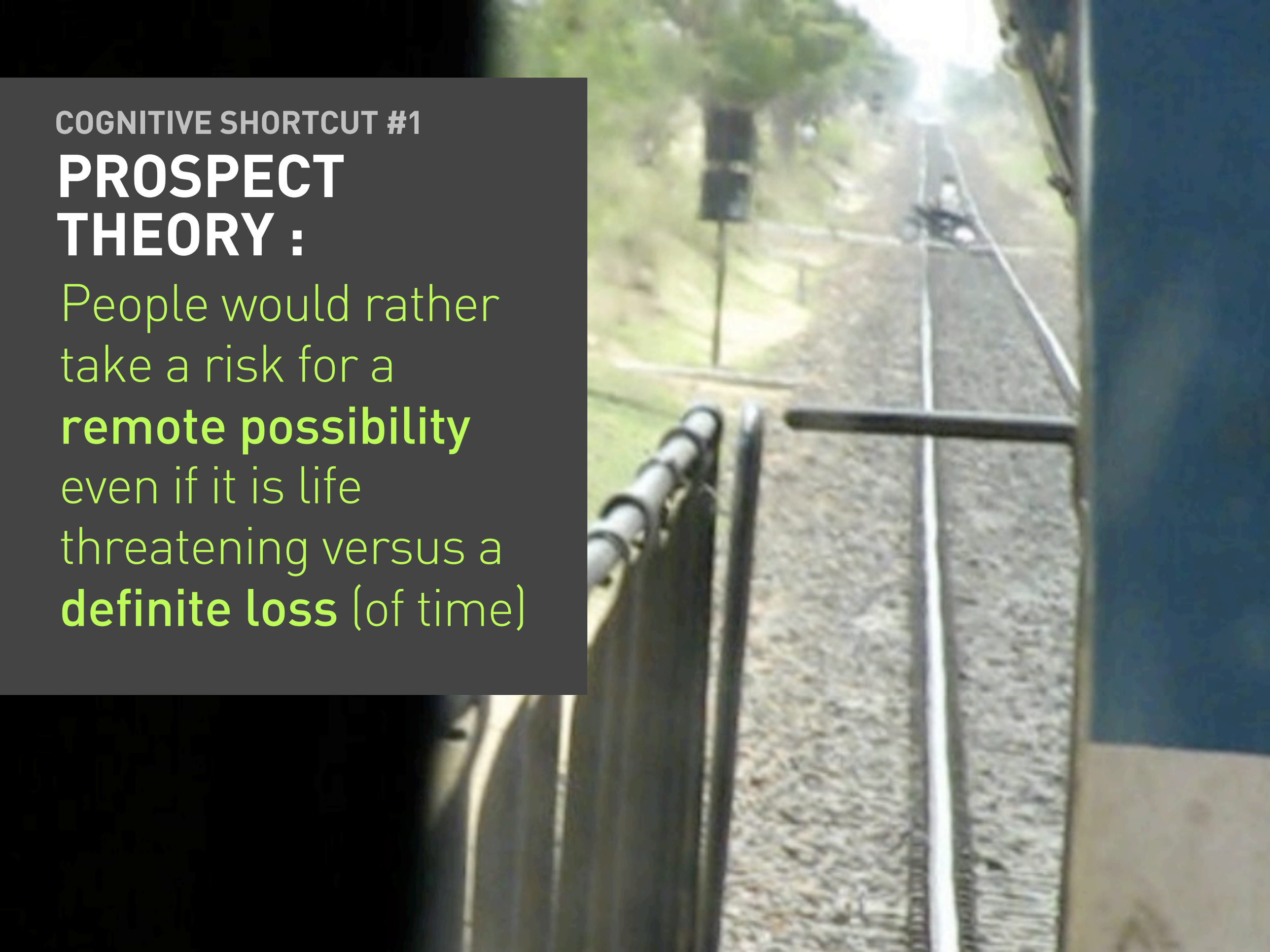
COGNITIVE
SHORT CUTS

WHY DOES HE NOT WAIT FOR A FEW SECONDS?

COGNITIVE SHORTCUT #1

PROSPECT THEORY :

People would rather take a risk for a **remote possibility** even if it is life threatening versus a **definite loss** (of time)



Poor Visibilty

WHY DO ACCIDENTS HAPPEN MORE

WHERE THE VISIBILTY IS MORE ?

High Visibilty

COGNITIVE SHORTCUT #2

RISK COMPENSATION

GREATER
PERCEPTION
OF SAFETY

GREATER
RISK
TAKEN

SOURCE : THE CLASSIC THEORY OF RISK COMPENSATION (ADAMS, 1995)

COGNITIVE SHORTCUT #3

OVERCONFIDENCE & ILLUSION OF CONTROL

EASIER THE TASK =
LESS ATTENTION PAID TO IT

MORE FAMILIAR THE ROAD =
MORE OVERCONFIDENT THE DRIVER

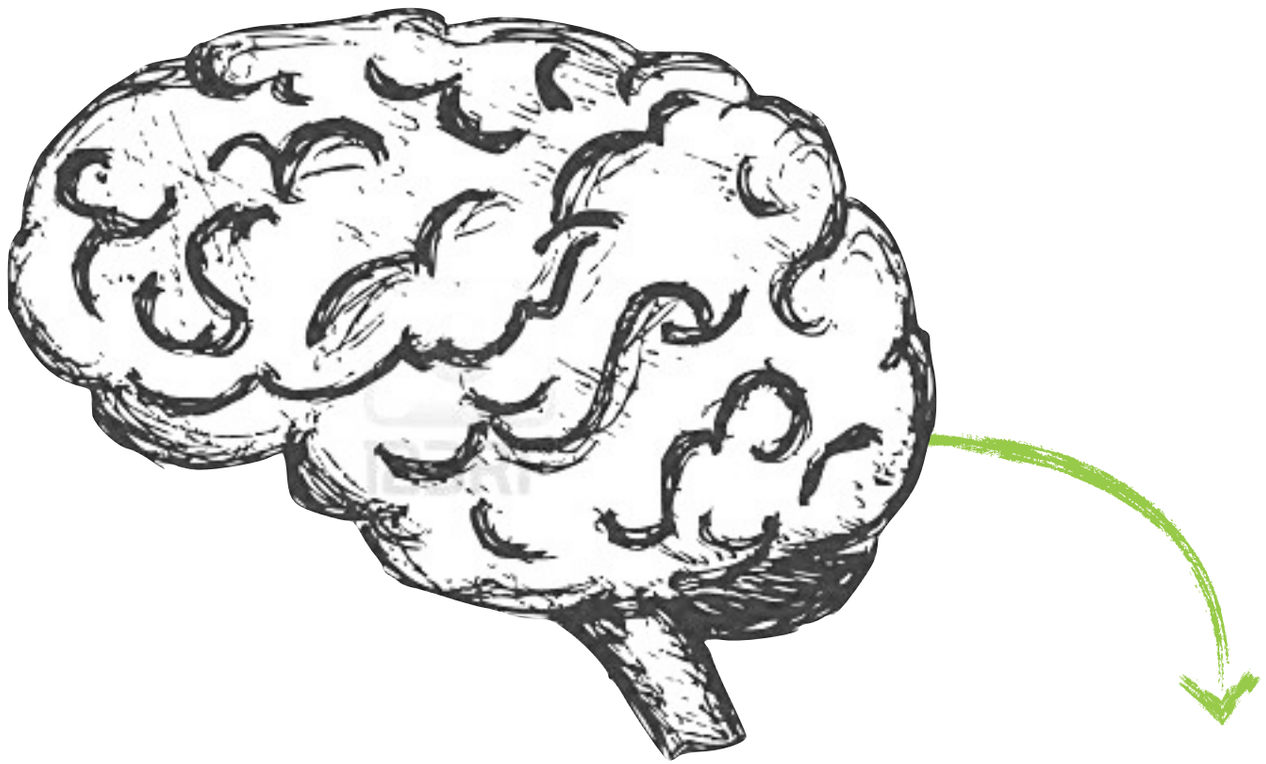
Eg. Mumbai-Pune Expressway - highest per/km fatality rate

COGNITIVE SHORTCUT #4

OPTIMISM BIAS

PEOPLE IN GENERAL BELIEVE THAT POSITIVE OUTCOMES ARE MORE LIKELY THAN NEGATIVE OUTCOMES

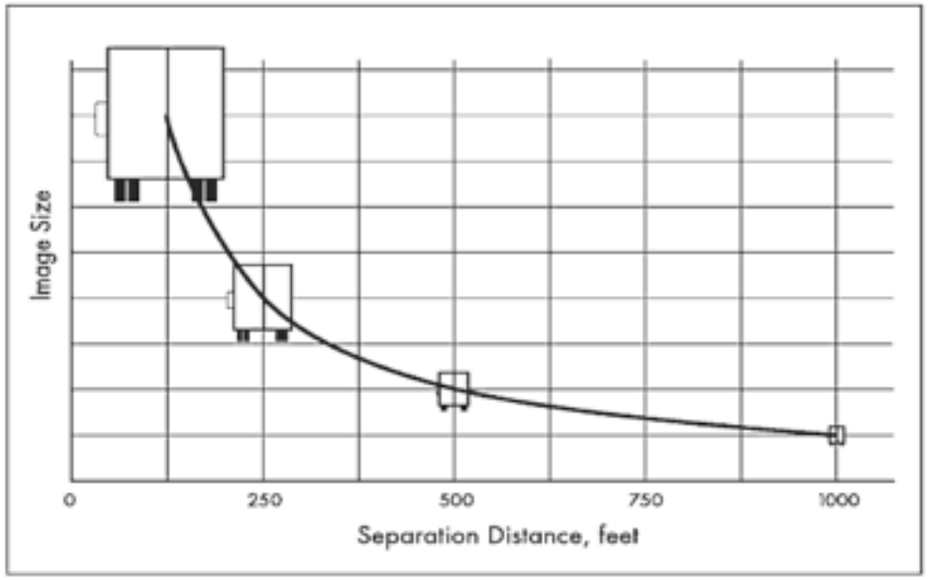
They do not anticipate a collision with the train



BIOLOGICAL
DEFICIENCIES

BIOLOGICAL DEFICIENCY #1

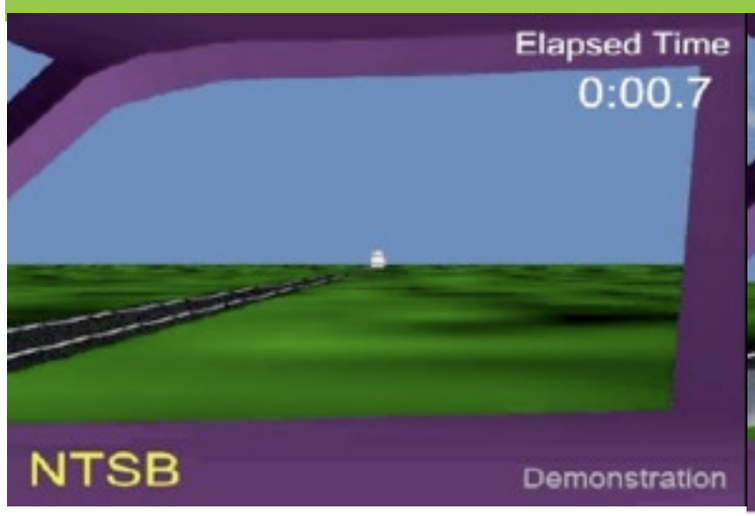
VISUAL PROCESSING ERRORS

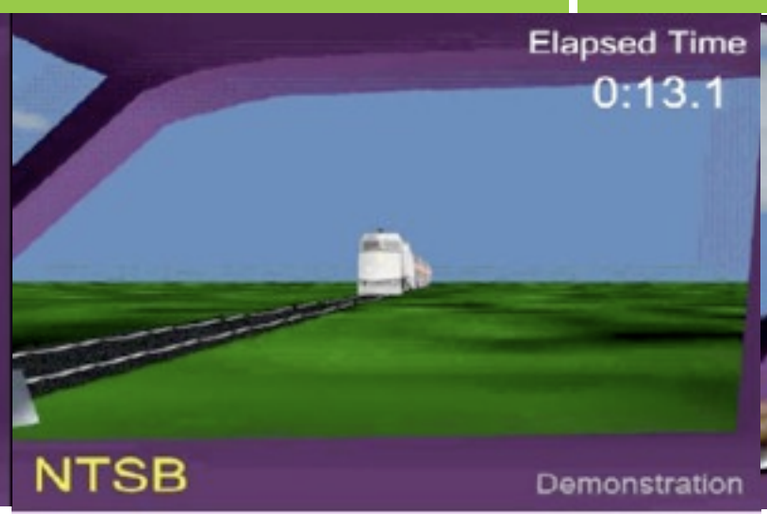


LEIBOWITZ HYPOTHESIS

TRAIN LOOKS SLOWER THAN WHAT IT IS - LEADING TO JUDGEMENT ERRORS

IMAGE OF THE TRAIN LOOMS EXPONENTIALLY



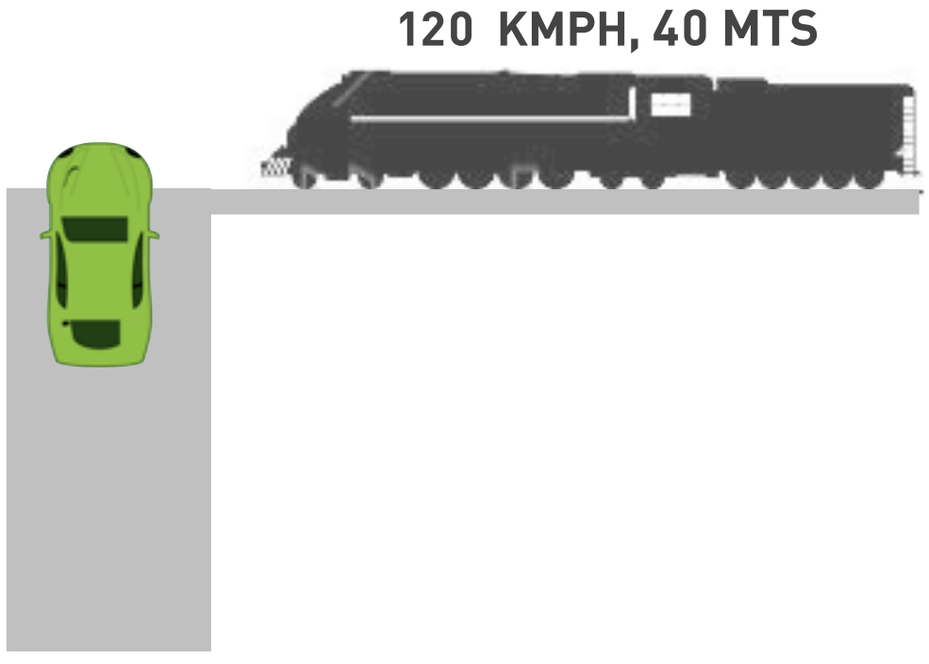


18 secs versus 30 secs for train approaching at 75mph @40% underestimation

BIOLOGICAL DEFICIENCY #2

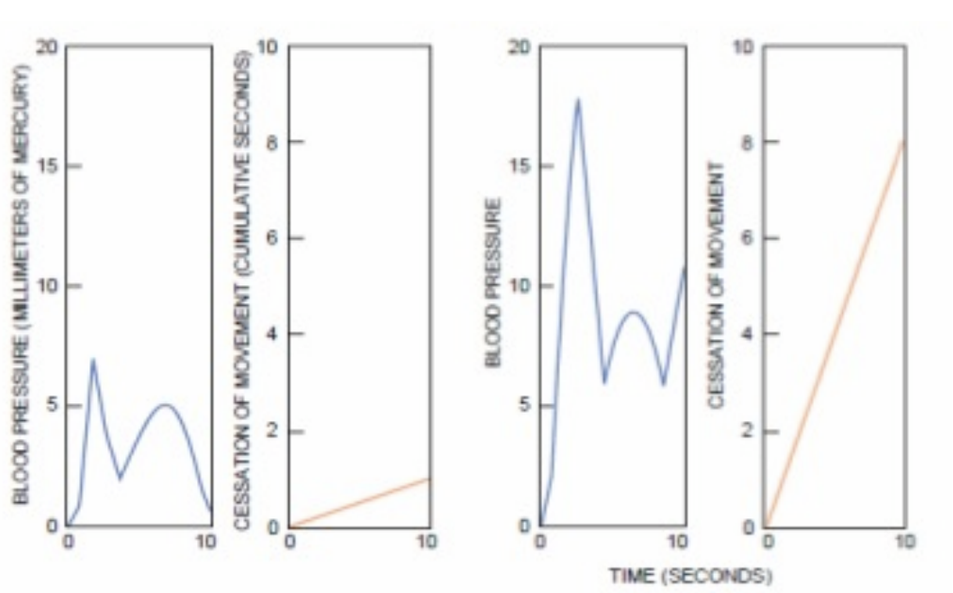
FREEZE RESPONSE

WHEN NON-CONSCIOUS ACTS BECOME CONSCIOUS IT LEADS TO CHOKING



"He would have been saved if he hadn't stopped"

LOCO PILOT



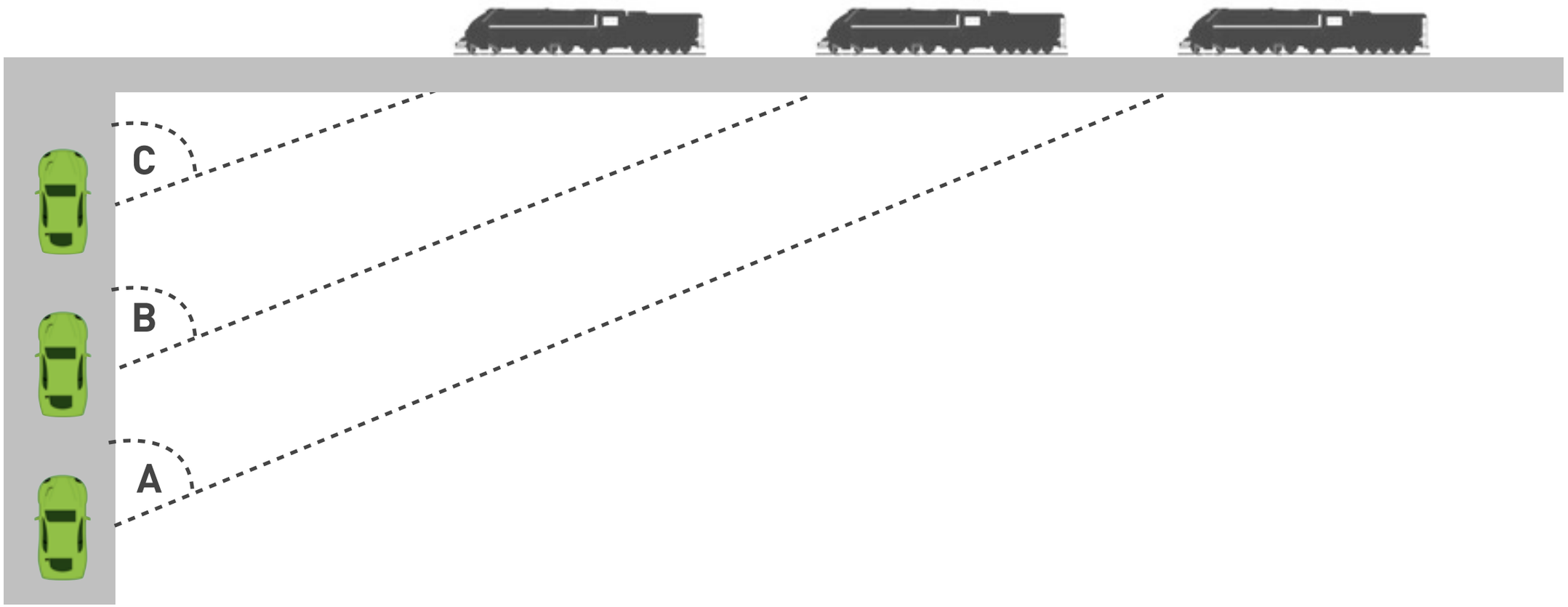
FEAR RESPONSE IS AN ACTIVE RESPONSE TO HELPLESS DANGER

BIOLOGICAL DEFICIENCY #3

COMPLEXITY DUE TO BOTH VEHICLES IN MOTION

ILLUSION OF RELATIVE STABILITY

Angle A = Angle B = Angle C



DEVELOPING INTERVENTIONS

THE CONTEXT ?

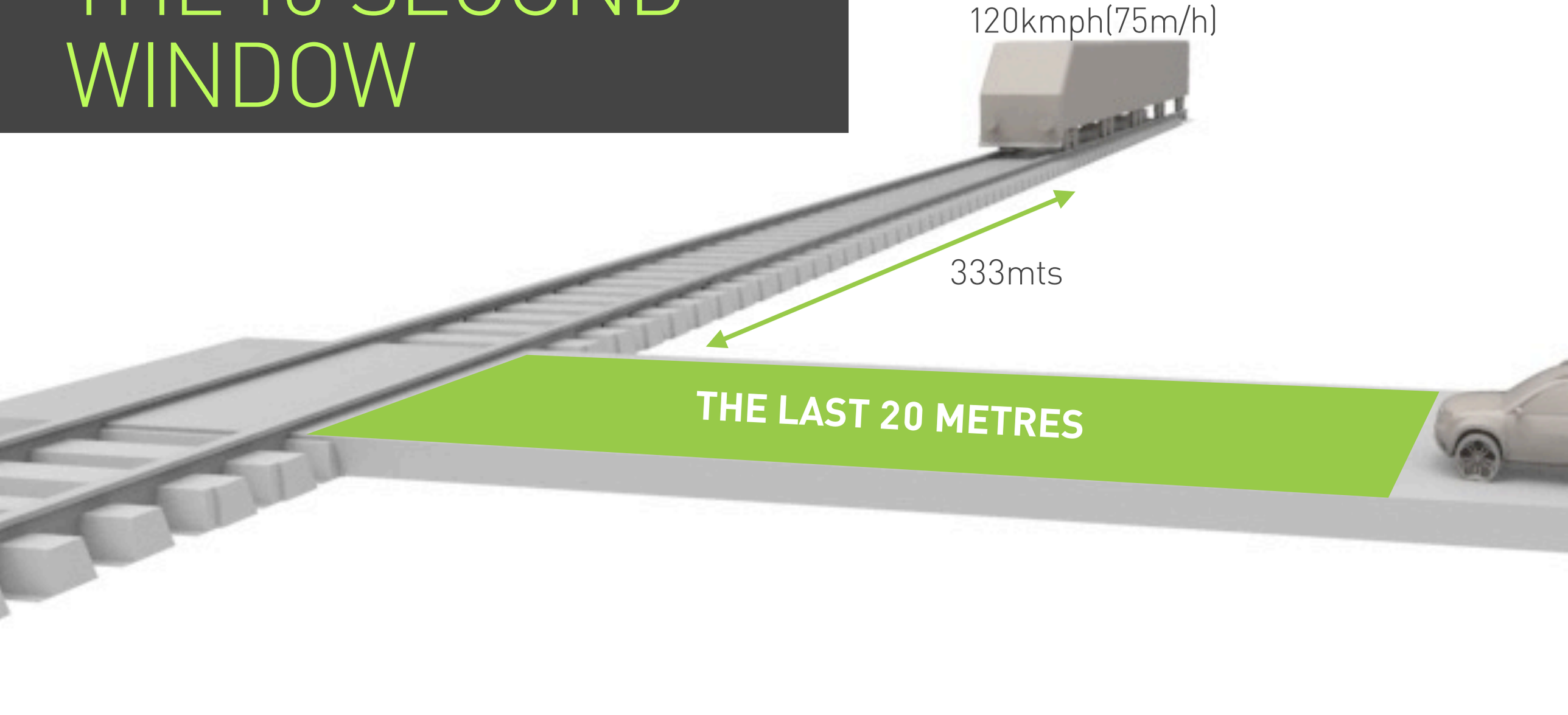
ROAD SIGNAGE STARTS @ 200 MTS

BUT DRIVERS DO NOT GET INTO AN ATTENTION MODE

THE VITAL POINT OF ACTION

COLLISION COURSE

THE 10 SECOND WINDOW



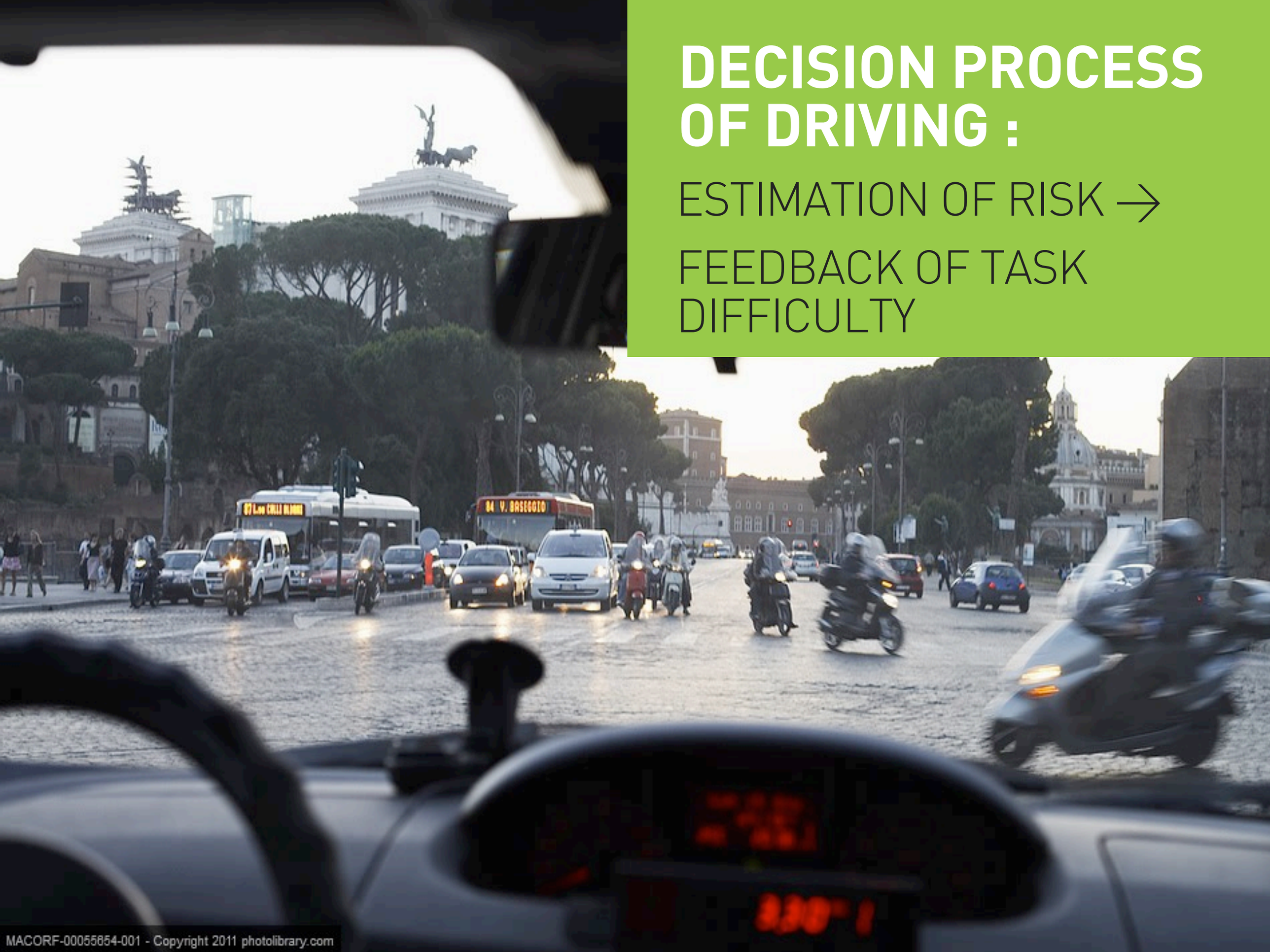
DISSUADE ANY AGGRESSIVE DECISIONS

IN LAST 20 MTS

DECISION PROCESS OF DRIVING :

ESTIMATION OF RISK →

FEEDBACK OF TASK DIFFICULTY



DRIVER CAPABILITY > TASK DEMAND

↓

EASY TASK

↓

OVERCONFIDENCE

DRIVER CAPABILITY < TASK DEMAND

↓

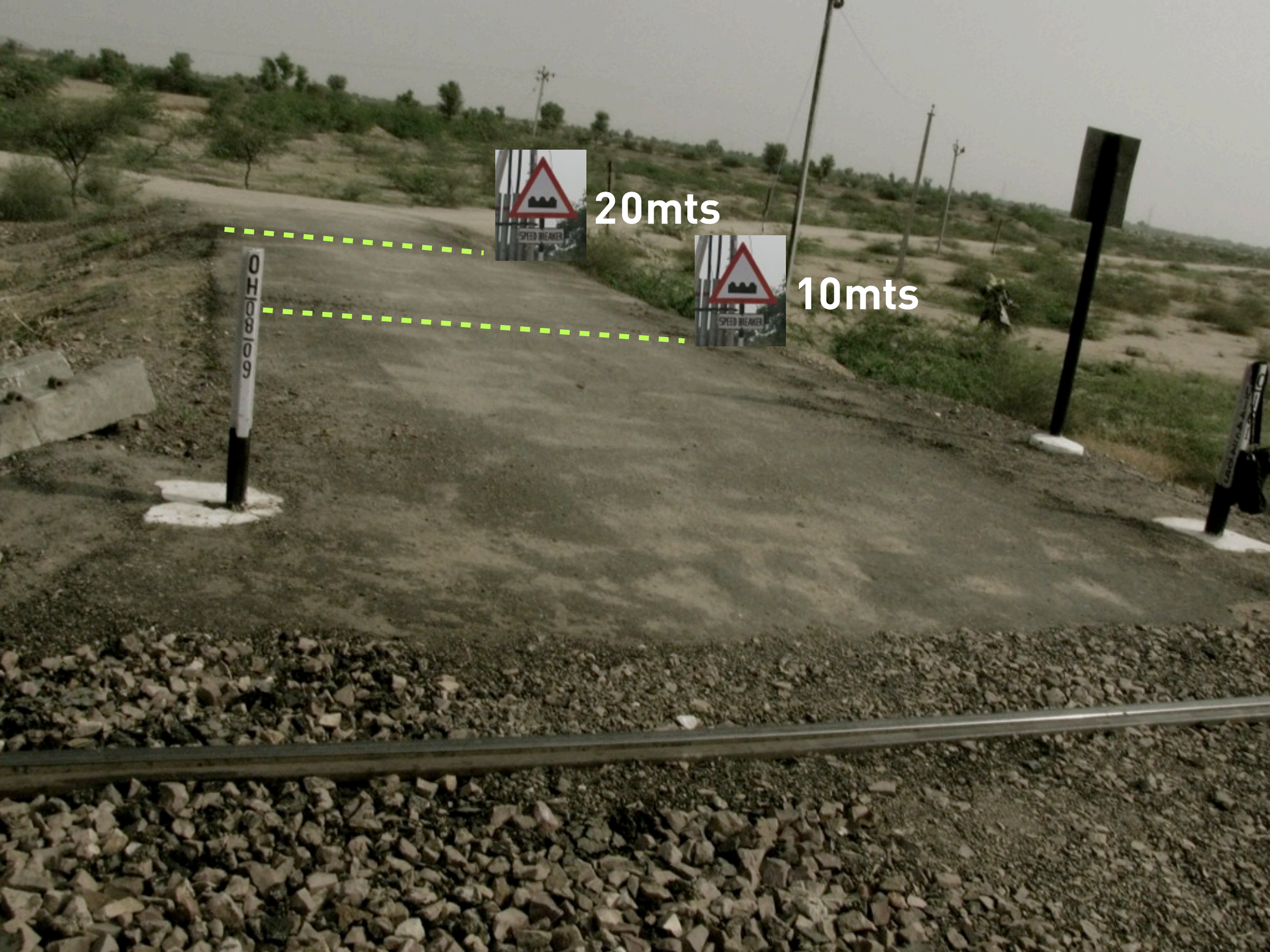
DIFFICULT TASK

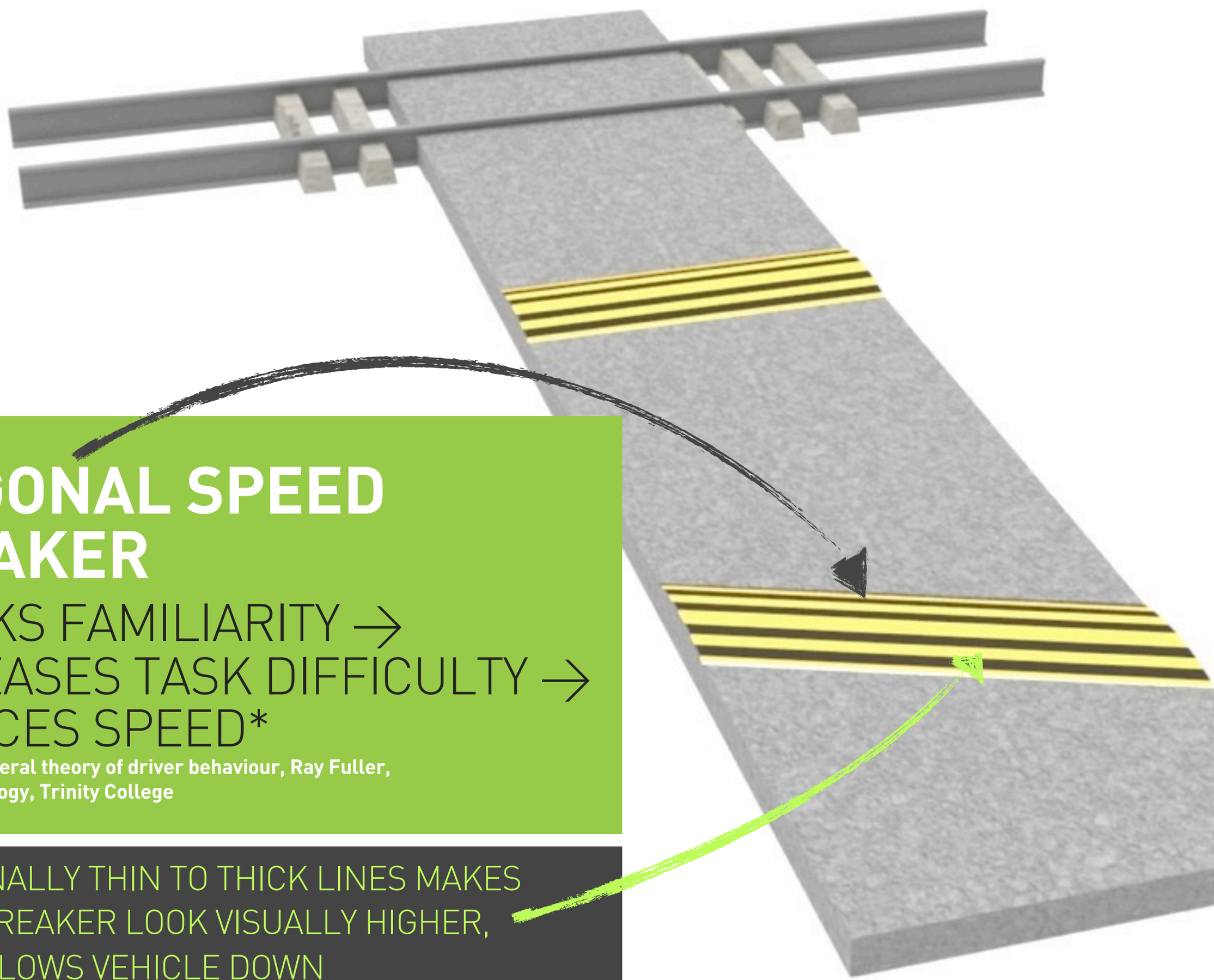
The Brief #1

INCREASE TASK DIFFICULTY

BREAK THE FAMILIARITY BY DISTURBING RELATIVE STABILITY

AVOID TENDENCY TO SPEED UP AFTER A SPEED BREAKER


SPEED BREAKER
20mts
SPEED BREAKER
10mts



DIAGONAL SPEED BREAKER

BREAKS FAMILIARITY →
INCREASES TASK DIFFICULTY →
REDUCES SPEED*

***Towards a general theory of driver behaviour, Ray Fuller, Dept of Psychology, Trinity College**

ADDITIONALLY THIN TO THICK LINES MAKES SPEED BREAKER LOOK VISUALLY HIGHER, HENCE SLOWS VEHICLE DOWN

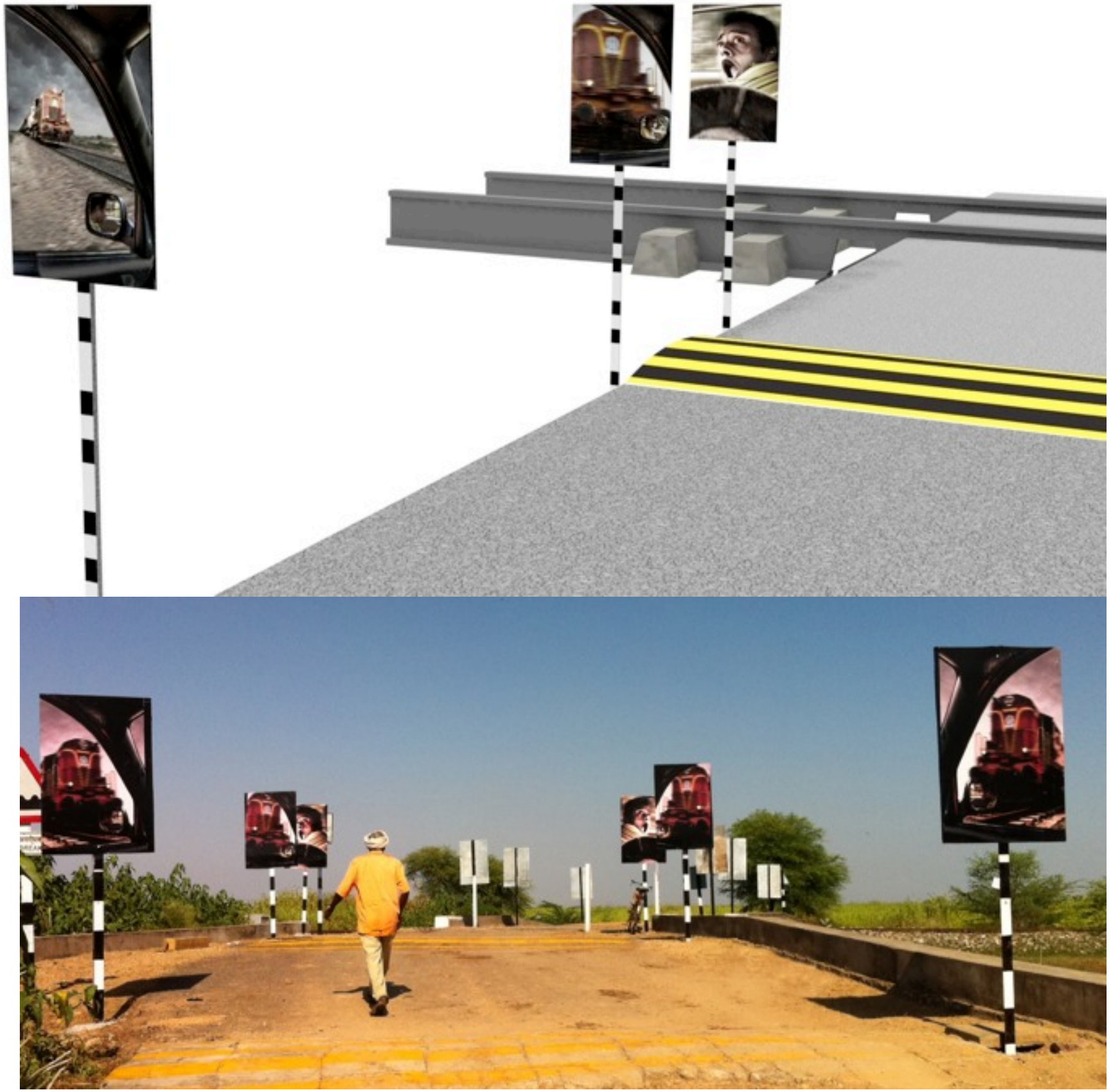

OH08109

The Brief #2

INDUCE 'FUTURE SEEING' THEREBY FAST FORWARD THE EMOTIONAL RESPONSE

NEXTING IMPROVES TIMING AND QUALITY OF RESPONSE

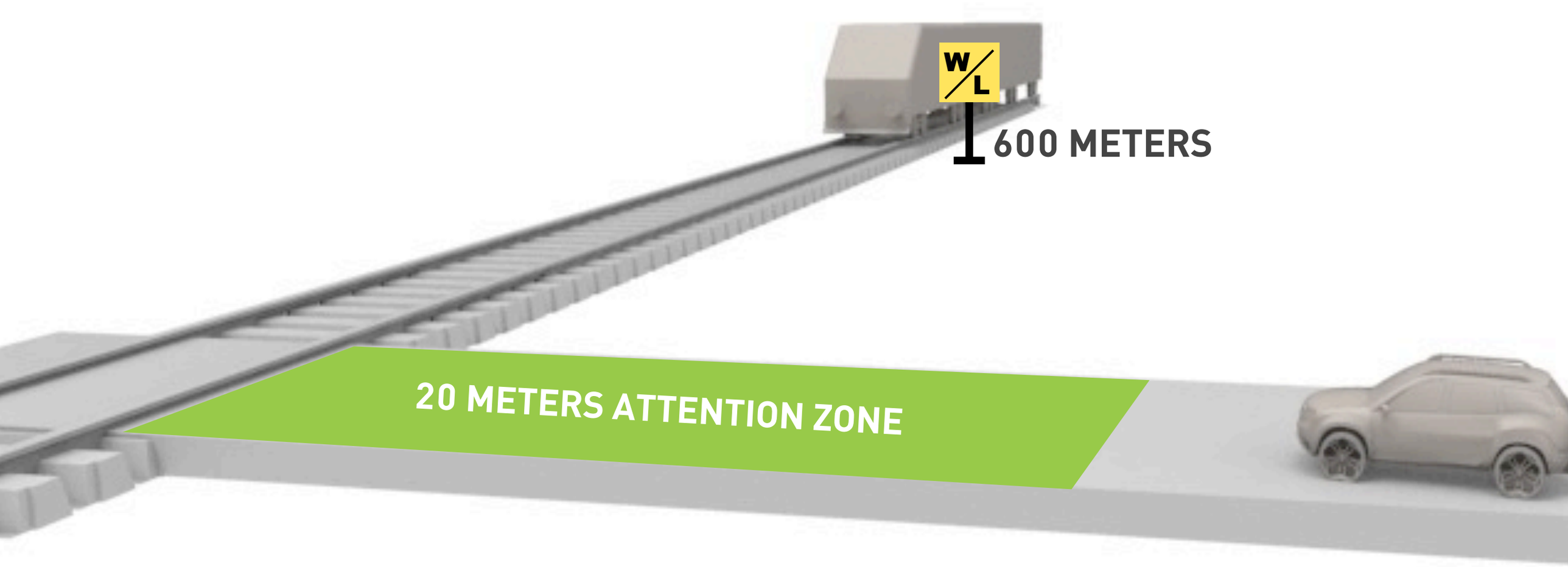
SUCH A RESPONSE IF ENGINEERED, CAN BREAK THE OVER CONFIDENCE OF DRIVERS



The Brief #3

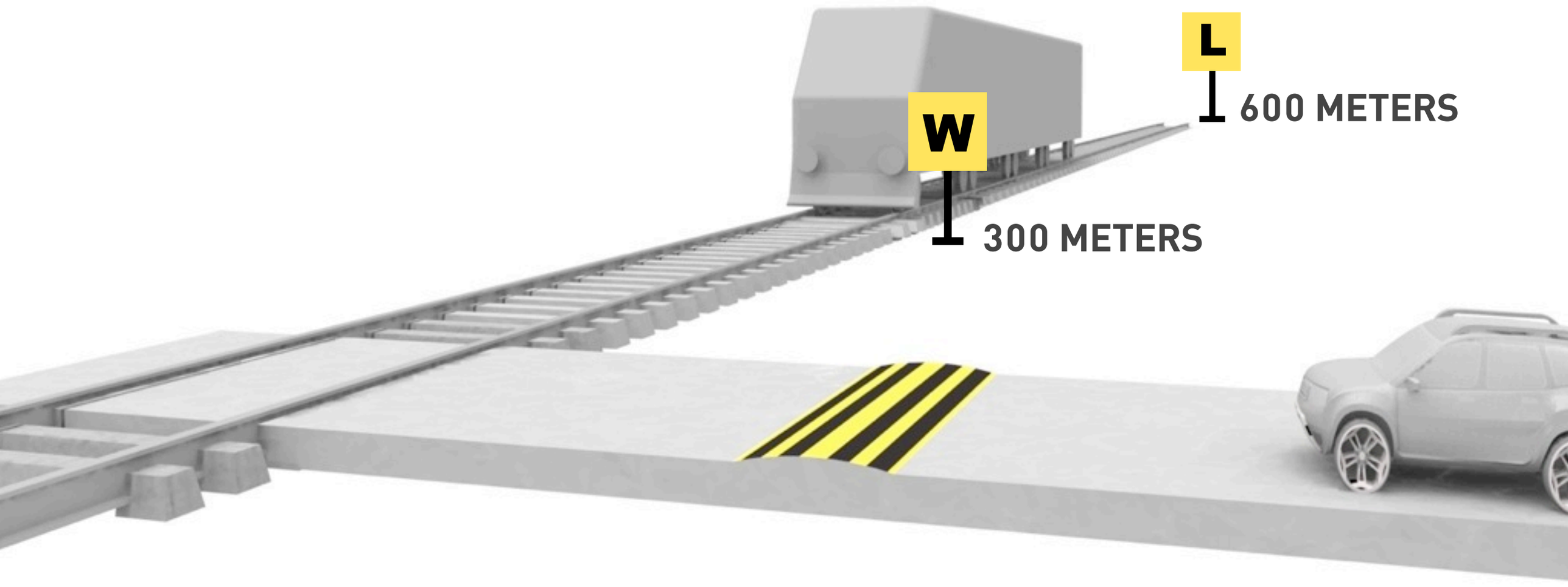
IMPROVING SENSITIVITY TO THE HORN

WHISTLE BEGINS MUCH BEFORE ONE IS IN THE ATTENTION ZONE



HABITUATION VS SENSITISATION

MOVE THE WHISTLE BOARD TO 300 METERS



Summary of Solutions

a) **Focus on the last 20 meters to manage the problem accurately**

b) **Break familiarity and relative stability with an additional diagonal speed-breaker (Better speed-breakers)**

c) **Engineer Future Seeing (Generate fear response through signage)**

d) **Improve sensitivity to horn**

EXPERIMENT CARRIED OUT

@ Level Crossing in Rajasthan

SLOWER IS SAFER :

70%+ of accidents happen because people lose attention for 3 secs.

→ **3 secs** in driving condition is a lot of time

EXPERIMENT OBJECTIVE

MAKING THE DRIVER TAKE A CONSERVATIVE DECISION

MAKING THE DRIVER SLOWER

MORE TIME = MORE ATTENTION = LESSER CONFIDENCE

CRITERIA OF EVALUATION

MEASURE OF SUCCESS :

ADEQUATE REDUCTION OF SPEED OF DRIVERS AS SEEN IN TIME TO CROSS.

BEFORE AND AFTER COMPARISON

Tractor Speeds before Implementation

10 mts = 12 sec

Tractor Speeds after Implementation

10 mts = 16 sec

BEFORE AND AFTER COMPARISON

Car Speeds before Implementation

10 mts = 7 sec

Car Speeds after Implementation

10 mts = 11 sec

BEFORE AND AFTER COMPARISON

Bike Speeds before Implementation

10 mts = 6 sec

Bike Speeds after Implementation

10 mts = 8 sec

BEHAVIOR IS THE REAL PROBLEM, NOT AWARENESS

NEED TO FOCUS ON THE NON-CONSCIOUS AS IT DOMINATES BEHAVIOR