

KRIS2026, 3-4th of June – Helsingborg, Sweden



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Human Behaviour during large-scale evacuation

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Human Behaviour in emergency evacuation

- Understanding and predicting human behaviour in evacuation emergencies requires knowledge of several science fields

Engineering

Psychology

Mathematics/Applied Physics

... and many more!

Human Behaviour in emergency evacuation

Several emergency management **strategies** can be adopted in case of a large-scale emergency

Need to evaluate their **effectiveness** in given events

- **Mandatory evacuation**
- **Recommended evacuation**
- *Stay or go*
- **Stay and defend**
- **Voluntary evacuation**

Authorities' instructions may change over time

May have to react to rapidly changing conditions

... or

- **Lack of policy!**

During an emergency evacuation, do people behave rationally or do they panic?



Panic

Panic concept is often represented in media and movies



BBC

Home News Sport Business Technology Health Culture Arts Travel Earth Audio Video Live

Israel strikes Beirut after evacuation warning sparks panic

6 March 2026

Share Save Add as preferred on Google

Alice Cuddy, Senior international reporter, Beirut and David Gritten



Menu **AOL** Search

Evacuation panic in Florida ahead of Hurricane Milton sparks widespread backups and shortages

NEW YORK POST

CAITLIN MCCORMACK
Oct 8, 2024



India panic: Bomb threat forces evacuation of four schools

24 Apr 2026 16:55

INDIA Share

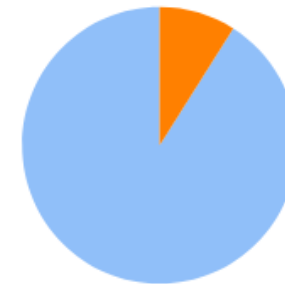


Photo: Getty Images

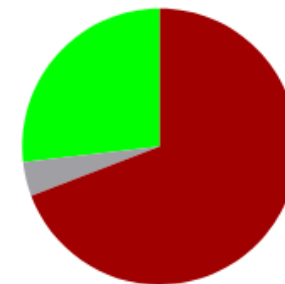
... and sometimes even used in the scientific literature

- Majority of the panic quotes obtained from studies in the domain of physical sciences (mostly modelling studies) → Treat the existence of panic as a proven fact
- The situation is the opposite when examining the quotes extracted from the studies published by social scientists

Supporting Panic



■ Soc.
■ Phys.
■ Bio.

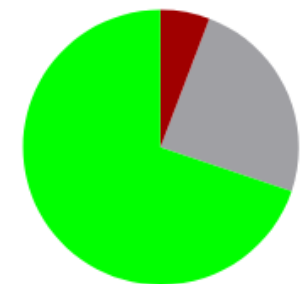


■ Mod.
■ Emp. Test.
■ Conc.

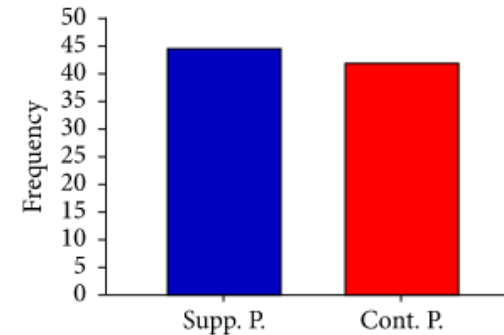
Challenging Panic



■ Soc.
■ Phys.
■ Bio.



■ Mod.
■ Emp. Test.
■ Conc.



Do people panic in evacuation?

Some definitions of panic

- An **excessive fear reaction** which is persistent and unrealistic in terms of the situation (Sime, 1980)
- **Breaking of social order, competition** unregulated by social forces (Johnson, 1987)

Criticism on the use of the panic term (Sime, 1980)

- Used as “scapegoat”
- Used by media to achieve sensationalism and with no explanation
- Connected to irrational behaviour



Panic term is used:

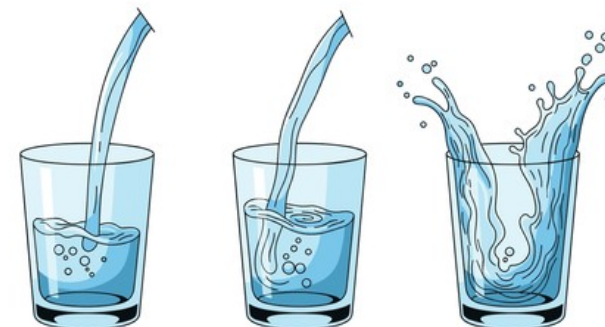
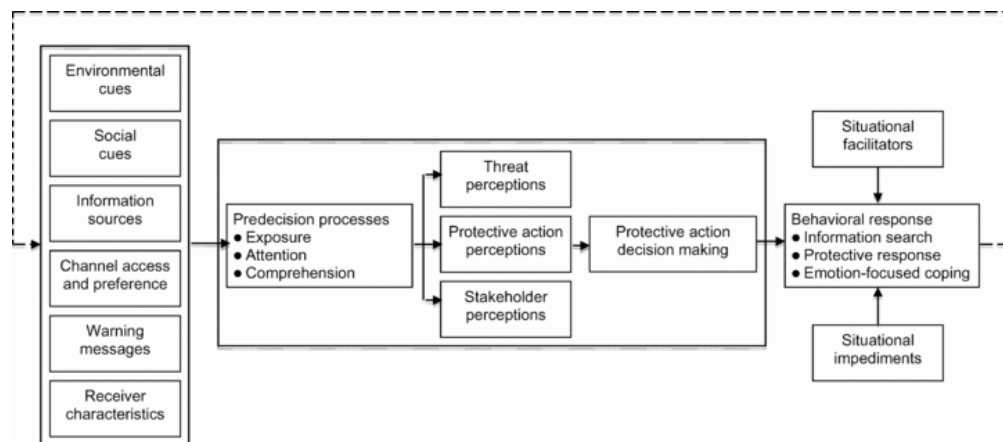
- Describing own/other people behaviour referring to **stress, anxiety or fear**
- Assume people **have complete information** or always take most **appropriate decisions**
- Assessing own ability to respond or responses that **do not appear the best** for the situation (shaking, crying, yelling, running, etc.)

INSTEAD: Panic concept does not match actual behaviour, which in most cases are based on **rational** decision making

Key behavioural theories

How do people respond to an emergency?

Protective action decision model (Lindell & Perry, 2012) →
 Decision-making process before deciding to evacuate →
 Information-seeking behaviour precede protective actions



Key behavioural theories

Role-rule model, Tong and Canter, 1985

- People keep their “pre-emergency” roles during an emergency evacuation (linked with rules)



Examples:

Guests/Staff

Authorities/General Public

Manager/Employee

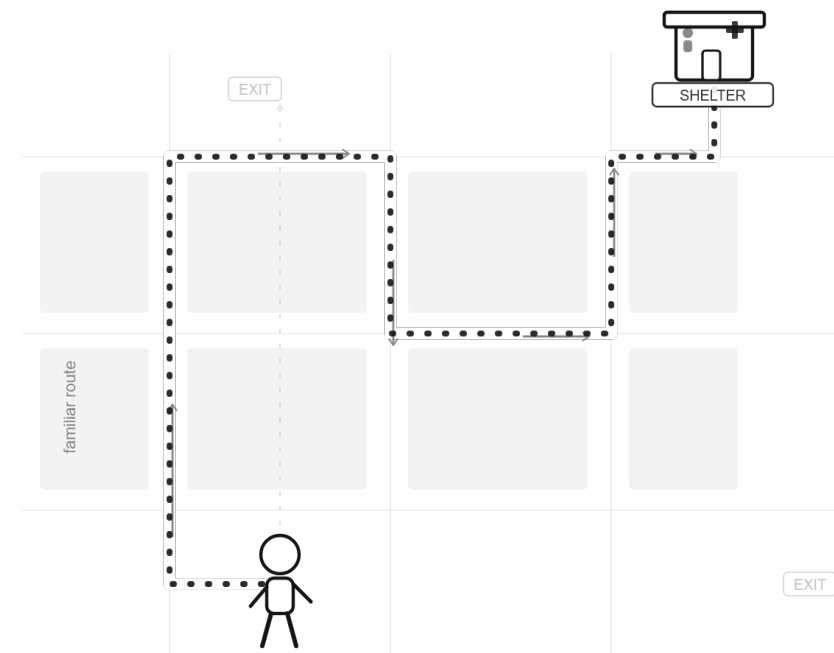
Security guards/attendees



Key behavioural theories

Affiliation theory (Sime, 1980)

- How do people choose where to go?
- Why do people evacuate in groups?
- People tends to move towards the familiar
- Familiar can be: PLACES OR PEOPLE



Examples

PLACES: We know a route that we use in our everyday life

PEOPLE: We would prefer to evacuate with our friends/relatives

Key behavioural theories

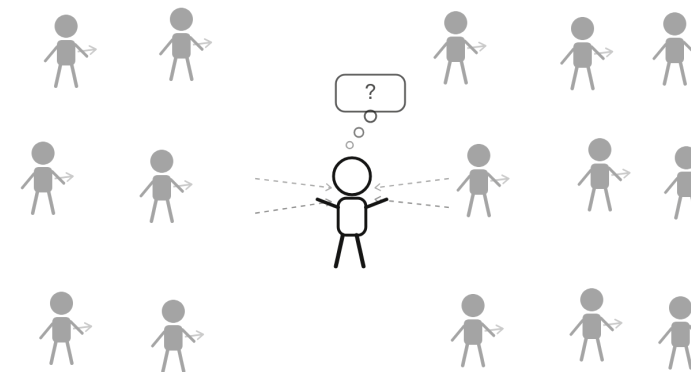
Social influence (Latané & Darley, 1970)

- People tend to respond earlier to an emergency when they have to take a decision alone
- Passive bystander effect (linked to social influence)

Normative social influence

Behaviour according to the norm

Nobody wants to stick out and look different



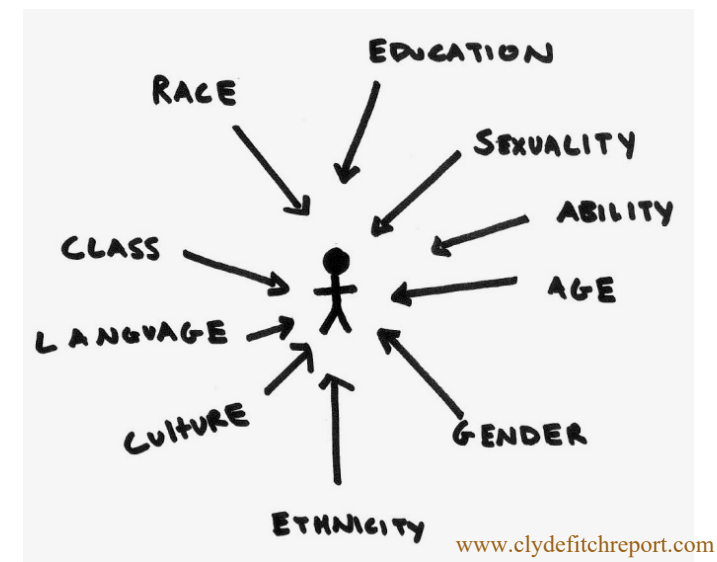
Informational social influence

Observe actions/non-actions of others to collect information

Key behavioural theories

Social identity (Tajfel and Turner, 1979)

From personal to social identity
Aggregate vs psychological crowd



Shared social identity determines social behaviour

During an evacuation emergency, people share a collective social identity

Key behavioural theories

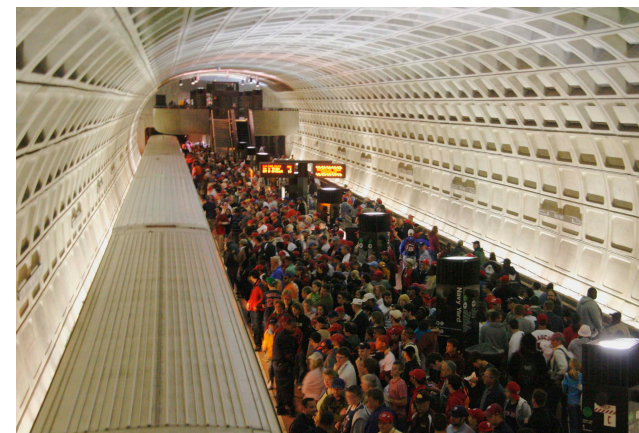
Social identity

PSYCHOLOGICAL CROWD

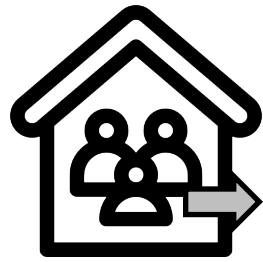
- ✓ Greater concern towards others in the crowd (including strangers)
- ✓ co-ordination, help and personal self-sacrifices (including strangers)
- ✓ expectations of support
- ✓ fewer personally selfish or competitive behaviours.

THE AGGREGATE

- ✓ all the opposite



The evacuation process: timeline



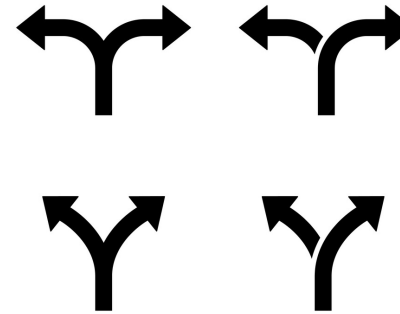
Evacuation
decision



Departure
actions/time



Transportation
mode choice



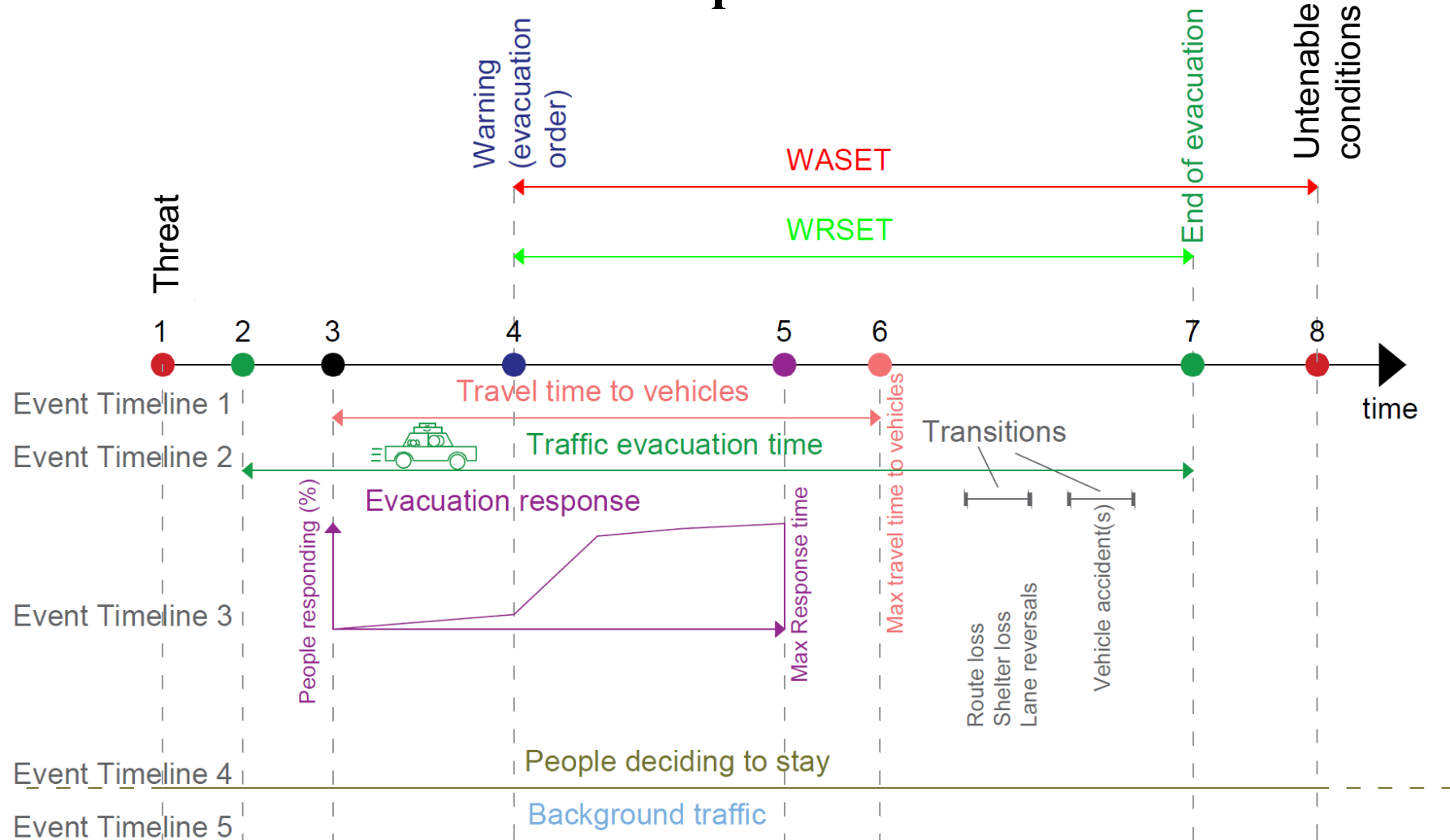
Route choice



Destination
choice

The evacuation process: timeline

Large-scale evacuation timelines can be complex



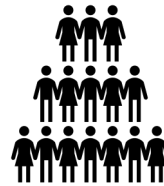
The evacuation process: timeline

Threat



**Spatial/Temporal
Evolution of the threat
→ network availability**

Pedestrians



**Population assessment
Evacuation time within a
building/area
Input into traffic
departure time**

Traffic



**Vehicle demand
Road network capacity
and management
Route choice
Route availability**

Evacuation research

What can we do today?

- 1) Learn and educate stakeholders and general public based on existing science
 - Become familiar with expected behaviours during large-scale evacuation
 - Collaborate with researchers developing evacuation tools for specific application fields

- 2) Get involved in alternative safety training methods
 - A lot of new technology in the evacuation field, such as Virtual Reality → VR lab at Campus Helsingborg



Evacuation research

Example of research project

Egressibility

5-year 2 million eur project started
on the 1st of Oct 25



REAL WORLD
EMERGENCIES



INTERVIEWS



VIGNETTE
EXPERIMENTS



MULTI-SENSORIAL VR
SYNAESTHESIA
“merging of the senses”

*THE EGRESSIBILITY OPEN
DATABASE*



INCLUSIVE MACHINE
LEARNING
Fairness of AI
*THE EGRESSIBILITY
MODEL*

EGRESSIBILITY

A paradigm shift in evacuation research

ERC Consolidator Grant 2024

ENRICO RONCHI



European Research Council

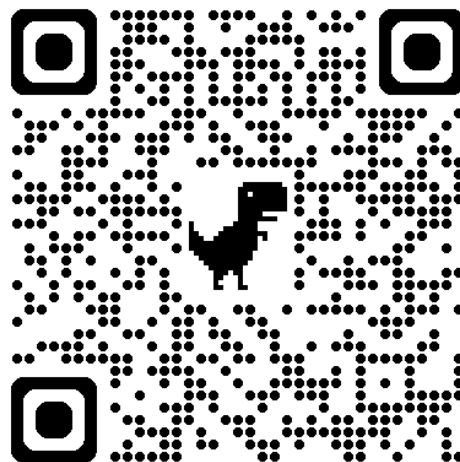
Established by the European Commission

EGRESSIBILITY

ACCESSIBILITY TO MEANS OF EVACUATION

Present and future: Final thoughts

- Currently most of my research efforts are on “egressibility”, i.e., accessibility to means of evacuation for everyone → This is because in an evacuation (at all scales), most vulnerable people are those most affected → I will work on this topic for several years to come 😊, so I am looking around for people interested in the topic!
- Want to know more about evacuation and human behaviour, check out this event on Oct 6-8, 2026 at Campus Helsingborg

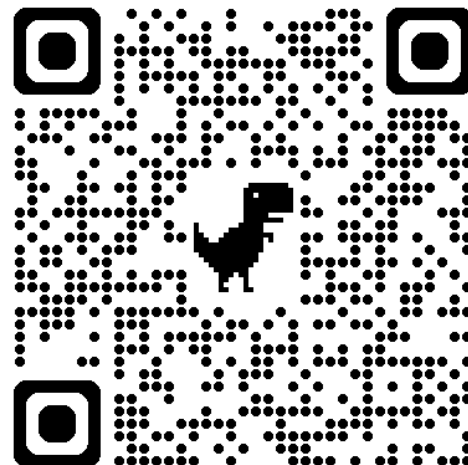


THANK YOU!

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References

- Drury, J., Novelli, D., & Stott, C. (2013). Psychological disaster myths in the perception and management of mass emergencies. *Journal of Applied Social Psychology*, 43(11), 2259-2270
- Drury, J., Cocking, C., Reicher, S., Burton, A., Schofield, D., Hardwick, A., ... & Langston, P. (2009). Cooperation versus competition in a mass emergency evacuation: a new laboratory simulation and a new theoretical model. *Behavior research methods*, 41(3), 957-970.
- Haghani, M., Cristiani, E., Bode, N. W., Boltes, M., & Corbetta, A. (2019). Panic, irrationality, and herding: three ambiguous terms in crowd dynamics research. *Journal of advanced transportation*, 2019.
- Latané, Bibb, and John M Darley. *The Unresponsive Bystander: Why Doesn't He Help?* Appleton-Century Crofts, 1970.
- Lindell, M. K., & Perry, R. W. (2012). The protective action decision model: Theoretical modifications and additional evidence. *Risk Analysis: An International Journal*, 32(4), 616-632.
- Sime, J. D. (1985). Movement toward the familiar: Person and place affiliation in a fire entrapment setting. *Environment and behavior*, 17(6), 697-724.
- Tajfel, H., & Turner, J. C. (1979). An integrative theory of intergroup conflict. *The social psychology of intergroup relations?*, 33, 47.