



Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich



Materials Science & Technology

Modelling of Transport Noise in LCA

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Goal & Scope

- Impact assessment according to ISO 14'040ff:
is procedure suitable for noise?
- Presentation of a model to include traffic noise in
LCA

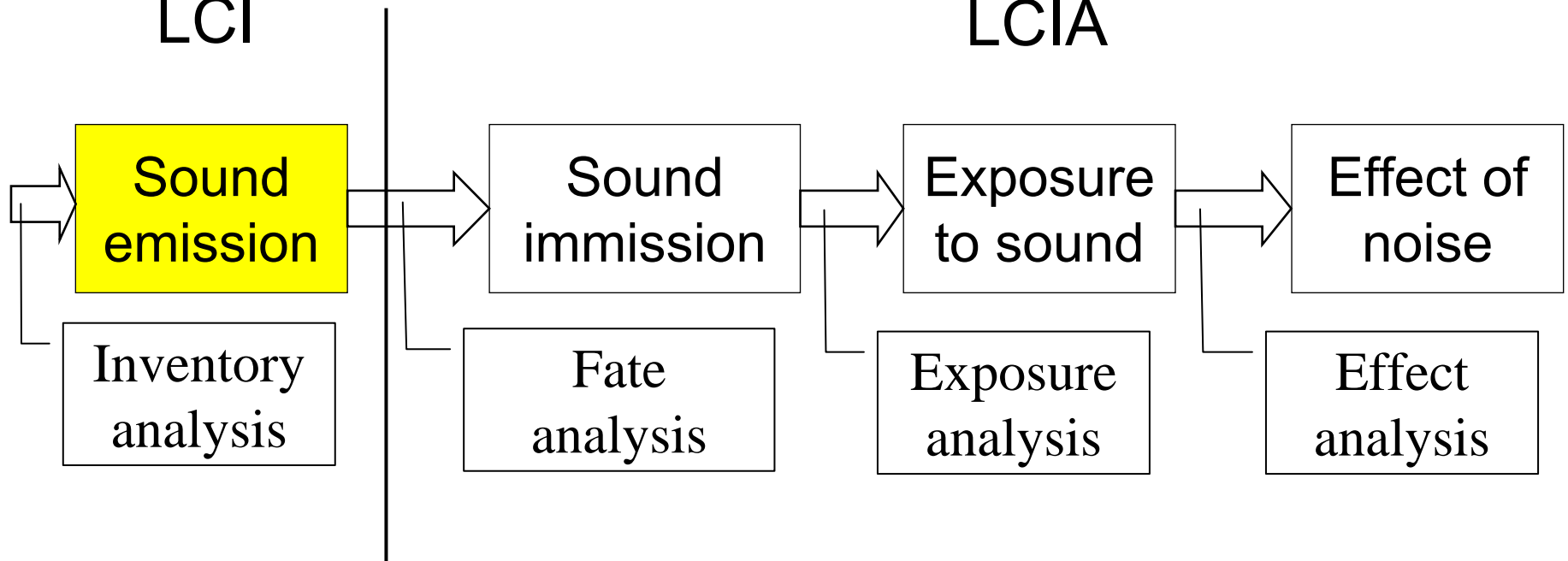
What is sound?

- Physical quantity
- Free of value judgements.
- Relevant properties are:
 - Sound pressure (pressure variations)
 - Spectral properties (frequency)
 - Distribution over time
- Indicators for sound:
 - Sound level (L [dB])
 - Equivalent continuous sound level (L_{eq} [dB])
 - Maximum sound level (L_{max} [dB]) & Number of loud events

LCA according to ISO

LCI

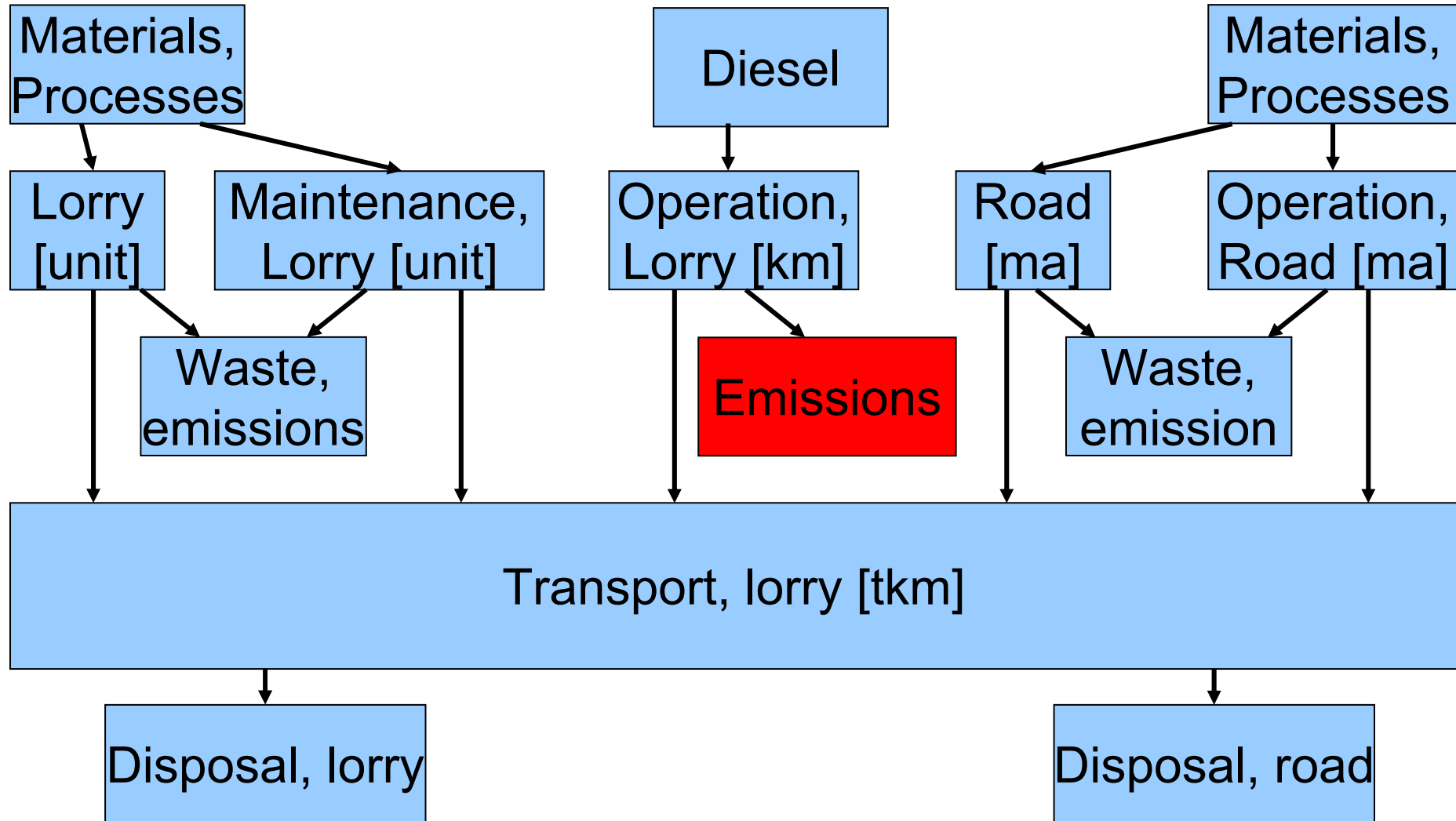
LCIA



Factors for sound emissions of a car

- Engine / construction
 - Tyres
 - Design (aerodynamics)
 - Speed
 - Inclination of road
 - Road surface
- → sound emission depends on vehicle, road and traffic situation.

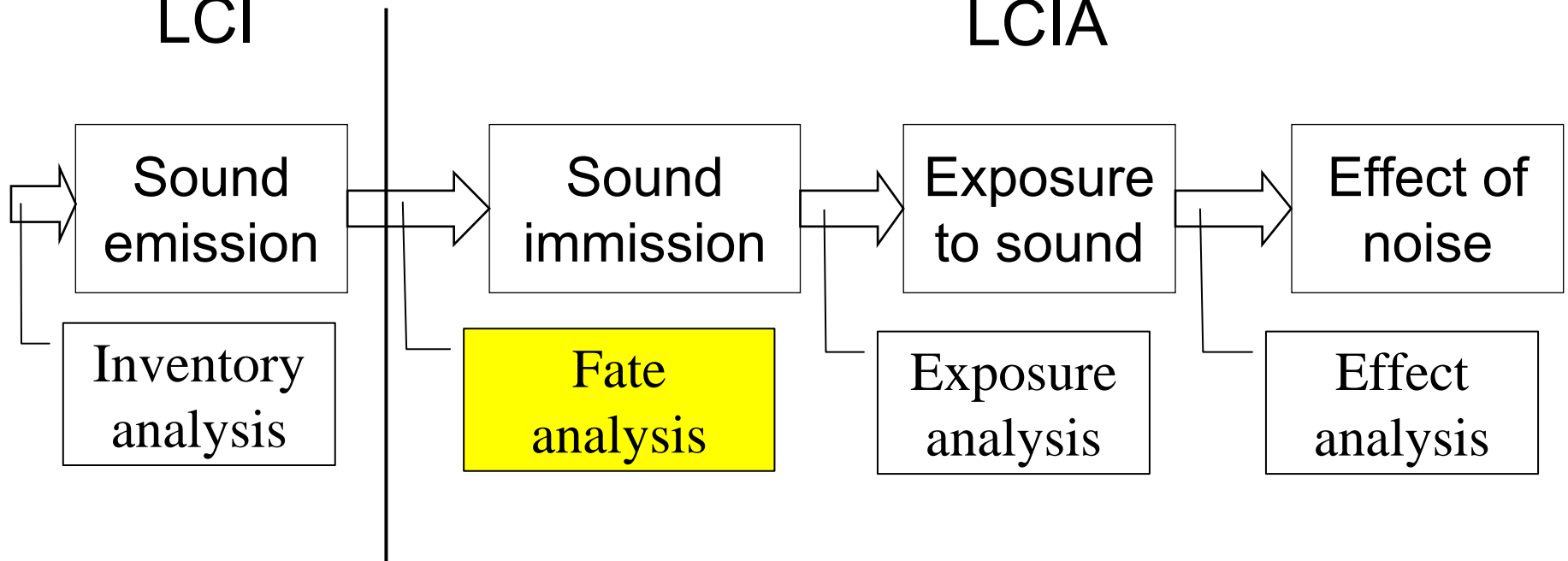
Transport in LCA



LCA according to ISO

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Propagation of sound

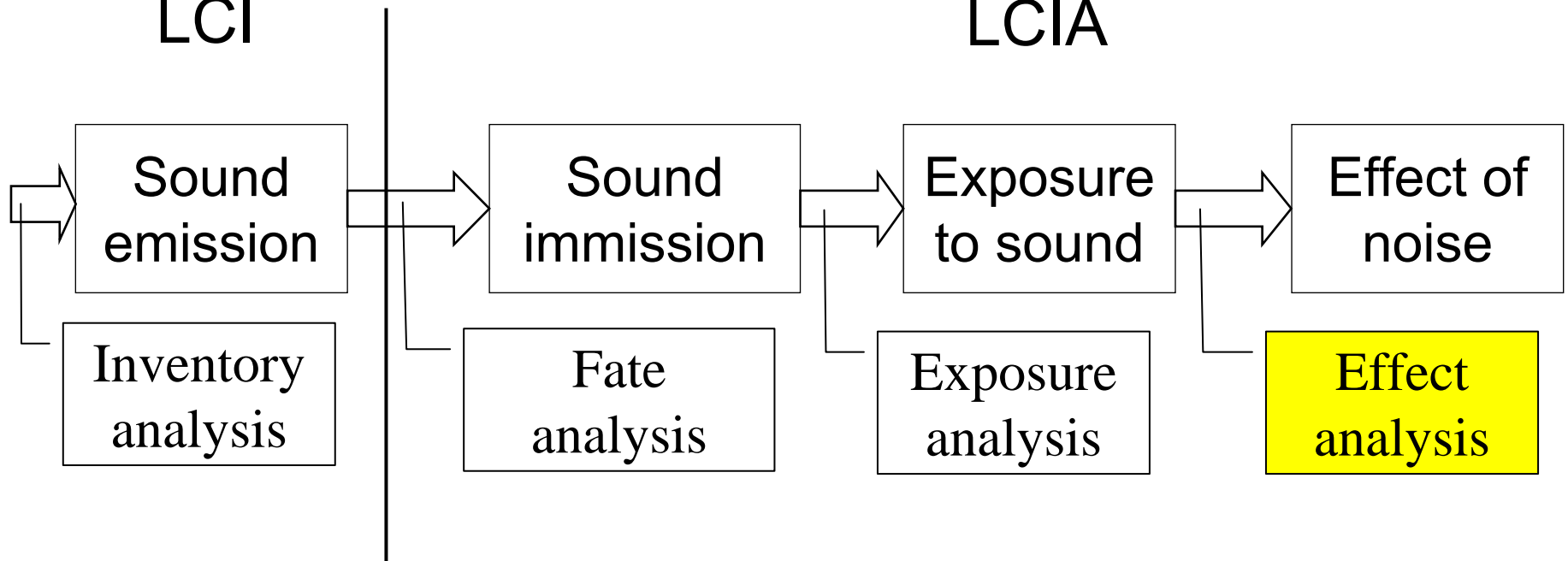
- Sound can propagate over long distances depending on weather conditions.
- Sound can be easily absorbed or reflected by obstacles such as buildings or sound barriers.
- Sound stops as soon as the source is eliminated (except reflected sound)

→ Fate of a sound emission strongly depends on the place of the emission.

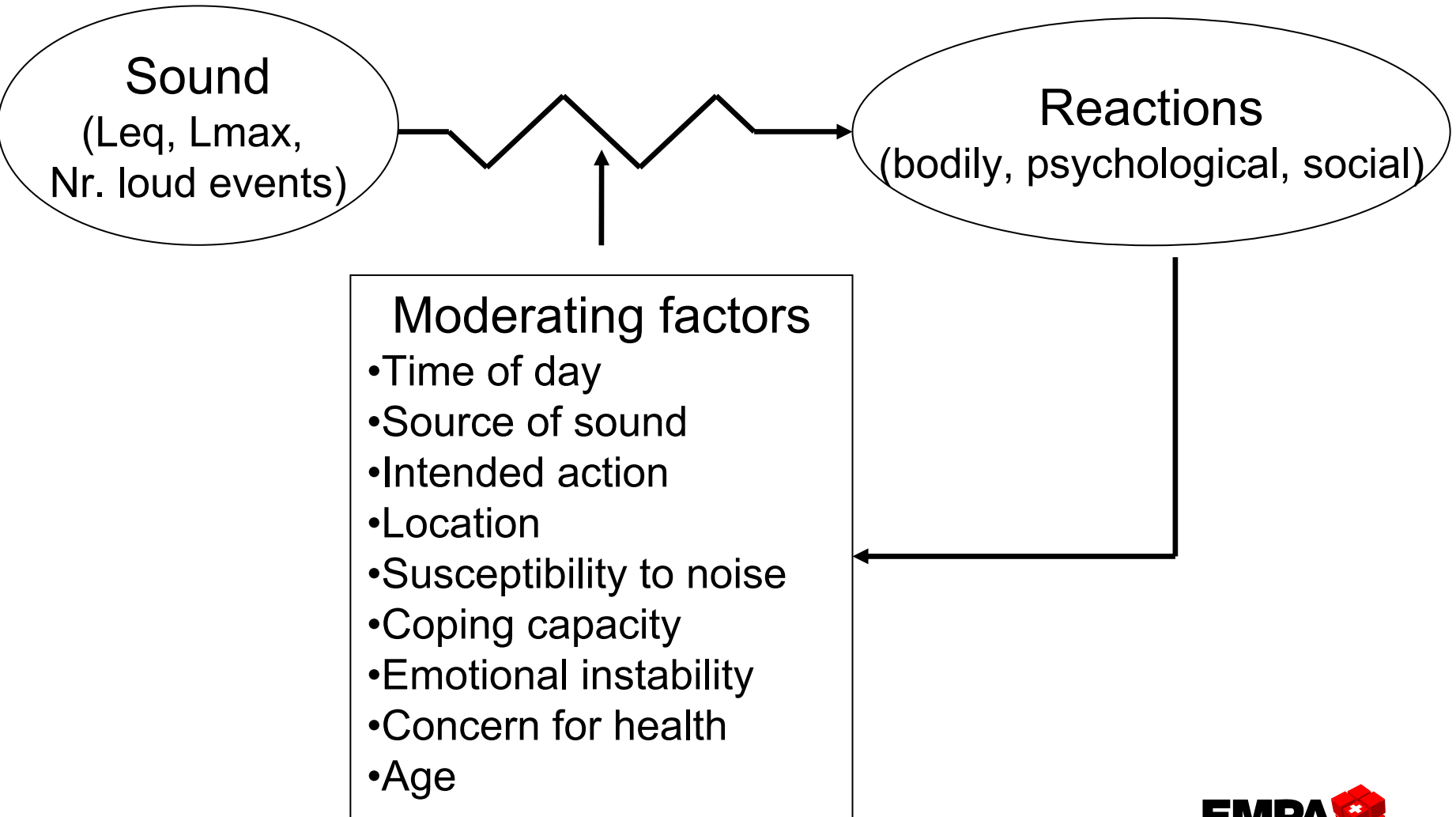
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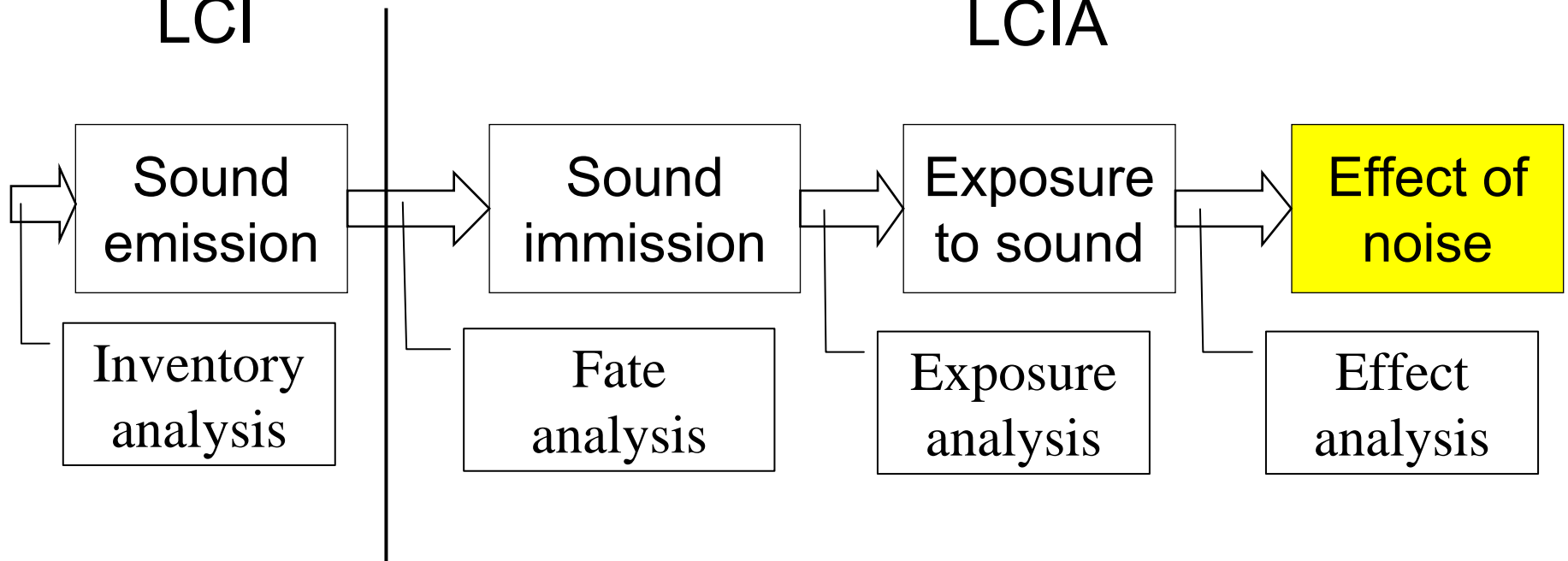
(Health) impacts of sound



LCA according to ISO

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Possible effects of sound exposure

- Hypertension
- Heart attack
- Hormone change (stress)
- Annoyance
- Disturbance of communication
- Insomnia

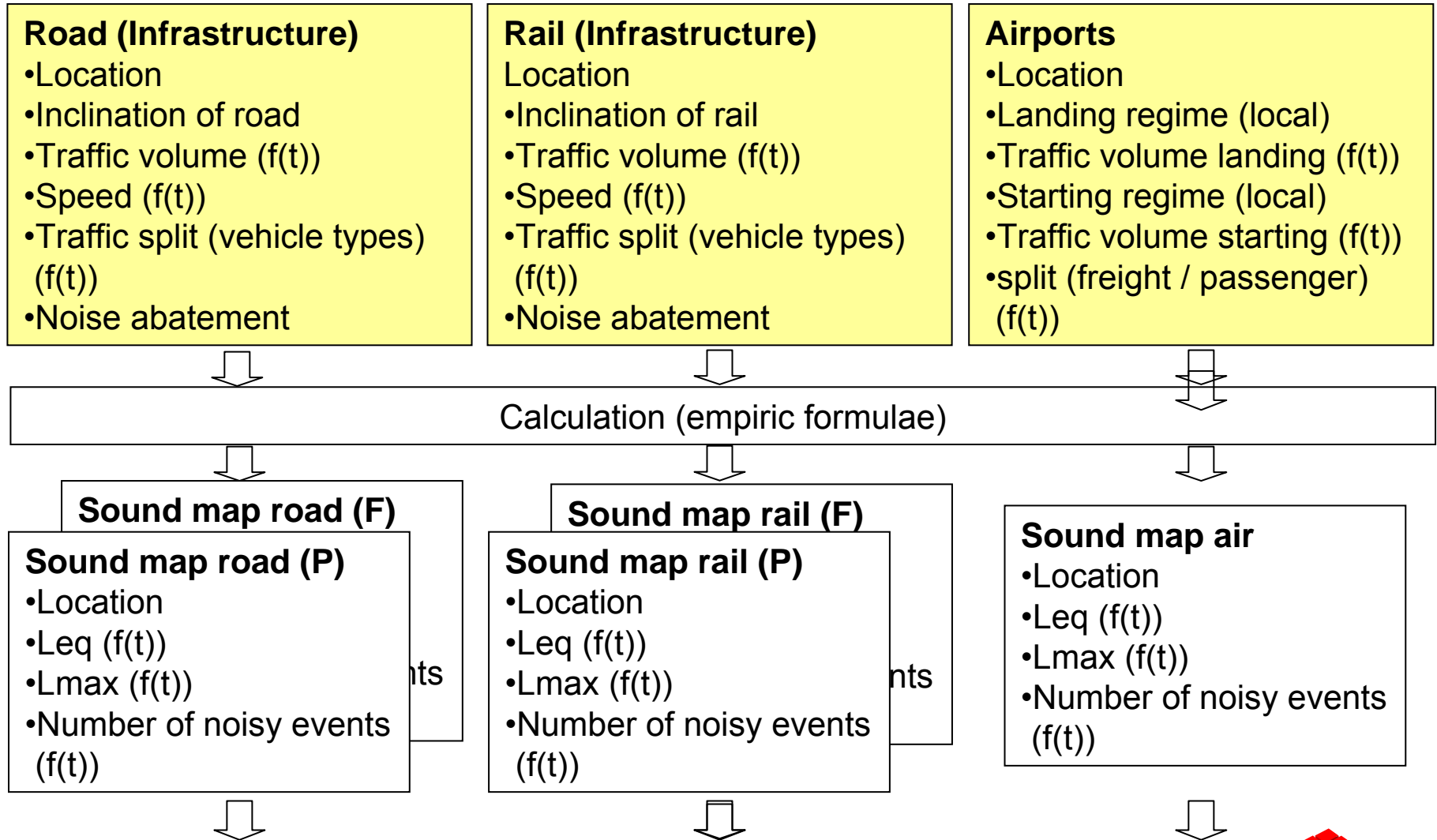
Important factors for noise effects

- Equivalent sound level (L_{eq})
- Maximum sound level (L_{max})
- Number of loud events
- Time of loud events
- Source(es) of sound (connotation)
- Location of sound source (fate of sound and exposure)
- Intended activity of exposed persons
- Coping capacity of exposed persons

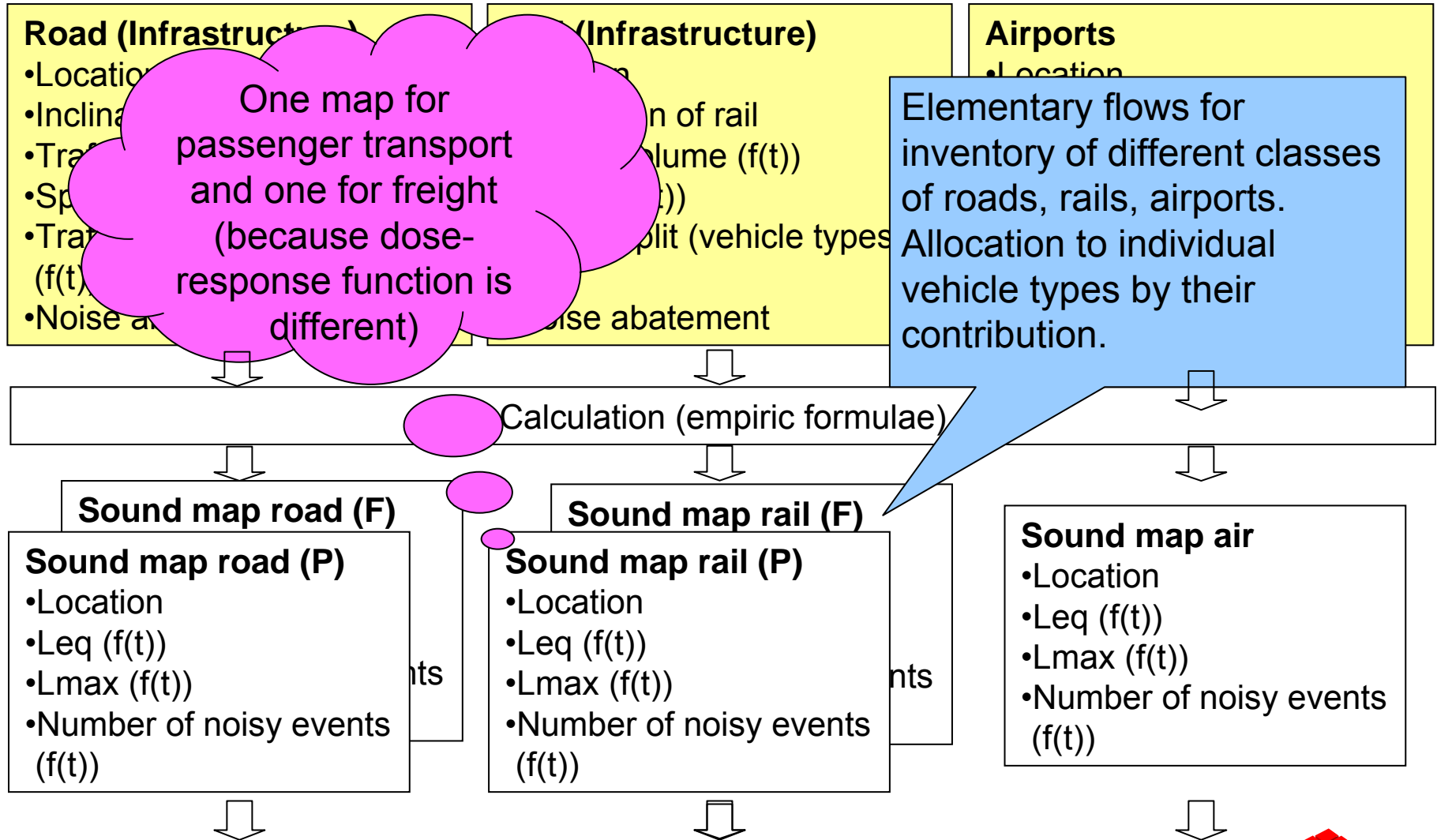
Important factors for noise effects

- Noise is not a physical quantity
→ No LCI parameter for noise!
- LCI parameters for sound need to carry situational and individual information
- Every vehicle type needs more than 1000 LCI elementary flows for sound emissions!

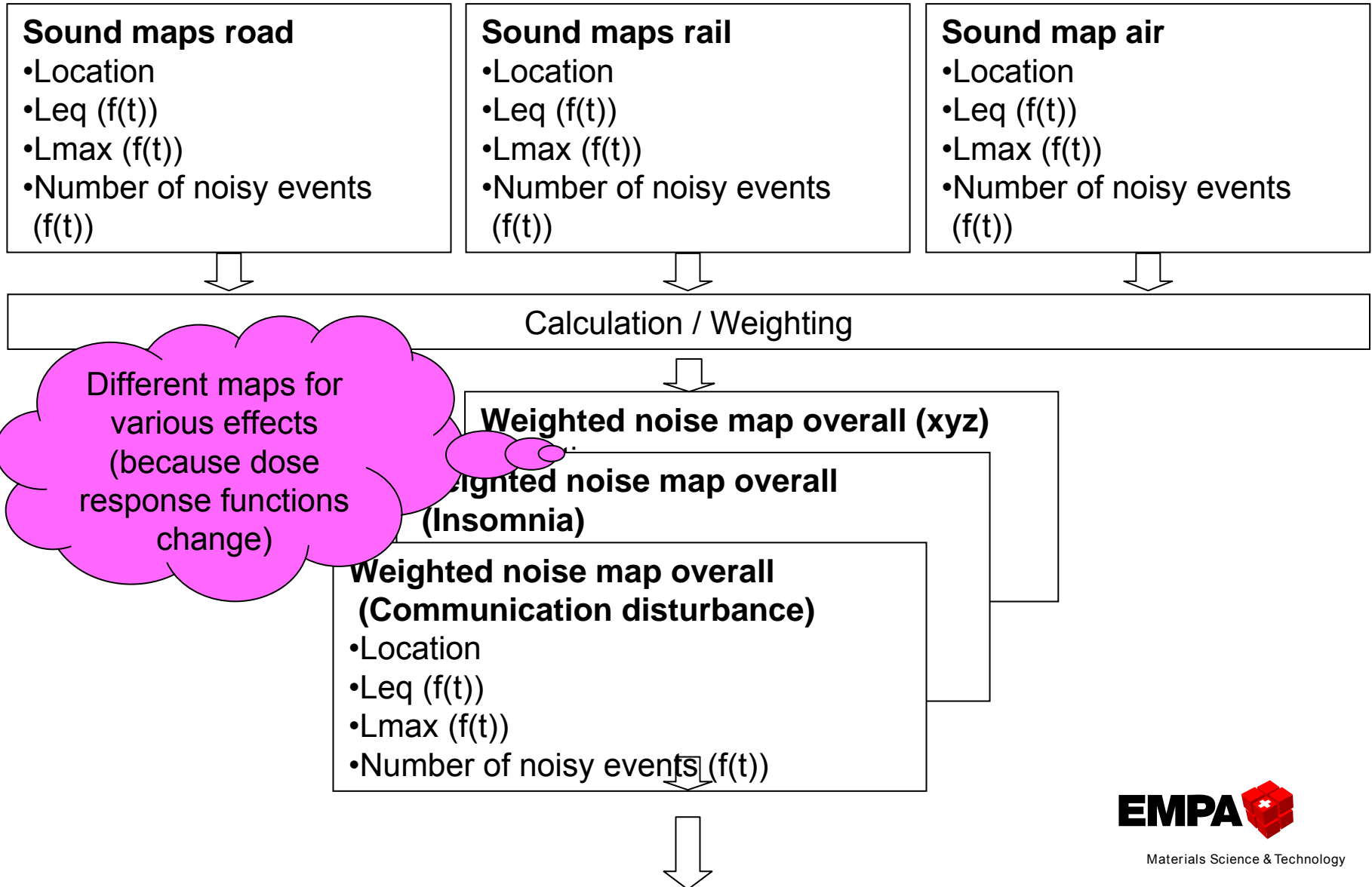
Modelling of traffic noise and its impacts on human health



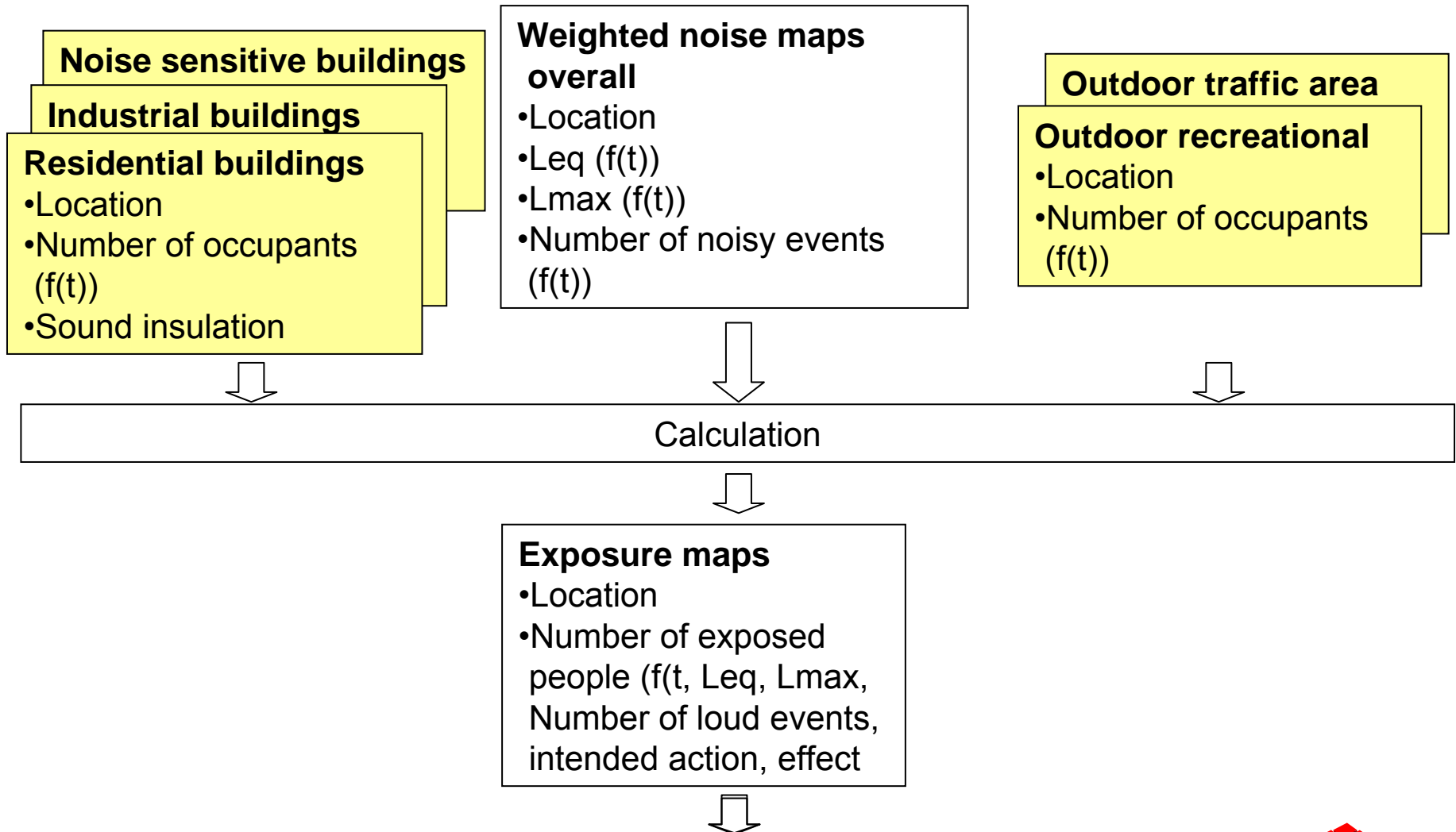
Modelling of traffic noise and its impacts on human health



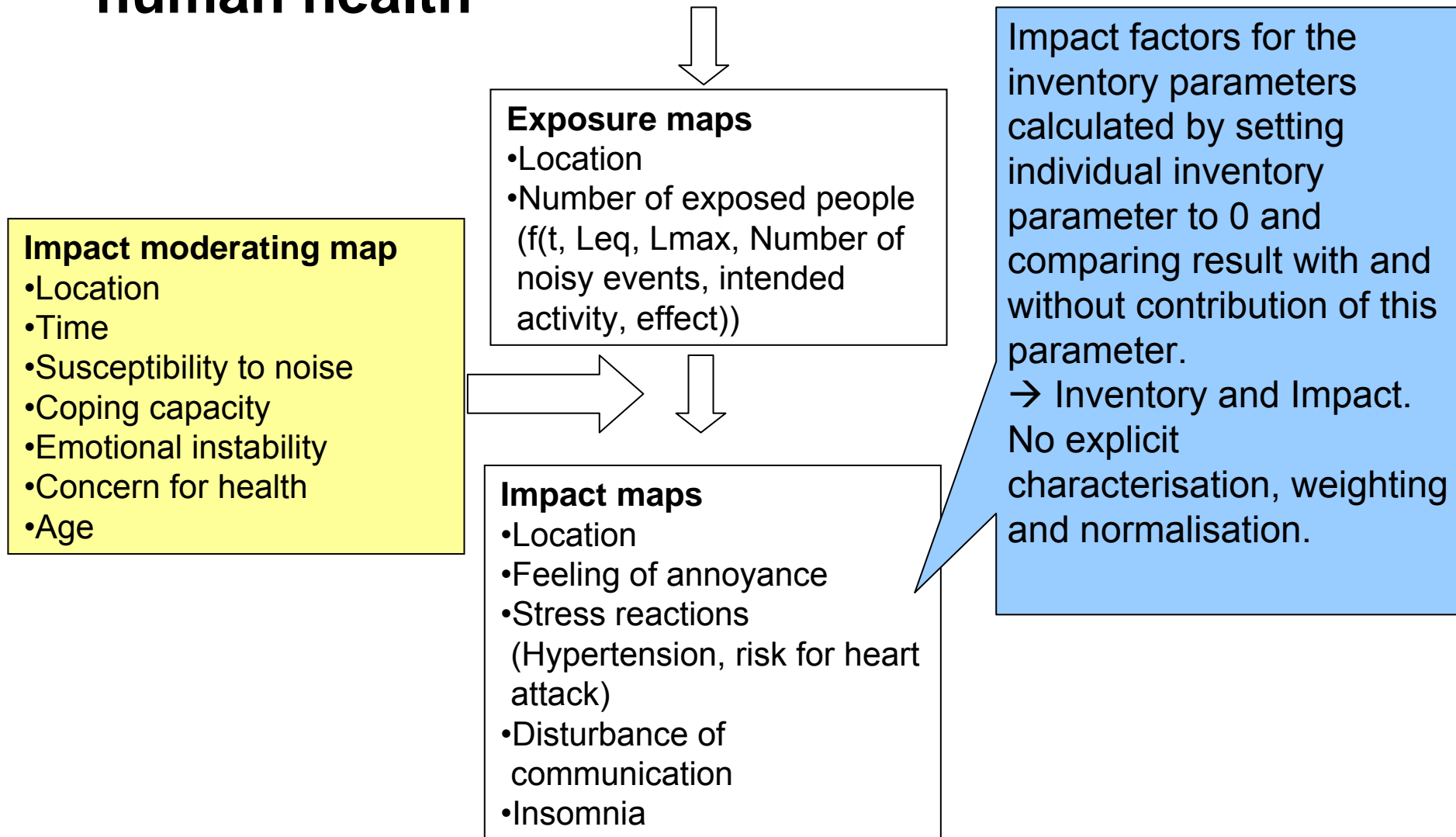
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Modelling of traffic noise and its impacts on human health



Modelling of traffic noise and its impacts on human health



Conclusions

- Separation of inventory parameter and impact factor is not feasible for noise.
- An integrated model is needed and proposed.

Thank you for your attention

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