PREVENTING DEER AND MOOSE ACCIDENTS THROUGH ROAD MANAGEMENT MEASURES – EXPERIENCES AND SOLUTIONS FROM FINLAND

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1. INTRODUCTION

1.1 Moose and deer

Moose change their grazing areas during the summer and winter seasons, which also increases the risk of moose accidents in traffic.

The white-tailed deer is an invasive alien species in Finland, which has spread especially to south-western and southern Finland.

Figure 1 - I will use for moose and deer will cover moose (left), white-tailed deer (middle) and wild roe deer (right).

1.2 Population

- Population after hunting season: 81 000 moose and 110 000 white-tailed deer
- Annual 14 000 traffic accidents, at least €92 million in costs, 122 personal injuries and 3 fatalities

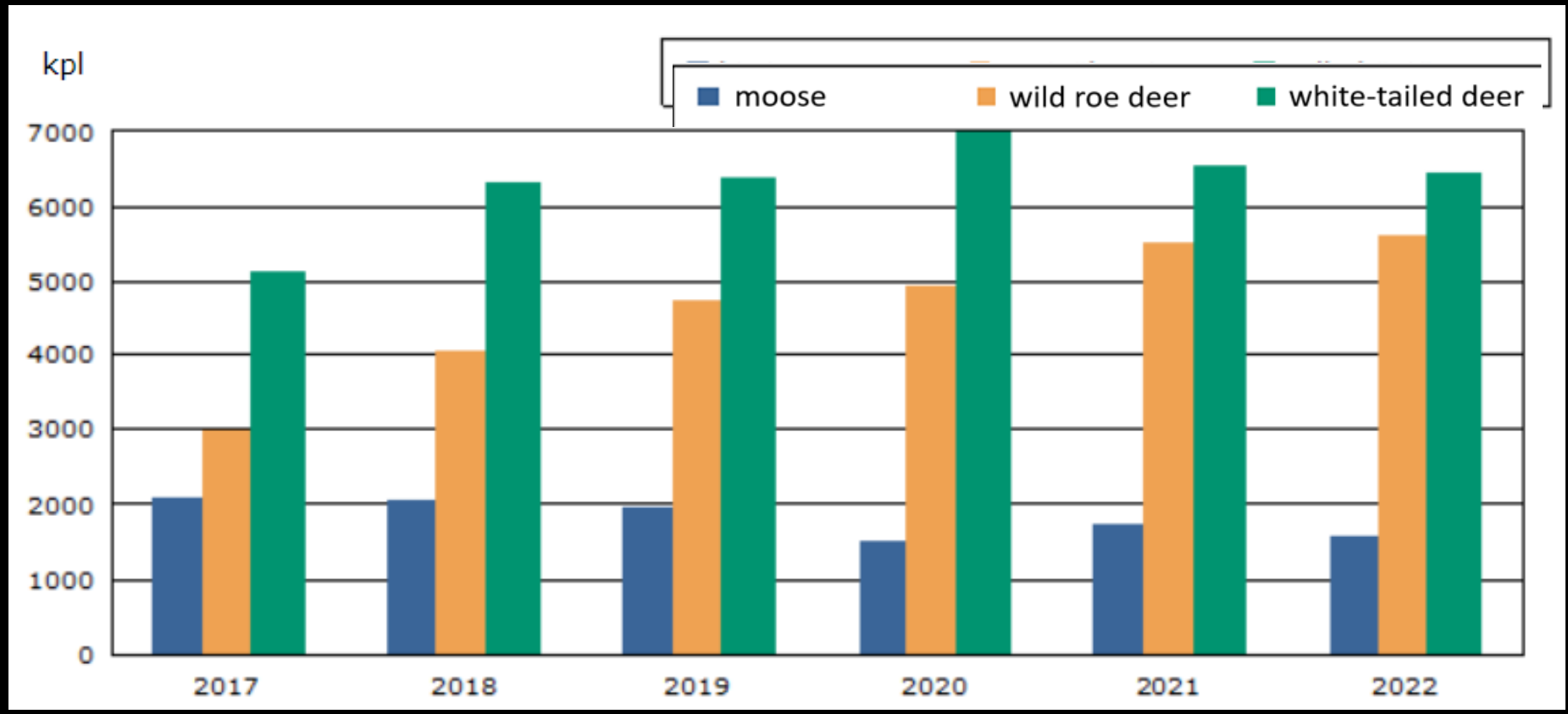


Figure 2 - Annual number of moose, roe deer and white-tailed deer accidents in Finland by animal species.

1.3 Accidents

- Without the effect of the coronavirus in reducing private car use, especially spring 2021, the number of accidents could have been even higher.
- Most of these collisions involve white-tailed deer and wild roe deer, and their share of accidents has been steadily increasing.

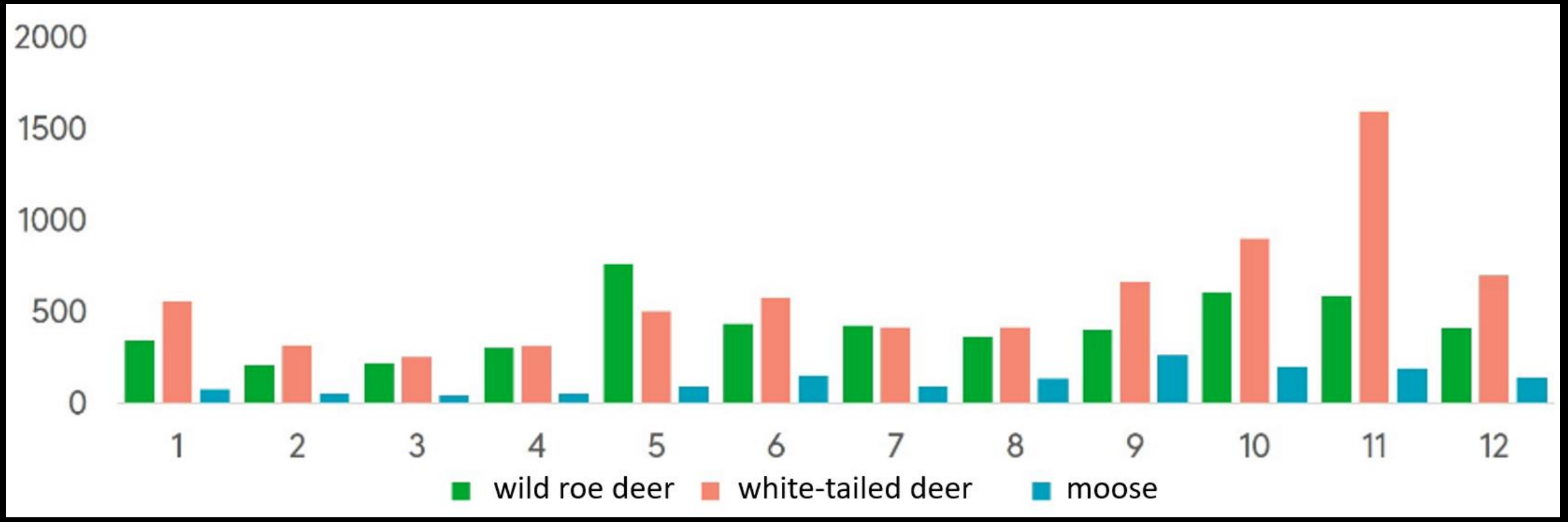


Figure 3 – Wild roe deer, white-tailed deer, and moose in road accidents by month in 2020. The highest number of deer accidents typically occurs in November and is most often caused by white-tailed deer.

2. MEASURES AFFECTING DRIVER BEHAVIOUR

Measures to influence driver behaviour include increasing driver awareness of deer, improving deer visibility and limiting driving speeds to give drivers more time to react and avoid collisions

2.1 Raising driver awareness

Awareness-raising aims to inform drivers about the risk of deer accidents so that they can prepare for deer on certain stretches of road at certain times and reduce their speed on these stretches of road.

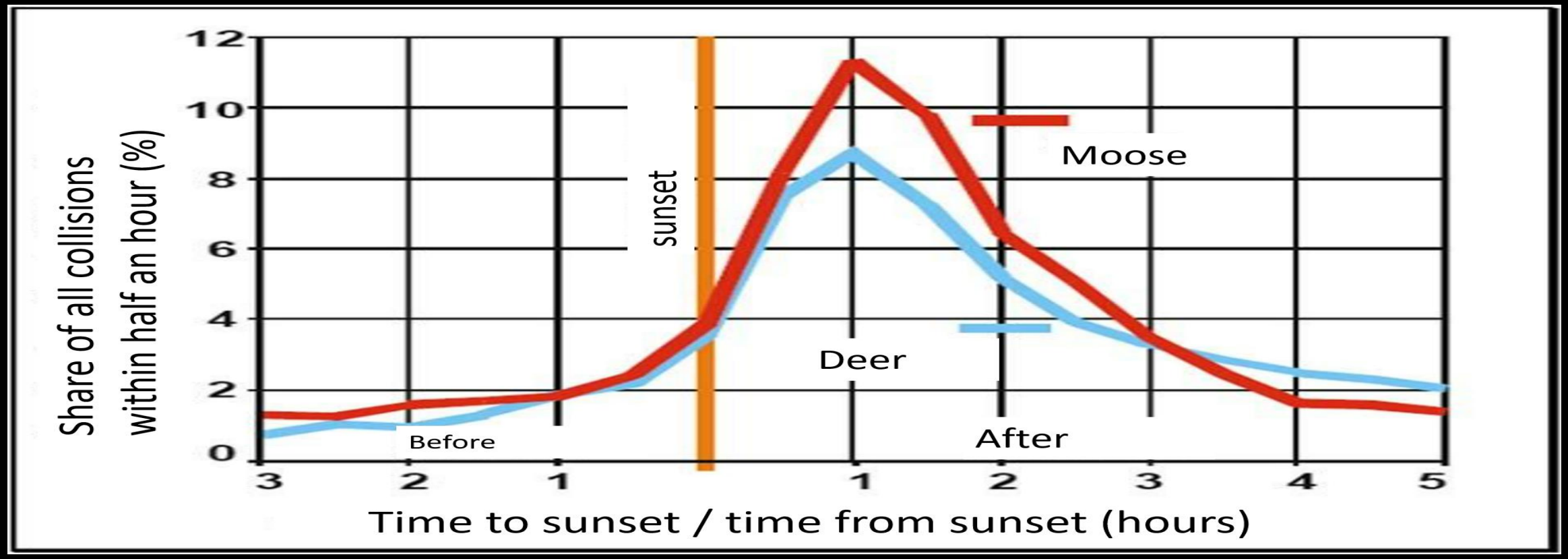


Figure 4 - Timing of moose and deer collisions in relation to the sunset in the whole country 1989-1997. In all seasons, the highest number of moose and deer collisions at any time of day is one hour after sunset.

2.2. Warning traffic signs

The length of the Finnish road network is about 78 000 km, of which 4.2% is moose- or deer-proofed. Between 2017 and 2021, 35% of all deer accidents and 24% of all moose accidents occurred on these stretches.

Figure 6 - Passive Road signs always have a fixed message, although they may use beacons or other enhancement devices.

2.3. Active traffic signs

A trial on Highway 7, the Porvoo motorway, found that an active deer warning traffic sign only reduced driving speeds in dark or rainy weather. There were problems with the implementation and technology of the system, which probably affected the credibility of the warning signs.

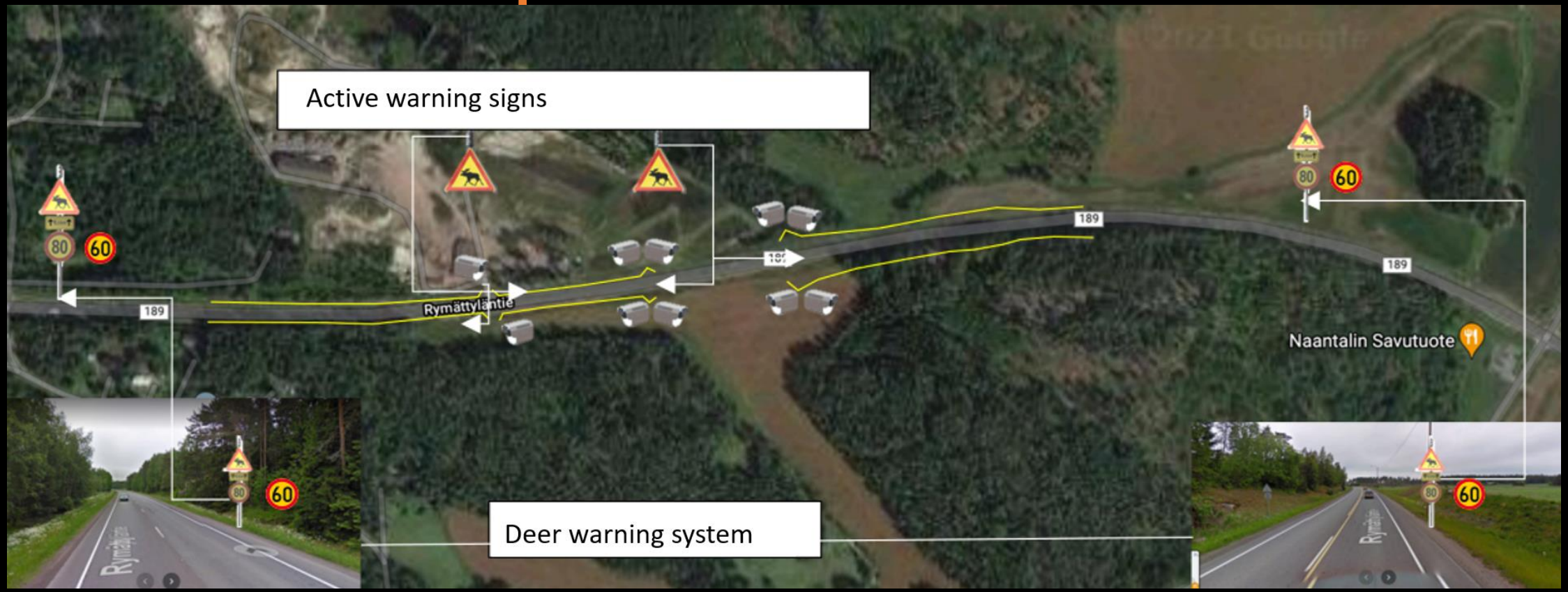


Figure 7 - View of the active deer warning system on regional road 189 from Luonnonmaa in Naantali. The warning area is 1.1 km long.

2.4. Deer detectability

Our studies show that lighting does not affect deer behaviour and tends to increase driving speeds. More research is needed on the safety benefits of clearing.

Figure 8 - On Highway 10, forest has been cleared within 30 m of the centre line of the road towards the forest in the deer warning area and the branch height has been increased by 2.5 m.

2.5. New car models

A significant proportion of moose and deer collisions in the dark could be avoided if cars were equipped with automatic braking systems with modern night vision technology.

Figure 9 - Vehicle infrared technology can detect deer and other heat-emitting objects and transmit the information to the driver's display. Source: Teledyne Flir

2.5. Speed limits

Of all deer accidents, 60% were on stretches of road where the speed limit was 80 km/h. This is explained by the prevalence of this general speed limit on the rural road network and the 80 km/h winter speed limit on main roads. However, the statistics do not show whether the speed limit was obeyed in the event of an accident.

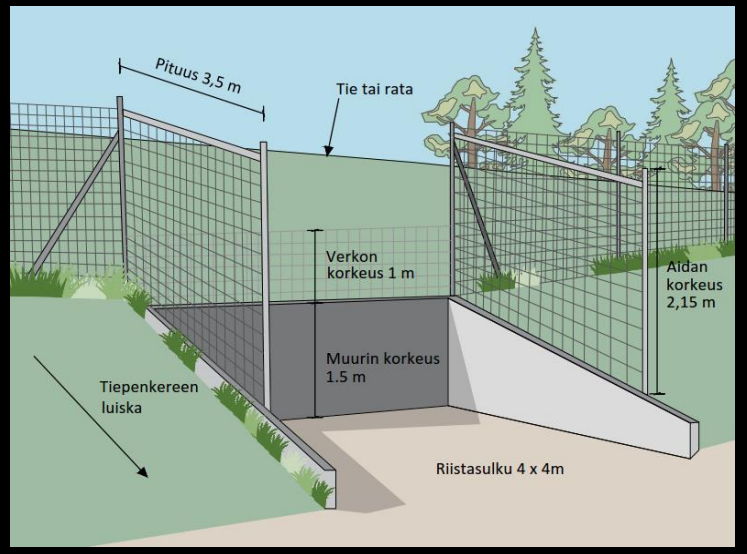
3. MEASURES AFFECTING THE BEHAVIOUR OF MOOSE AND DEER

… using fencing solutions or by making the road crossing unpleasant or frightening using different types of repellents near the road.

3.1 Fences

Fences are a widely used measure in Finland to limit the access of moose and deer to road areas. At best, fencing can reduce deer accidents by up to 80-90%.

Fences should be built 2.2-2.4 m high and in continuous sections of sufficient length (over 5 km) to avoid simply diverting animals to the ends of the fence.



Usually, the police are unable to guide a deer caught between the fences back into the forest through the escape road or gate and must put down the panicking deer.

3.2 Moose and deer tape

Their message to motorists that this is a heavily used deer crossing is also important. The problem is that the animals become accustomed to the tapes and the maintenance of the tapes is cumbersome.

Figure 11 - Moose and deer tape should be placed in a highly visible position at the roadside so that the moose or deer can see the tape well before the roadside.

3.3 Under- and overpasses

Fences do not eliminate animals` needs to move around, so fencing should ensure that animals are allowed safe access to the other side of the road. The solution lies in a variety of overpasses and underpasses.

Figure 12 - Green bridges and other animal access structures provide a safe route for animals to cross the road.

3.4 Moose and deer flat crossing

Drivers should be warned as clearly and visibly as possible by warning traffic signs of the deer crossing point. In Finland, there are currently some experiments with the use of active warning signs to warn drivers of deer approaching a level crossing.

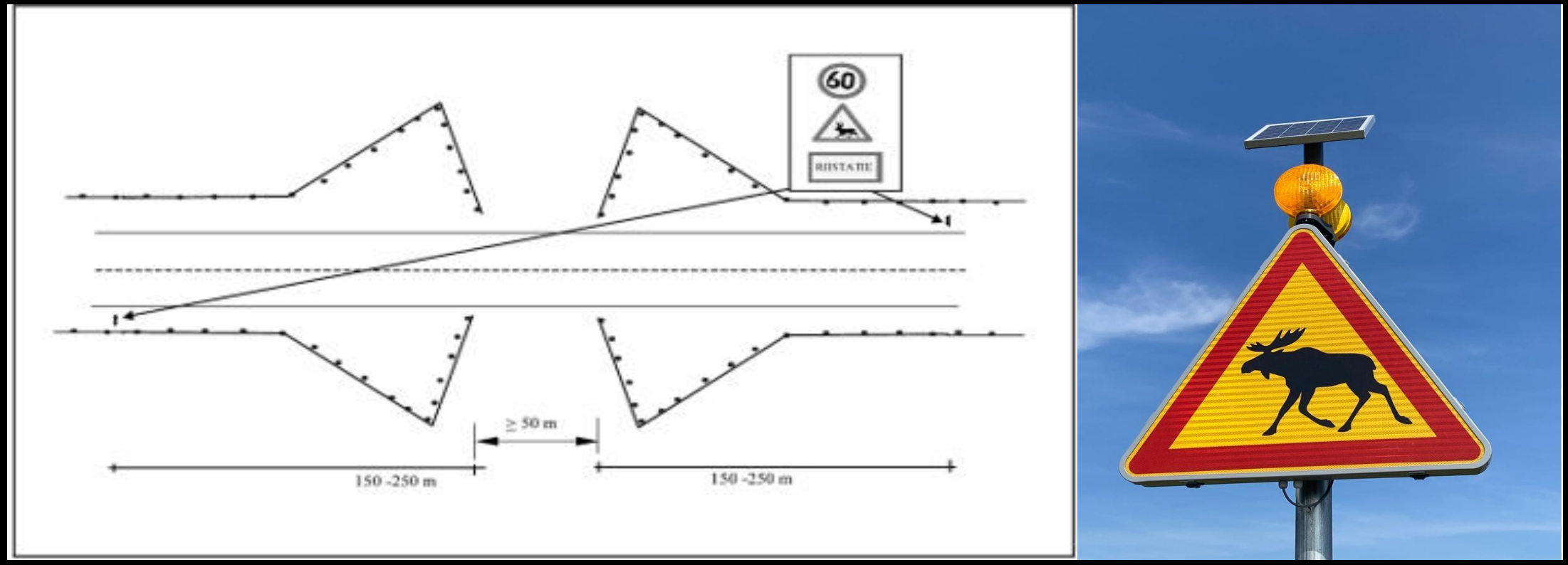


Figure 13 - Deer level crossing dimensioning and warning sign placement. In addition to the flashing traffic sign, the warning system includes a reversible speed limit sign.

3.5 Access solutions for side roads on a fenced road section

The functional advantages of a deer grating (quard) over a gate are:

- The simplicity of opening and closing the gateway for users
- Deer cannot enter the road area, unlike through an open gate
- The deer guard and fence can be built closer to the main road than at the gated junction, as no waiting area is needed for stopping vehicles

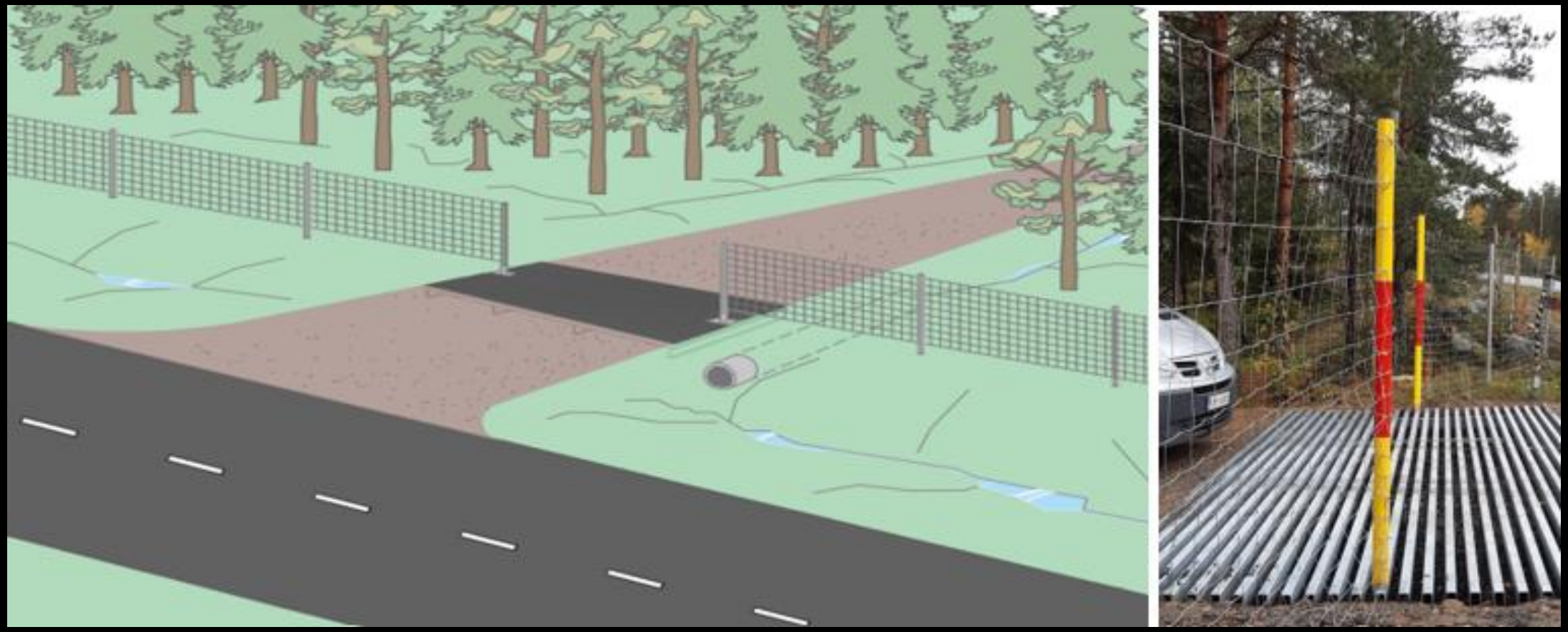


Figure 14 - The connection of a deer guard structure to a fence and road structure. The deer grating is a Finnish application of the deer quard.

3.6 Repellents and alarms

Moose and deer mirrors were also tried in Finland in the 1970s but were not found to have the desired effect on moose and deer behaviour.

There are no peer-reviewed studies on the effectiveness of whistles, so they cannot be marketed in Finland as a means of preventing moose and deer collisions.

Figure 15 - The loudspeakers at the Vassori level crossing on Highway 8 play a human voice when sensors detect an approaching deer. The goal is for the sound to scare the animal away from the road and back into the forest.

4. POPULATION MANAGEMENT

The most important thing is to reduce the number of moose and deer. Hunting should be intensified so that population growth stops and starts to decline.

5. CONCLUSIONS AND RECOMMENDATIONS

There is no quick and inexpensive method to reduce moose and deer accidents.

1. Hunting should be intensified so that population growth stops and starts to decline.
2. The only widely accepted method with solid evidence of effectiveness is well-designed and maintained fencing, combined with underpasses or overpasses as appropriate.
3. Roadside clearing may be effective, although very limited information supports it.
4. Both temporary passive signs and active signs appear promising in specific situations, but considerable research is required to evaluate the long-term driver response and to improve and test moose and deer detection technology for active signs.
5. Timely warning through information targeted at specific road sections needs further design and development.

Thank you for your attention

PREVENTING DEER AND MOOSE ACCIDENTS THROUGH ROAD MANAGEMENT MEASURES:

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