



# Relation between weather and traffic accidents on the main roads of Lithuania

**Assoc. Prof. Justas Kažys**  
**and Aistė Jančiauskaitė (B.Sc.)**  
Institute of Geosciences, Vilnius University

## Introduction

- In Lithuania, in 2018 for 1 mil. inhabitants 61 fatal accidents were registered, it was **11% less** than in **2017** and, even, **43% less** than in **2010** (Ministry of Transport and Communications 2019)
- However, the accidents still remain very serious problem; **every year about 1.24 mil. people are killed** during the crashes all over the world (Benjamin & Roth 2016)
- The previous research found that **20-30%** of road accidents could be related to weather impact (Perrels et al.2015; Gao et al. 2016) and the **potential risk** of crash on **wet roads increases** several times (Eisenberg & Warner 2005)



## History recall



- **First local conference** – Kažys J. (2004). Increase of road accidents under unfavourable meteorological conditions in Vilnius. Science in faculty of Natural Sciences: the 3rd faculty conference proceedings, 22-23rd of April, 2004, Vilnius, Lithuania, pp. 232-239 (in Lithuanian).
- **First article** – Kažys J., Valiukas D., Rimkus E. (2004). The potential accident risk evaluation during meteorological phenomena on Lithuanian roads. Geografija (ISSN 1392-1096), 40(2), pp. 5-10 (in Lithuanian).
- **First international conference** – Kazys J., Rimkus E., Valiukas D., (2006). Variation of traffic accidents volume on different phases of adverse weather conditions. Proceedings of the XIII Standing International Road WEather Conference (SIRWEC) 2006, March 25-27, 2006, Turin, Italy. 13th – 2006 – Torino, Italy



# CAI index



- The **Comparative road traffic Accident Intensity (CAI)** during adverse meteorological phenomena at definite time intervals was calculated for Vilnius city using 2001-2002 road accidents data (36 165 in total).
- The accidents also were classified into accidents of **cold** (November–March) and **warm** (April–October) seasons.

$$CAI_T = \frac{5CAI_{WD} + 2CAI_{WE}}{7}$$

$CAI_T$  – total CAI for concrete meteorological phenomenon;  
 $CAI_{WD}$  – CAI for working days;  $CAI_{WE}$  – CAI for weekend days.  
 Multipliers express the number of weekend and working days.

Year	Season	Adverse meteorological conditions						
		rain	showers	snow	sleet	fog	blizzard	freezing rain
2001–2002	<b>Cold</b>	1.4*	–	1.5	1.2	1.3	1.3	1.1
2001–2002	<b>Warm</b>	2.0	1.6	–	4.3	1.5	–	–

## Data and methods



- The main objective of this research was to determine possible impact of adverse weather conditions on road traffic accidents by adjusting the original methodology (Kažys 2005) for 2 main roads in Lithuania.
- Two types of data were used: road traffic accidents and road weather (surface) conditions.
- All the data were provided by the Lithuanian Road Administration under The Ministry of Transport and Communications.
- The research covered 2017-2019 period.
- In 2017–2019 the accident rate on the road during adverse weather conditions was compared with the accident rate in favourable weather conditions which are dry road surface without precipitation.

# Data and methods (2)

- Recurrence of road traffic accidents and road weather conditions divided into different groups of weather (surface) condition types in two main roads in Lithuania during 2017-2019 period

Type	Condition	Road traffic accidents, number (%)		Road weather conditions, number (%)	
		E85	E67	E85	E67
Road weather	<b>No precipitation</b>	<b>1278 (79.1)</b>	<b>674 (82.4)</b>	<b>1822150 (88.6)</b>	<b>1857317 (91.0)</b>
	Precipitation	22 (1.4)	0 (0.0)	22864 (1.1)	30731 (1.5)
	Drizzle	44 (2.7)	26 (3.2)	39797 (1.9)	36639 (1.8)
	Rain	152 (9.4)	65 (8.0)	82571 (4.0)	68278 (3.3)
	Sleet	10 (0.6)	4 (0.5)	6187 (0.3)	3955 (0.2)
	Snow	90 (5.6)	43 (5.3)	51947 (2.5)	33122 (1.6)
	Fog	9 (0.6)	3 (0.4)	21760(1.1)	5973 (0.3)
	Mist	10 (0.6)	2 (0.2)	10638 (0.5)	6695 (0.3)
Road surface	<b>Dry</b>	<b>1059 (65.6)</b>	<b>535 (66.3)</b>	<b>1377721 (67.7)</b>	<b>1497727 (71.0)</b>
	Moist	215 (13.3)	139 (17.2)	427541 (21.0)	378548 (18.0)
	Wet	257 (15.9)	92 (11.4)	208597 (10.2)	206084 (9.8)
	Slushy snow	25 (1.5)	10 (1.2)	7994 (0.4)	9150 (0.4)
	Snow	33 (2.0)	16 (2.0)	8114 (0.4)	12605 (0.6)
	Ice	27 (1.7)	15 (1.9)	5464 (0.3)	4388 (0.2)

# Data and methods (3)

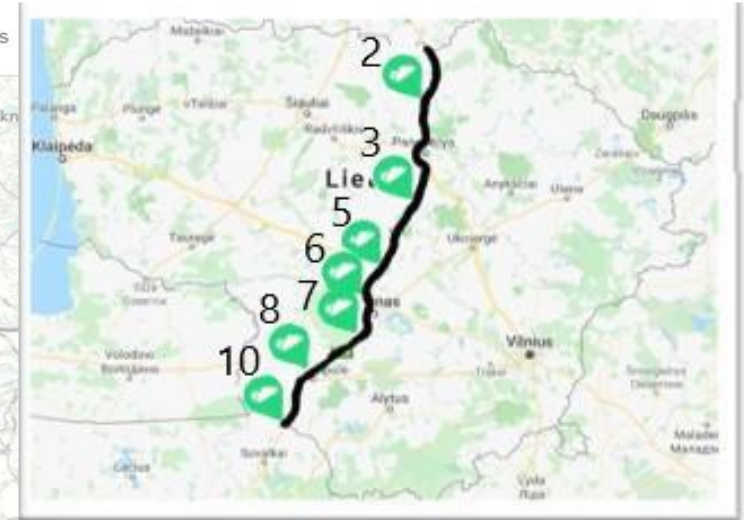
[eismoinfo.lt](http://eismoinfo.lt)

Naujienos

Kelių oro sąlygos

Vaizdo kameros

Atviri duomenys



The main roads crossing Lithuanian territory (modified map, the base taken from [eismoinfo.lt](http://eismoinfo.lt) and GDB10LT National Land Service, 2012):

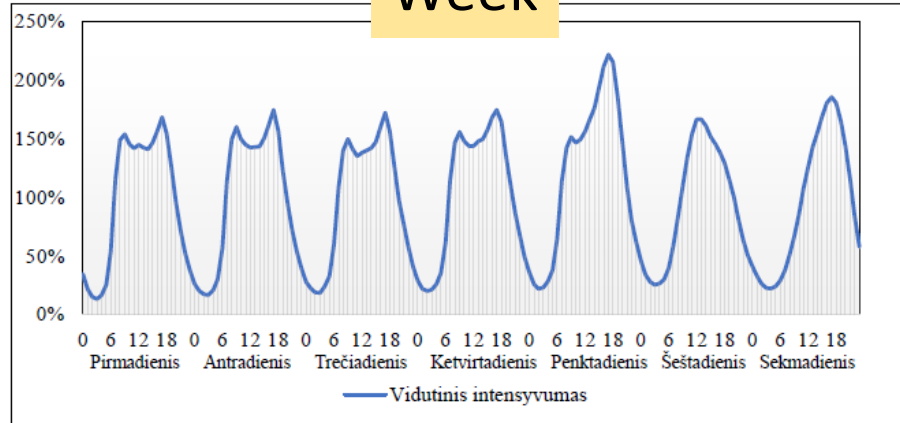
- A1 (E85) from East to West (data from 15 RWS)
- 'Via Baltica' (E67) from North to South (data from 10 RWS)



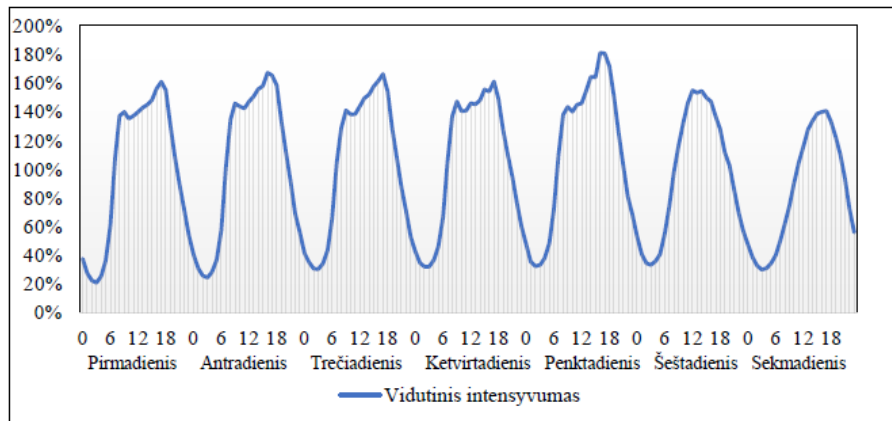
# Data and methods (4)

A1

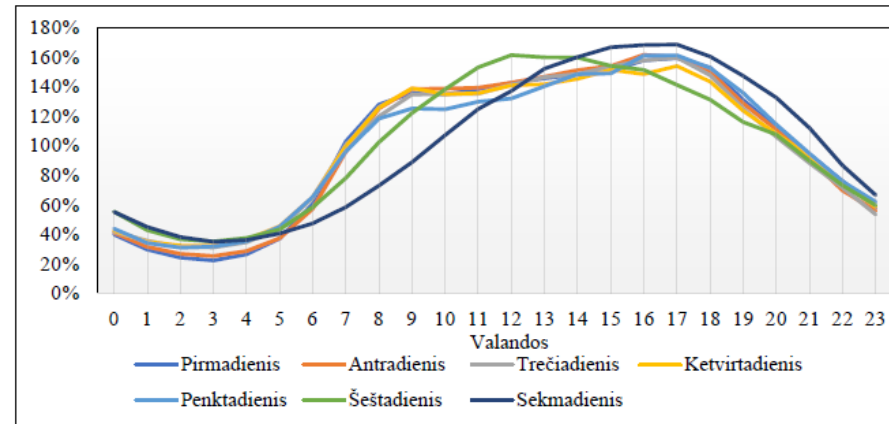
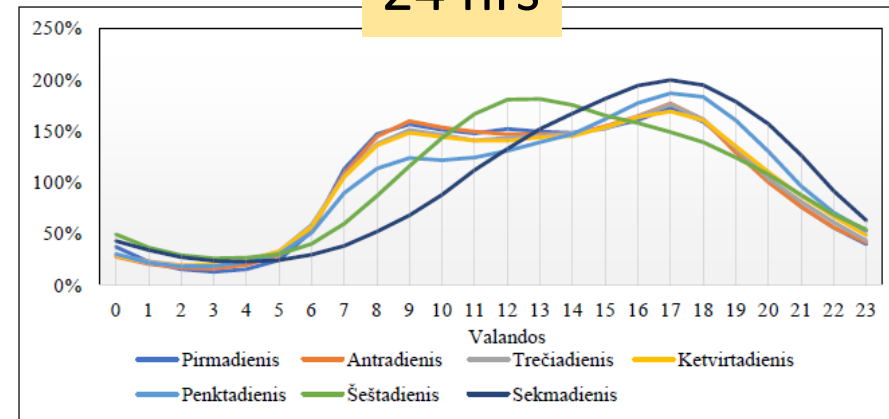
Week



E67



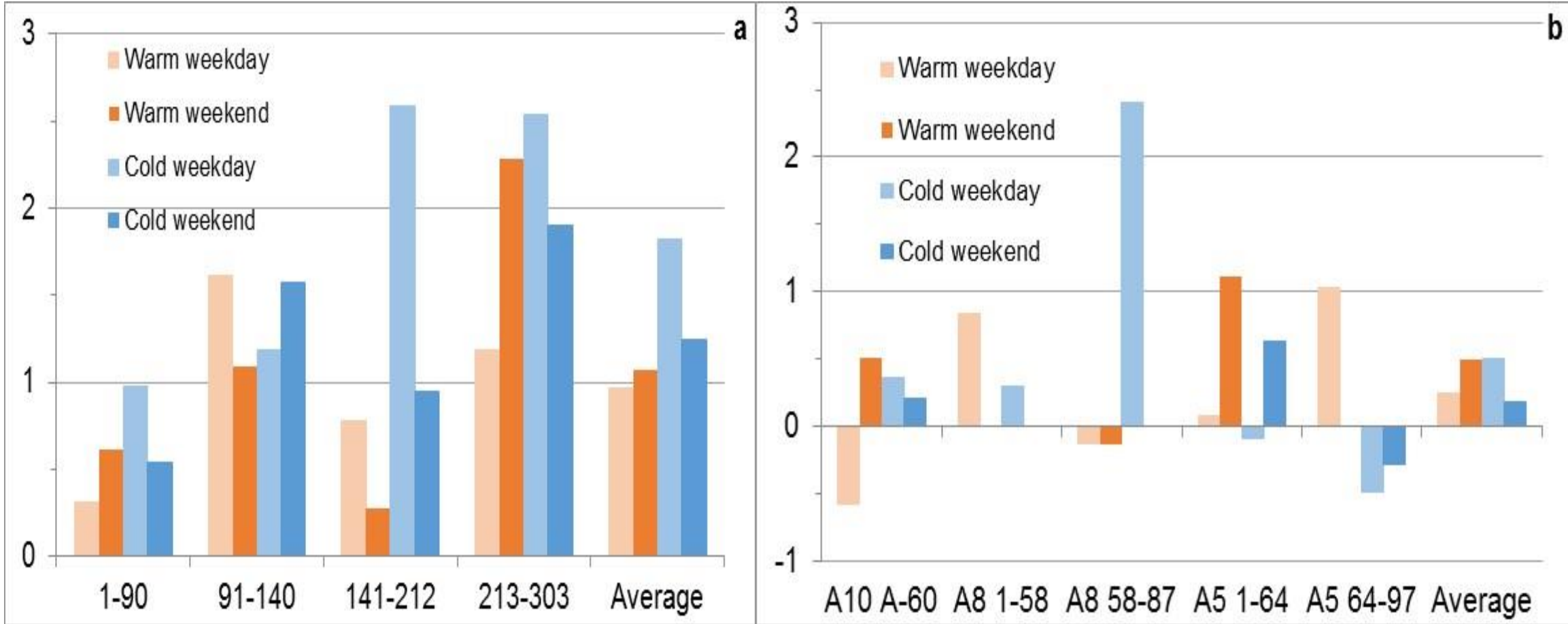
24 hrs



- Averaged traffic intensity on the main roads in Lithuania in 2018

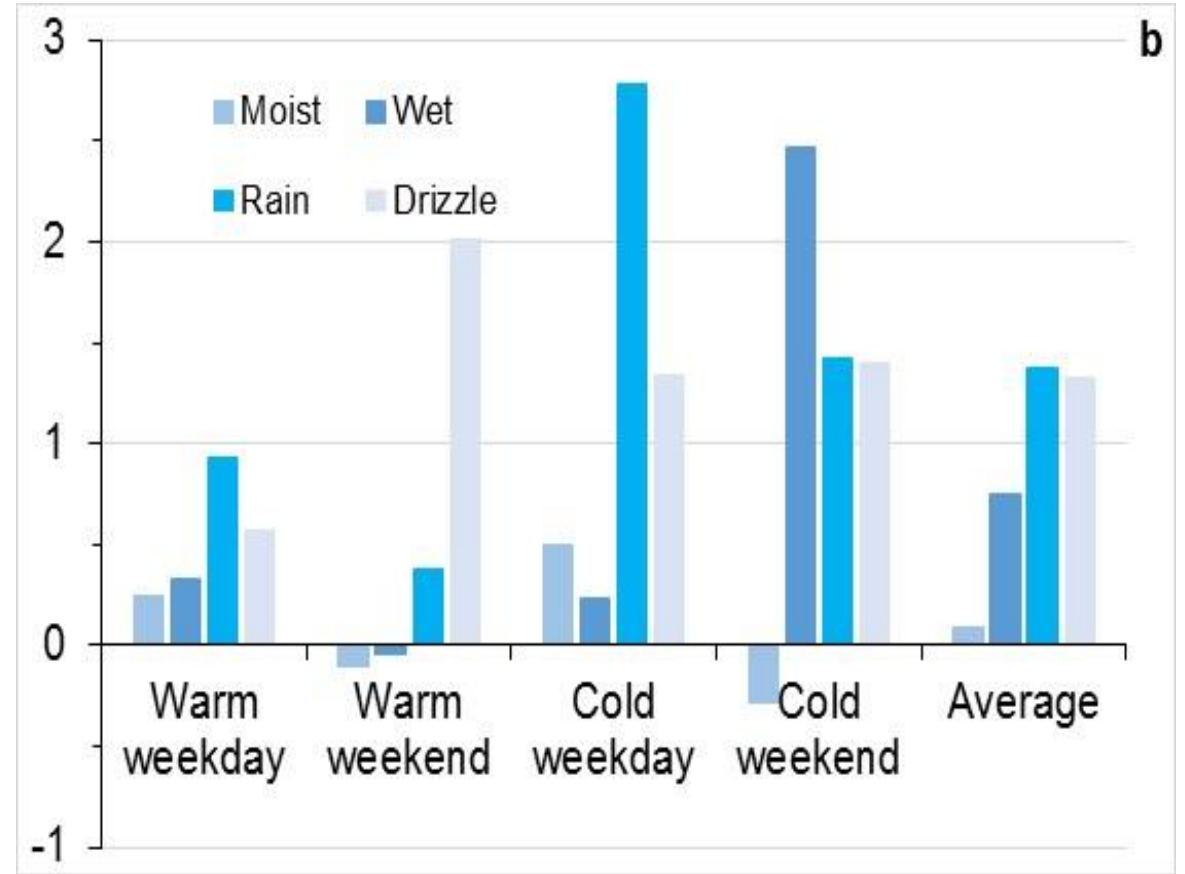
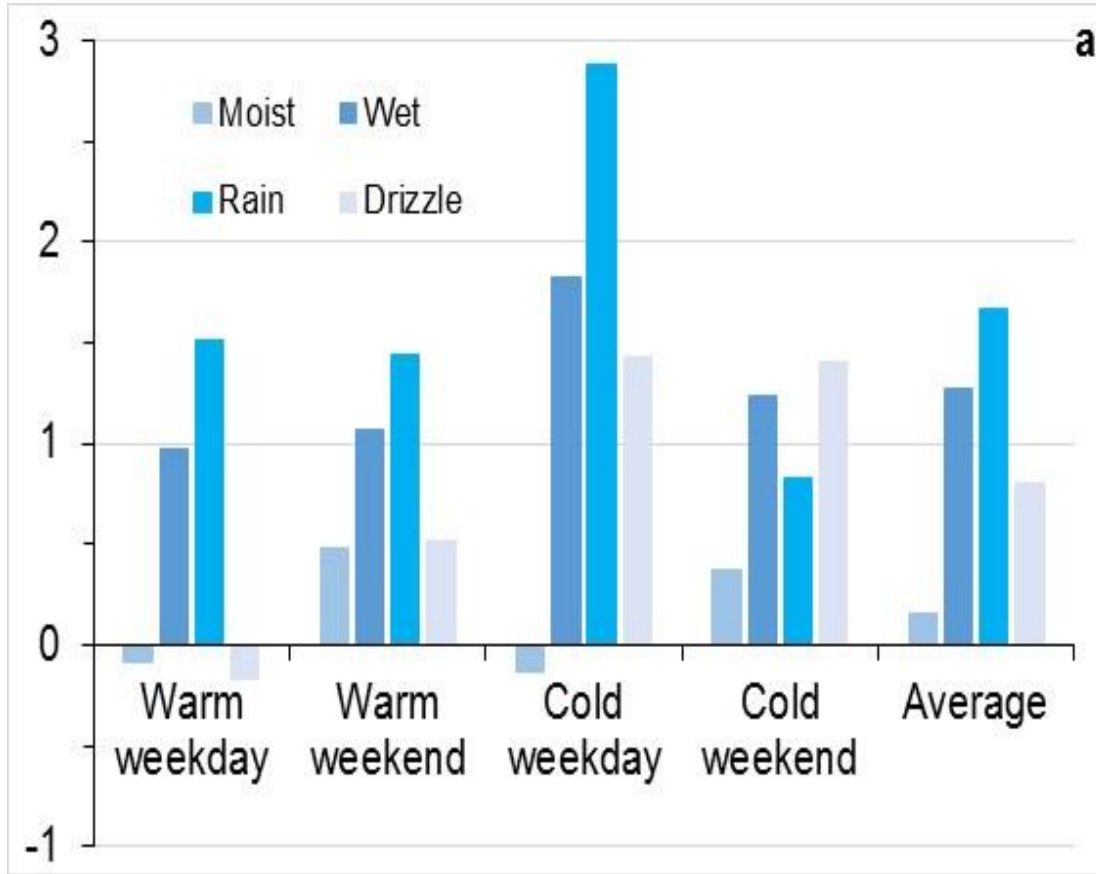


# Main findings



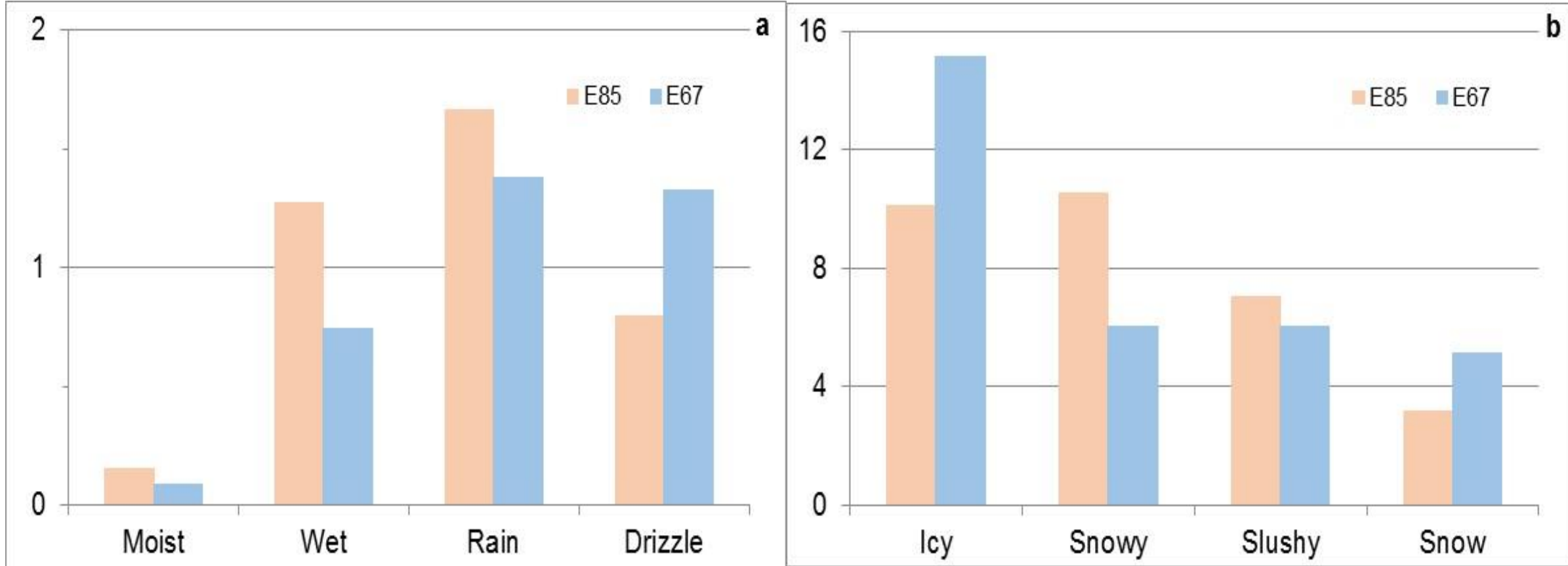
- The comparison (in times) of road accidents between wet road surface and dry road surface conditions on different sections (km) of the roads: a – A1 (E85); b – ‘Via Baltica’ (E67)

# Main findings (2)



- The comparison (in times) of difference in seasons/ days of the week of road accidents between various road surface (weather) and dry road surface (no precipitation) conditions: a – A1 (E85); b – ‘Via Baltica’ (E67)

# Main findings (3)



- The comparison (in times) of road accidents between various road surface (weather) and dry road surface (no precipitation) conditions on two main roads in Lithuania.

Water state: a – liquid; b – solid

## Conclusions



- On two main roads in Lithuania in 2017-2019 period the overall **numbers of traffic accidents were higher during all types of precipitation and wet road surface** comparing to normal conditions. Therefore, the accidents could be potentially linked to the adverse weather conditions.
- **The potential impact** of adverse weather conditions fluctuated in **very wide range**: from 9% on moist 'Via Baltica' road surfaces (16% – A1 road) to 15.2 times on icy 'Via Baltica' road surfaces (10.1 times – A1 road).
- **Cold season impact** on road accidents rates **were higher** because snow and ice had showed very high potential risk of accidents. However, the recurrence of icy and snowy conditions was not frequent (around 1% of all weather conditions).
- The potential impact of **all types of rains and wet road surface** on road accidents were **more frequent all year round**, respectively 7% and 10% of all conditions, due to climate change effect (higher temperatures in cold season).



Thank you for your  
attention!

For more information please contact: [Justas.kazys@gf.vu.lt](mailto:Justas.kazys@gf.vu.lt)