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# Collective Perception
# Wild Animal Info Sharing

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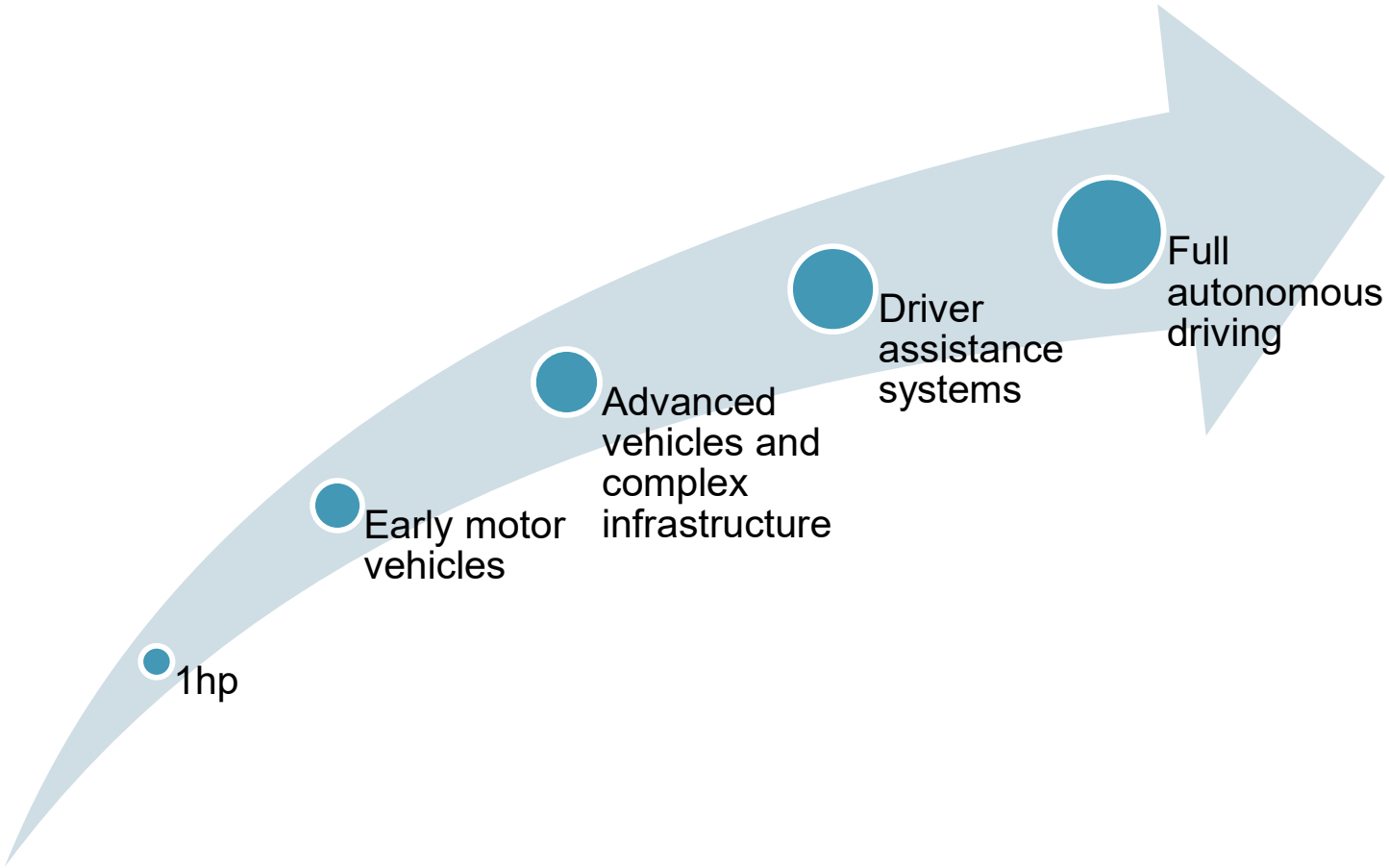
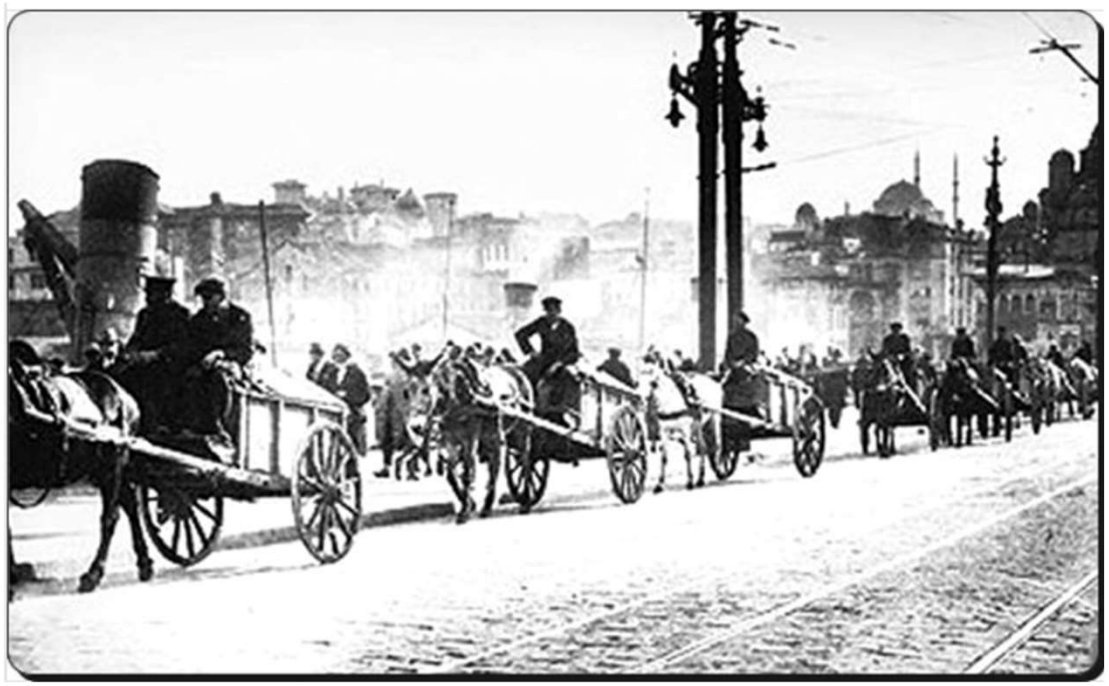
11/24/2023

# Introduction and use case

# Evolution of mobility

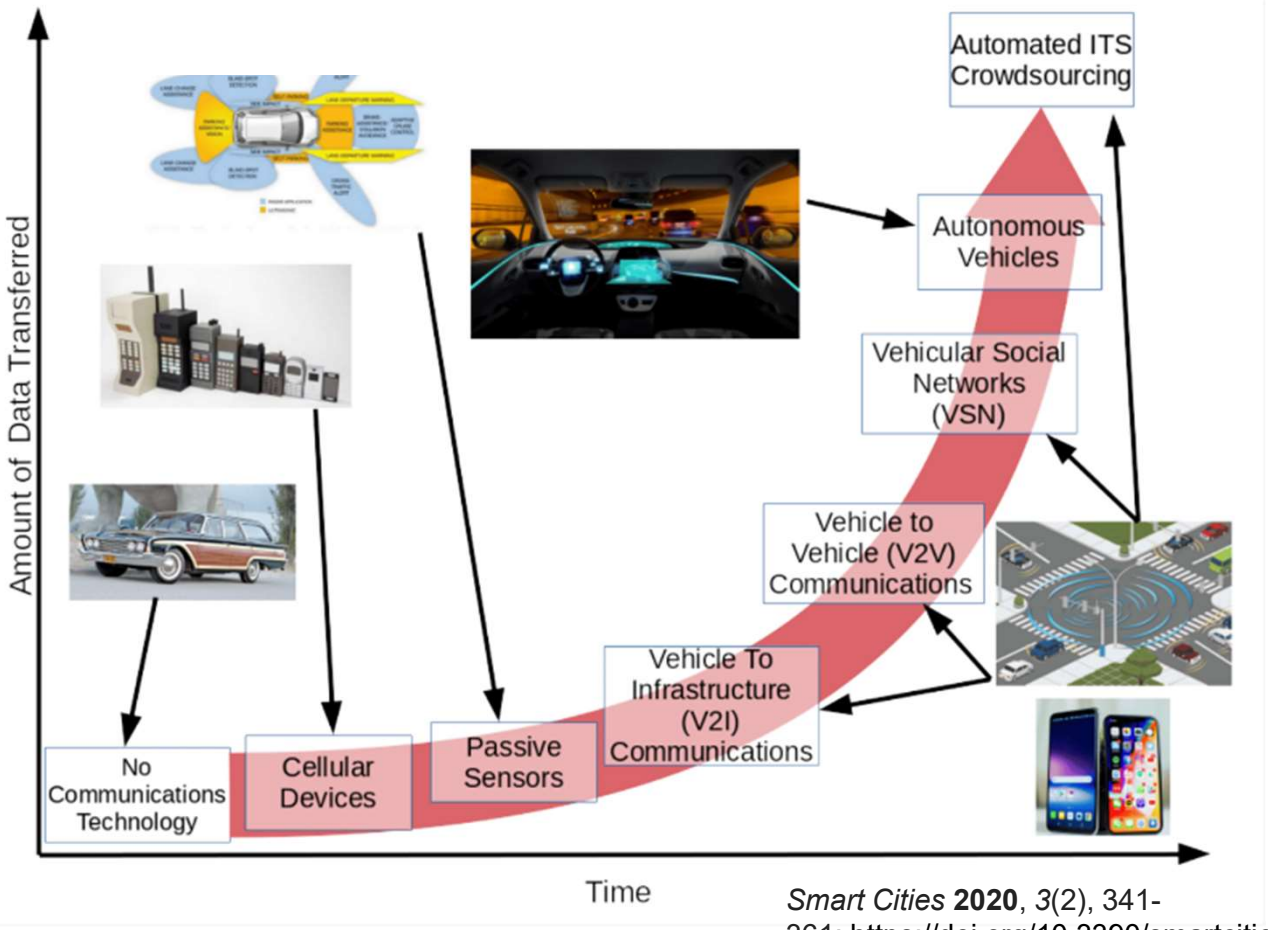




*1930-Istanbul, Galata Bridge*

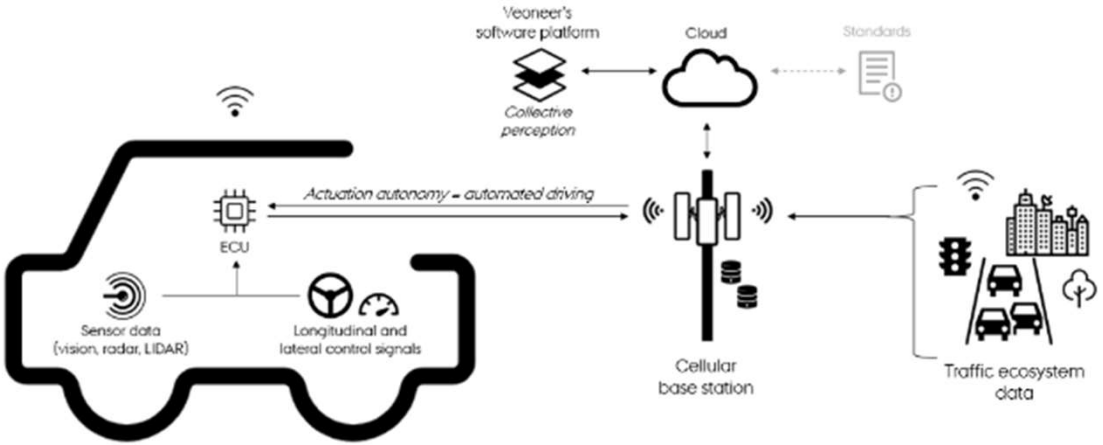

*20's-Istanbul*

# Evolution of communication in mobility




*Smart Cities* **2020**, *3*(2), 341-361; https://doi.org/10.3390/smartcities3020018

# Collective Perception




Increasing number of intelligent and connected entities in the traffic ecosystem

Collective data flow is the future

To have a safer flow in the complex traffic environment, coordination and interactions between entities

Collective perception connects the information from single entities in the following ways;

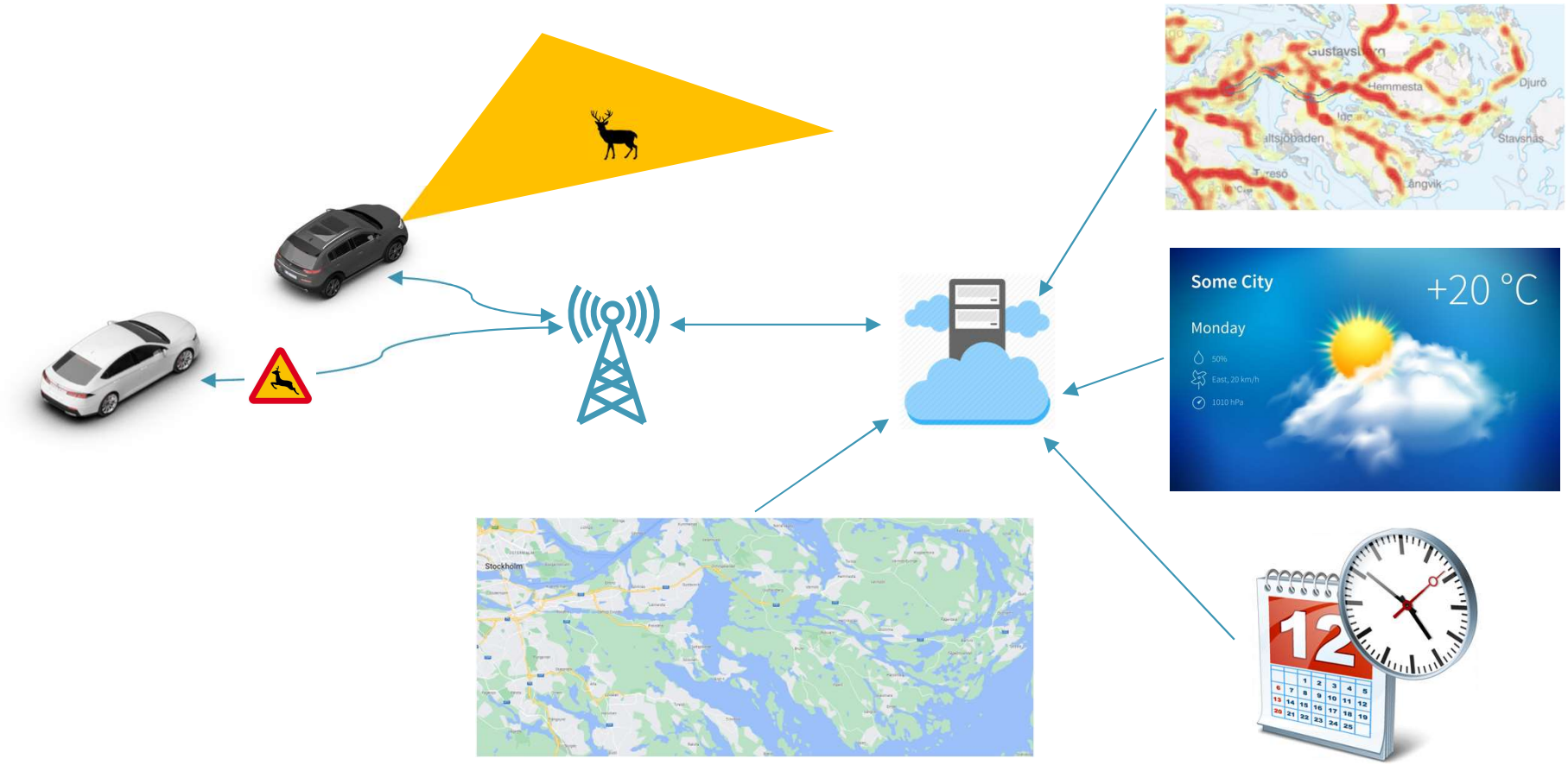
- secure
- auditable
- sharable
- dynamic
- transferable (with reasonable latency)

Background: animal accidents in Sweden

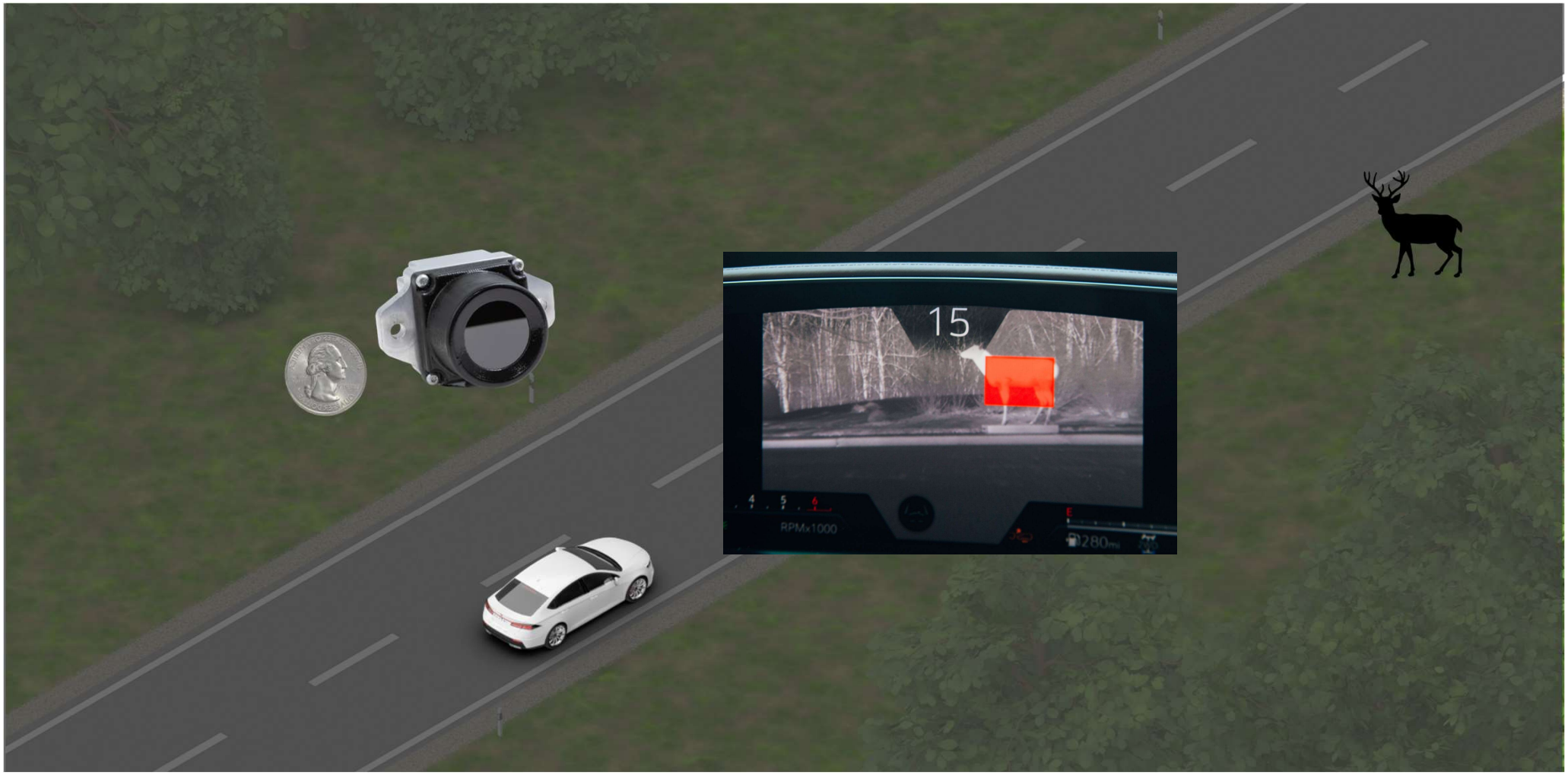
Our solution: thermal sensor & collective perception

Challenges: trust & safety

# Our solution: thermal sensor & collective perception



# Our solution: thermal sensor & collective perception



# Our solution: thermal sensor & collective perception

**(a)** *A multicopter.*
*By courtesy of Alexander Glinz. The photograph is taken from* `https://commons.wikimedia.org/wiki/File:Hexacopter_Multicopter_DJI-S800_on-air_credit_Alexander_Glinz.jpg` *the 3rd of May 2016.*

**(b)** *An unmanned plane.*
*By courtesy of Stefan Sundkvist. The photograph is taken from* `https://www.flickr.com/photos/stefansundkvist/4697864162/in/photostream/` *the 3rd of May 2016.*

***Figure 6.1:*** *Example of different UASs.*

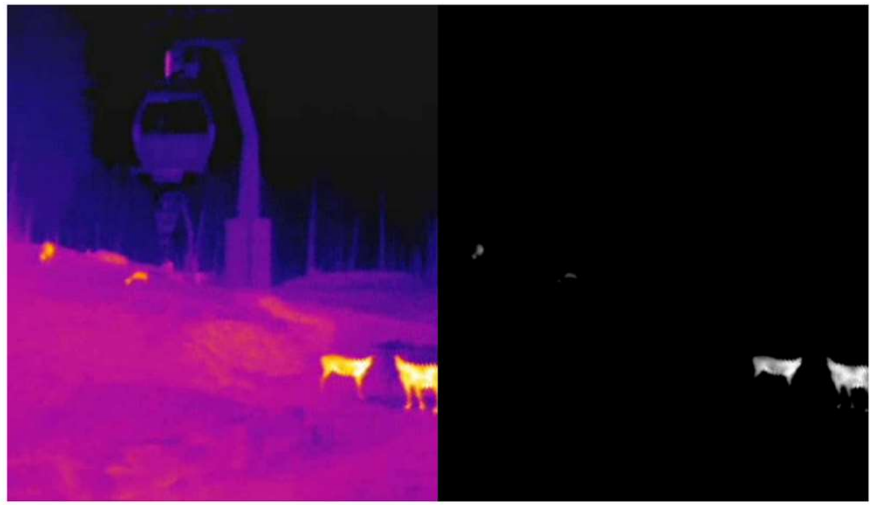


***Figure 3.1:*** *A thermal enhanced image.*

*Ref: Wildlife Surveillance Using a UAV and Thermal Imagery, Albin Flodell and Cornelis Christensson, Linköping University, 2016*

# Data Management
## Challenges & Opportunities

# Animal accidents

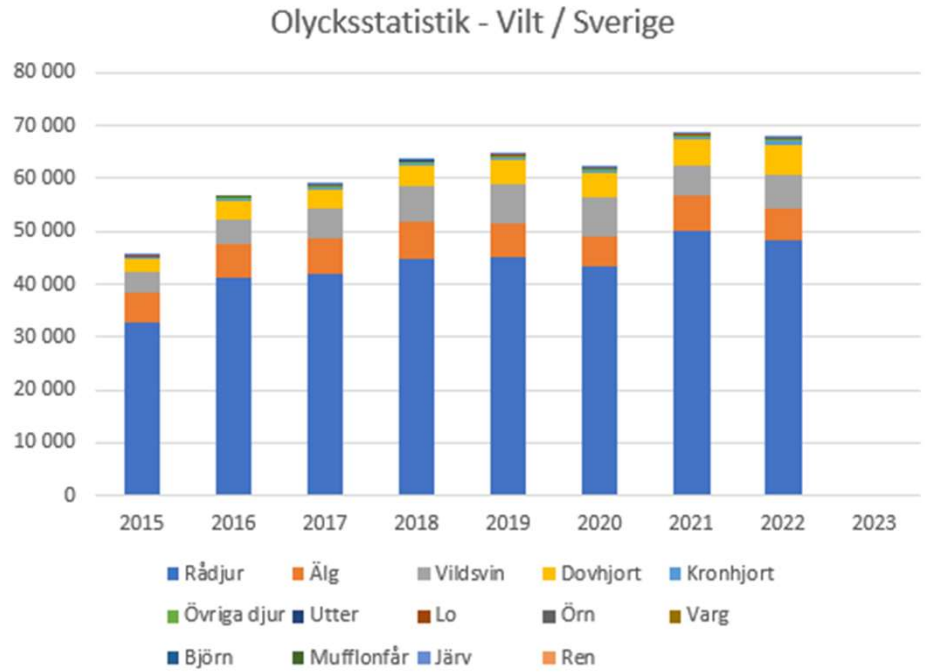
Collisions between large animals and motor vehicles are an increasing threat to

- traffic safety
- socio-economics
- animal welfare
- wildlife management and conservation

in many countries world-wide.

*Ref: Child & Stuart 1987; Lavsund & Sandegren 1991; Groot-Bruinderink & Hazebroek 1996; Romin & Bissonette 1996; Schwabe, Schuhmann & Tonkovich 2002).*

# Animal accidents in Sweden




*Ref: Nationella Viltolycksrådet*

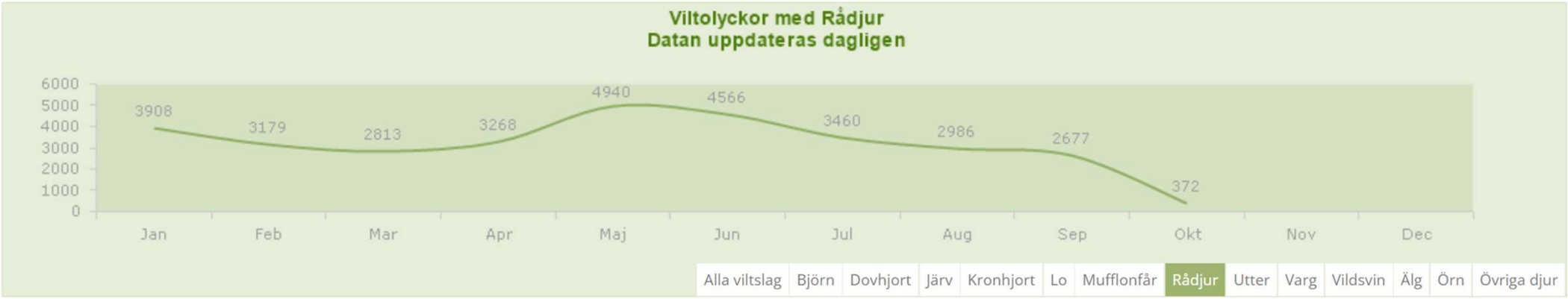
# Animal accidents in Sweden

Nationella Viltolycksrådet

**43 698**

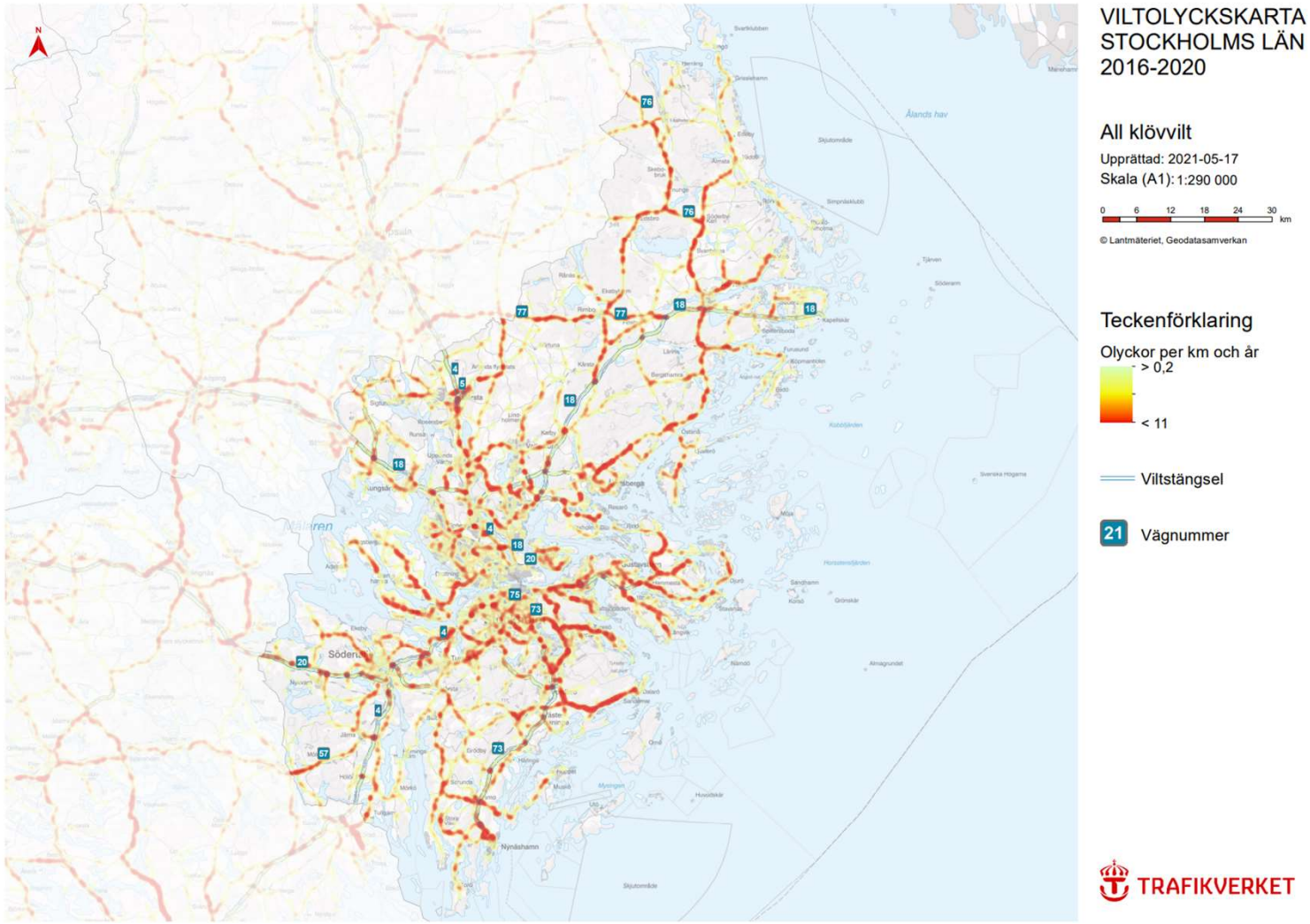
Antal djur som varit inblandade i viltolyckor under 2023
(hela landet)

| Rådjur | Älgar | Vildsvin |
|---|---|---|
| 32 712 | 3 764 | 3 440 |

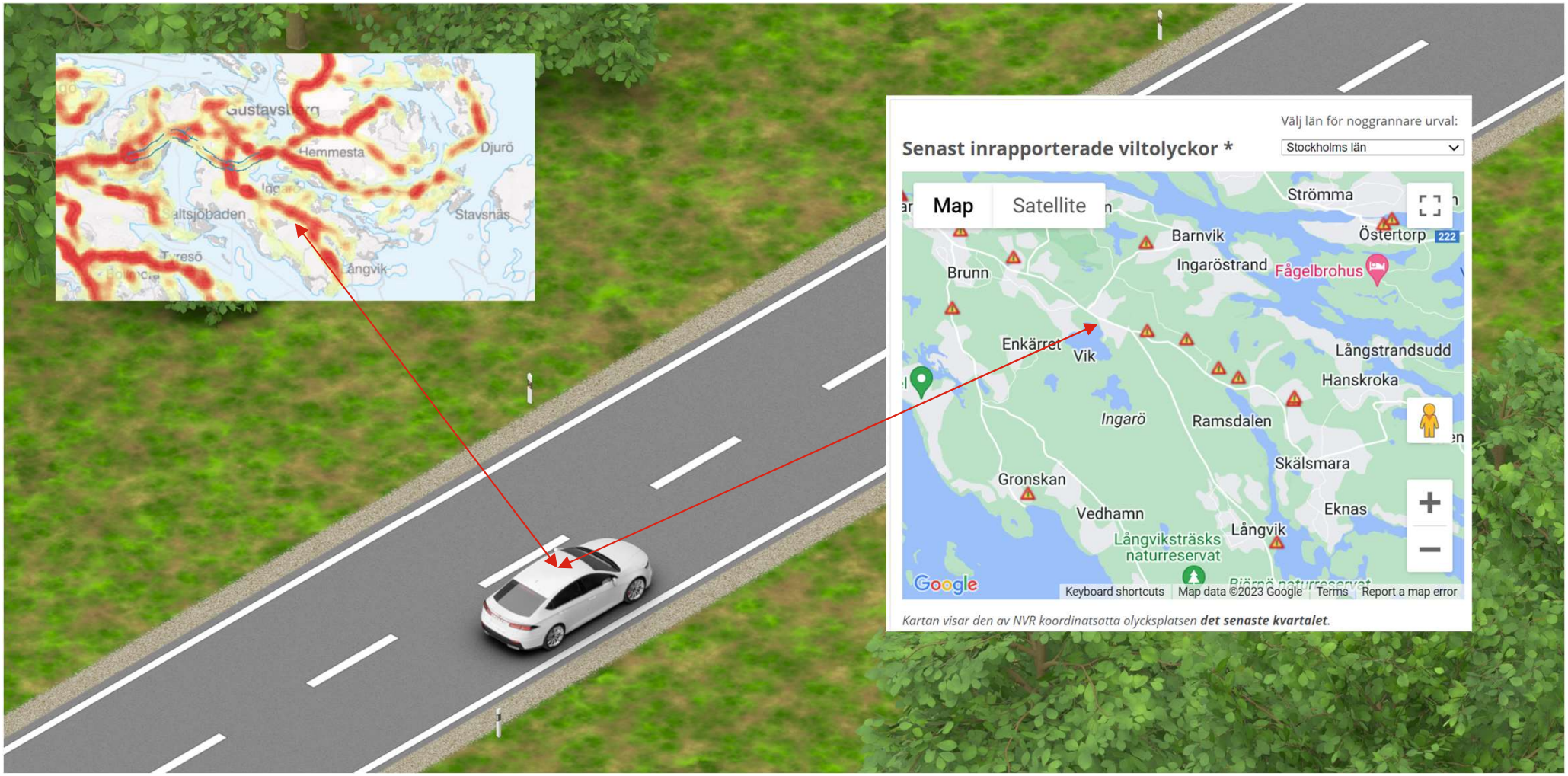



*Ref: https://www.viltolycka.se/*

# Animal accidents in Sweden



# Our solution: collective perception



# Our solution: collective perception

Proportion of agricultural land (arcsine)
Proportion of urban areas (arcsine)
Proportion of coniferous forest (arcsine)
Proportion of deciduous forest (arcsine)
Ln of the distance (m) to nearest forest edge
Distance (m) to nearest intersection with private road
Density of land cover type edges (km km$^{-2}$)
Proportion of deciduous and coniferous forest (arcsine)
Average annual moose harvest per 100 ha
Density of residencies and farms per km$^2$
Land cover diversity (SIMPSON index)
Proportion of open land (arcsine)
Density of road passages across the accident road (per km)
Density of private roads (km km$^{-2}$)
Density of public roads (km km$^{-2}$)
Density of railways (km km$^{-2}$)
Variation in topography (density of 10-m isoclines)
Density of water courses (km km$^{-2}$)
Average speed limit on accident road (km h$^{-1}$)
Number of vehicles in thousands per average day
Proportion of wetland (arcsine)
Density of intersections with forest edges (per km road)
Density of intersections with private roads (per km road)
Density of intersections with water courses (per km road)

Occurrence of fences, 'yes' or 'no'

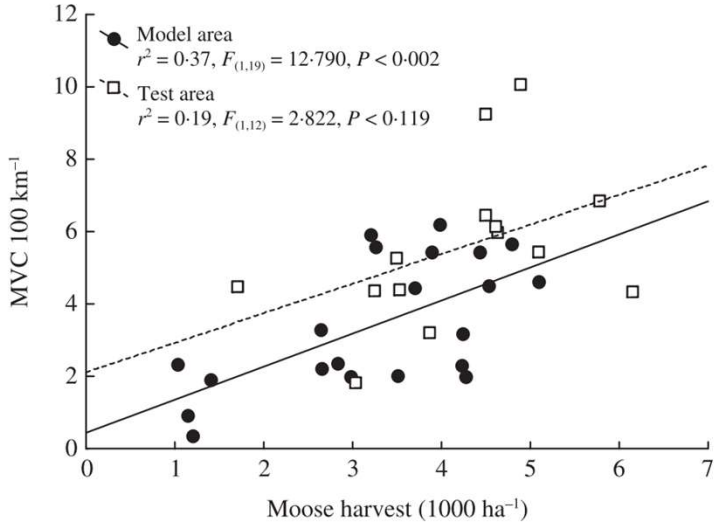



**Fig. 4.** Relationship between the average annual density of moose–vehicle collisions (MVC) per hundred kilometres road and the average number of moose shot 1000 ha$^{-1}$ in hunting districts (model area, $n = 21$; test area, $n = 14$) during the years 1990–99 in the two study areas.

*Ref: Journal of Applied Ecology - 2005 - SEILER - Predicting locations of moose vehicle collisions in Sweden.pdf*

# Challenges: trust & safety

**Trust**

- **Authorization**
- **Verification**
- **Quality**
- **Privacy**

# Challenges: trust & safety

**Safety**

- **Functional safety**
- **Regulation**
- **Operational safety**
- **Standards**
- **Security**

# Conclusions

- **Improved traffic scenario perception**
- **Trust**
- **Safety**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