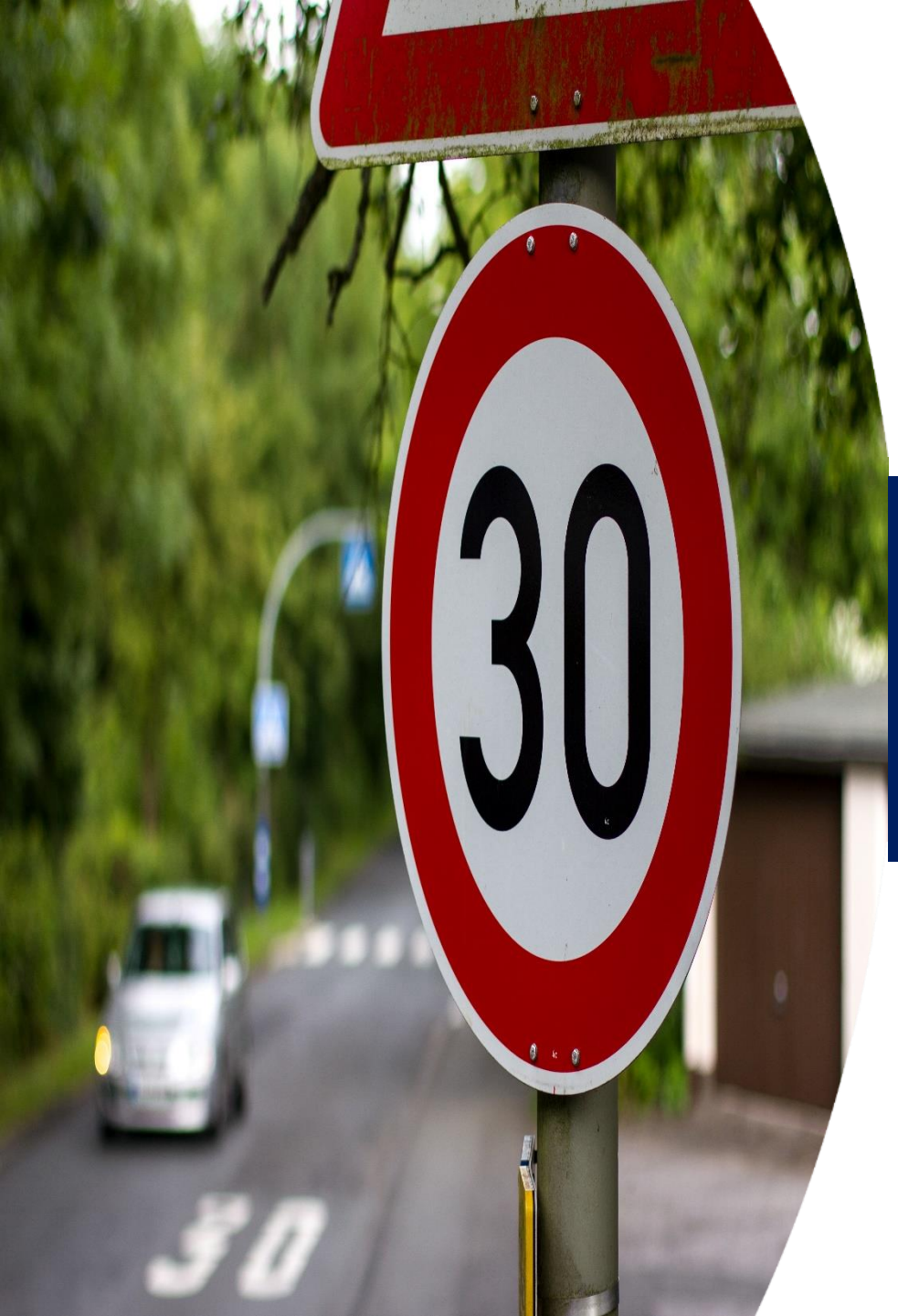

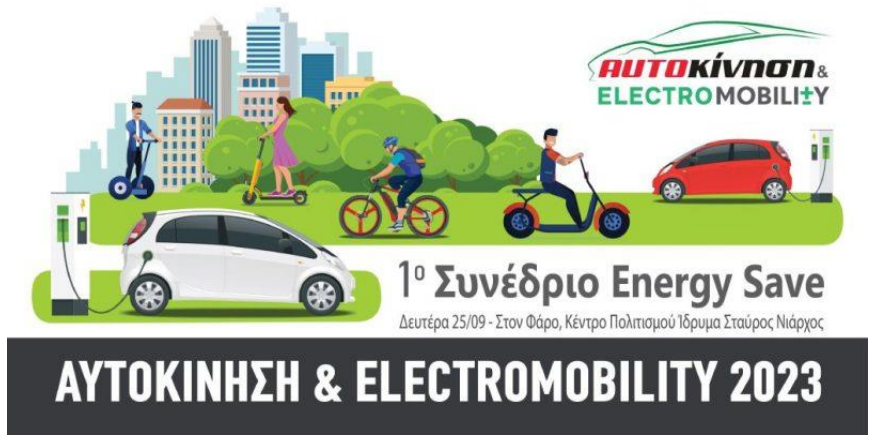

Significant benefits from speed limits reduction

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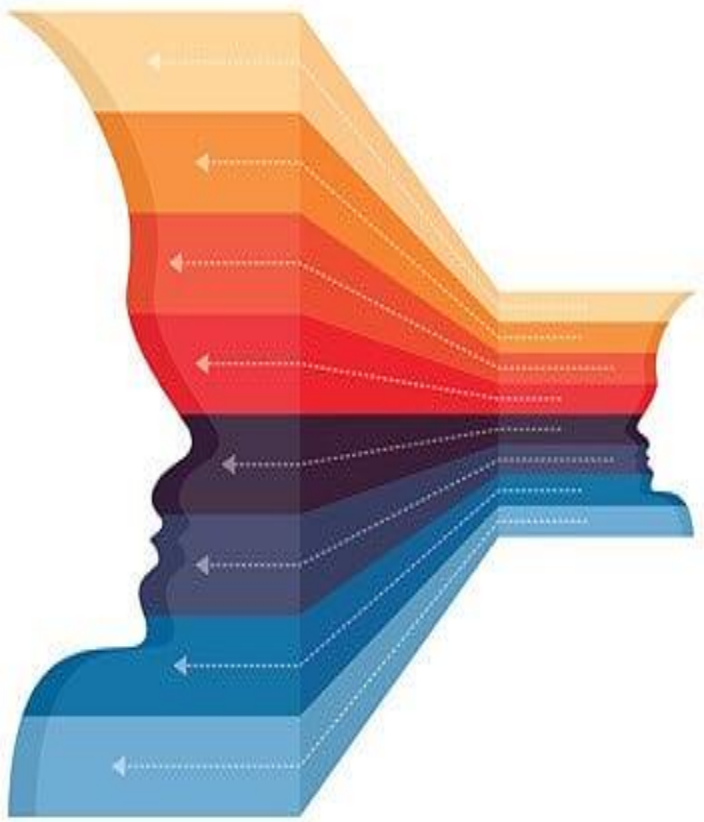
Objective & Outline

The objective is to systematically analyse the benefits from speed limits reduction in cities and on the interurban road network

Successful European examples as well as the results of recent socio-economic analyses in Greece are presented

Outline:

1. Introduction
2. Benefits from speed limits reduction
3. Reduction of speed limits in cities
4. Reduction of speed limits in interurban network
5. Conclusions



Cost Benefit Analysis

- Cost Benefit Analysis (CBA) is becoming a necessary economic appraisal tool used to evaluate transport policies from a social welfare point of view
- In the framework of the CBA the following analyses are carried out:
  - Financial analysis
  - Socio-economic analysis

to evaluate the feasibility of the policy from the investor and society's point of view, respectively, over time

- The CBA requires the comparison of at least two main Scenarios:
  - **Scenario 0** (S0): do-nothing
  - **Alternative Scenario**: policy implementation
- The following economic performance indicators are calculated:
  - Net Present Value – FNPV
  - Internal Rate of Return– IRR
  - Benefits to Costs ratio – B/C
- Sensitivity analysis is developed to investigate economic feasibility to extreme changes in critical parameters and assumptions

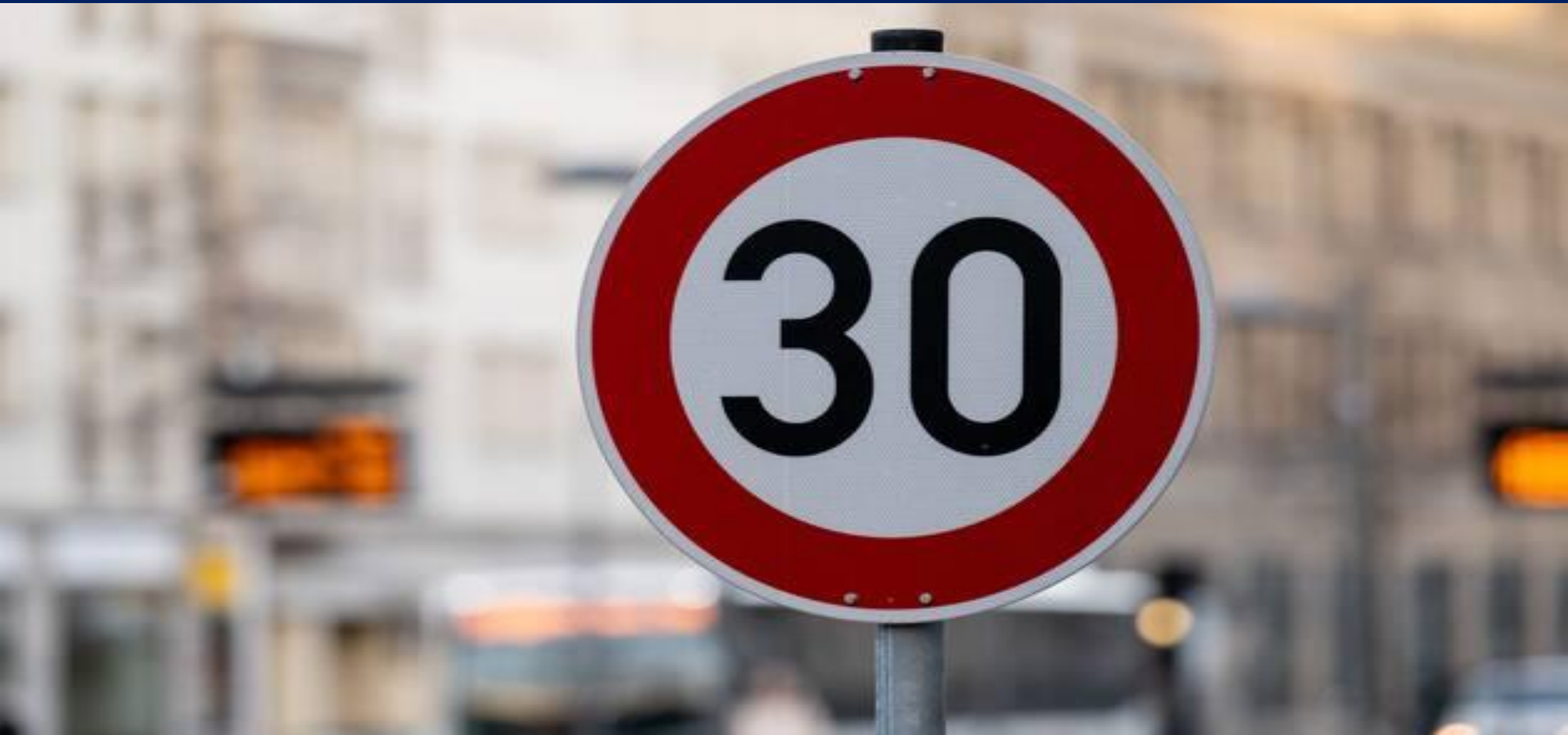
Socio-economic Analysis

- Socio-economic Analysis is a tool for evaluating the socio-economic impact of a public policy, including indirect impacts
- The following benefits (costs) must be considered in the social CBA to capture the impact on the society:
  - Travel time
  - Vehicle Operating Costs
  - Road casualties
  - Noise emissions
  - Air pollution
  - GHG emissions
- Costs and benefits at different times should be discounted using the Social Discount Rate, which reflects the long-term opportunity cost of resources to society as a whole
- For a socio-economically sustainable policy, the following criteria must be met:
  - Net Present Value (NPV) >0
  - Internal Rate of Return (IRR) > social discount rate
  - Benefit to Cost (B/C) >1

Socio-economic impact of speed limit reduction

Costs (-)	Benefits (+)
C1 Initial Investment Cost	**B1 Road User Surplus**
C1.1 Supply and installation of cameras	B1.1 Travel time
C1.2 Supply and installation of signs and markings	B1.2 Fuel consumption
C1.3 Study	
C2 Operating Cost	**B2 Externalities**
C2.1 Human resources	B2.1 Road crashes
C2.2 Operational system and Mechanical equipment maintenance	B2.2 Environment
C2.3 Social media campaigns	B2.1.1 Greenhouse gas emissions
C2.4 Measure effectiveness	B2.1.2 Air pollutants emissions

Benefits from Speed Limits Reduction



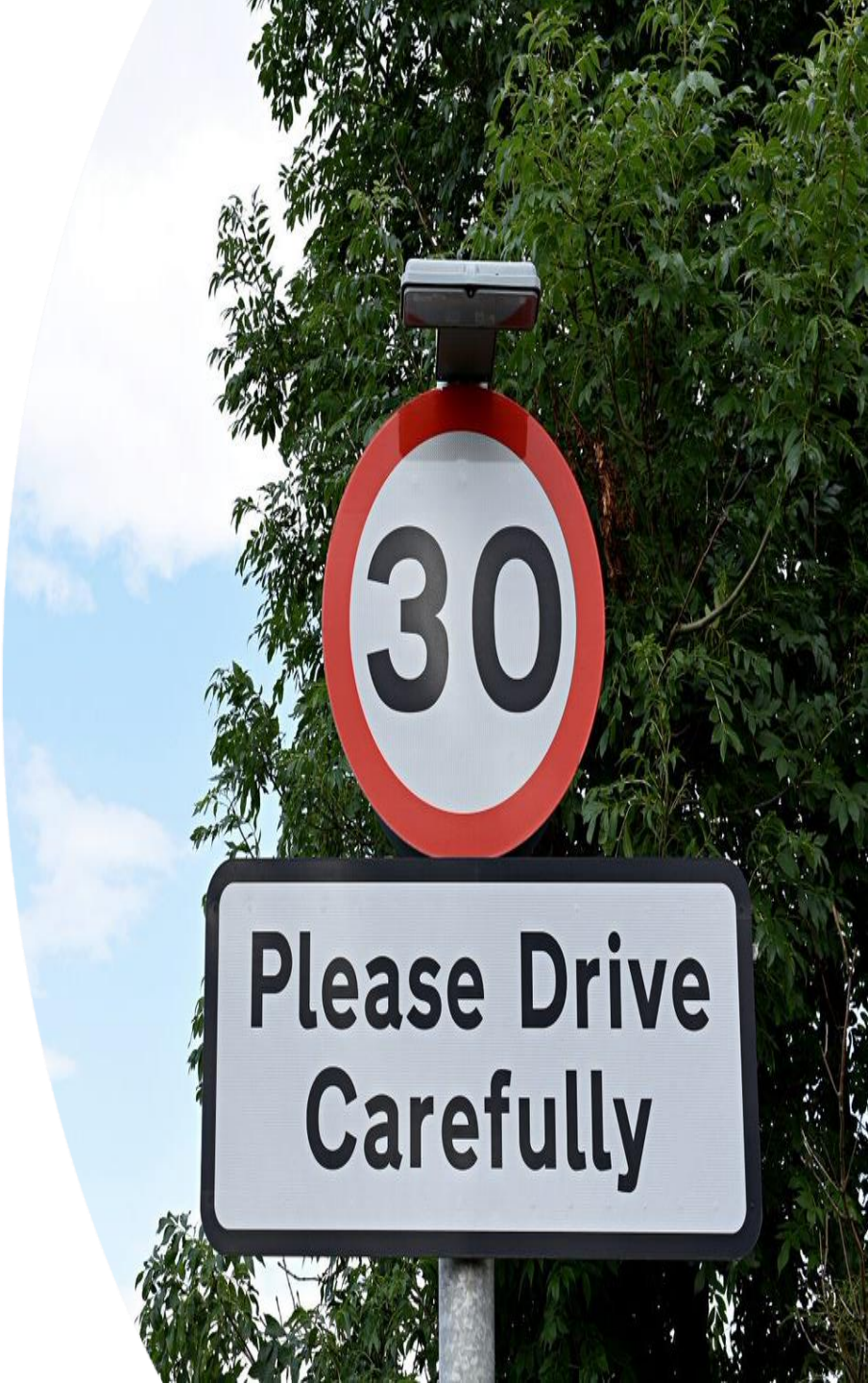
Benefits from Speed Limits Reduction (1/2)

Fuel consumption reduction

- Lower speeds lead to lower fuel consumption
- Smoother traffic flow leads to additional fuel economy (eco-driving)

Air pollution reduction

- Streets that promote safe walking and cycling can reduce car dependency and harmful vehicle emissions that contribute to climate change
- 30 km/h zones reduce carbon dioxide and nitrous oxide emissions from diesel cars, and particulate matter emission from both diesel and petrol cars, thus reducing air pollution



Benefits from Speed Limits Reduction (2/2)

Road crashes reduction

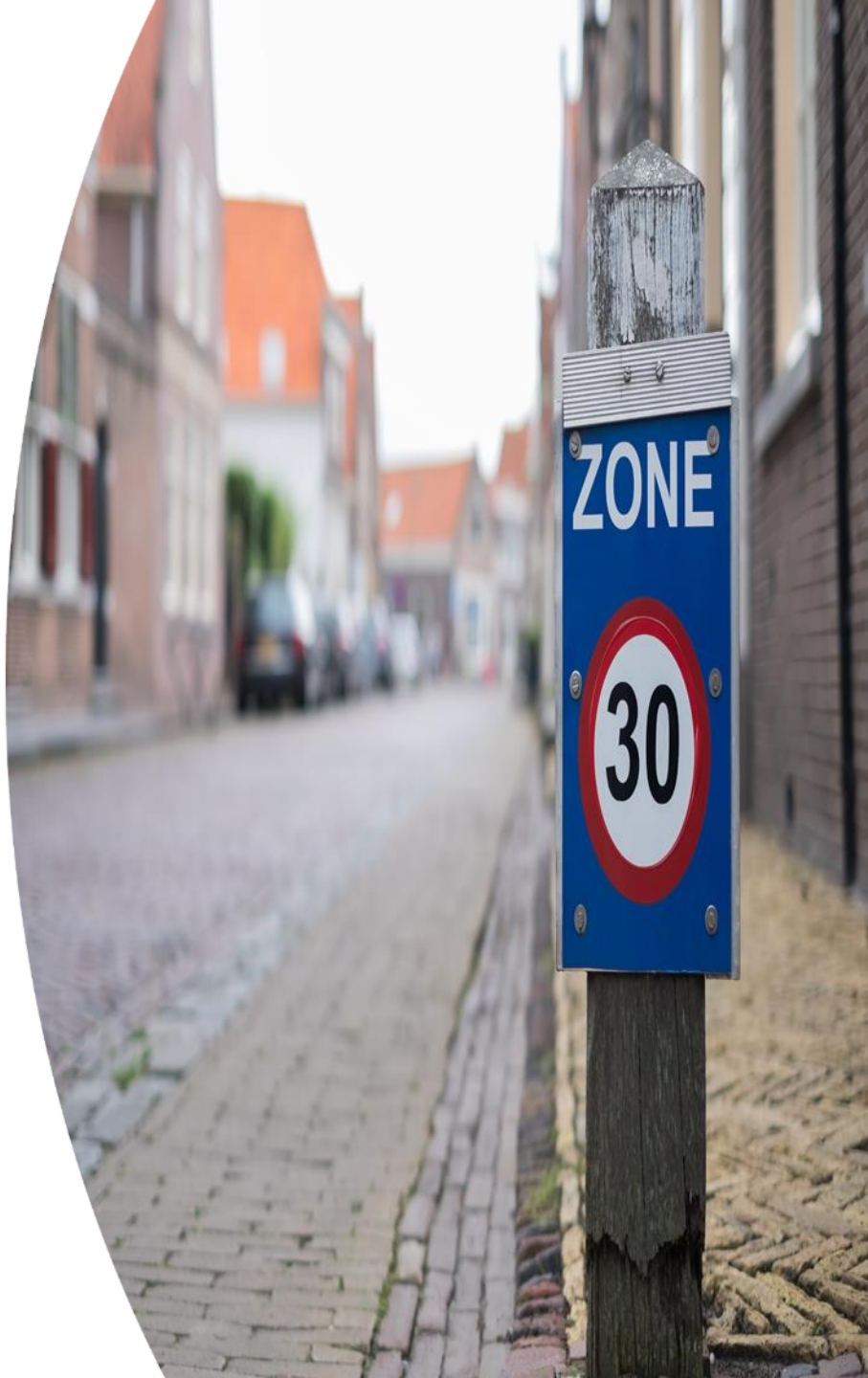
- Reductions in speed limits are intended to improve road safety by decreasing travelling speed and thus reducing the risk of crashes occurring and the severity of crashes that do occur
- The risk of death is almost five times higher in collisions between a car and a pedestrian at 50 km/h compared to the same type of collisions at 30 km/h

Traffic flow improvement

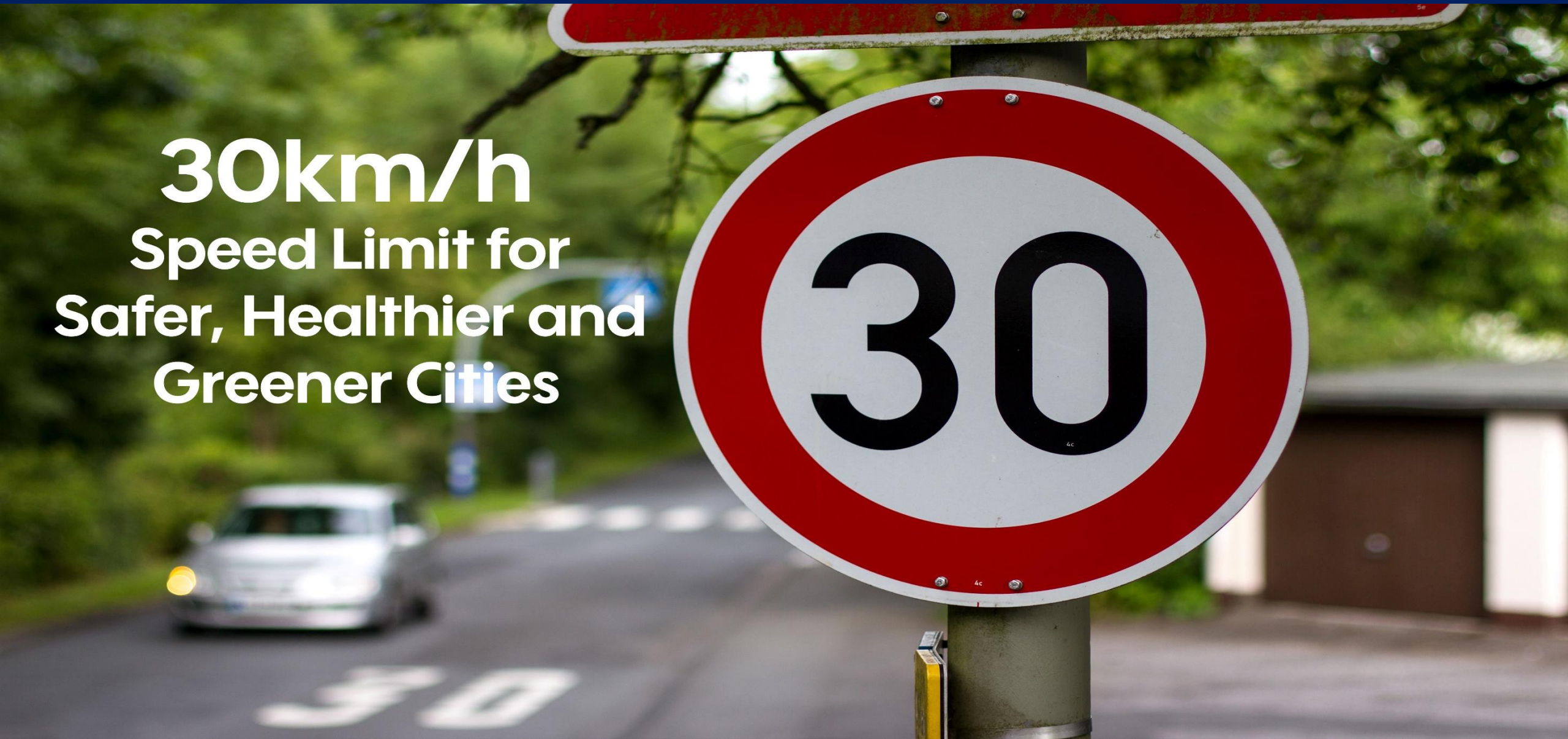
- Motor traffic volumes decrease, since slower speeds encourage active, sustainable and shared travel
- Reducing the speed limit at 30km/h improves traffic flow, reduces congestion and improves travel times as there is less stop/start traffic movement

Sustainable improvement

- Calm driving in lower speeds is a mean of healthier living for the drivers and all road users
- All road users and especially children and the elderly are more likely to walk and are more confident in venturing outside their homes, trying to cross the street



Reduction of Speed Limits in Cities

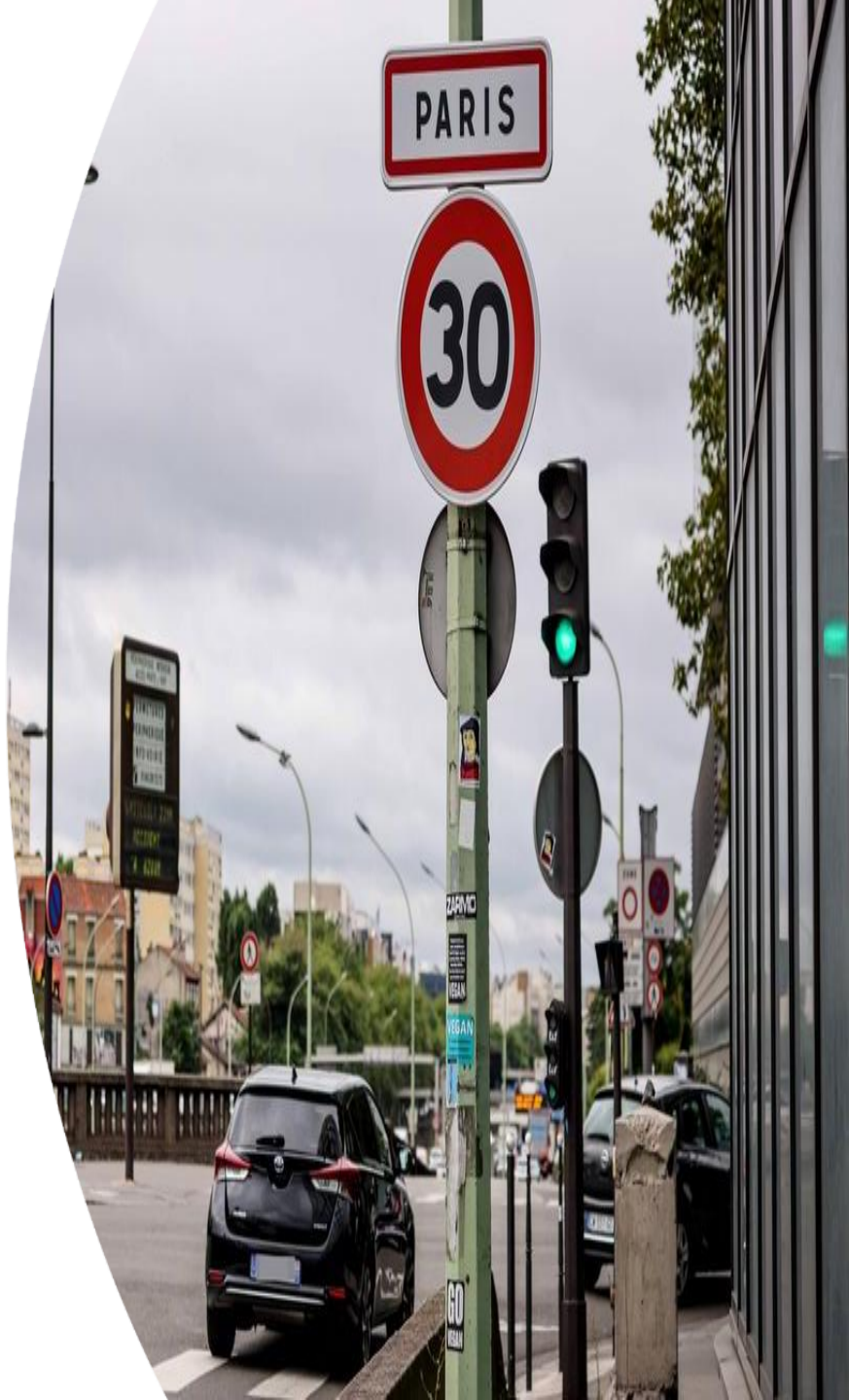


Cities with 30 km/h Speed Limit

City	Implementation Started	City	Implementation Started
Bologna	2023	Valencia	2021
Florence	2022	Munster	2021
Copenhagen	2022	Den Haag	2021
Lyon	2022	Nantes	2020
Paris	2021	Glasgow	2020
Montpellier	2021	Antwerp	2020
Brussels	2021	Barcelona	2019
Leuven	2021	Madrid	2018
Vienna	2021	Bilbao	2018
Zurich	2021	Edinburgh	2016

30km/h Speed Limit in Cities (1/2)

- In January 2021, Brussels in Belgium, established a citywide 30 km/h limit. Maximum speed is 30 km/h on all roads in the Brussels Capital region, except of the major axes where the speed limit remains 50 or 70 km/h. Five months after installing the general speed limit of 30km there was:
  - *Reduction in fuel consumption* by 10%
  - *Reduction in traffic noise* by 2,5 db
  - *Reduction in the number of road crashes* by 50%
- In August 2021, Paris in France, began reducing the speed limit to 30 km/h in most city streets. It was observed:
  - *Reduction in noise pollution* by 50%
  - *Reduction in the number of road crashes* by 25%
  - *Reduction in those considered serious and fatal* by 40%
- In July 2021, Munster in Germany, introduced 30 km/h speed limits. One year after the implementation of the 30 km/h speed limit, it was revealed:
  - *Reduction in fuel consumption* by 12%
  - *Reduction in the number of people severely injured in road crashes* by 72%



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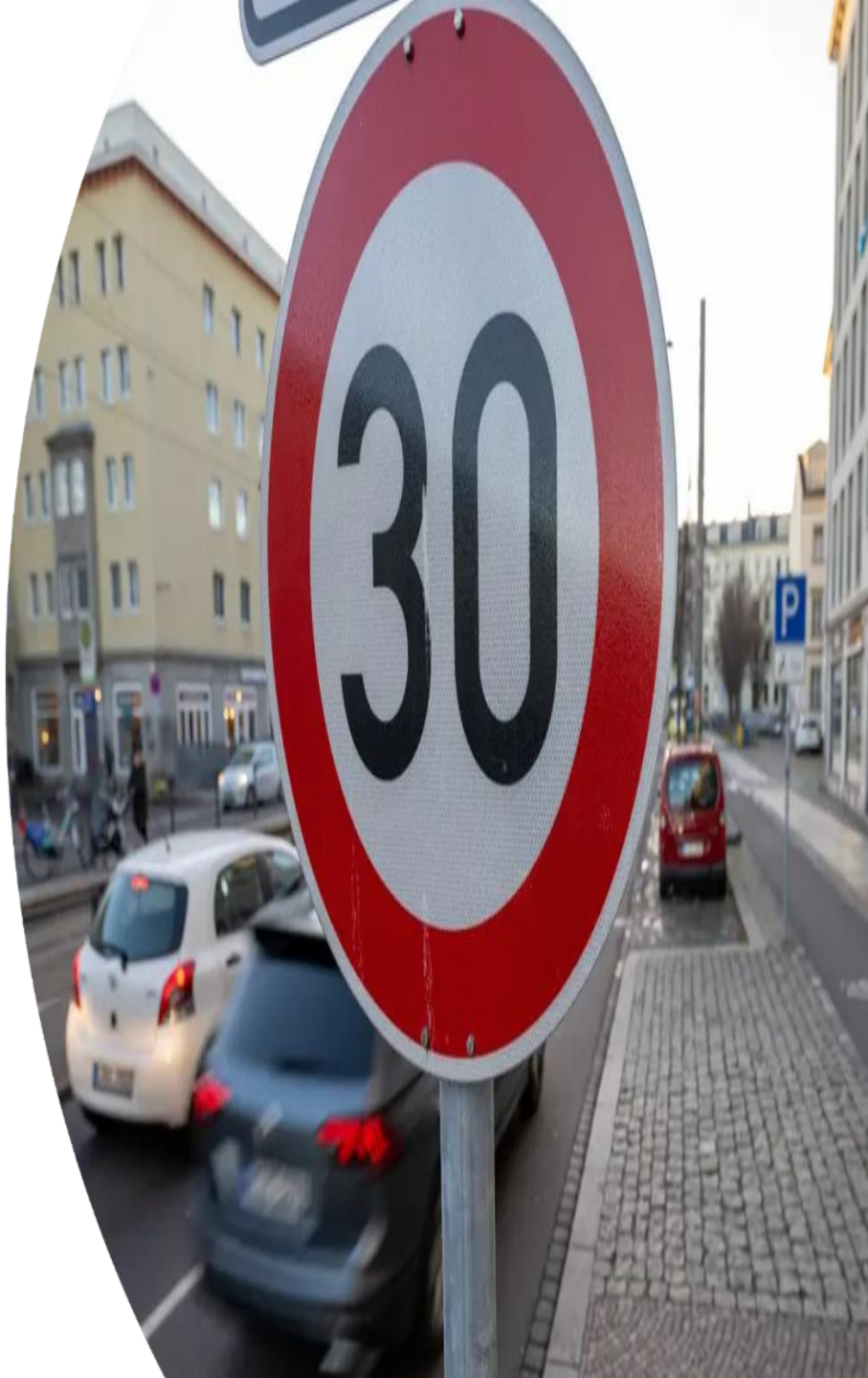
30km/h Speed Limit in Cities (2/2)

- In June 2018, Bilbao in Spain, limited speed to 30 km/h with the triple aim of reducing noise, pollution and increasing road safety. One year after the implementation of the 30 km/h speed limit, the city had:
  - *Reduction in air pollution*: 11,4% decrease in NO_2-µm3, 17,1% decrease in NO_X-µm3 and 19,1% decrease in PM_{10}
  - *Reduction in the number of road crashes* by 23%
- In July 2016, Edinburgh in UK, lowered the speed limit on almost all of its roads from 30 mph to 20 mph. One year later, the zones with a reduced speed limit saw:
  - *Reduction in particulate matter (PM)* by 8%
  - *Reduction in the number of road crashes* by 38% including fewer crashes involving cyclists and pedestrians
- In November 2021, Zurich in Switzerland, implemented 30km/h speed limit restrictions. After the implementation of this measure, it was observed:
  - *Reduction in traffic noise* between 3dB and 5dB
  - *Reduction in fatalities in road crashes* by 25%



Cost-Benefit Analysis on Athens Urban Road Network (1/2)

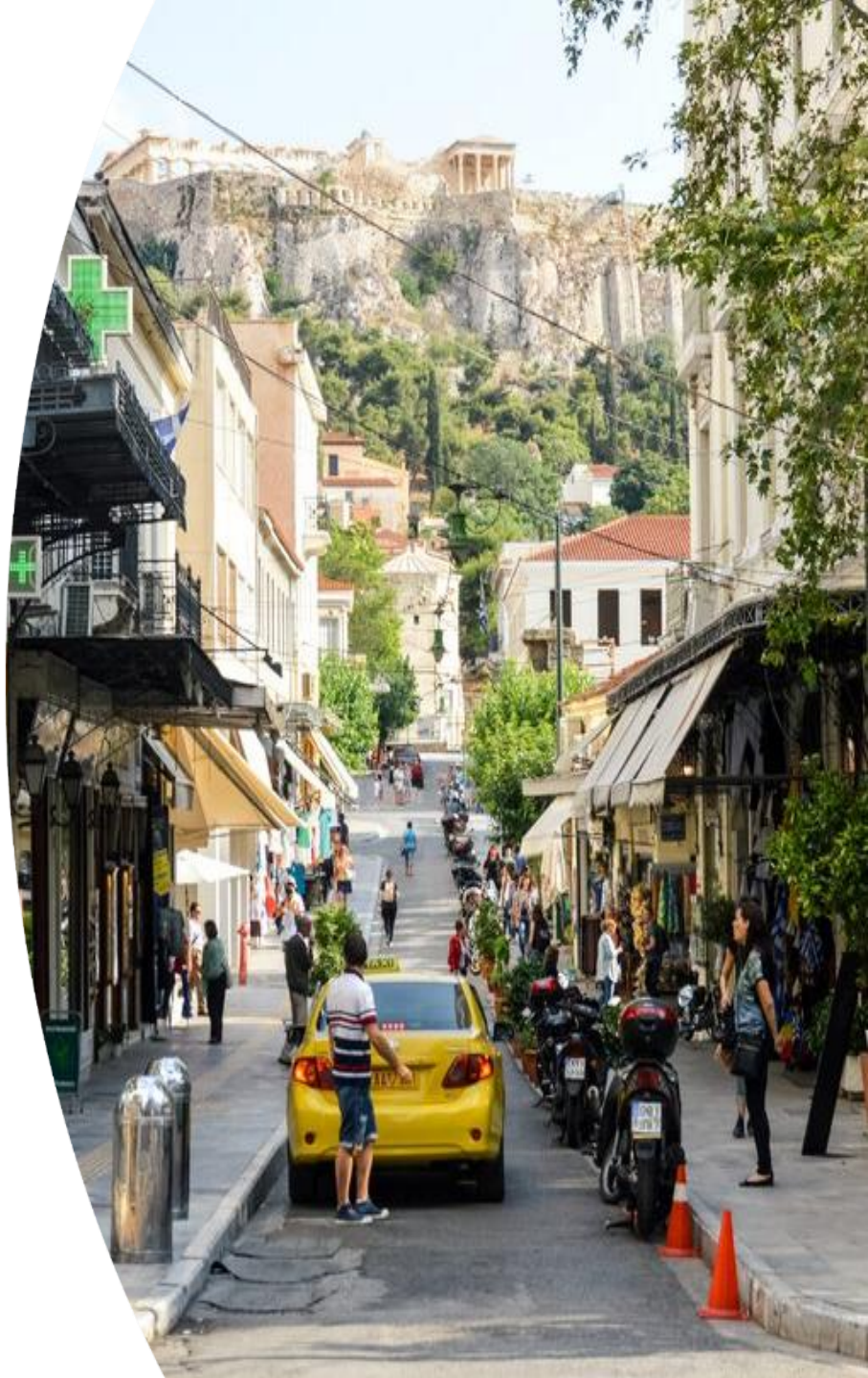
- Investigating the economic viability of reducing the speed limit from 50 km/h to 30 km/h throughout the urban road network of the Municipality of Athens, developing a socio-economic analysis

- Reducing the speed limit is socio-economically sustainable since:
  - NPV = 35 mil. € >0
  - ERR = 64.5% > 0.8%
  - B/C Ratio = 1.55 >1

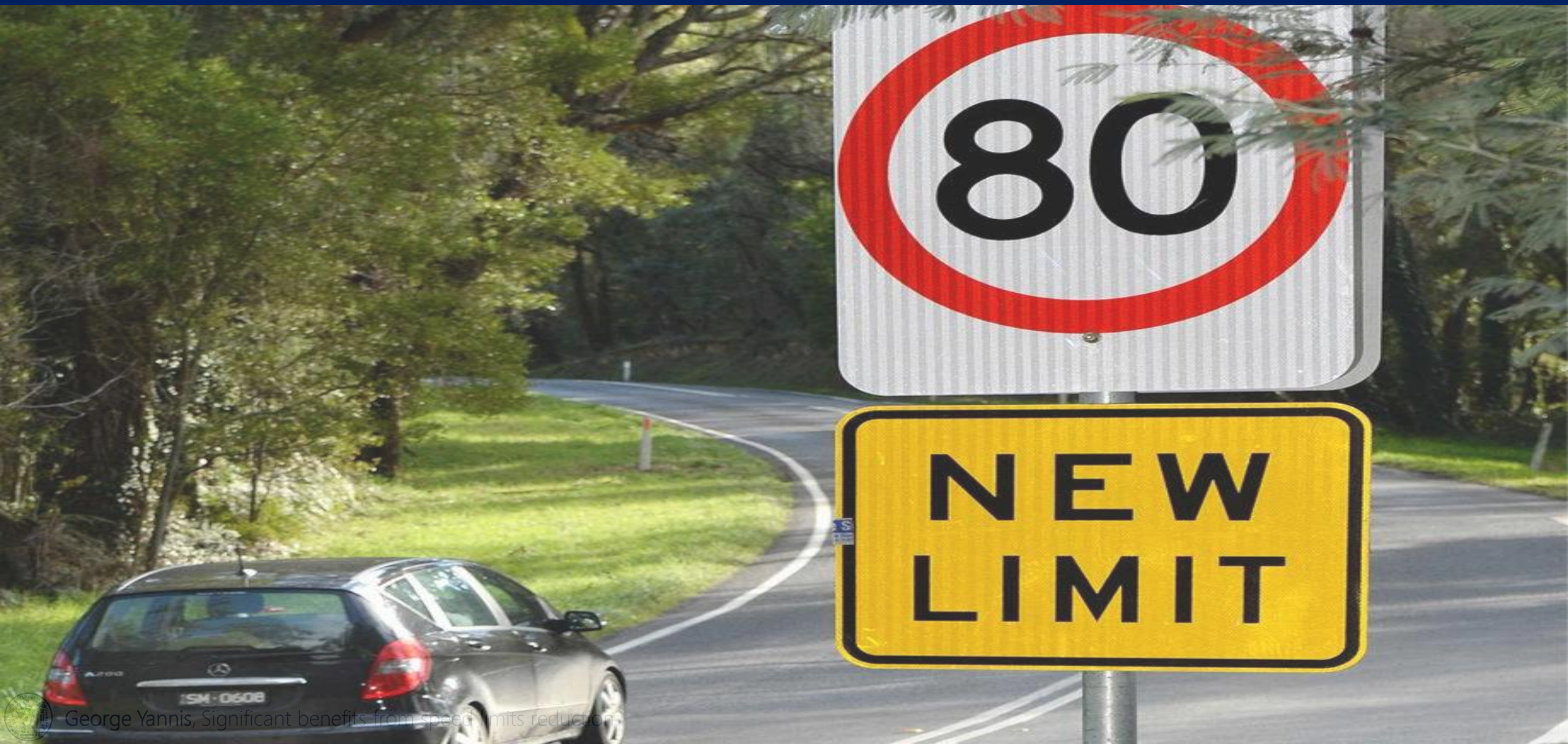
			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
			Installation	Operation								
Benefits and Costs		**NPV (0,8%)**										
C1 Initial Investment cost	**K€**	**-6,103**	**-6,152**	0	0	0	0	0	0	0	0	0
C1.1 Supply and Installation of cameras	K€	-4,980	-5,020	0	0	0	0	0	0	0	0	0
C1.2 Installation of speed humps	K€	-397	-400	0	0	0	0	0	0	0	0	0
C1.3 Supply and installation of signs and markings	K€	-528	-532	0	0	0	0	0	0	0	0	0
C1.4 Cost of study	K€	-198	-200	0	0	0	0	0	0	0	0	0
C2 Operating Cost	**K€**	**-56,918**	**-200**	**-6,605**	**-6,615**	**-6,605**	**-6,615**	**-6,605**	**-6,615**	**-6,605**	**-6,615**	**-6,605**
C2.1 Employment of additional human resources	K€	-51,490	0	-6,000	-6,000	-6,000	-6,000	-6,000	-6,000	-6,000	-6,000	-6,000
C2.2 Operational system maintenance	K€	-2,617	0	-305	-305	-305	-305	-305	-305	-305	-305	-305
C2.3 Mechanical equipment maintenance	K€	-858	0	-100	-100	-100	-100	-100	-100	-100	-100	-100
C2.4 Social media campaigns	K€	-1,915	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200
C2.5 Bi-annual measure effectiveness	K€	-38	0	0	-10	0	-10	0	-10	0	-10	0
Costs (C1+C2)	**K€**	**-63,022**	**-6,352**	**-6,605**	**-6,615**	**-6,605**	**-6,615**	**-6,605**	**-6,615**	**-6,605**	**-6,615**	**-6,605**
B1 Road User surplus	**K€**	**-40,645**	**0**	**-3,126**	**-3,454**	**-4,013**	**-4,711**	**-4,968**	**-5,229**	**-5,495**	**-5,766**	**-6,041**
B1.1 Travel time	K€	-78,227	0	-7,256	-7,404	-8,285	-9,392	-9,583	-9,778	-9,976	-10,178	-10,385
B1.2 Fuel consumption	K€	37,583	0	4,131	3,950	4,272	4,681	4,615	4,548	4,481	4,413	4,344
B2 Externalities	**K€**	**138,465**	**0**	**13,524**	**13,400**	**14,536**	**17,667**	**17,547**	**17,427**	**17,256**	**17,136**	**16,964**
B2.1 Road Safety	K€	129,673	0	12,572	12,469	13,530	16,568	16,465	16,362	16,208	16,106	15,951
B2.2 Environment	K€	8,792	0	952	931	1,006	1,099	1,082	1,064	1,048	1,030	1,013
B2.2.1 CO2 Emissions	K€	7,081	0	754	744	806	884	872	861	849	837	825
B2.2.2 NOx Emissions	K€	1,643	0	189	179	191	207	202	196	191	186	181
B2.2.3 PM Emissions	K€	69	0	9	8	9	8	8	7	8	7	7
Benefits (B1+B2)	**K€**	**97,821**	**0**	**10,398**	**9,946**	**10,523**	**12,956**	**12,579**	**12,198**	**11,761**	**11,370**	**10,923**
NPV	K€	**34,799**	**-6,352**	**3,793**	**3,331**	**3,918**	**6,341**	**5,974**	**5,583**	**5,156**	**4,755**	**4,318**
ERR		64.5%										
B/C Ratio		1.55										

Cost-Benefit Analysis on Athens Urban Road Network (2/2)

- Reducing the speed limit on the urban road network of Athens to 30 km/h is estimated to have an effect by 2030:
  - 33 fewer deaths,
  - 83 fewer serious injuries and 830 fewer light injuries
  - reduction in fuel consumption of 48 mil. liters
  - reduction in CO_2, NO_X and PM emissions of 65.5K tones
- Increase in travel times is not significant
- The indirect benefits of increasing Public Transport use and active commuting are also significant



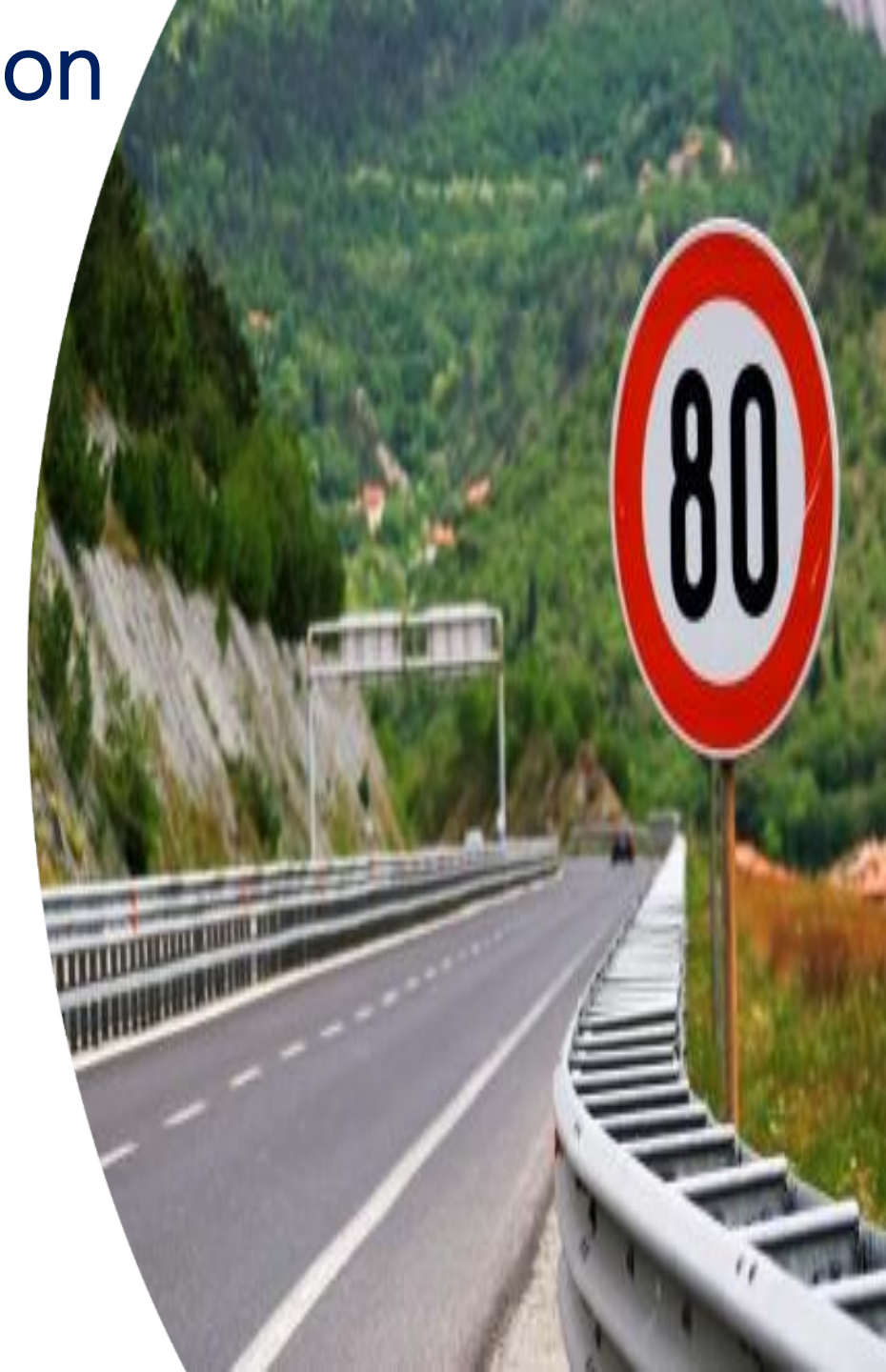
Reduction of Speed Limits in Interurban Network



Interurban Roads - Speed Limit Reduction

- In July 2018, France implemented the reduction of the speed limit on interurban roads from 90 km/h to 80 km/h. With the implementation of the measure, *travel time increased by 2.2%, greenhouse gas emissions* (mainly CO2) *decreased by 3%,* resulting in a corresponding *decrease in fuel consumption by 3%,* while the *mortality rate decreased by 10%*

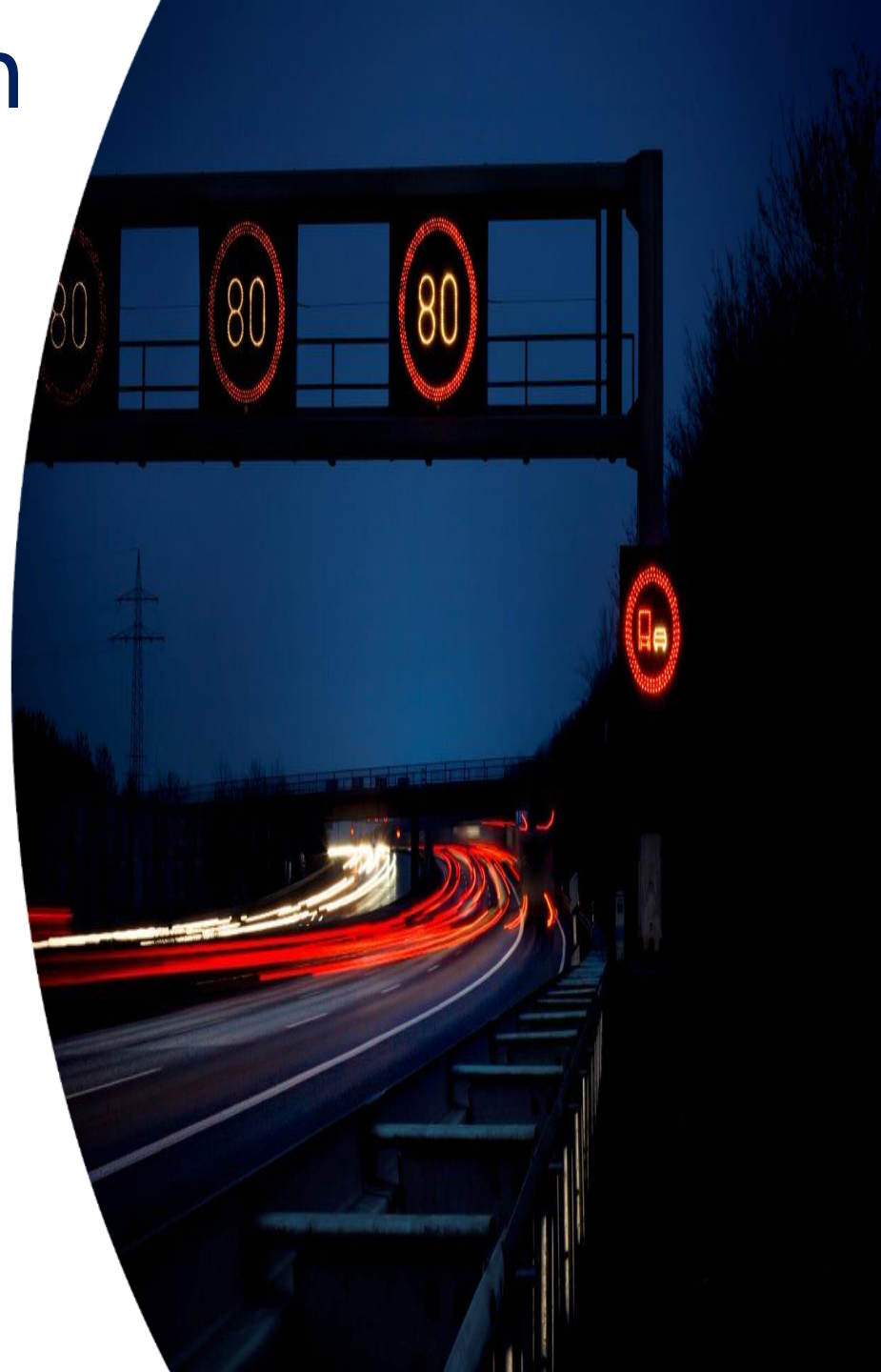
- Oslo in Norway implemented the measure by reducing the speed limit from 80 to 60 km/h for environmental reasons. Analysis shows that the *driving speed was reduced by 5.8 km/h*, which implies potential private benefits in terms of *lower fuel consumption, estimated at 82 NOK per vehicle* per ESL-period. Finally, an improvement in road safety was observed with the range of *reduction in road accidents ranging from 24.7% - 50.9% for fatal accidents*



Motorways - Speed Limit Reduction

- In 2019, in the Netherlands, the speed limit on motorways was reduced to 100 km/h. The measure was intended to *reduce emissions (nitrogen oxides and CO_2)* in the short term - cars travelling at 100 km/h are *25% more efficient than cars travelling at 130 km/h*. However, the implementation of the measure has also had *positive effects on road safety*; at speeds above 100 km/h, each faster kilometer leads to 3-4% more deaths

- Since 2019, Luxembourg has been testing a 90 km/h limit on certain motorway sections during peak hours. Over the last four years, *congestion has increased by 10%* on these sections, *while road accidents have decreased*. The restriction is activated every morning between 6.45am and 9.15am, but the authorities want to use it at other times of the day, noting the positive benefits



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Impact of Speed Limit Reduction on the Interurban Road Network

➢ Results of the implementation of lower speed limits in different countries

Study		Parameter	Annual impact	Country
1. Road Traffic				
1.1 Travel Time				
	ONISR, 2020	Travel Time	+2 %	France
1.2 Fuel Consumption				
	ONISR, 2020	Fuel	-3%	France
2. Road Safety				
2.1 Slight Injuries				
	Lopez-Aparicio et al., 2020Susana Lopez-Aparicio, et al. 2020	Slight Injuries	-14%	Norway
	Elvik, 2004	Slight Injuries	-16%	NA
	ITF, 2018	Slight Injuries	0%	Sweden
2.2 Serious Injuries				
	Lopez-Aparicio et al., 2020	Serious Injuries	-19%	Norway
	Elvik, 2004	Serious Injuries	-30%	NA
	ITF, 2018	Serious Injuries	0%	Sweden
2.3 Fatalities				
	Lopez-Aparicio et al., 2020	Fatalities	-23%	Norway
	Elvik, 2004	Fatalities	-41%	NA
	ITF, 2018	Fatalities	-42%	Sweden
	ONISR, 2020	Fatalities	-10%	France
3. Environment				
3.1 Climate Change (CO_2)				
	ONISR, 2020	CO_2	-3%	France

Cost-Benefit Analysis on Greek Interurban Road Network (1/2)

- Investigation of the economic feasibility of reducing the speed limit from 90 km/h to 80 km/h on the intercity network of Greece (excluding motorways), through a socio-economic analysis

- Reducing the speed limit is socio-economically feasible if:
  - **NPV** = 171M € >0
  - **ERR** = 39,1% > 0.8%
  - **B/C Ratio** = 2,14 >1

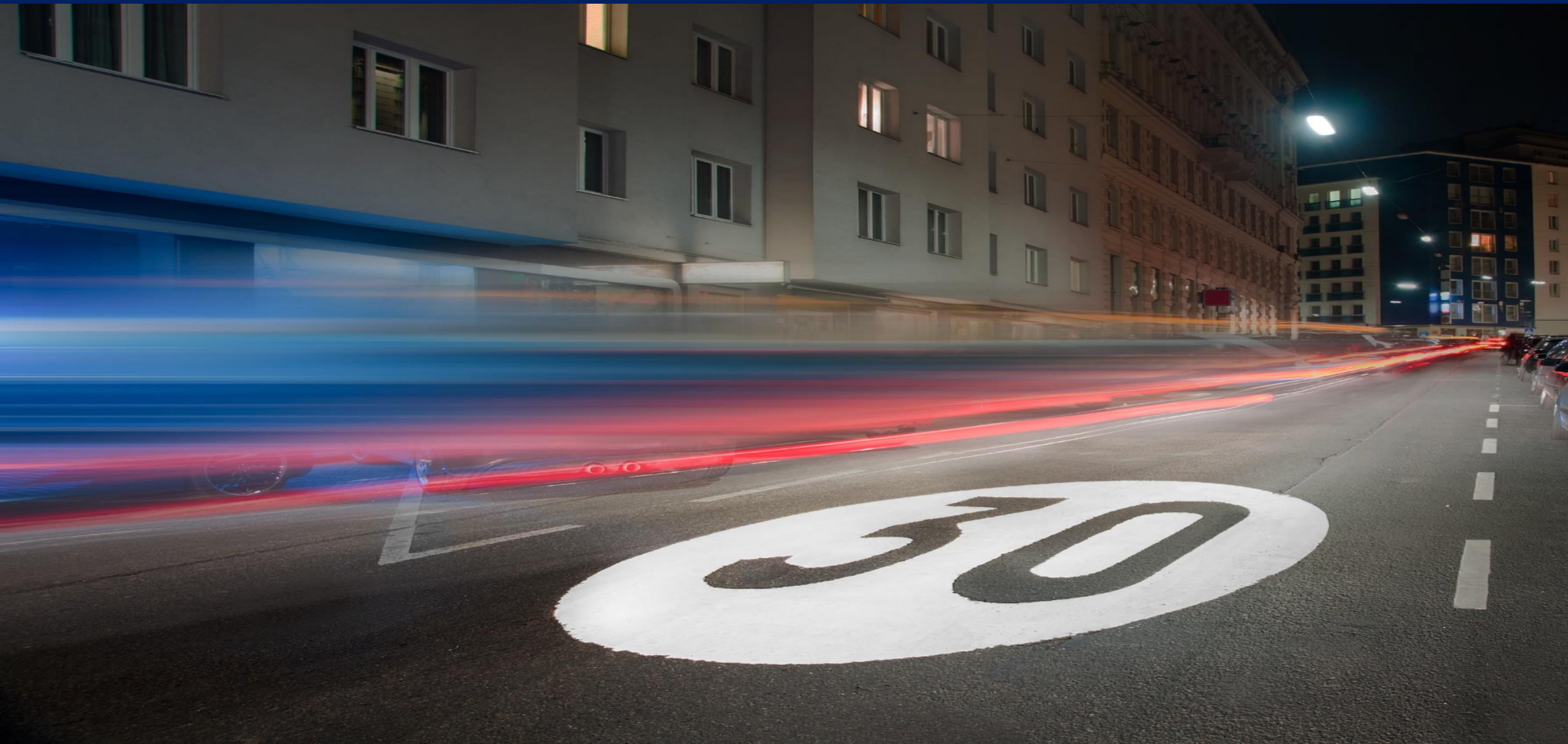
Benefits and Costs			2023	2024	2025	2026	2027	2028	2029	2030
Costs		NPV (0,8%)	Application	Operation						
C1. Initial Investment Cost	K€	-122,000	-122,976	-	-	-	-	-	-	-
C1.1 Study		-744	-750	-	-	-	-	-	-	-
C1.2 Supply and installation of signs		-1,617	-1,630	-	-	-	-	-	-	-
C1.3 Supply and installation of cameras		-119,639	-120,596	-	-	-	-	-	-	-
C2. Operating cost	K€	-27,655	-3,573	-3,593	-3,573	-3,593	-3,573	-3,593	-3,573	-3,593
C2.1 Employment of additional human resources		-21,277	-2,756	-2,756	-2,756	-2,756	-2,756	-2,756	-2,756	-2,756
C2.2 Operational system maintenance		-2,316	-300	-300	-300	-300	-300	-300	-300	-300
C2.3 Annual Mechanical equipment maintenance		-772	-100	-100	-100	-100	-100	-100	-100	-100
C2.4 Social media campaigns		-3,088	-400	-400	-400	-400	-400	-400	-400	-400
C2.5 Bi-annual Measure effectiveness		-77	-	-20	-	-20	-	-20	-	-20
C2.6 Maintenance of signs		-126	-16	-16	-16	-16	-16	-16	-16	-16
Costs (C1+C2)	K€	-149,655	-126,549	-3,593	-3,573	-3,593	-3,573	-3,593	-3,573	-3,593
Economic Impacts and Benefits										
B1 Road User surplus	K€	-170	-12	-17	-23	-23	-24	-25	-26	-26
B1.1 Travel time		-311	-24	-34	-43	-43	-44	-44	-45	-45
B21 2 Fuel consumption		141	12	17	20	20	20	20	19	19
B2 Externalities	K€	320,598	31,762	43,925	53,785	41,624	41,522	41,471	39,221	38,897
B2.1 Road Safety		320,538	31,758	43,919	53,777	41,617	41,514	41,463	39,212	38,887
B2.2 CO2 emissions		59	4	6	7	8	8	9	9	10
Benefits (B1+B2)	K€	320,428	31,750	43,908	53,762	41,601	41,498	41,447	39,196	38,870
NPV	K€	170,773	-94,798	40,315	50,189	38,009	37,926	37,854	35,623	35,278
IRR		39.1%								
B/C Ratio		2.14								

Cost–Benefit Analysis on Greek Interurban Road Network (2/2)

- Reducing the speed limit on the interurban road network to 80 km/h is estimated to have an effect by 2030:
  - 136 fewer deaths,
  - 55 fewer serious injuries and 486 fewer light injuries
  - Reduction in fuel consumption of 163 thousand liters
  - reduction in CO_2 emissions of 324 tones

- Increase in travel times is not significant

Conclusions



Conclusions

More livable cities

Speed limits reduction gaining rapid acceptance across Europe and more and more Europe's cities adopting lower speed limits

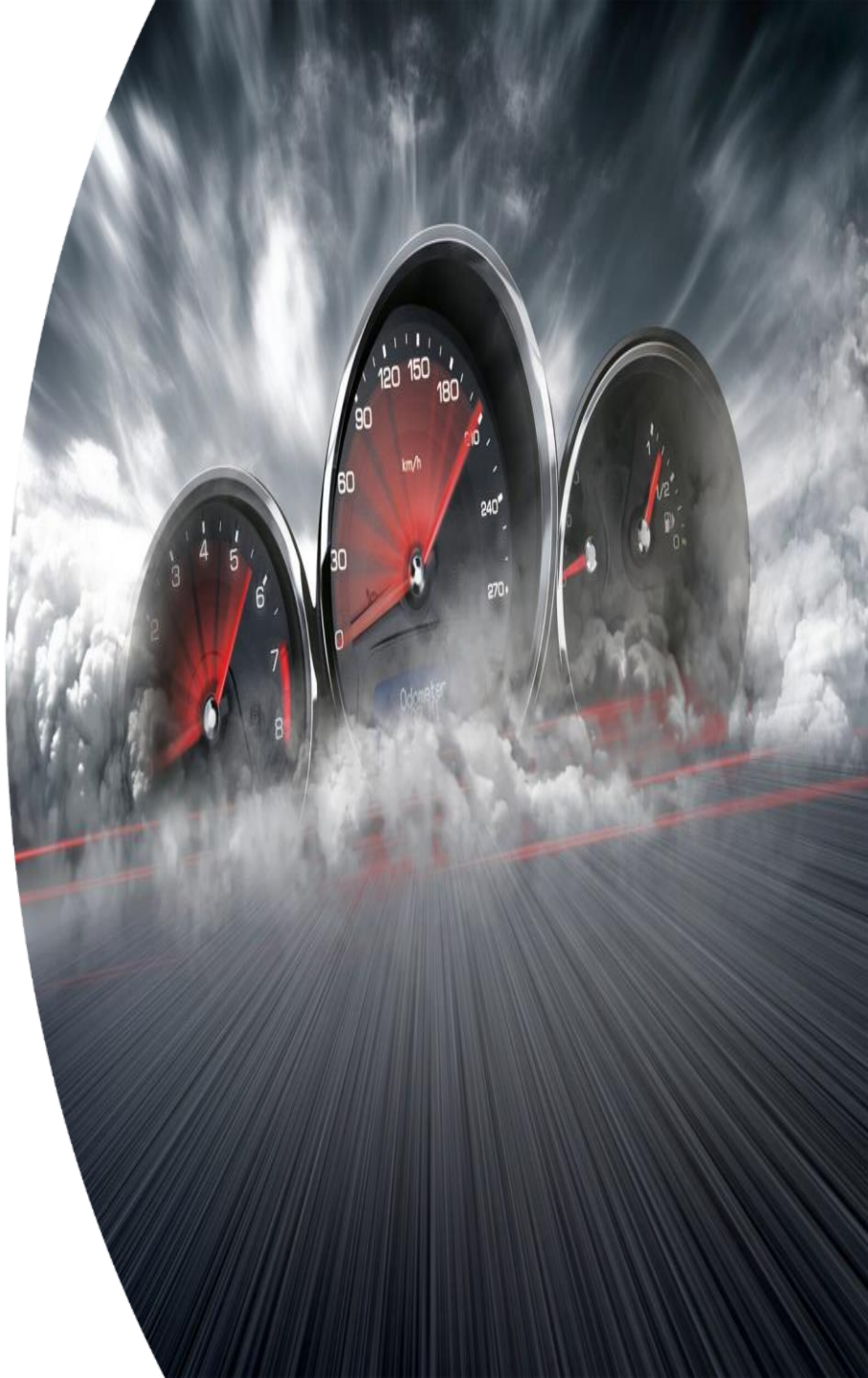
Significant socio-economic impact

The reduction of speed limits in cities (30km/h), on the interurban network (80km/h) and on motorways (100km/h) leads to a significant reduction in:

- fuel/energy consumption and air pollution
- road crashes and congestion
  without a significant decrease in travel times

Increase of commuters' acceptance

- Public acceptance of speed limits reduction tends to improve over time
- Pedestrians, cyclists and public transport passengers are more strongly in favour of lower speeds for private cars



Implementation Modalities (1/2)

Public Awareness Campaigns

- Emphasize the safety benefits and explain the rationale behind the 30km/h speed limit to gain public support
- Convince the society (citizens and politicians) to support large-scale interventions
- Launch public awareness through media campaigns, road signage, informational brochures and community outreach programs

Public Transportation and Active Mobility Promotion

- Encourage the use of public transportation and active mobility options, such as walking and cycling
- Enhance public transit services, developing cycling infrastructure, and creating pedestrian-friendly zones can help reduce the reliance on private vehicles and contribute to a safer and more sustainable urban environment

Traffic Calming Measures

- Implement physical changes to the road infrastructure, such as speed bumps, raised crosswalks, traffic circles and narrower lanes

Implementation Modalities (2/2)

Intelligent Transportation Systems

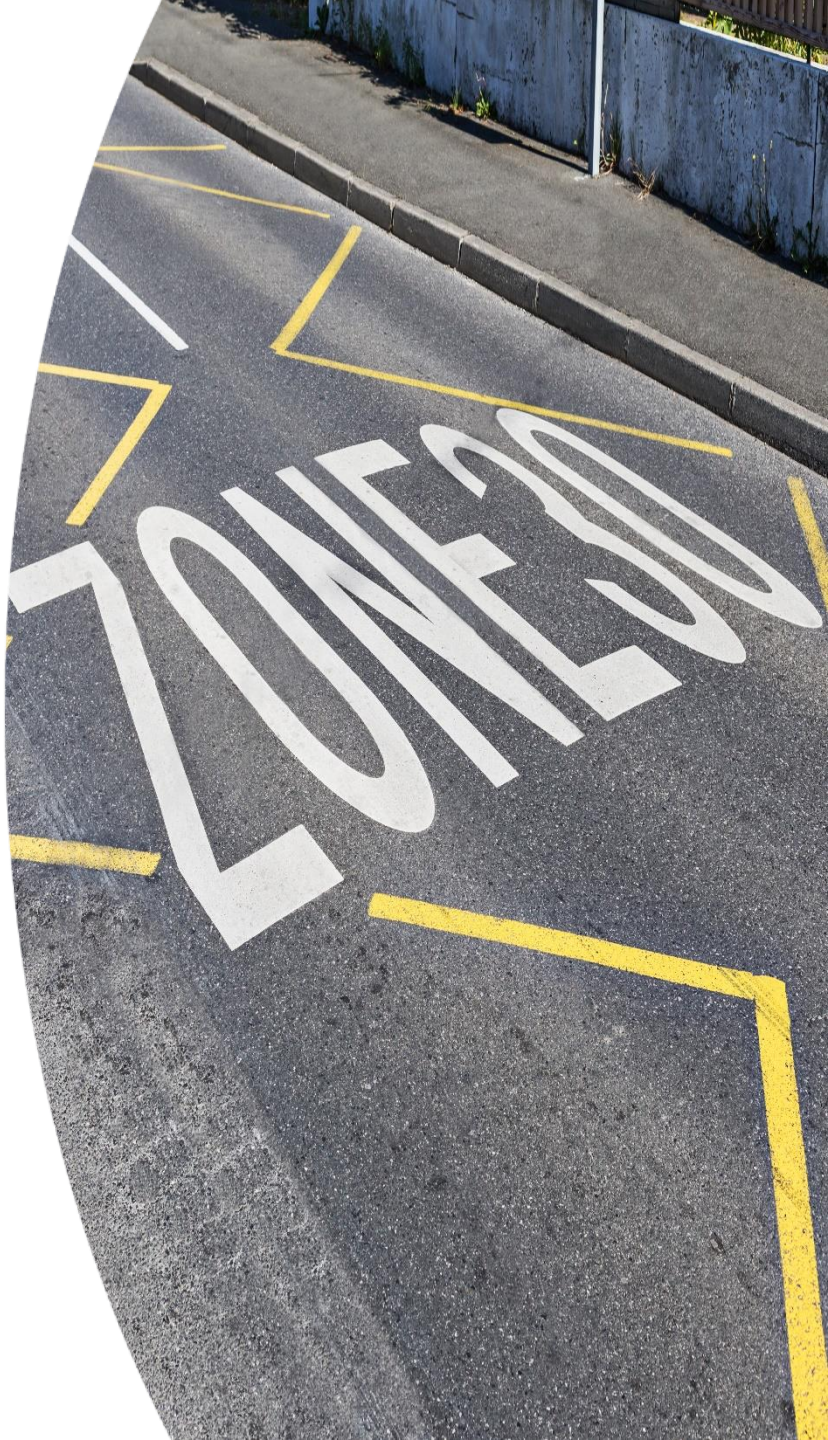
- Install electronic speed limit signs that display the current speed limit and use radar speed displays to alert drivers of their speeds
- Implement adaptive traffic signal systems that adjust signal timings based on prevailing speeds

Monitoring and Evaluation

- Collect data on traffic volumes, vehicle speeds, crash statistics and public feedback to assess the effectiveness of the implemented measures
- Use this information to make necessary adjustments and improvements over time

Enforcement and Police Cooperation

- Promote the collaboration between stakeholders and government levels to implement sustainable mobility and safety policies more effectively
- Collaborate with law enforcement agencies to ensure proper enforcement of the speed limit
- Educate and train police officers on the importance of the new speed limit and the increased presence of traffic patrols

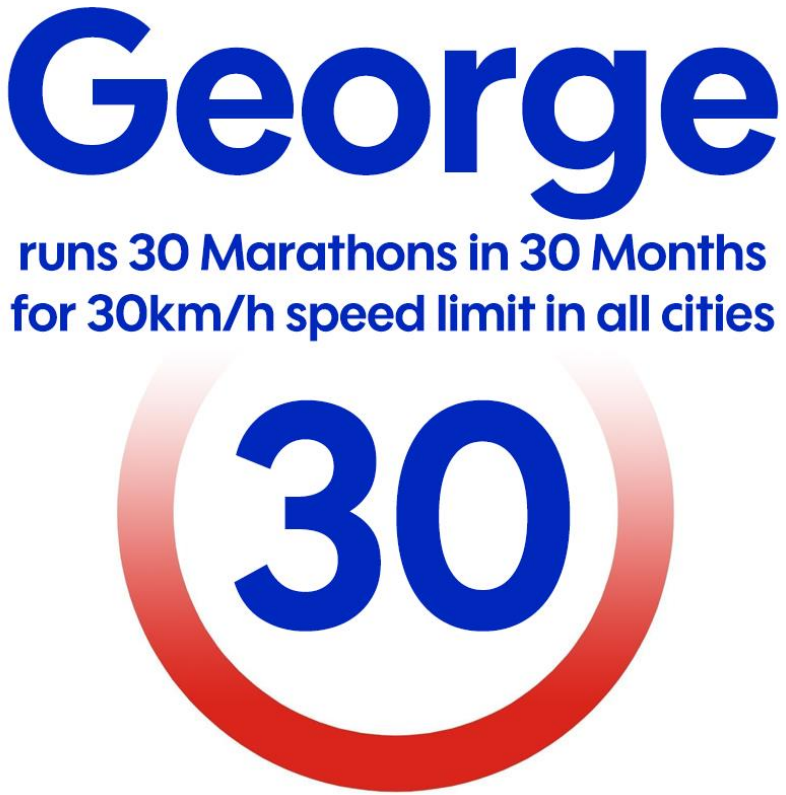


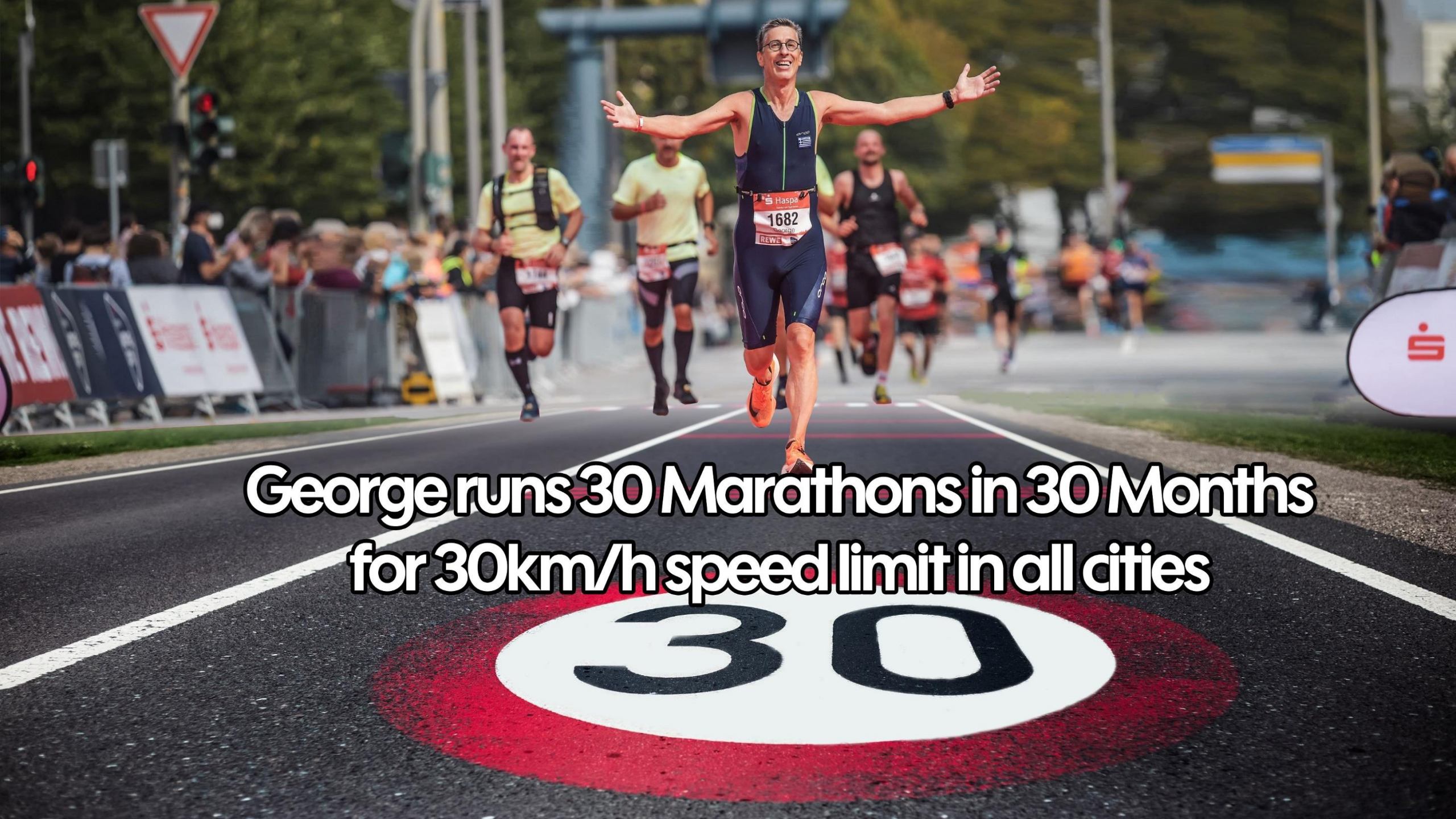
Campaigns to Reduce Speed Limits

- Scientific evidence from several cities so far, demonstrates more than 40% lives saved with the introduction of 30km/h zones; in parallel to significant environmental, energy and health impacts with less fuel consumption and more walking and cycling

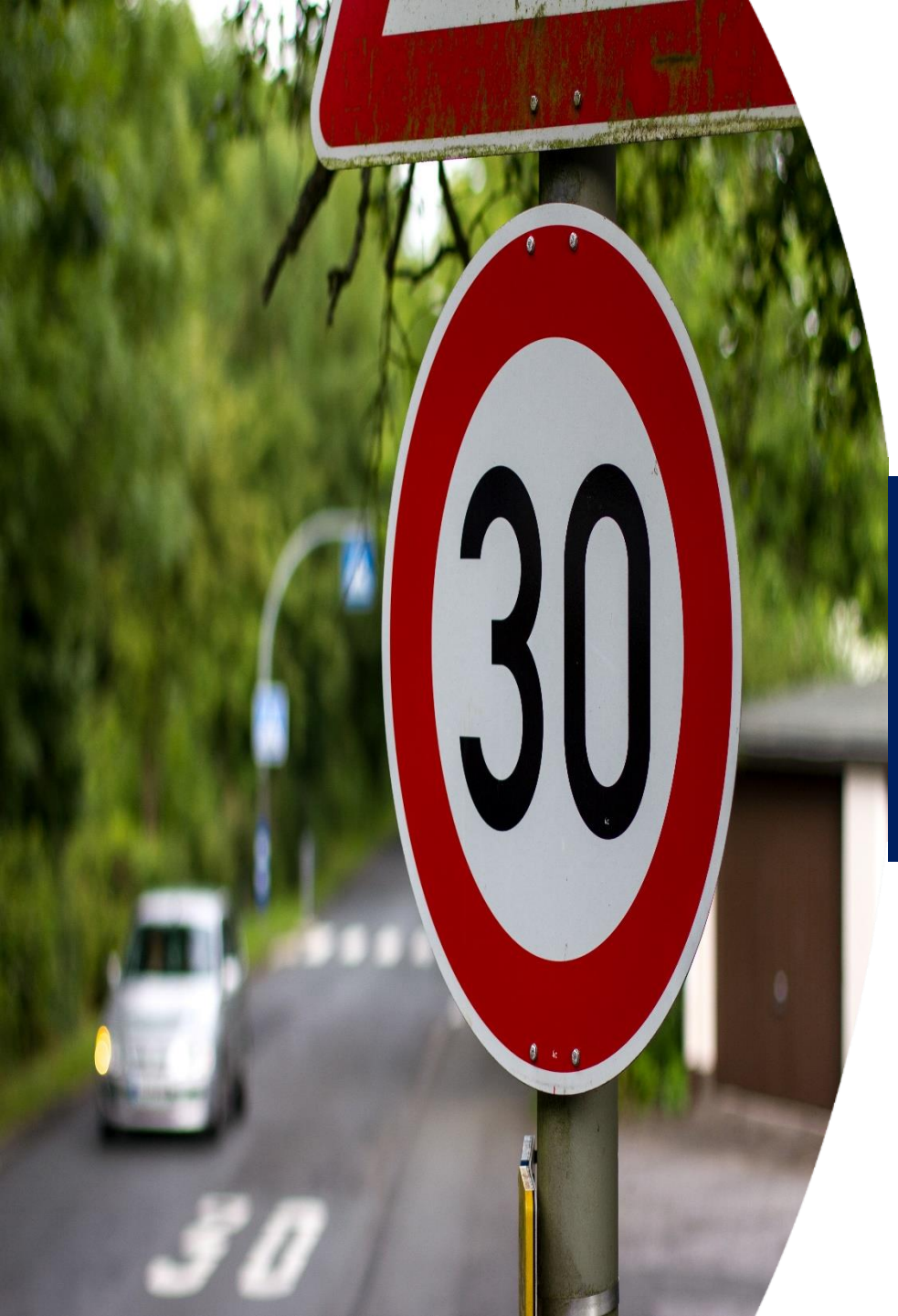
- The discussion and introduction of 30 km/h city zones faces strong reactions and rigid inertia, whereas supporters' voices are weak and inefficient resulting in hesitant politicians and Authorities

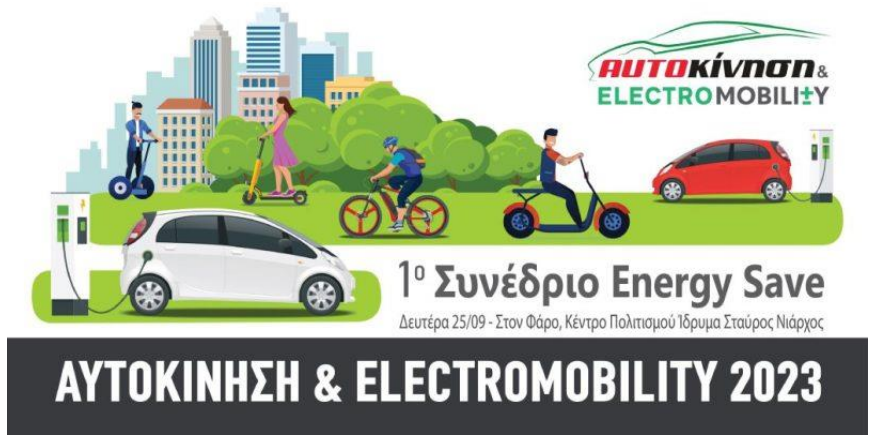
- After more than 30 years of dedication to road safety science and several Marathon races, stepping beyond the continuous scientific pleas and promoting more actively the 30 km/h city through the challenge of 30 Marathons in 30 months





George runs 30 Marathons in 30 Months for 30km/h speed limit in all cities





Significant benefits from speed limits reduction

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