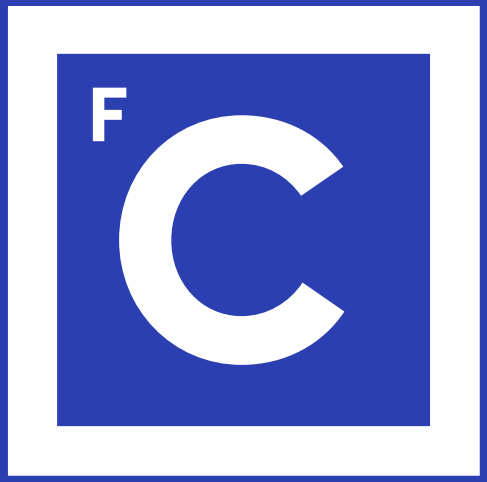


Ciências ULisboa

Faculdade
de Ciências
da Universidade
de Lisboa

Eng. Energy & Environment

Sustainable Mobility

Information

Prof. Carla Silva camsilva@fc.ul.pt

PhD student Ângelo Soares arsoares@fc.ul.pt

Transport related SDG

MAKE CITIES AND HUMAN SETTLEMENTS INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE

Challenge

Mobility and the SDGs: A safe, affordable, accessible and sustainable transport system for all

Challenge

CHALLENDGE

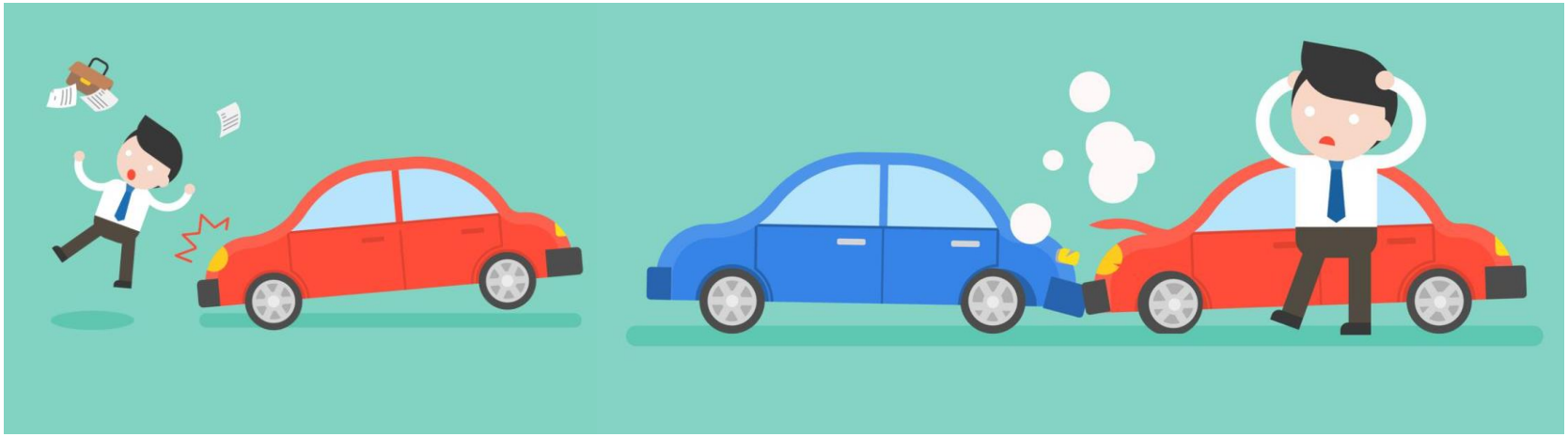
Is Lisbon mobility more sustainable than Other cities (at least 3 cities)?

Challenge

Assignment #1

Calculate the indicator for 2011 and 2017:

$$\frac{(NUMBER\ OF\ INJURIES + NUMBER\ OF\ DEATHS)}{POPULATION} * 100.000$$

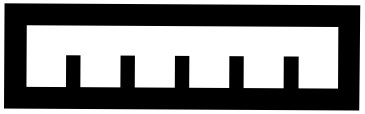


Acidente Vetores por Vecteezy

Assignment #1

Transform the outcome in a 0 to 10 scale

Linear Interpolation

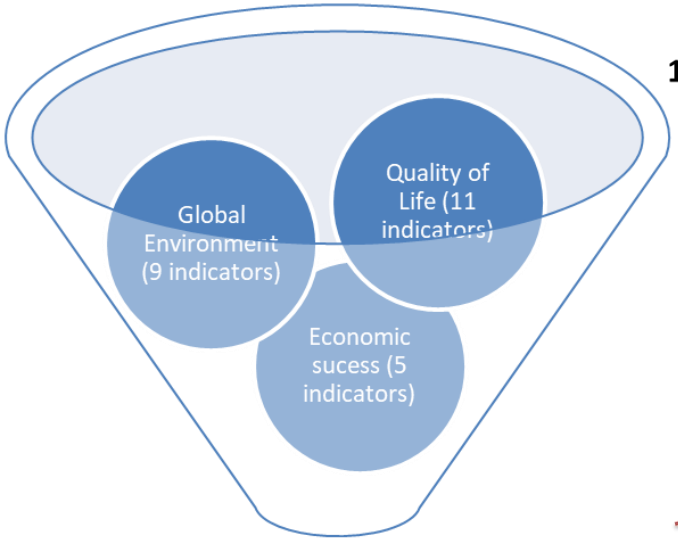


0	>= ?? per 100.000 inhabitants
10	0 fatalities per 100.000 inhabitants

Challenge

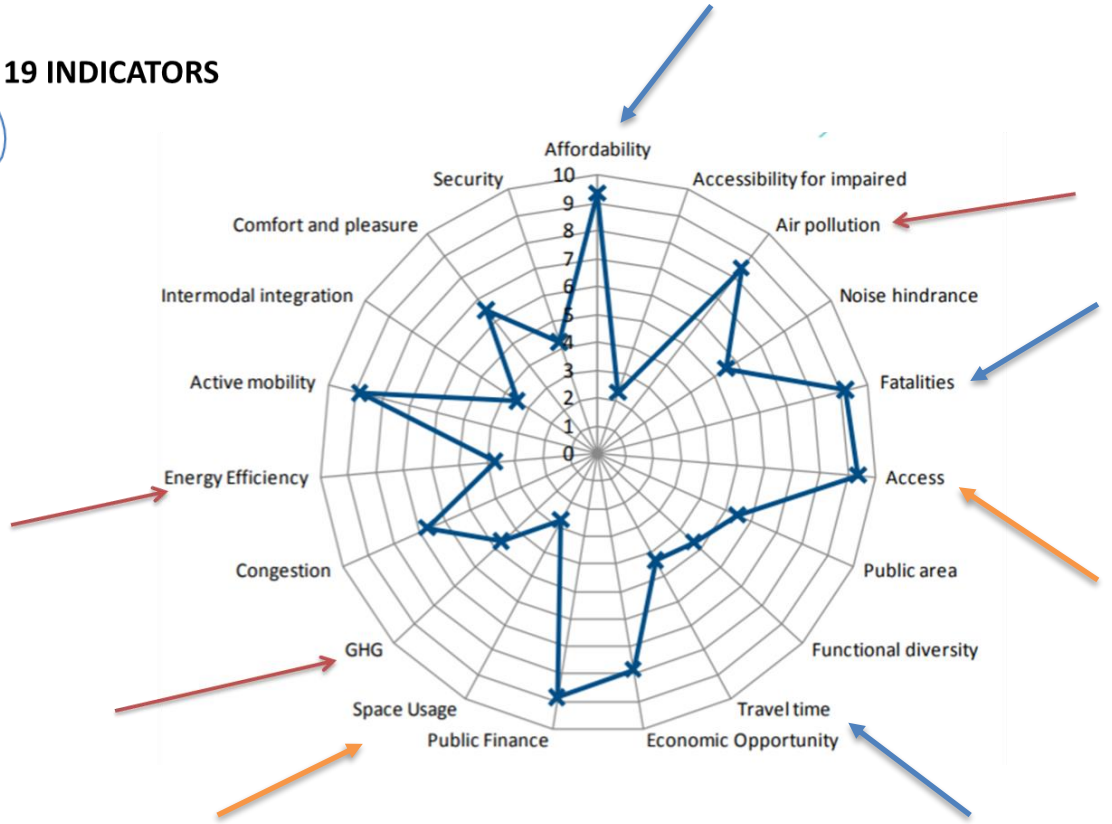
https://www.wbcsd.org/Programs/Cities-and-Mobility/Sustainable-Cities/City-Business-Collaboration/SiMPlify/Resources/SMP2.0-Sustainable-Mobility-Indicators-2nd-Edition

SMP2.0 – Sustainable Mobility Project v2.0



Radar graph

19 INDICATORS



wbcsd mobility

Challenge

FATALITIES (page 40)

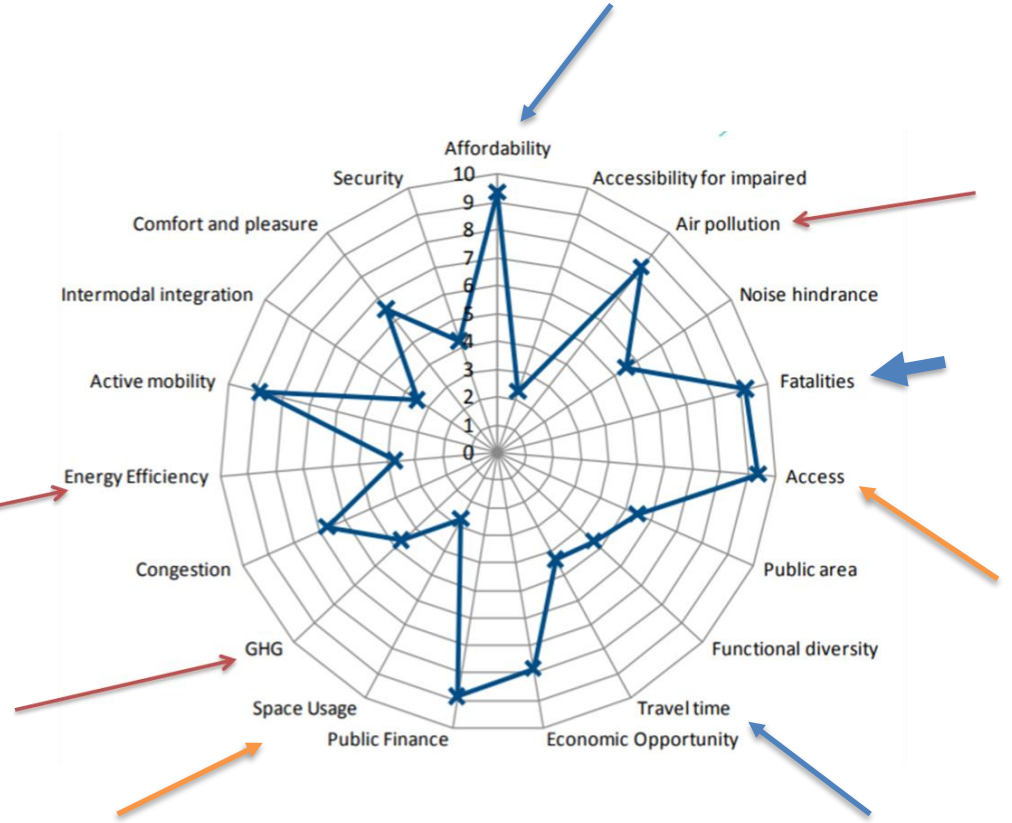
d Formula & calculation method

$$FR = \frac{\sum_i K_i * 100000}{Cap}$$

FR = Fatality rate [# per 100.000 population per year]

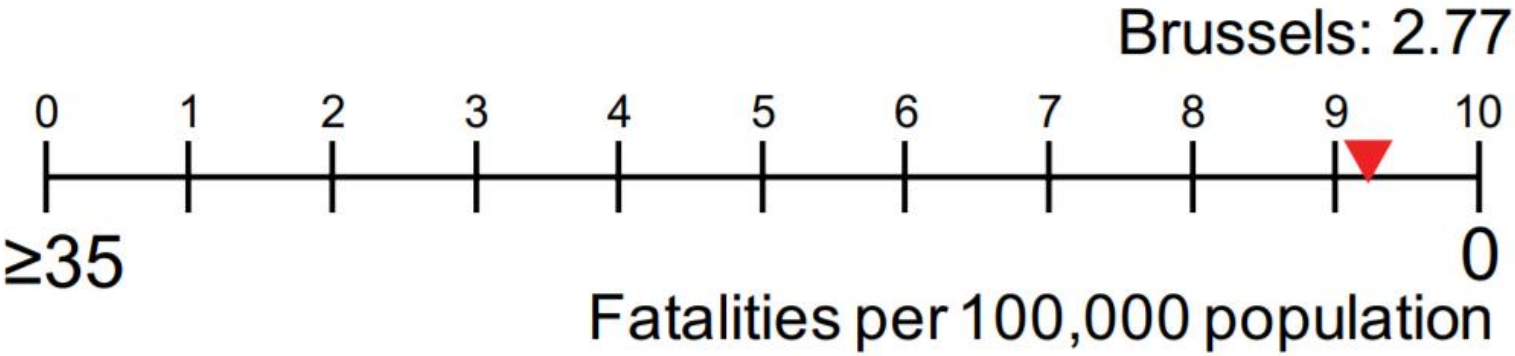
Ki = Number of persons killed in transport mode i [# per year]

Cap = Capita or number of inhabitants in the city [#]
i = Transport mode (passenger car, freight traffic, tram, bus, train, motorcycle, river transport, etc.) [type]



Challenge

f Scale



➔ 0: 35 [fatalities/100.000 capita]
➔10: 0 [fatalities/100.000 capita]
➔Reference for scale 0; “Vision zero” objective
➔Reference for scale 10; Egypt, 2000: 42 fatalities per 100.000 pop.

Population

Portugal Census each 10 year, last one CENSUS 2021

https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0011166&xlang=pt

https://censos.ine.pt/scripts/db_censos_2021.html

Population

Portugal Census each 10 year, last one CENSUS 2021

› Incluir/retirar indicadores | › Alterar condições de seleção | › Alterar formato do quadro | › Visualizar quadro

Período de referência dos dados	Local de residência	População residente (N.º) por Local de residência, Sexo e Grupo etário; Decenal (1)		
		Sexo		
		HM	H	M
		Grupo etário		
		Total		
		N.º	N.º	N.º
2021	Portugal	10 344 802	4 921 170	5 423 632
	Continente	9 857 593	4 687 985	5 169 608
	Área Metropolitana do Porto	1 736 491	822 395	914 096
	Área Metropolitana de Lisboa	2 870 770	1 350 790	1 519 980
2011	Portugal	10 562 178	5 046 600	5 515 578
	Continente	10 047 621	4 798 798	5 248 823
	Área Metropolitana do Porto	1 759 524	838 916	920 608
	Área Metropolitana de Lisboa	2 821 876	1 334 605	1 487 271

População residente (N.º) por Local de residência, Sexo e Grupo etário; Decenal - INE, Recenseamento da população e habitação - Censos 2021

Nota(s):

(1) Dados provisórios.

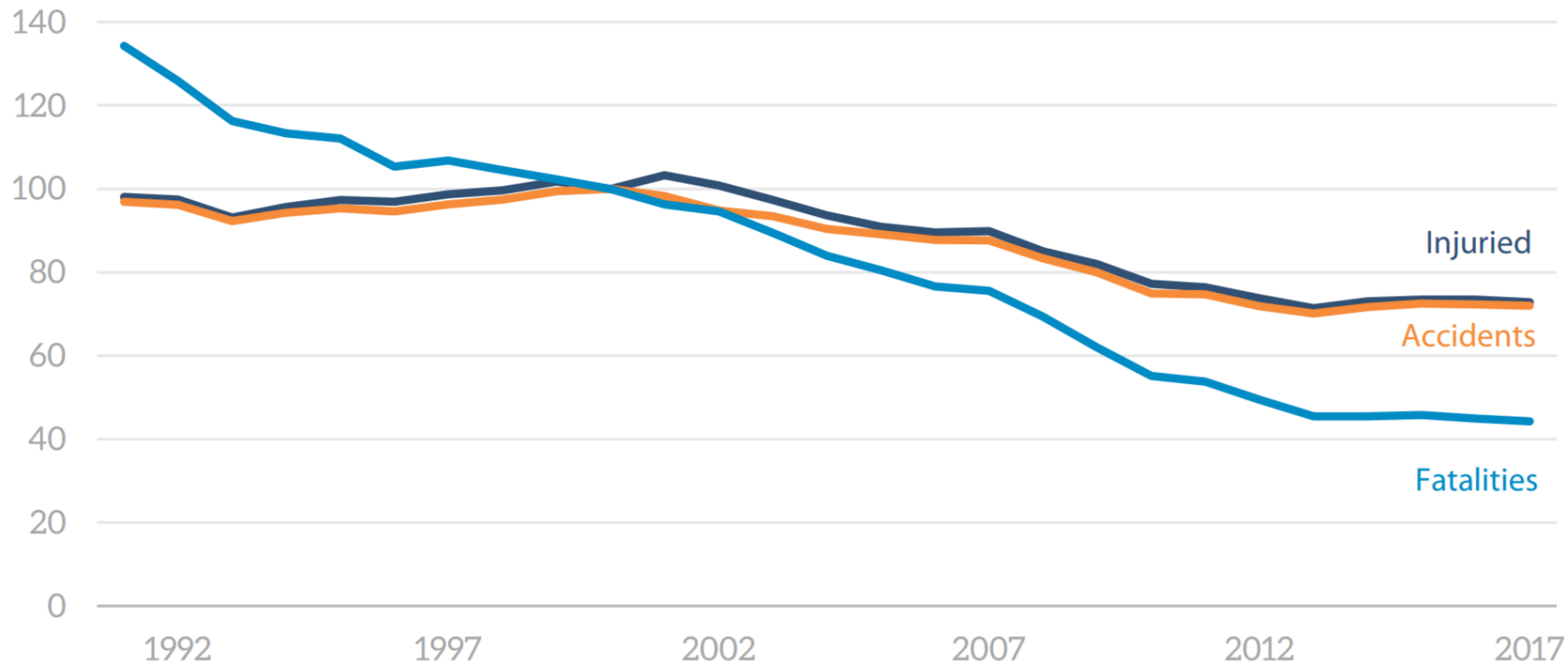
Última atualização destes dados: 16 de dezembro de 2021

Challenge


Vision Zero
Our goal is to to reduce road deaths to zero by 2050

Challenge

Figure 1 – Evolution of fatalities, accidents and injured in the EU (reference year 2000 = 100)



Source: EPRS calculation based on CARE (EU road accidents database) or national publications, December 2018.

Challenge

The long-term evolution, between 1991 and 2017, of three indicators – fatalities, accidents and injured people – shows that the EU has witnessed substantial improvements in terms of road safety, especially since 2000. While the number of injured people culminated at over 2 million in 2001, the figure steadily declined (with an exception for 2014 onwards) to over 1.4 million injured in 2017. In terms of fatalities, the downward trend was more constant, from 76 647 fatalities in 1991 to 54 960 in 2001 and 25 261 in 2017 (with slight exceptions, e.g. in 2014 and 2015). The evolution in terms of accidents followed a pattern somewhat similar to that of people injured, peaking at around 1.5 million in 2000, down to

https://epthinktank.eu/2016/11/21/road-safety-in-the-eu/evolution-of-fatalities-accidents-and-injured-in-the-eu/

Challenge

$$\frac{(NUMBER\ OF\ INJURIES + NUMBER\ OF\ DEATHS)}{POPULATION} * 100.000$$

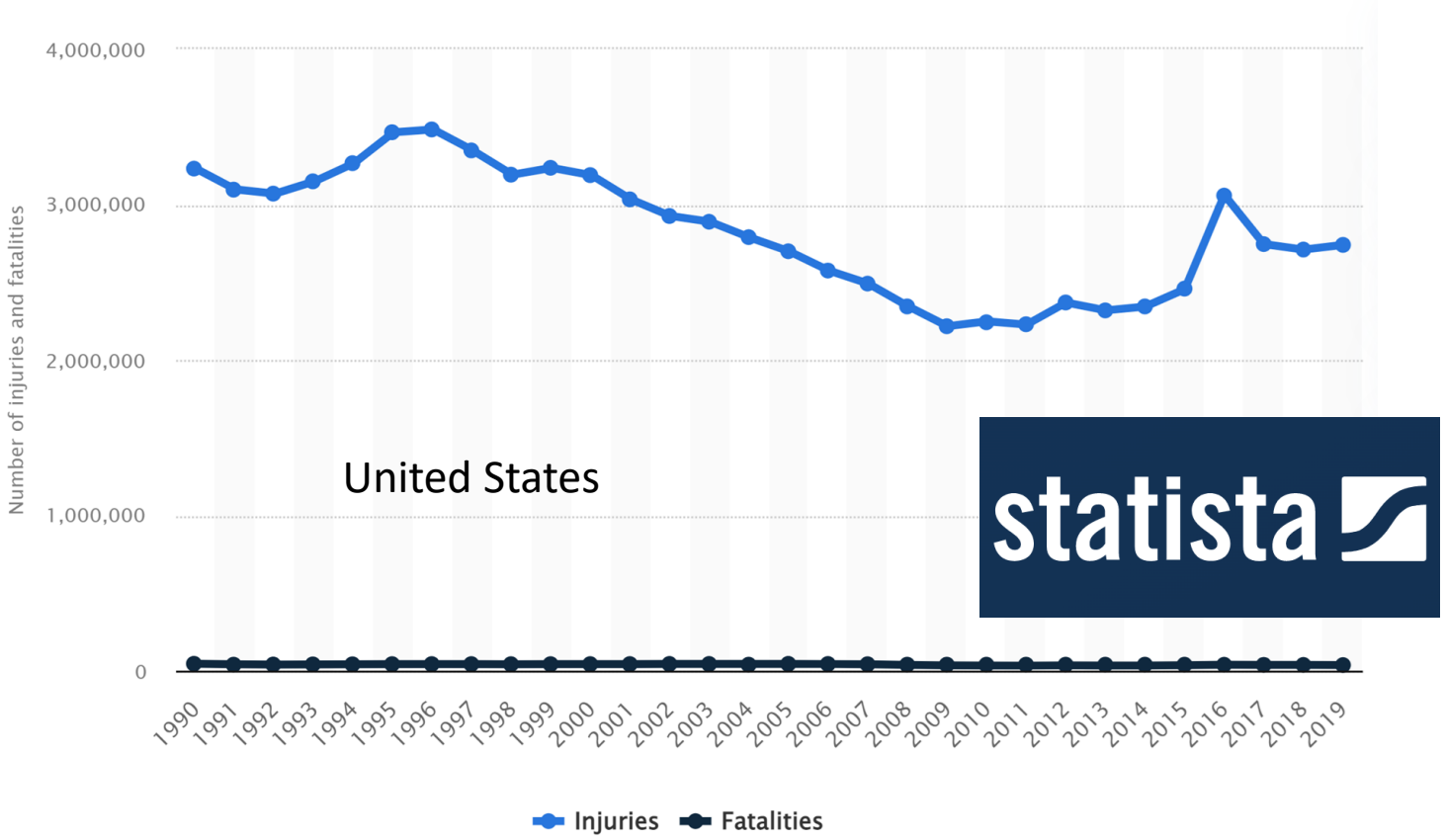
In 2001

$$\frac{(2000000 + 54\ 960)}{450000000} * 100.000 = 457$$

https://epthinktank.eu/2016/11/21/road-safety-in-the-eu/evolution-of-fatalities-accidents-and-injured-in-the-eu/

Challenge

The issue in considering injuries and fatalities is that the 0 cannot be maintained at >=35…..



Challenge

The issue in considering injuries and fatalities is that the 0 cannot be maintained at >=35…..

3 000 000/ 325 000 000*100 000 = 923

2017

?

https://www.sciencedirect.com/science/article/pii/S2352146517307913

Challenge

In 2013, 137 423 fatalities and 469 900 injuries

607 323/1 281 000 000*100 000 = 47.4

https://www.sciencedirect.com/science/article/pii/S2352146517307913

Challenge

Motorization index and new road safety index

Number of cars/1000 inhabitants

821 @ 2017

Index 923

430 @ 2001

Index 457

22 @ 2013

Index 47.4

Motorization & new road safety index

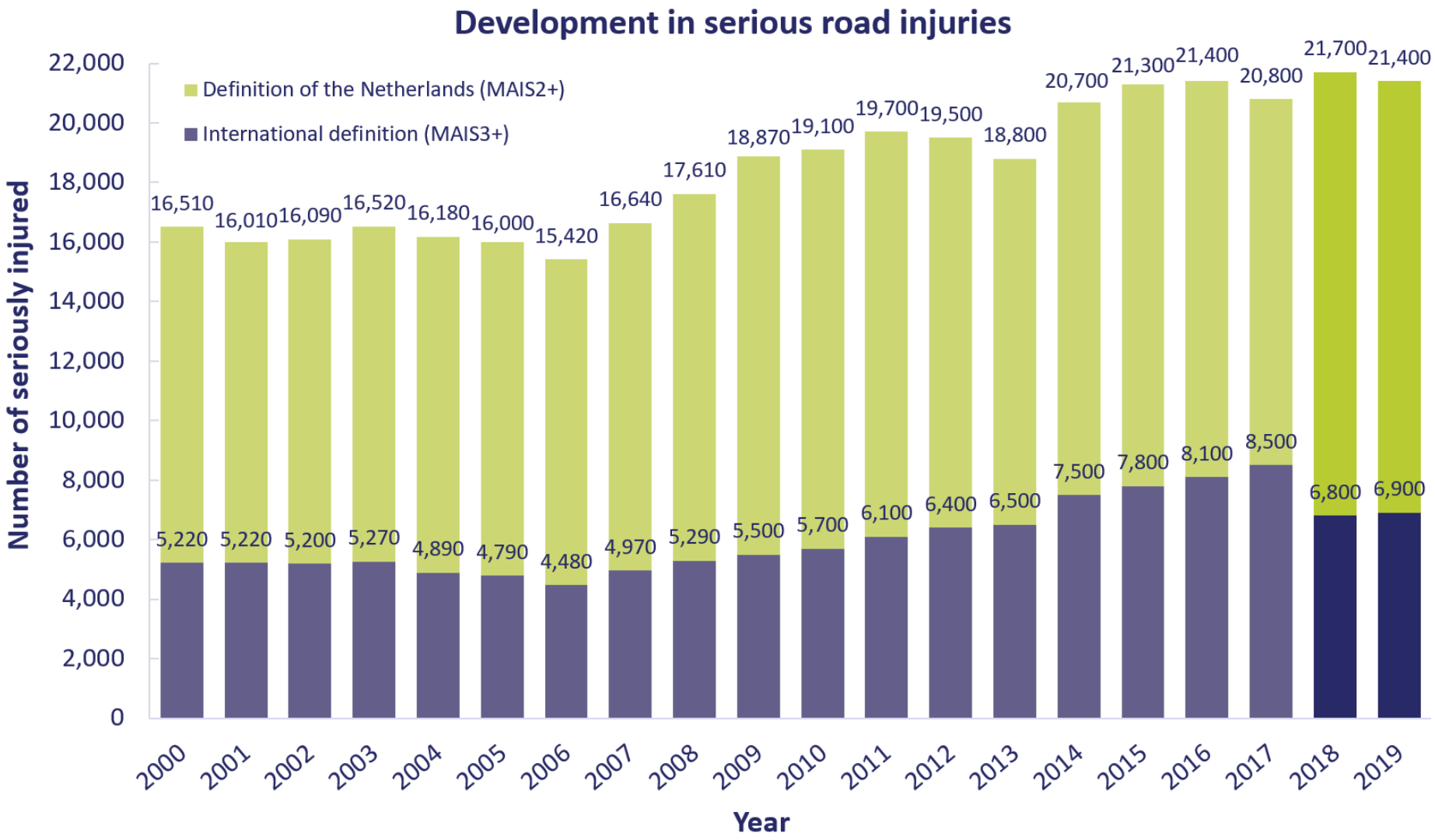
netherlands

464 @ 2018

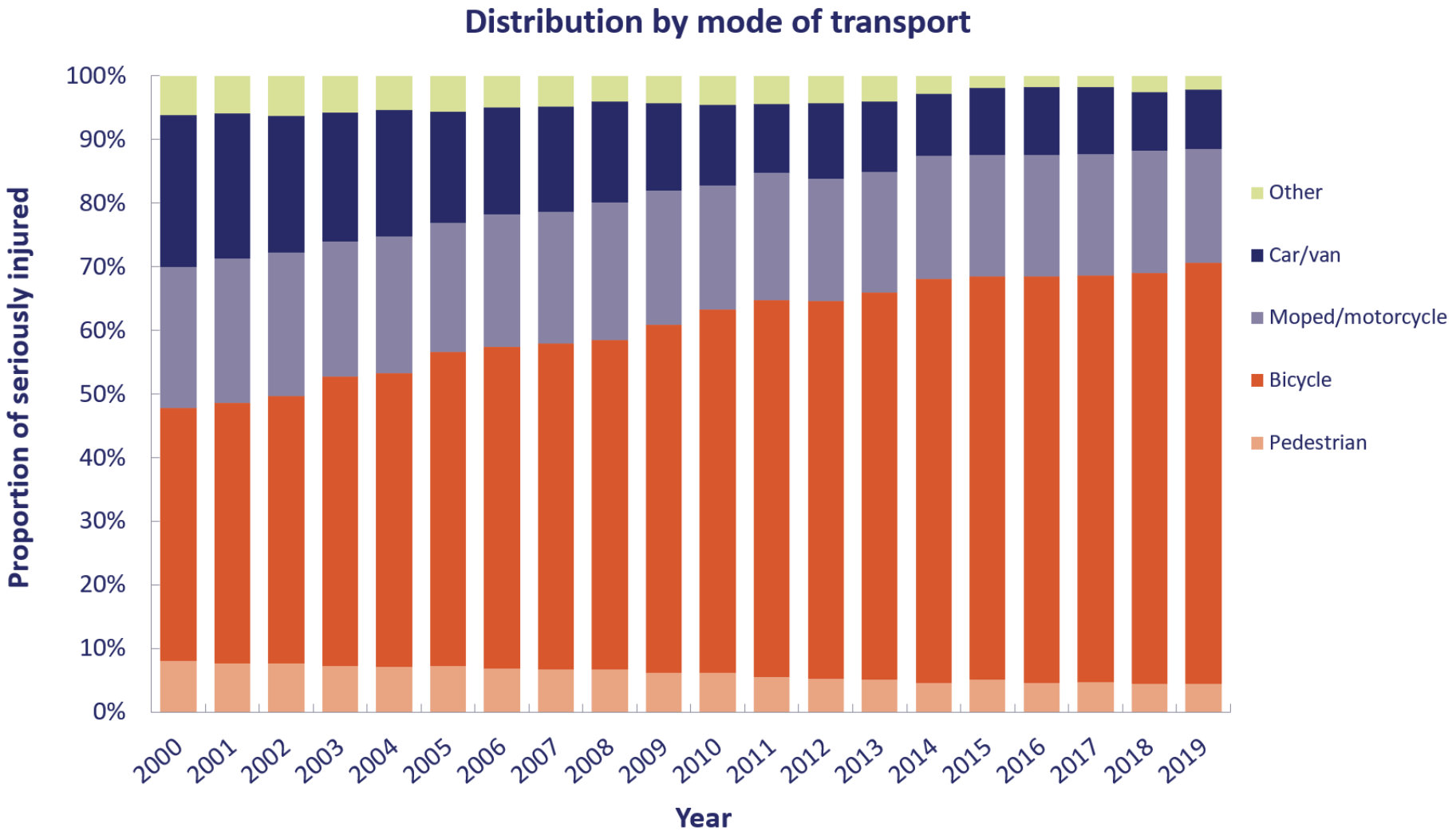
367 @ 1990

$$\frac{(NUMBER\ OF\ INJURIES + NUMBER\ OF\ DEATHS)}{POPULATION} * 100.000$$ in 2019???

Motorization & new road safety index

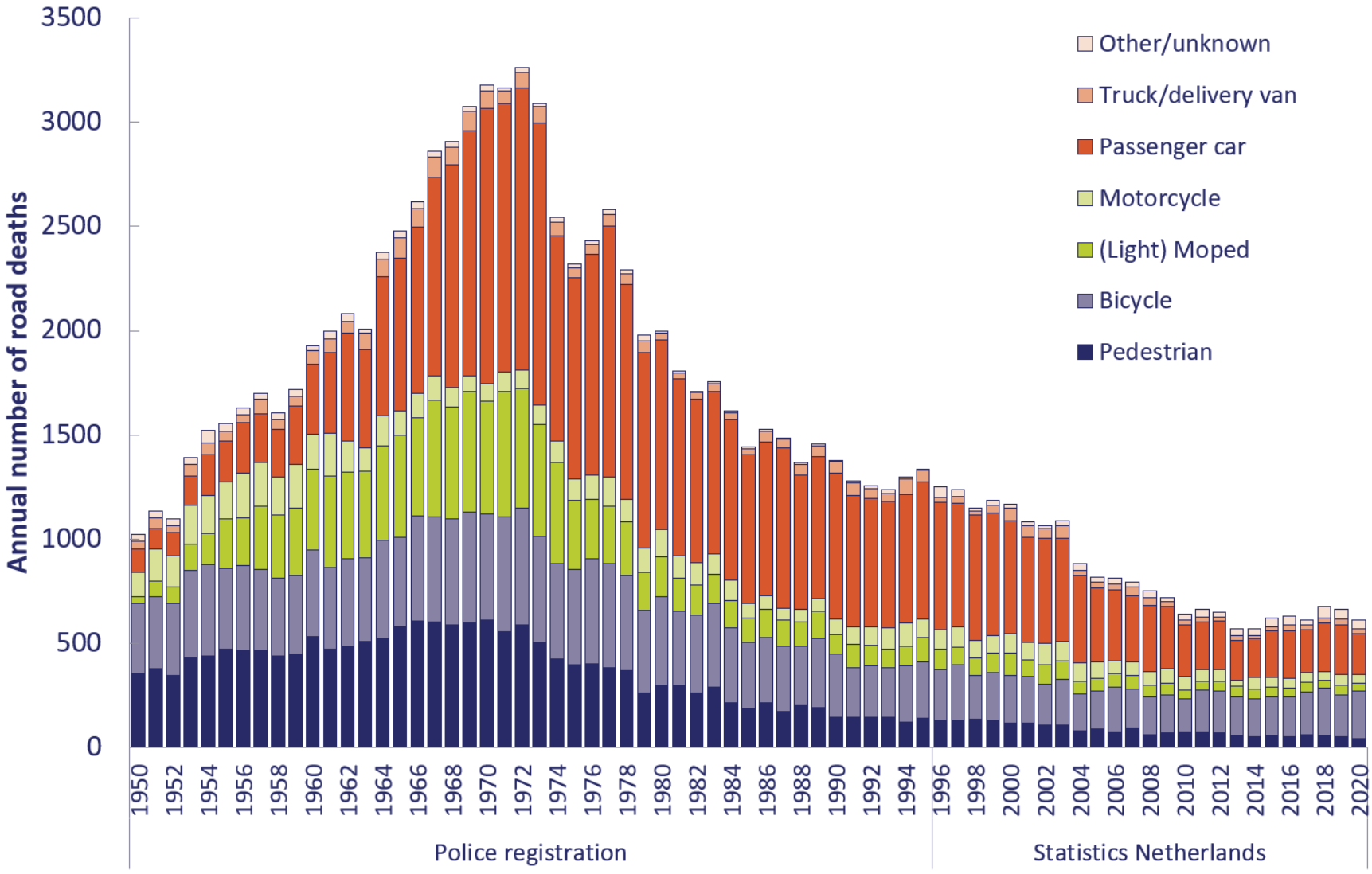


Motorization & new road safety index

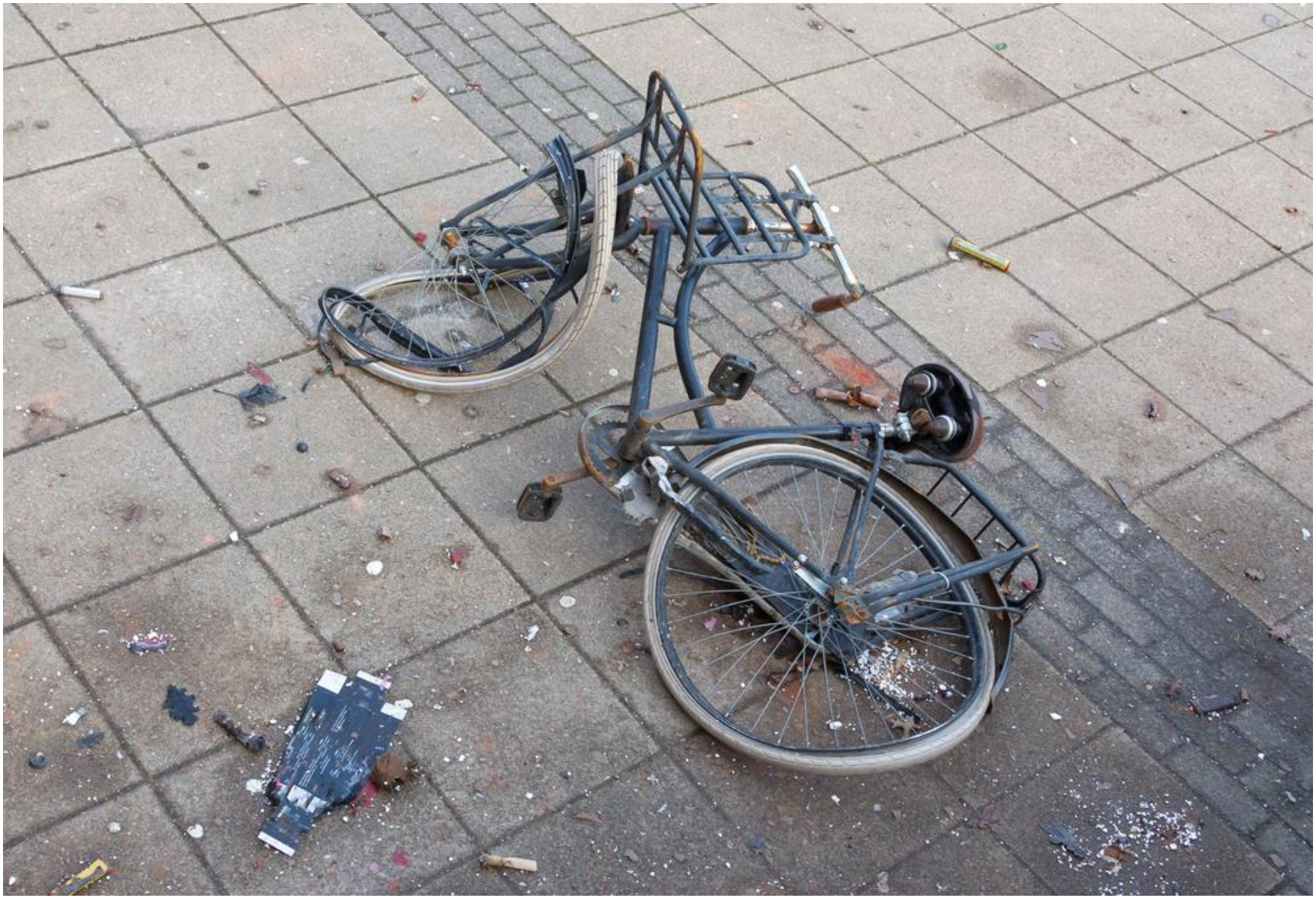


Motorization

Motorization & new road safety index

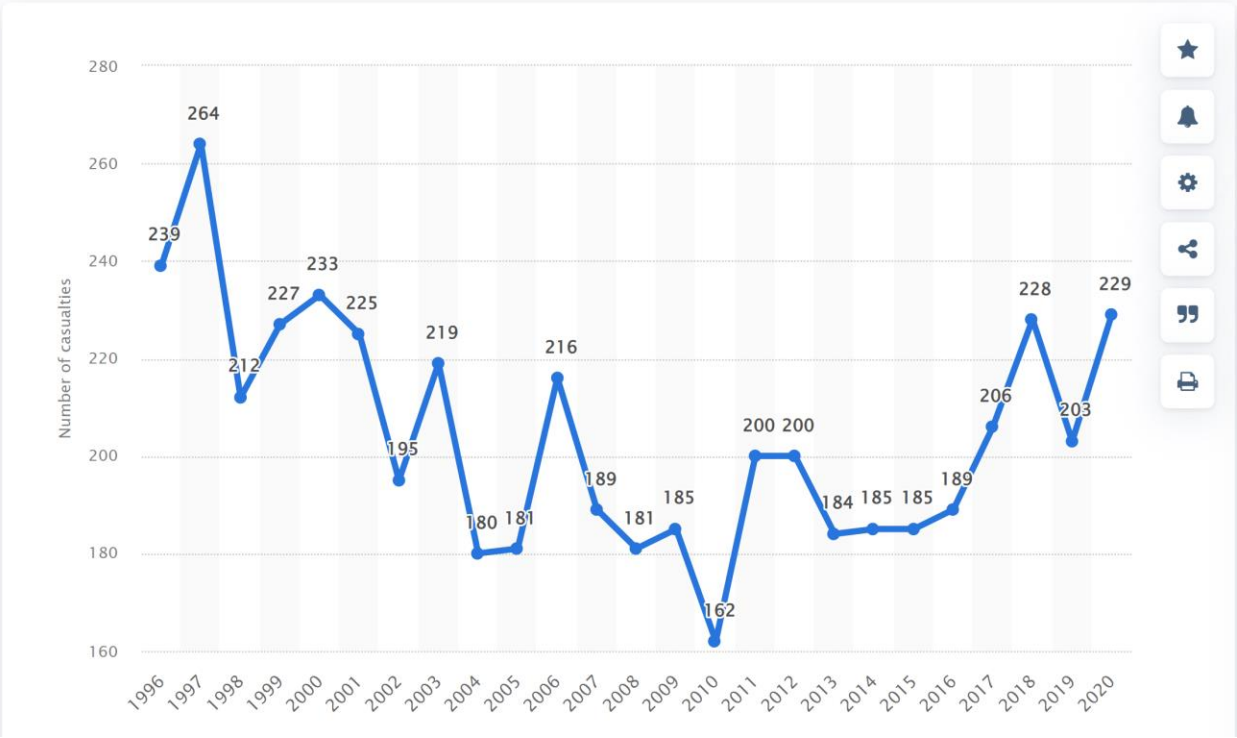


Motorization



Motorization

Number of cyclists killed in traffic in the Netherlands from 1996 to 2020



DOWNLOAD

PDF + XLS + PNG + PPT +

Source

→ Show sources information
→ Show publisher information
→ Use Ask Statista Research Service

Release date

April 2021

Region

Netherlands

Survey time period

1996 to 2020

Supplementary notes

Road fatality: a road user whose death is the result of an accident on the public road, connected to the

'80,000 injuries'

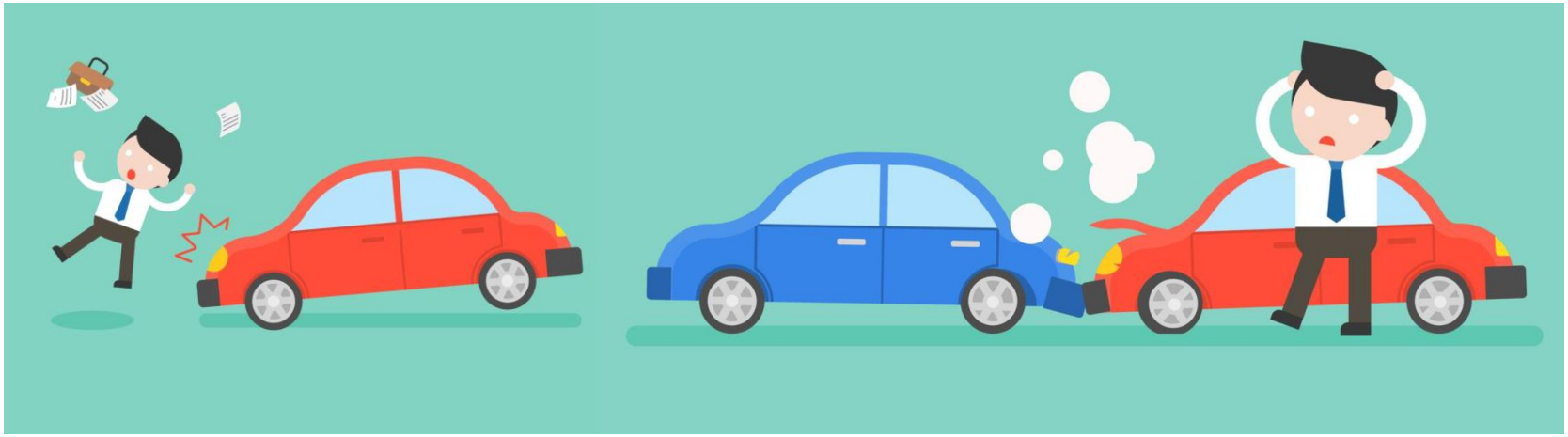
In 2019

https://www.dutchnews.nl/news/2021/09/cycling-injuries-three-times-more-than-official-figures/

Motorization

$$\frac{(661+80000)}{17\ 097\ 123} * 100.000 = 472$$

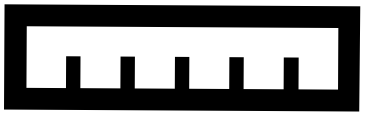
$$\frac{(NUMBER\ OF\ INJURIES + NUMBER\ OF\ DEATHS)}{POPULATION} * 100.000$$



Assignment #1

Transform the outcome in a 0 to 10 scale

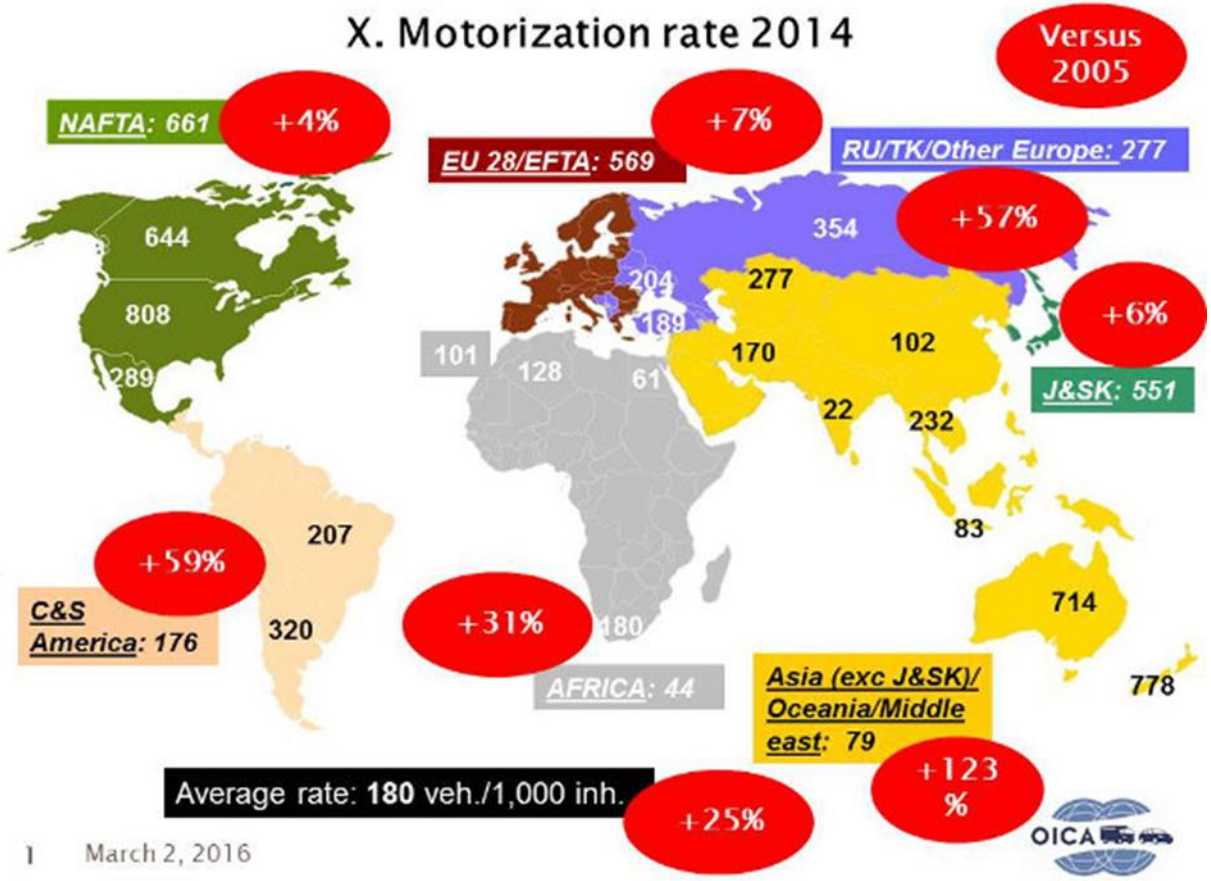
Linear Interpolation



0	>= 923 per 100.000 inhabitants
10	0 fatalities per 100.000 inhabitants

Challenge

Motorization index



Motorization

Motorization index evolution….

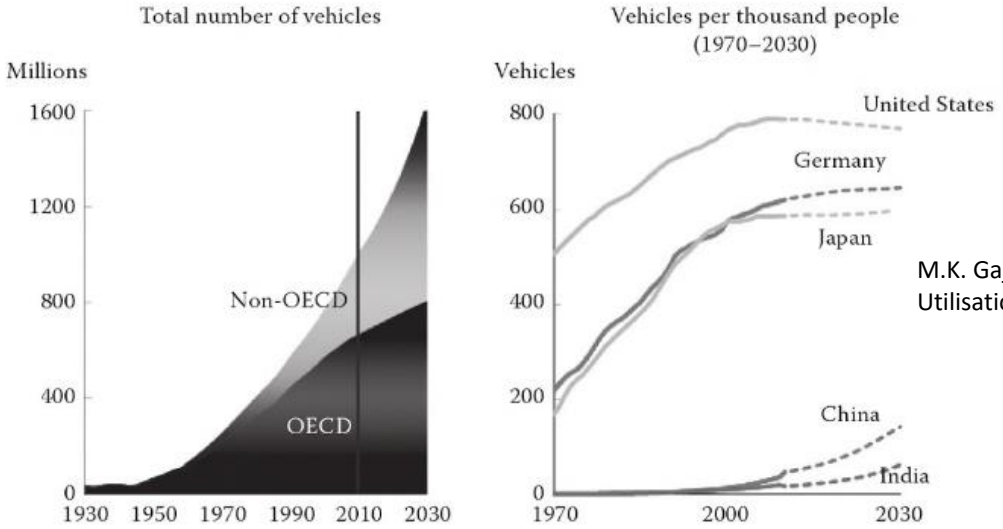


FIGURE 1.13
Growth of global vehicle fleet. (Adapted from BP Energy Outlook 2030, London, January 2012.)

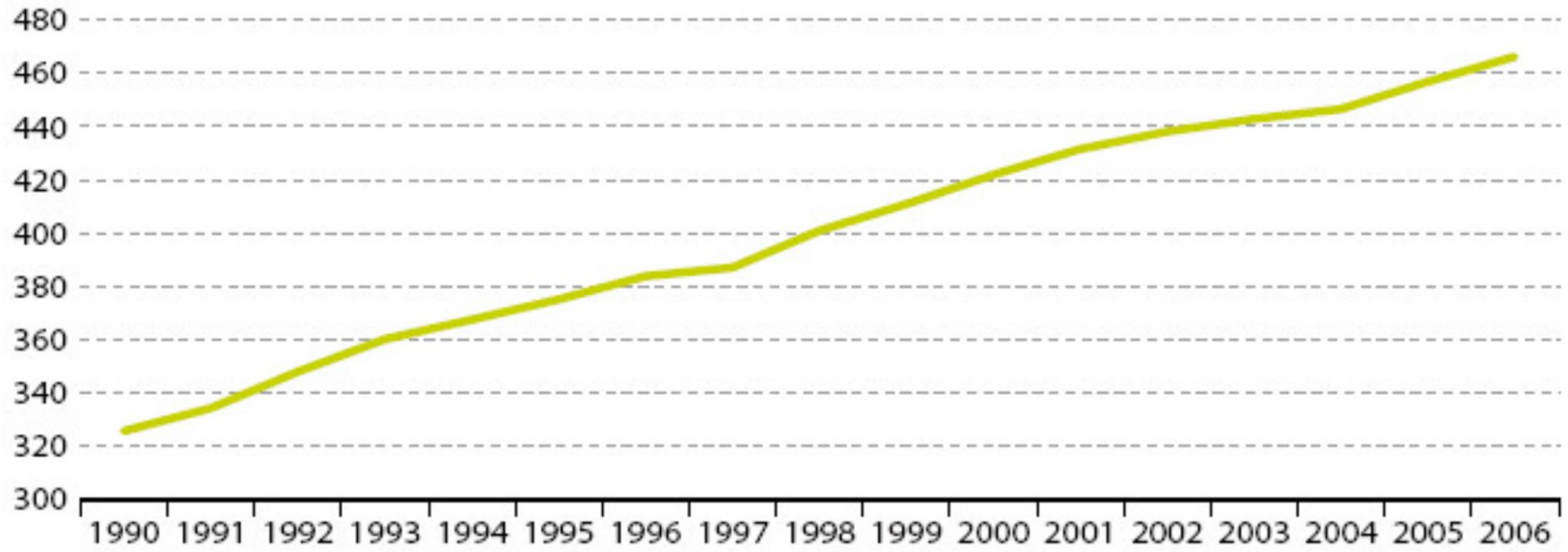
M.K. Gajendra Babu,K.A. Subramanian Alternative Transportation Fuels: Utilisation in Combustion Engines. 2013. CRC Press.

- Increase the need for mobility……private transport

Motorization

File:Motorisation rate, EU-27.jpg

File File history File usage



No higher resolution available.

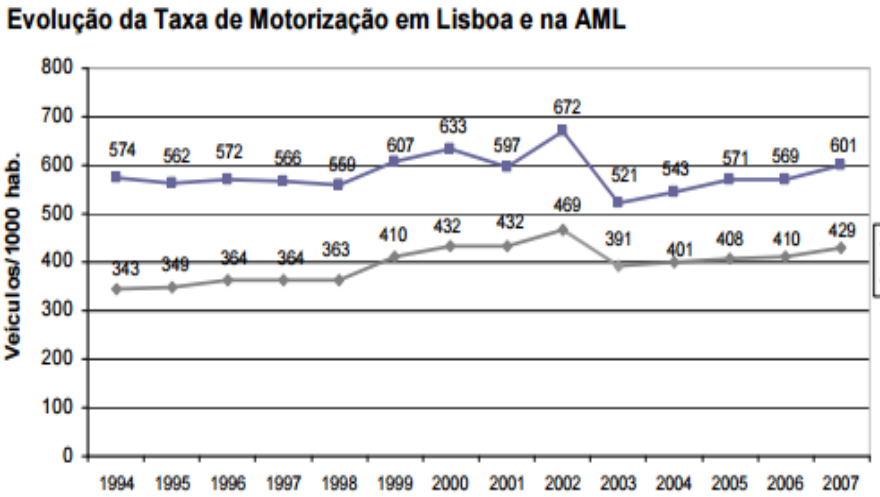
Motorisation_rate,_EU-27.jpg (656 × 242 pixels, file size: 40 KB, MIME type: image/jpeg)

Motorization

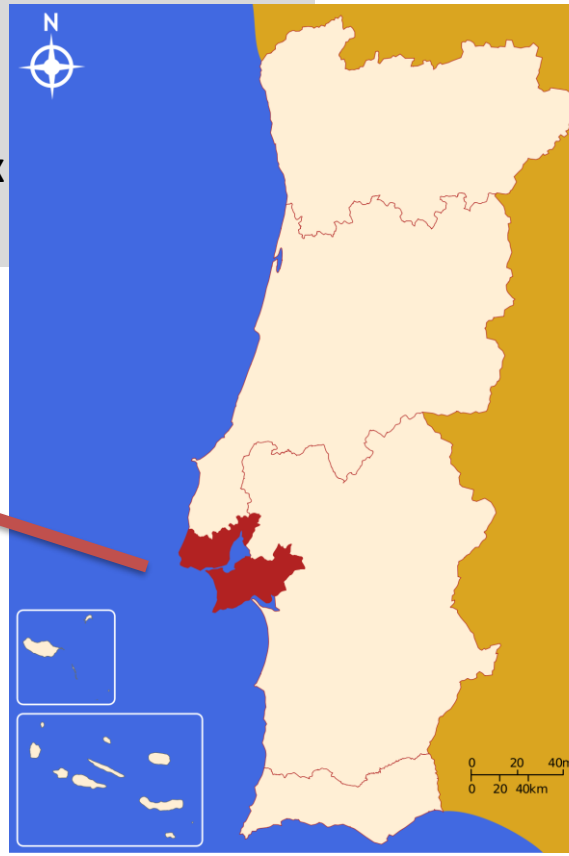
Portugal case study

@2015
~ 10 million
~ 64% urban zones
~ 4 million cars

Motorization index
400



Fonte: Instituto de Seguros de Portugal, 2008

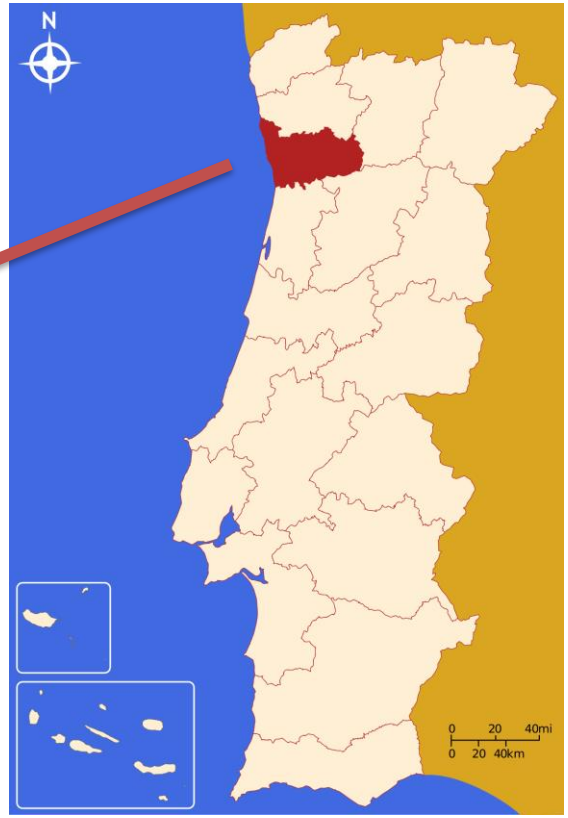


Motorization

Portugal case study

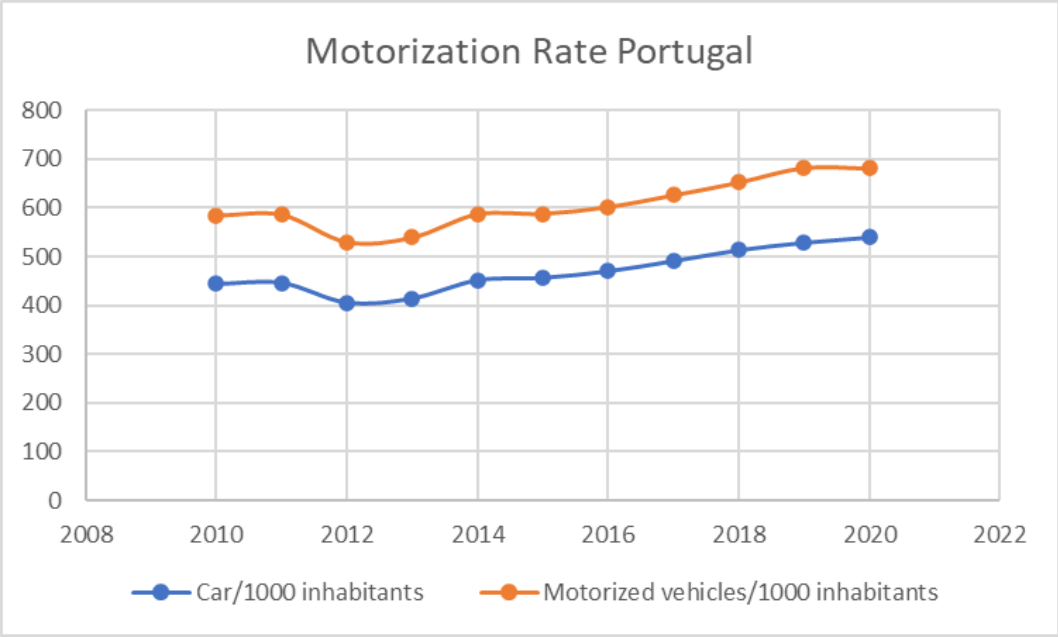
Quadro 3 - Taxa de motorização nos concelhos da AMP (Fonte: INE, 2000)

Concelho	Taxa de Motorização (veíc./1000 hab.)
Espinho	362
Gondomar	348
Maia	388
Matosinhos	365
Porto	346
Póvoa de Varzim	342
Valongo	337
Vila do Conde	354
Vila Nova de Gaia	357



Motorization

Motorization index evolution….

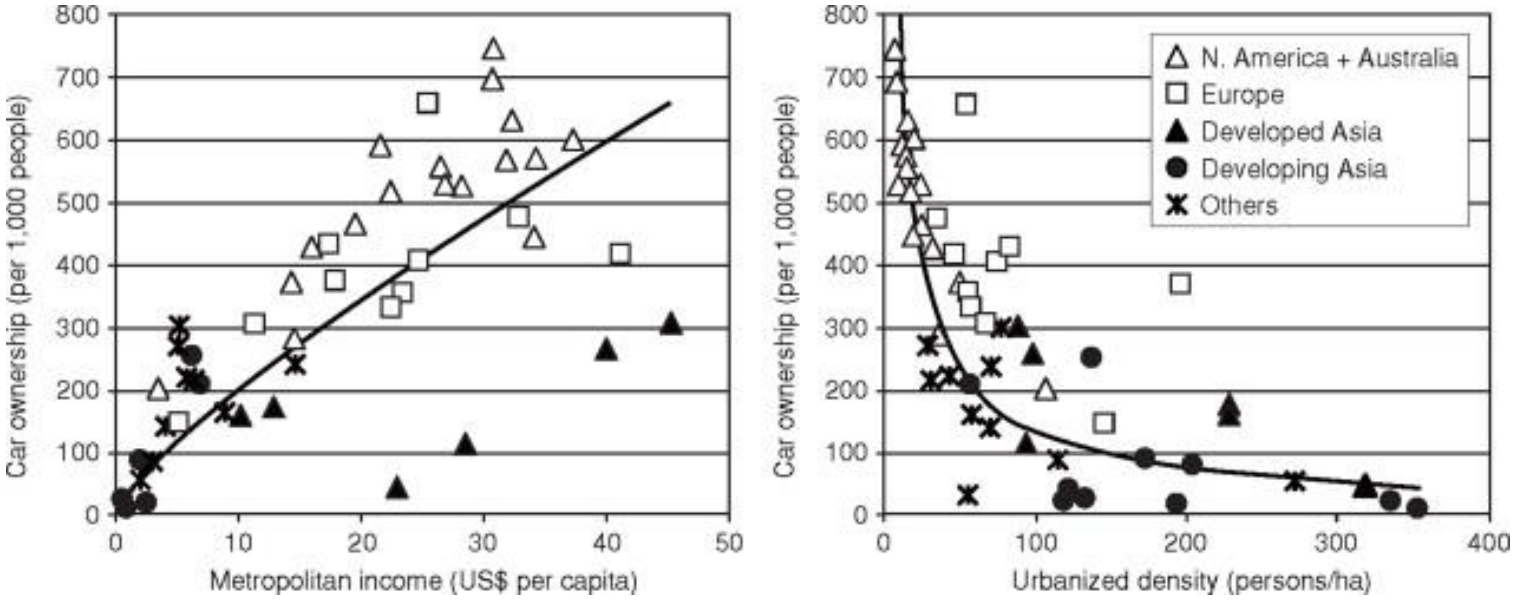


PORDATA
Base de Dados Portugal Contemporâneo

INSTITUTO NACIONAL DE ESTATÍSTICA
STATISTICS PORTUGAL

Motorization

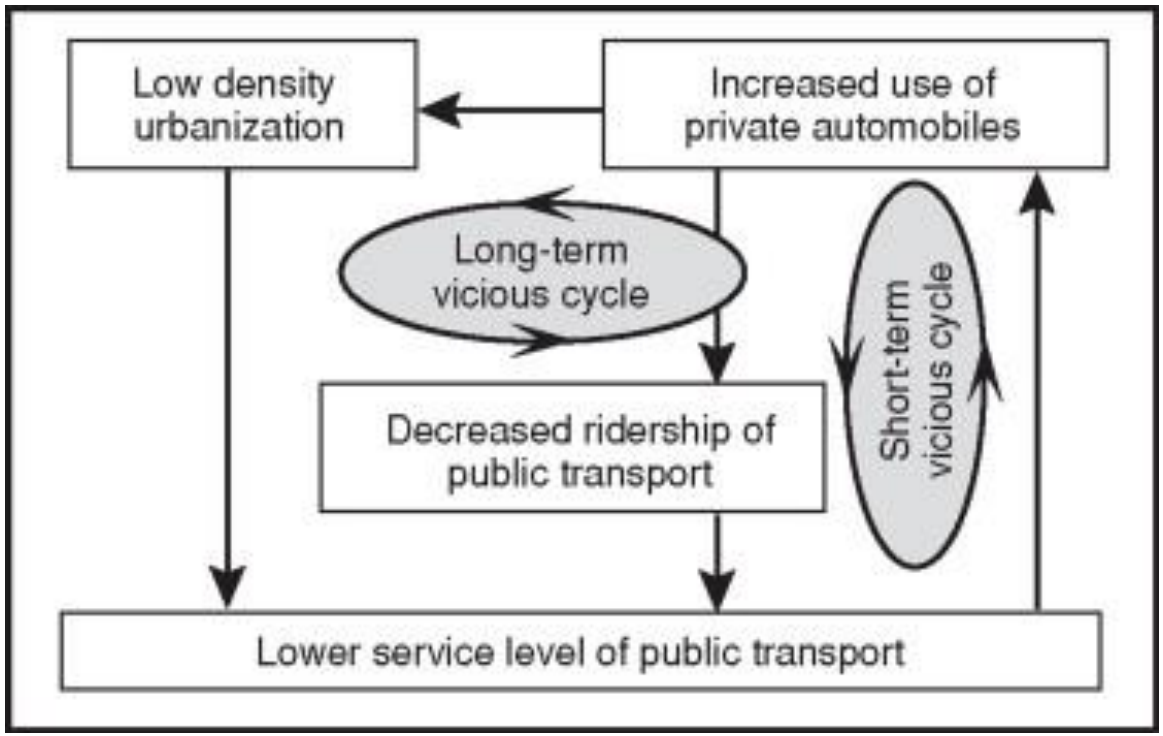
Motorization index, income and urban density



https://doi.org/10.1016/S0386-1112(14)60217-X

Motorization

Motorization index, income and urban density



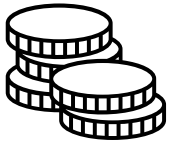
https://doi.org/10.1016/S0386-1112(14)60217-X

Affordability

Affordability

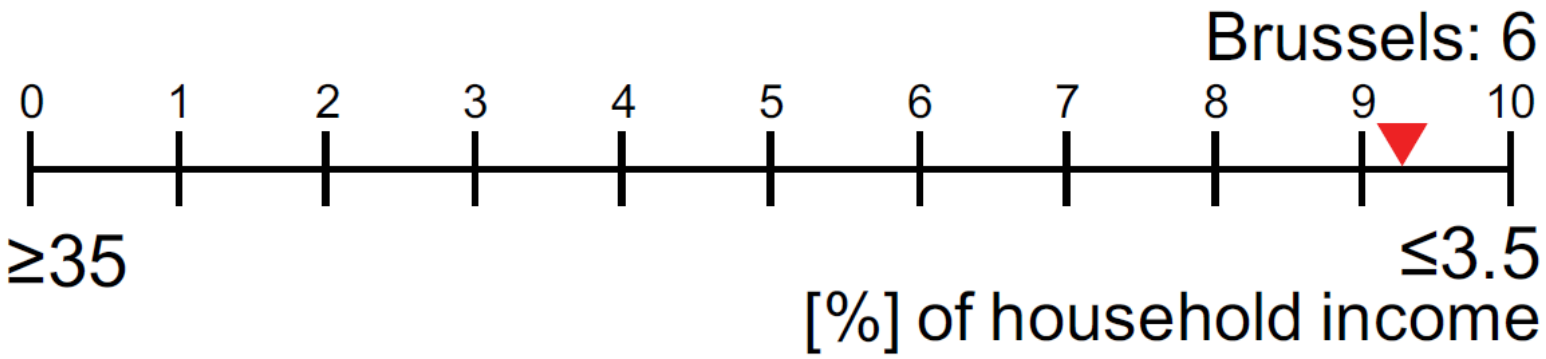
Affordability of public transport for the poorest group

$$\frac{Public\ Pass\ month\ (€)}{\text{Average monthly income of poorest population quartile } 25\%}$$



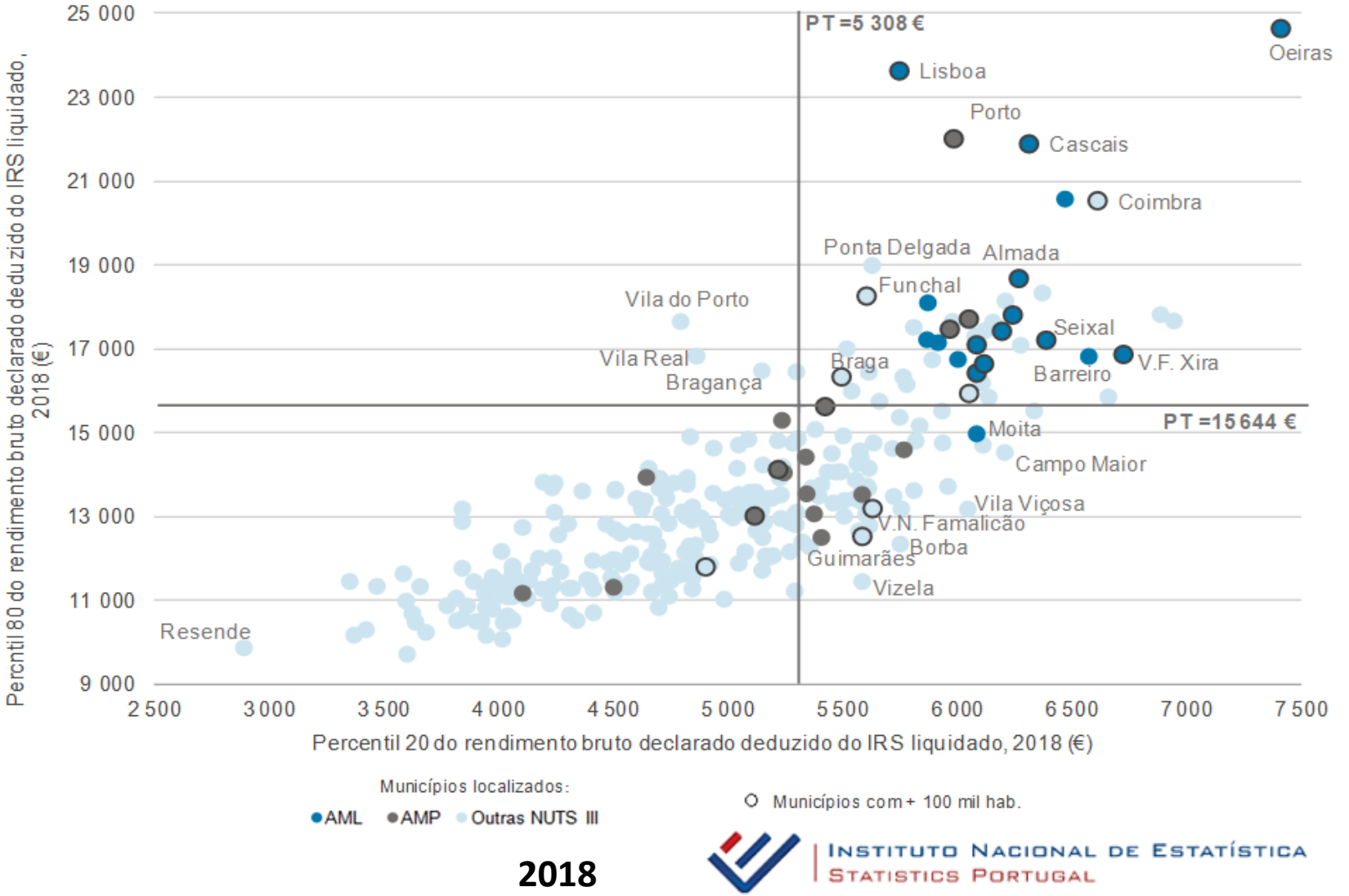
Affordability

Affordability of public transport for the poorest group



➔ 0: A.I. >35%,
➔ 10: A.I. <3,5%,

Affordability



2018

INSTITUTO NACIONAL DE ESTATÍSTICA
STATISTICS PORTUGAL

Affordability

https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_publicacoes&PUBLICACOESpub_boui=384207665&PUBLICACOESmodo=2

INSTITUTO NACIONAL DE ESTATÍSTICA
STATISTICS PORTUGAL

Índice

DTMN	DSG	Sujeitos Passivos	Rendimento bruto declarado	Rendimento bruto deduzido do IRS liquidado	Rendimento bruto declarado médio por sujeito passivo	Percentis do rendimento bruto declarado										
						10	20	25	30	40	50	60	70	75	80	90
		Nº	Milhares €	Milhares €	€	€										
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
PT	**Portugal**	**7 220 626**	**90 360 666**	**79 094 031**	**12 514**	**3 553**	**5 100**	**5 797**	**6 498**	**7 798**	**8 962**	**10 592**	**12 847**	**14 518**	**16 823**	**24 927**
0314	Vizela	17 529	165 629	153 953	9 449	3 899	5 334	5 872	6 421	7 414	7 981	8 628	9 669	10 500	11 449	15 363
11A	**A. M. Porto**	**1 230 691**	**15 292 364**	**13 360 611**	**12 426**	**3 600**	**5 111**	**5 779**	**6 454**	**7 724**	**8 830**	**10 421**	**12 573**	**14 167**	**16 465**	**24 836**
0104	Arouca	15 285	135 891	125 904	8 890	3 015	4 315	4 759	5 191	6 201	7 292	8 156	9 369	10 236	11 401	16 114
0913	Trancoso	5 882	52 201	47 831	8 875	2 400	3 917	4 334	4 775	5 861	7 074	7 979	9 375	10 343	11 609	16 980
170	**A. M. Lisboa**	**1 995 348**	**31 325 035**	**26 420 882**	**15 699**	**3 962**	**6 028**	**6 885**	**7 706**	**9 145**	**10 921**	**13 175**	**16 516**	**18 841**	**21 750**	**31 592**

STATS lab

2017

Affordability

https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_publicacoes&PUBLICACOESpub_boui=384207665&PUBLICACOESmodo=2

INSTITUTO NACIONAL DE ESTATÍSTICA
STATISTICS PORTUGAL

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						10	20	25	30	40	50	60	70	75	80	90
		Nº	Milhares €	Milhares €	€	€										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
PT	**Portugal**	**7 064 893**	**82 413 578**	**72 532 104**	**11 665**	**3 140**	**4 607**	**5 226**	**5 868**	**7 070**	**8 242**	**9 834**	**12 007**	**13 600**	**15 817**	**23 740**
0314	Vizela	17 301	148 928	138 983	8 608	3 376	4 776	5 307	5 795	6 713	7 279	7 887	8 794	9 499	10 424	14 162
11A	**A. M. Porto**	**1 207 708**	**13 888 094**	**12 202 363**	**11 500**	**3 067**	**4 577**	**5 174**	**5 808**	**6 996**	**8 077**	**9 596**	**11 663**	**13 164**	**15 312**	**23 456**
0104	Arouca	15 187	122 468	113 814	8 064	2 703	3 909	4 320	4 752	5 561	6 503	7 390	8 455	9 203	10 262	14 444
0913	Trancoso	6 015	48 971	45 156	8 141	2 400	3 722	4 134	4 489	5 282	6 254	7 250	8 448	9 432	10 623	15 754
170	**A. M. Lisboa**	**1 908 838**	**28 439 645**	**24 149 980**	**14 899**	**3 675**	**5 555**	**6 355**	**7 079**	**8 600**	**10 376**	**12 559**	**15 762**	**17 994**	**20 866**	**30 357**
1502	Alcochete	11 688	175 246	149 951	14 994	3 956	5 679	6 394	7 070	8 647	10 498	12 817	16 241	18 798	21 788	30 741

STATS lab

2015

Affordability

Intermodality

AML

AMP

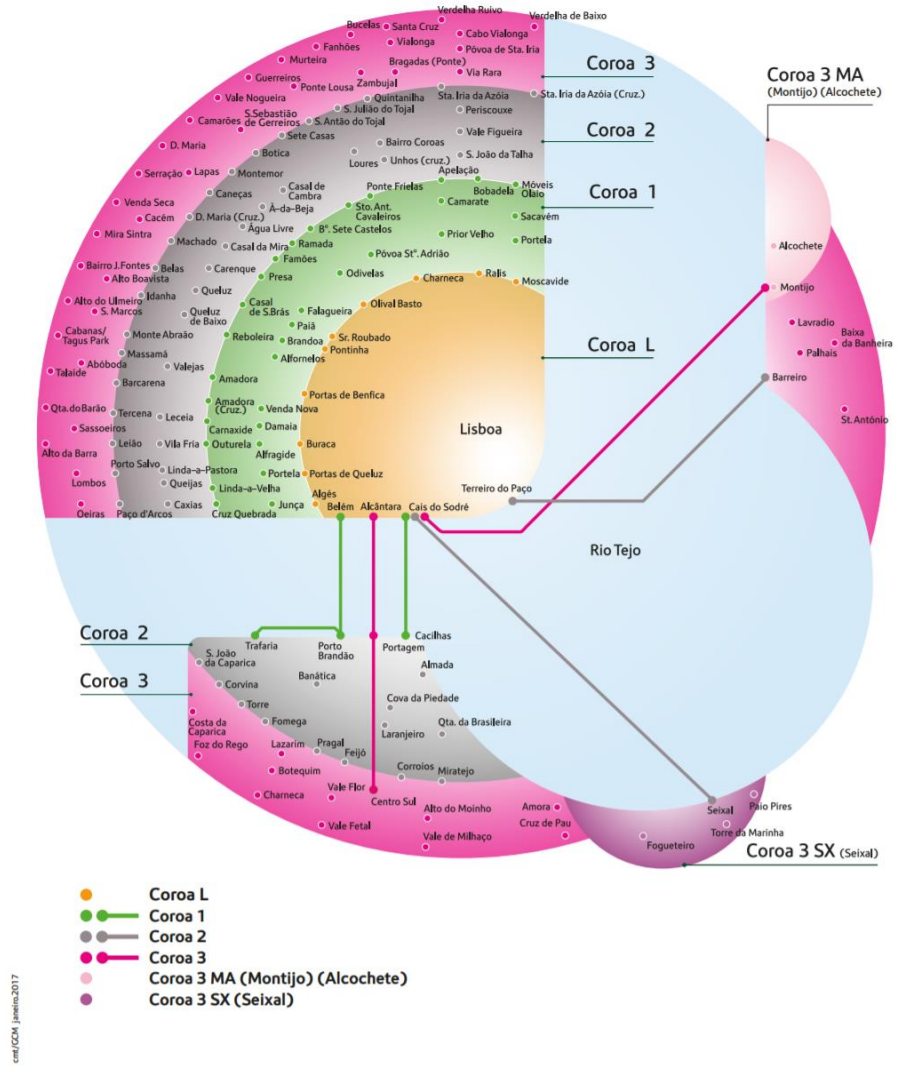
Affordability

	Passes Intermodais Social + Lisboa		
Título \ Modalidade	Normal	Social +	Bonificação
Carris – Metro Urbano	33,85 €	24,20 €	9,65 €
Carris – Metro Rede	37,50 €	28,05 €	9,45 €
L1	46,10 €	33,00 €	13,10 €
L12	55,55 €	39,50 €	16,05 €
L123	63,25 €	44,90 €	18,35 €
12	33,75 €	24,05 €	9,70 €
23	33,75 €	24,05 €	9,70 €
123	45,30 €	32,25 €	13,05 €

AML 2011

Affordability

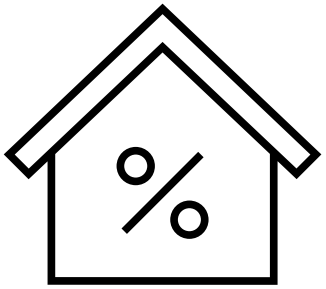
AML 2011



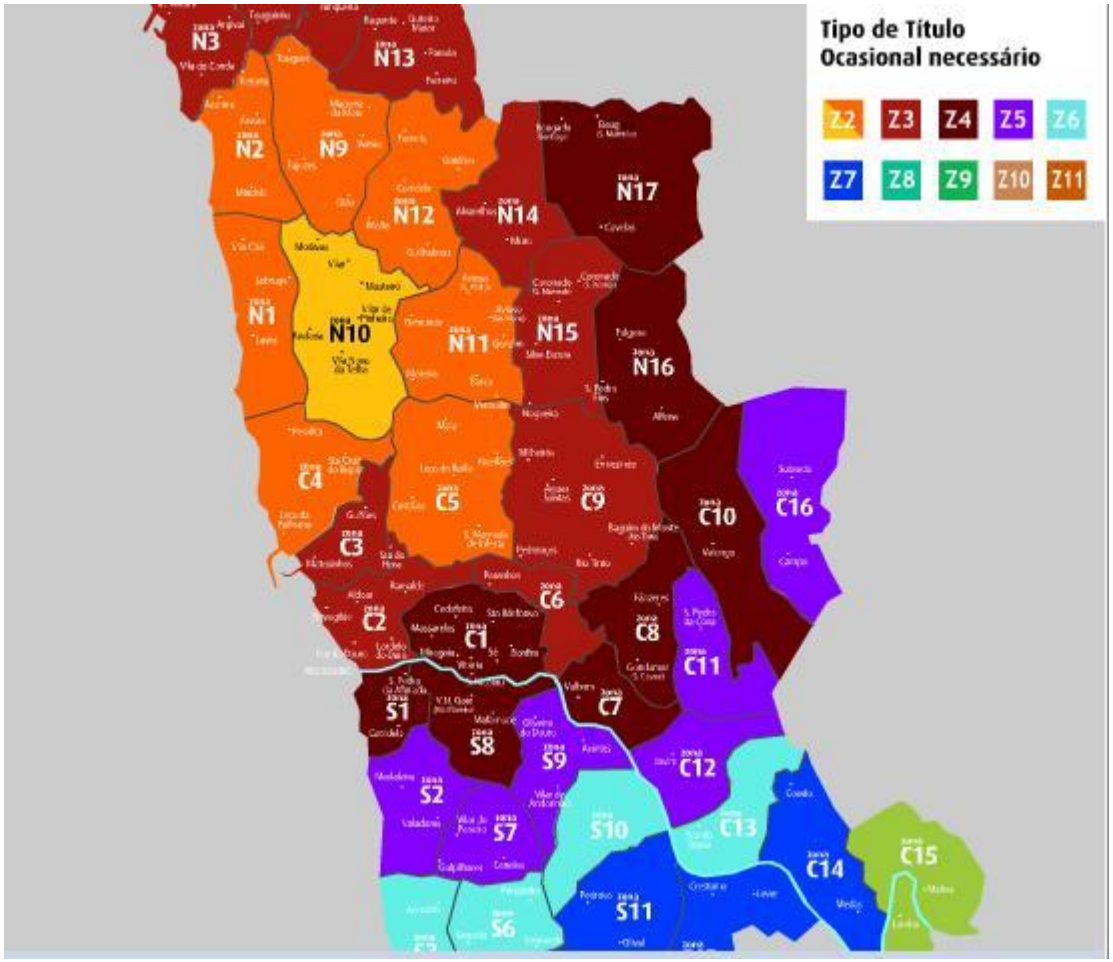
Affordability

AML 2017

Per person



Affordability



Affordability

Tarifário Intermodal

andante

	Títulos Ocasionais		Títulos de Assinatura	
	Títulos de Viagem	Andante 24	Normal	Social* (desconto 25%)
Z2	1,15	3,95	30,00	22,50
Z3	1,45	5,00	36,00	27,00
Z4	1,80	6,20	47,00	35,25
Z5	2,25	7,75	56,00	42,00
Z6	2,65	9,15	65,00	48,75
Z7	3,05	10,50	74,00	55,50
Z8	3,45	11,90	83,00	62,25
Z9	3,80	13,10	92,00	69,00
Z10	4,10	14,30	101,00	75,75
Z11	4,40	15,50	110,00	82,50
Z12	4,70	16,70	119,00	89,25

Desconto: Na compra de 10 títulos de viagem recebe 1 grátis

Cartões Andante: Azul - 0,50 €, Gold - 5,00 €, 4_18 e sub23 - 2,50 €

Títulos Diários Andante Tour 1 - 7,00 €, Andante Tour 3 - 15,00 €

* Júnior / Estudante / Social+ Reformado - Pensionista Sénior / 4_18 / Sub23

FEVEREIRO 2012

Valores em Euros e com IVA incluído à taxa legal em vigor

AMP 2012

Affordability

TARIFÁRIO INTERMODAL ANDANTE

Em vigor a partir de 01/01/2017*

ZONAMENTO	TÍTULOS OCASIONAIS		TÍTULOS DE ASSINATURA MENSAL			
	Títulos de viagem	Andante 24	Normal	Tarifário Social		
	DESCONTO: Na compra de 10 títulos de viagem recebe 1 grátis			Social+; Social+(D); Social+(R) 4_18(B); 4_18(F) Sub23(F) Júnior Estudante Sénior Reformado/Pensionista DESCONTO 25%	Social+(A) DESCONTO 50%	4_18(A) Sub23(A) DESCONTO 60%
Z2	€ 1,20	€ 4,15	€ 30,30	€ 22,75	€ 15,15	€ 12,10
Z3	€ 1,55	€ 5,35	€ 37,00	€ 27,75	€ 18,50	€ 14,80
Z4	€ 1,95	€ 6,75	€ 47,10	€ 35,35	€ 23,55	€ 18,85
Z5	€ 2,35	€ 8,10	€ 57,60	€ 43,20	€ 28,80	€ 23,05
Z6	€ 2,75	€ 9,50	€ 66,90	€ 50,20	€ 33,45	€ 26,75
Z7	€ 3,15	€ 10,85	€ 76,15	€ 57,10	€ 38,10	€ 30,45
Z8	€ 3,55	€ 12,25	€ 85,40	€ 64,05	€ 42,70	€ 34,15
Z9	€ 3,95	€ 13,65	€ 94,65	€ 71,00	€ 47,35	€ 37,85

*Nos termos do Despacho Normativo nº 14-A/2016 de 19 de dezembro.

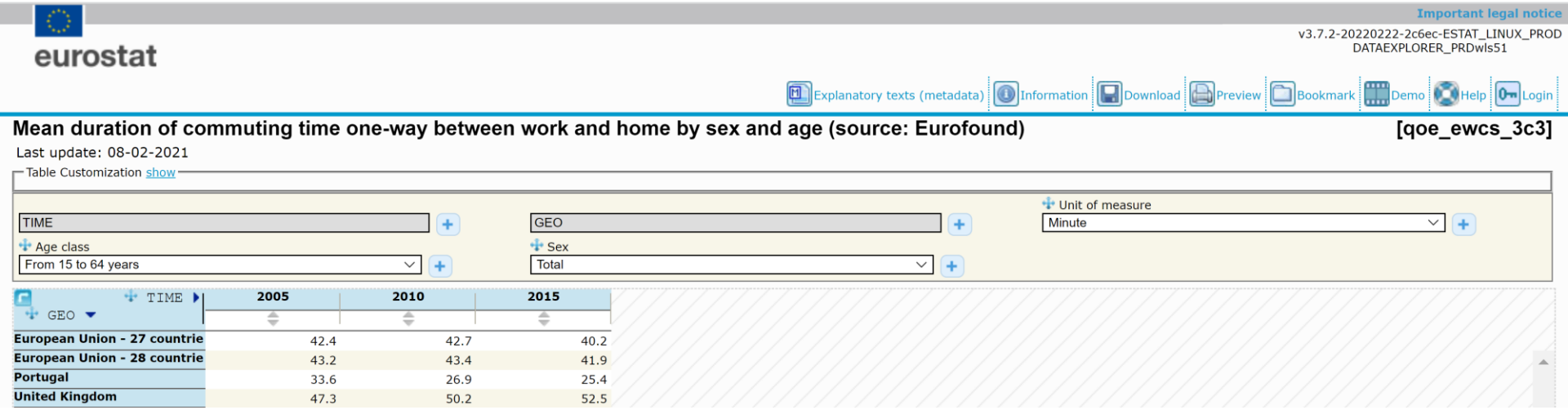
AMP 2017

Commuting duration

Waste fuel ↓ **Waste time** ↓ Quality of life/ €

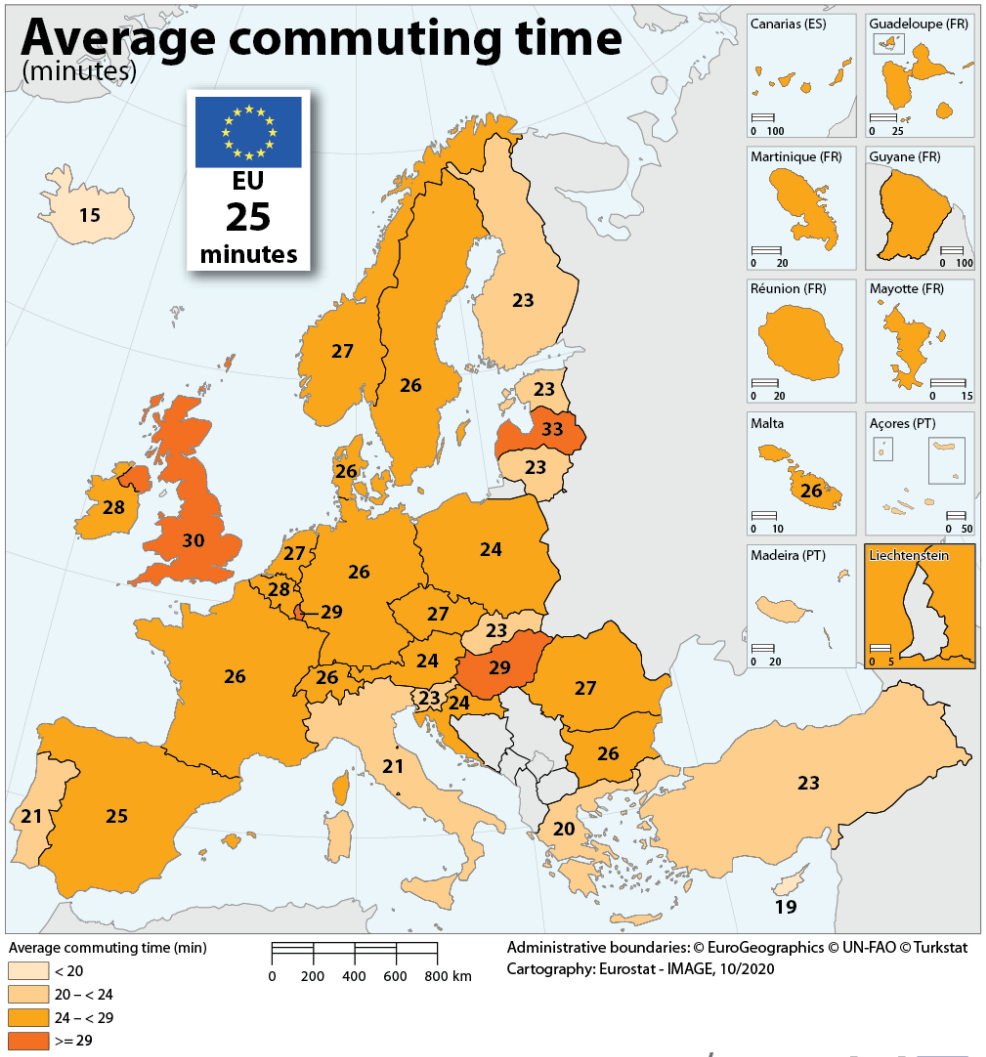
Commuting duration

https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do



One -way

Commuting duration



Commuting duration

Commuting travel time

a Definition
Duration of commute to and from work or an educational establishment.

b Parameter
Average duration of the combined outward journey and return journey to work or an educational establishment expressed in minutes per person per day.

c Methodology description
M2 = Survey
The outline of the "Survey methodology" is described in the general part. The target population is the inhabitants commuting to work or for education purposes.

d Formula & Calculation method
The valuable is the average survey score.

$$Tcom_{av} = \frac{\sum Tcom_i}{n}$$

$$Tcom_i = Tout_i + Treturn_i$$

Where:

$Tcom_{av}$ = Average commuting time[minutes/day]

$Tcom_i$ = Averaged commuting time surveyed person i

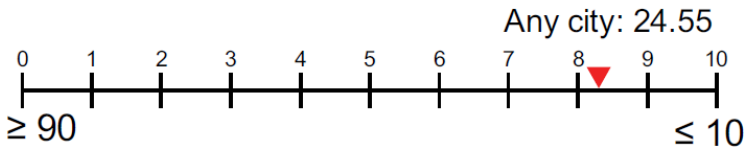
$Tout_i$ = Commuting time home to work/school [minutes/day]

$Treturn_i$ = Commuting time to home by person i [minutes/day]

n = Number of persons in survey

e Source
Methodology: The Gallup Organisation, Hungary (2009), Perception survey on quality of life in European cities.

f Scale



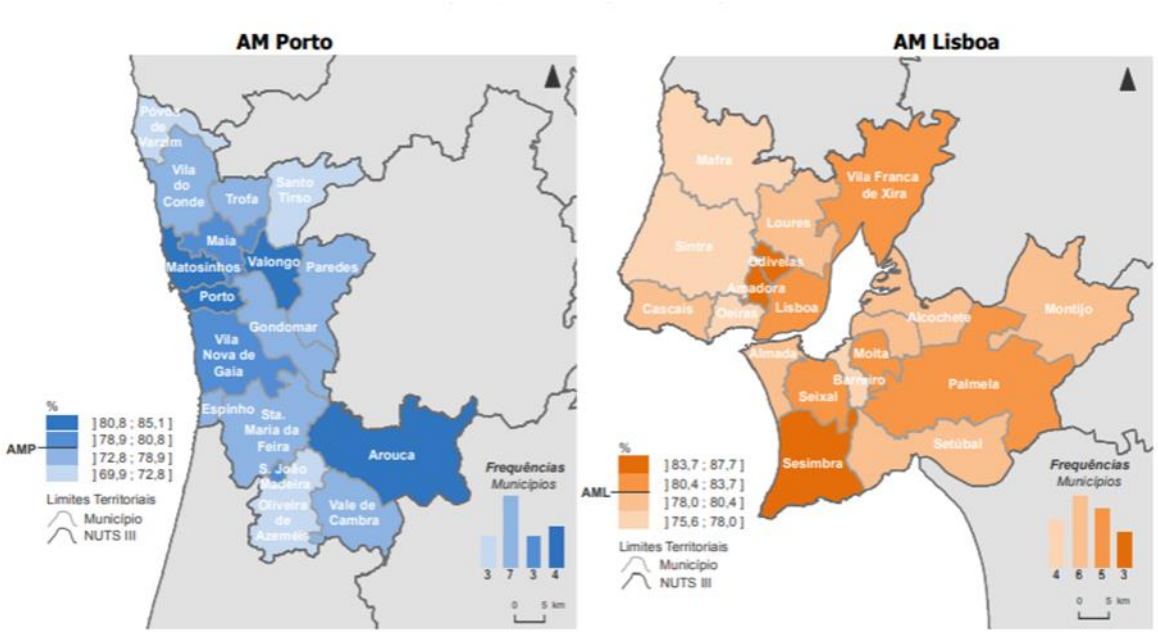
➔ 10: ≤ 10 [minutes per day]
➔ 0: ≥ 90 [minutes per day]

Commuting duration

CENSOS 2011

21 minutes

26 minutes

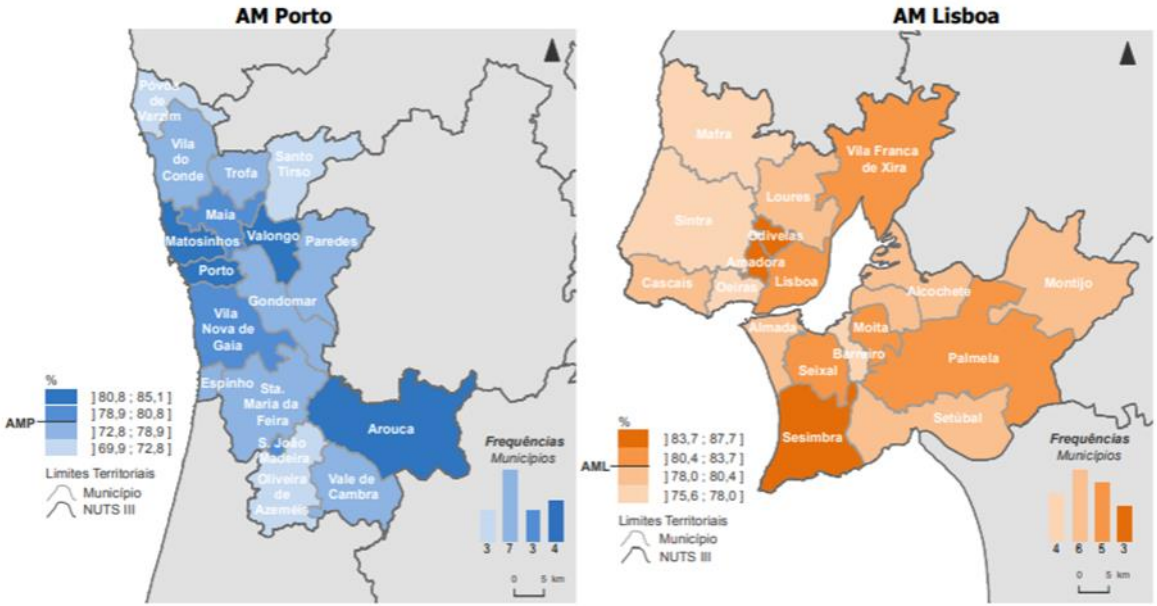


https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0008422&contexto=bd&selTab=tab2

Commuting duration

CENSOS 2021

No data yet.....



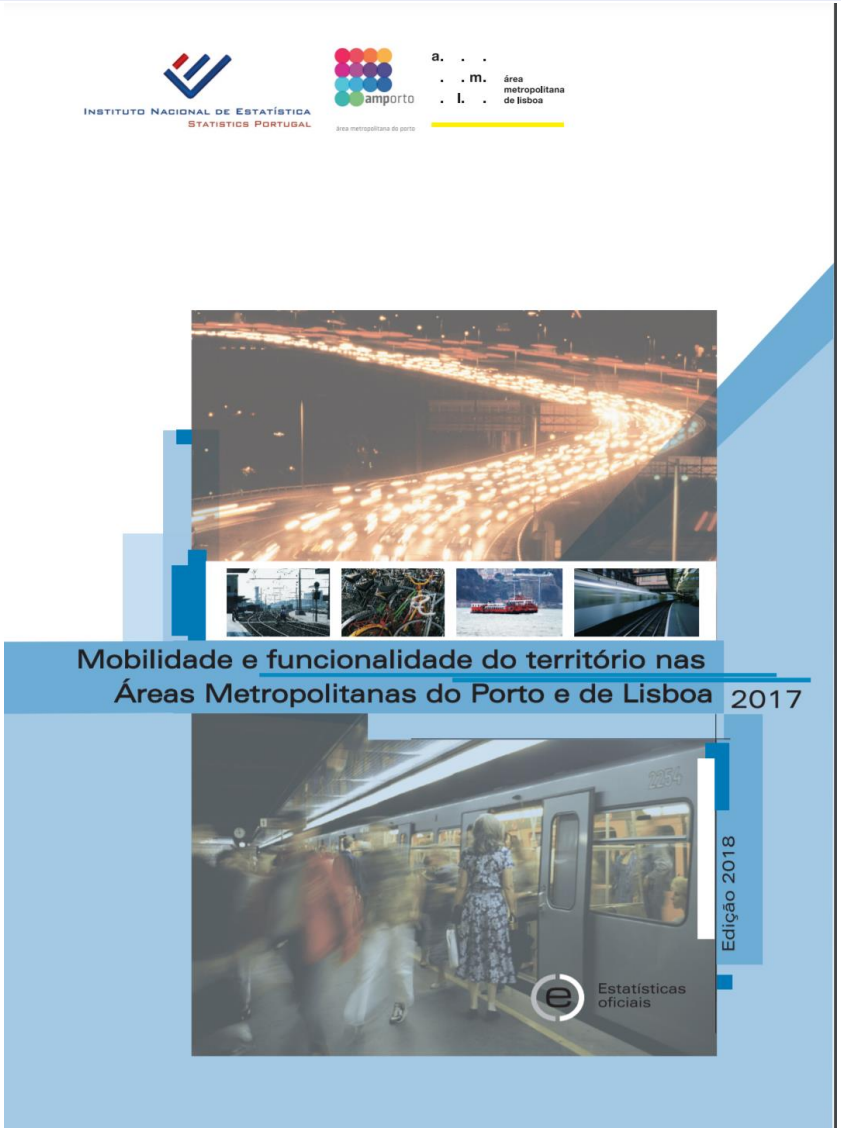
Commuting duration

2017???

Waste fuel ↓ **Waste time** ↓ Quality of life/ €

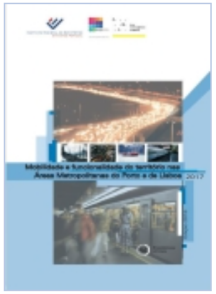
Commuting duration

2017



Commuting duration

https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_publicacoes&PUBLICACOESpub_boui=349495406&PUBLICACOESmodo=2&xlang=pt



Digital

Mobilidade e funcionalidade do território nas Áreas Metropolitanas do Porto e de Lisboa : 2017

Ano de Edição: 2018

Resumo

A publicação *Inquérito à Mobilidade nas Áreas Metropolitanas do Porto e de Lisboa - 2017* apresenta um capítulo distinto para cada uma das regiões, inicialmente sobre a Área Metropolitana do Porto seguindo-se um outro relativo à Área Metropolitana de Lisboa.

Cada capítulo subdivide-se em 3 partes, sobre:

- caracterização da população residente na perspetiva da mobilidade (população móvel), incluindo informação socioeconómica e despesas com a mobilidade;

- análise da mobilidade na área metropolitana de acordo com duas óticas:

  - deslocações totais realizadas, segundo a residência do respondente,
  - deslocações intrametropolitanas;

- opiniões dos residentes, evidenciando razões para utilização do transporte individual ou público, bem como a avaliação efetuada sobre os transportes públicos.

No final apresenta-se a nota metodológica bem como um glossário.

- Publicação
  - IMOB2017.pdf (58195 Kb)
- Quadros
  - XLSX - AML (535 Kb)
  - XLSX - AMP (548 Kb)
  - CSV - AML (58 Kb)
  - CSV - AMP (59 Kb)

Commuting duration

Quadro II.1 >> População móvel por município de residência

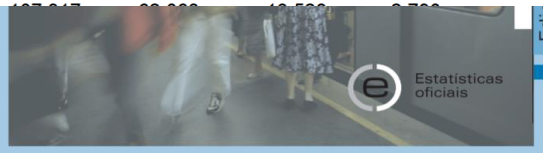
Municípios	População Móvel	
	N.º	%
AML	**2,068,610**	**80.4**
Alcochete	14,057	80.1
Almada	122,852	79.3
Amadora	142,264	87.7
Barreiro	53,756	76.3
Cascais	150,786	78.0
Lisboa	359,333	80.6
Loures	150,785	79.2
Mafra	57,383	75.6
Moita	49,925	83.6
Montijo	40,113	78.8
Odivelas	120,254	84.6
Oeiras	123,389	77.7
Palmela	49,659	83.6
Seixal	127,635	83.4
Sesimbra	39,421	83.9

Commuting duration

Quadro IV.1 Deslocações/dia por meio de transporte principal utilizado e por município de residência

Unidade: N.º

Meio transp. / Municípios	Total	Automóvel - condutor	Automóvel - passageiro	Motociclo ou ciclomotor	Táxi - passageiro	Autocarro - transp. público	Autocarro - tr. escolar/ empresa	Comboio	Metropo-litano	Barco	Avião	A pé	Bicicleta	Outro
AML	**5,385,300**	**2,475,192**	**697,821**	**47,330**	**19,220**	**420,838**	**51,388**	**173,669**	**166,827**	**16,564**	**4,244**	**1,239,201**	**26,187**	**46,820**
Alcochete	38,455	19,371	6,714	186 §	x	2,517	832	153 §	614	303	x	6,996	503	231
Almada	312,346	139,855	38,922	2,132	506	32,259	1,081	7,373	14,898	2,273	424 §	65,423	861	6,340
Amadora	403,230	154,803	49,635	1,613	973	33,923	2,057	15,646	20,631	x	x	120,572	1,752	1,551
Barreiro	135,807	58,465	18,438	108 §	x	9,850	2,283	1,697	4,098	6,623	x	32,963	630 §	264
Cascais	407,438	232,077	54,914	7,623	167 §	17,819	1,123	18,663	3,414	x	684 §	63,553	5,741	1,658
Lisboa	935,253	313,943	107,972	8,991	9,037	110,453	4,076	10,565	73,065	415	1,172	278,462	5,486	11,615
Loures	395,364	183,356	57,357	2,880	1,973	49,837	5,405	3,944	11,831	x	321 §	72,567	1,329	4,564
Mafra	149,001	90,327	25,493	1,811	x	6,444	3,163	x	478	x	45 §	17,069	256	3,892
Moita	121,120	45,381	16,530	1,155 §	919 §	6,133	2,864	4,605	1,021	1,779	x	40,289	372 §	72
Montijo	108,228	55,446	16,563	162	x	2,177	3,129	389 §	894	2,418	x	25,123	1,068	388
Odivelas	302,278	128,923	40,733	2,002	470	33,195	3,600	1,041	20,428	x	x	70,001	269 §	1,574
Oeiras	331,323	172,989	41,388	4,510	970	26,701	1,201	12,569	3,775	x	131 §	65,254	811	948
Palmela	133,379	70,383	22,642	844	x	6,549	2,627	3,854	469	815	121 §	22,948	1,440	678
Seixal	316,601	150,651	37,903	1,467	1,326	15,890	6,008	19,526	5,041	1,085	x	72,056	2,430	2,918



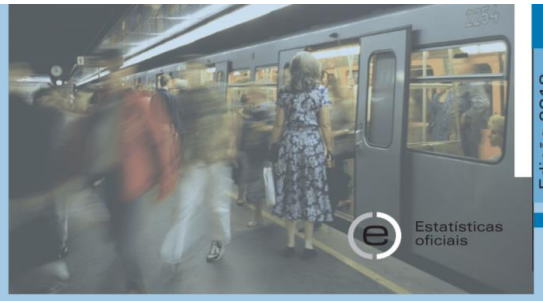
Commuting duration

Quadro IV.16 >> Duração média das deslocação/dia por motivo principal e por meio de transporte principal utilizado

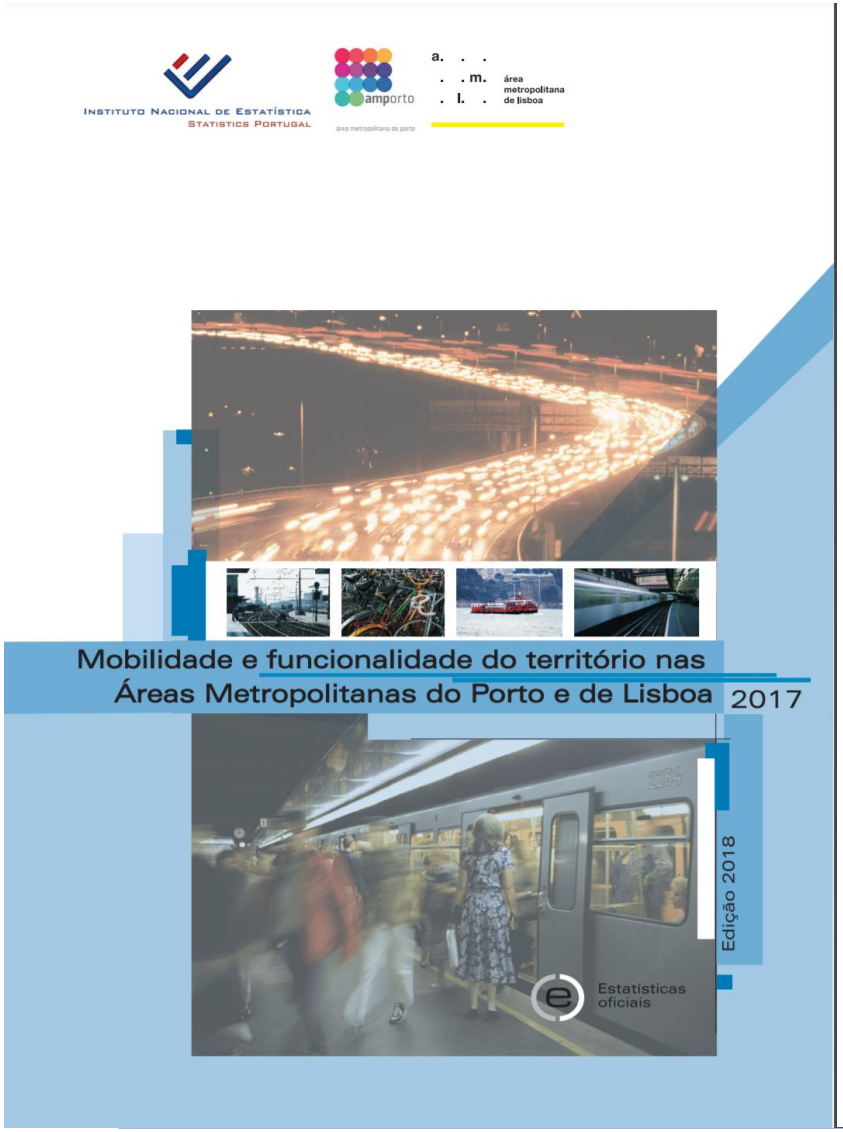
Unidade: Minutos

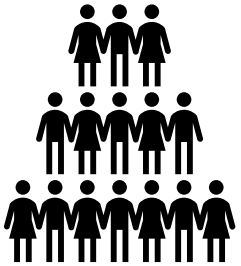
Motivo \ Meio transp.	Total	Automóvel - condutor	Automóvel - passageiro	Motociclo ou ciclomotor	Táxi - passageiro	Autocarro - transp. público	Autocarro - transp. esc./empr.	Comboio	Metropo-litano	Barco	Avião	A pé	Bicicleta	Outro
AML	**24.5**	**21.7**	**20.8**	**18.2**	**19.6**	**45.8**	**32.6**	**53.4**	**39.7**	**58.1**	**219.6**	**17.0**	**36.2**	**37.2**
Trabalho	29.5	24.8	25.5	19.5	22.6	48.3	33.2	51.0	41.4	54.2	262.7	15.1	32.2	56.2
Estudo	23.6	27.9	13.8	17.4	19.5	39.9	22.9	53.6	38.2	54.0	x	17.2	24.4	24.8
Acompanhar familiares/amigos	16.7	15.8	17.8	17.9	12.2	37.2	20.5	43.8	36.5	74.4	x	14.6	9.6	20.8
Lazer	28.0	26.5	27.8	17.2	20.9	46.9	41.1	52.5	31.7	56.3	148.3	23.3	41.0	49.6
Compras	16.7	15.6	17.0	13.7	14.5	32.9	21.3	46.8	29.0	51.5 §	x	15.3	29.3	26.3
Assuntos pessoais	28.4	26.7	25.8	18.7	22.3	47.6	28.8	60.8	27.7	63.7	166.9	17.4	41.0	18.6
Outra atividade	24.3	24.0	24.5	8.3	23.1 §	48.8	24.0	58.6	48.4	x	x	16.2	33.2 §	24.1
Regresso a casa	25.1	22.1	21.1	18.4	19.1	47.3	37.2	54.5	43.3	60.9	236.5	16.9	39.6	32.1

Fonte: Inquérito à Mobilidade nas Áreas Metropolitanas do Porto e de Lisboa

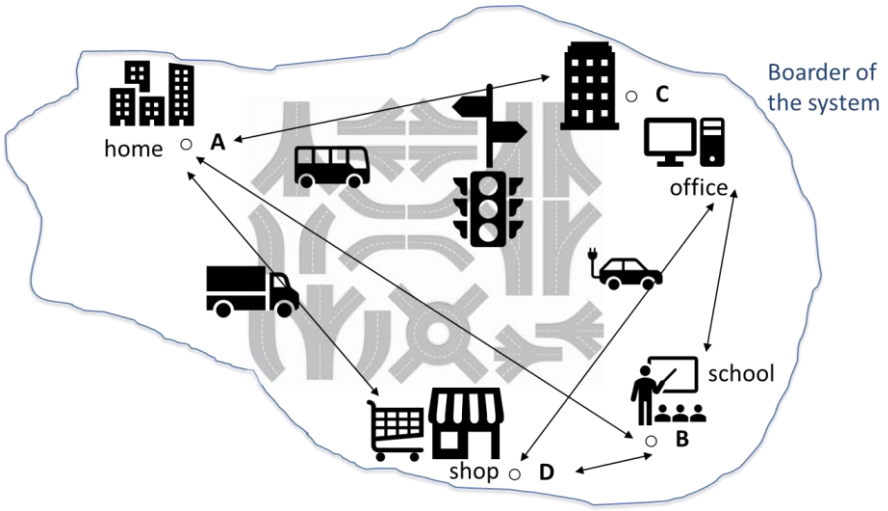


Commuting duration





2 068 610



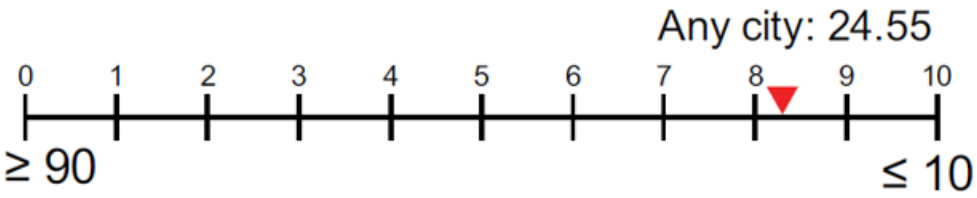
5 385 300 trips/day

24.5 minutes/trip

Commuting duration

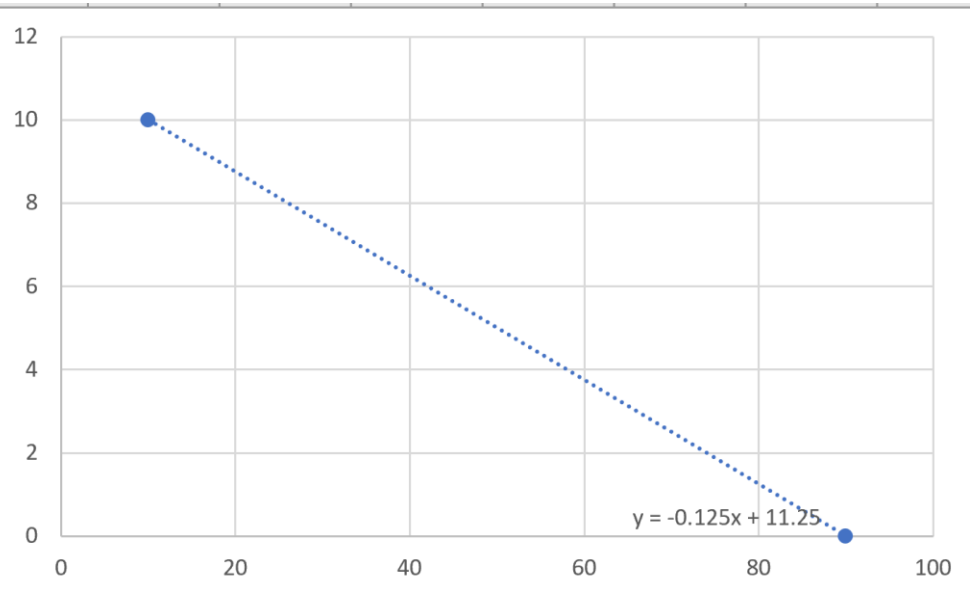
(5 385 300 trips/day x 24.5 minutes/trip) / 2 068 610 = 63.7 minutes/day

f Scale



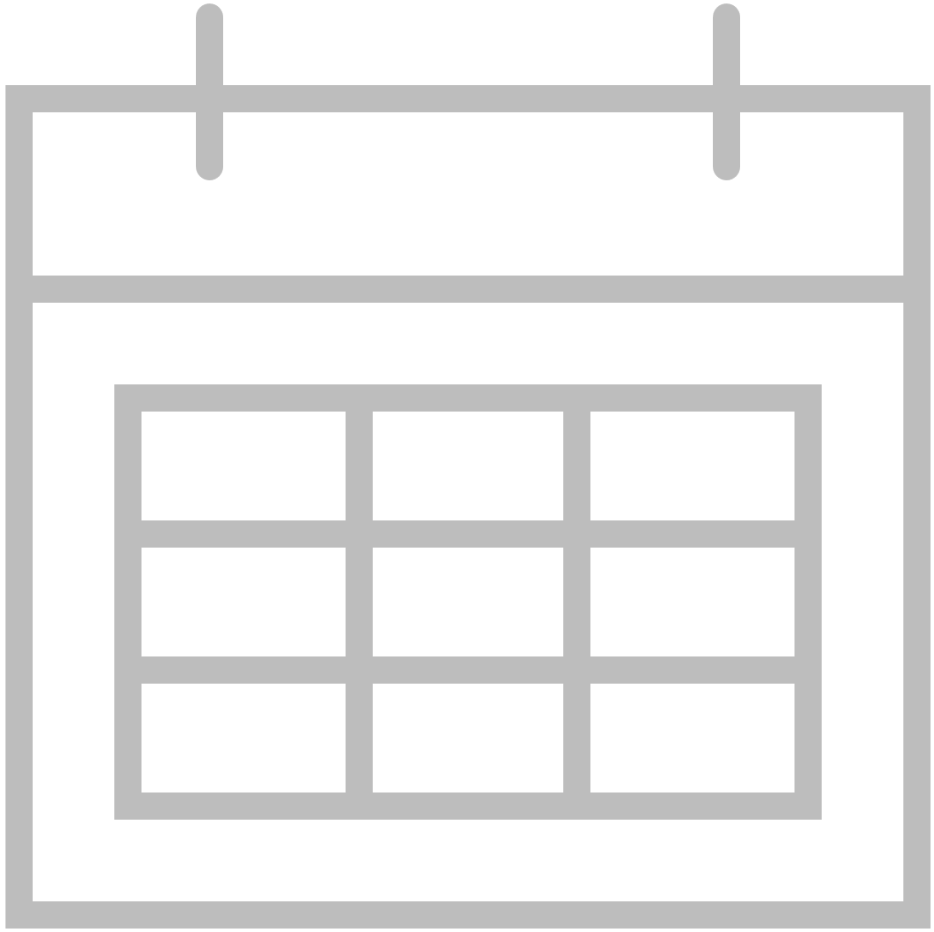
➔ 10: ≤ 10 [minutes per day]
➔ 0: ≥ 90 [minutes per day]

0	90
10	10
3.2875	63.7



Assignment #2

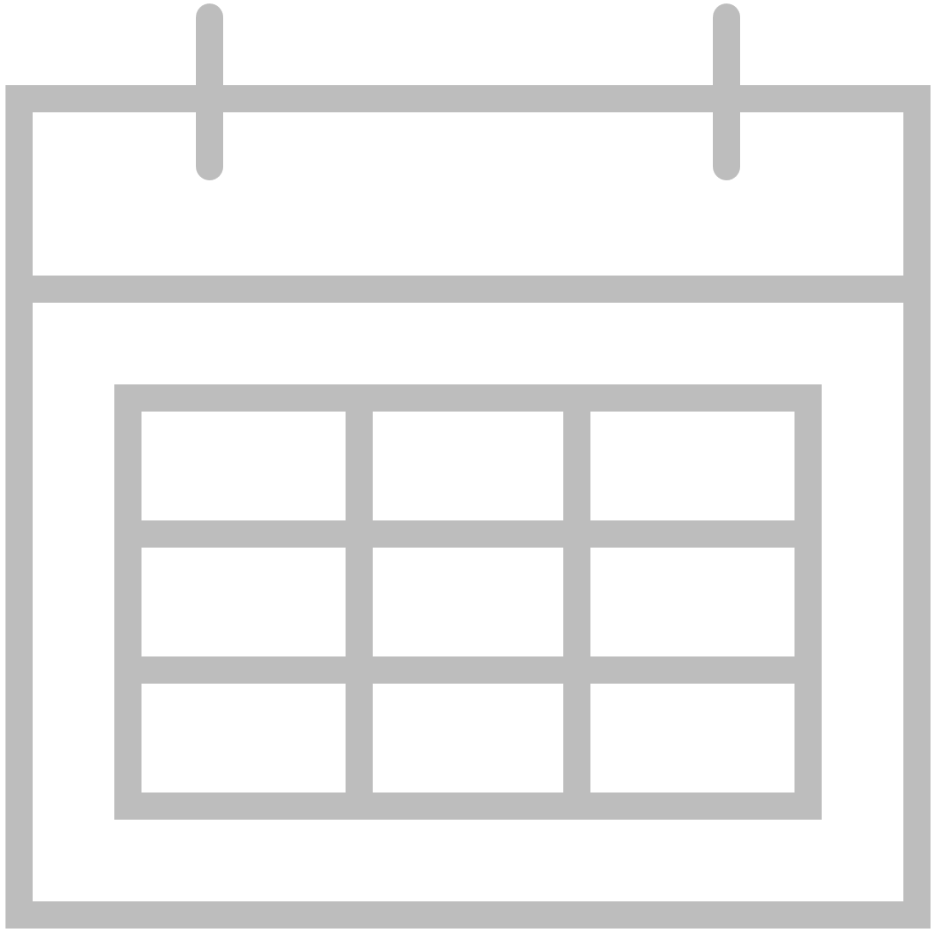
Excel calculation of AFFORDABILITY for the cities of Assignment #1



2017,
2020,
2021

Assignment #3

Excel calculation of COMMUTING DURATION for Lisbon and other cities
Indicate all assumptions and sources of data



2017,
2020,
2021

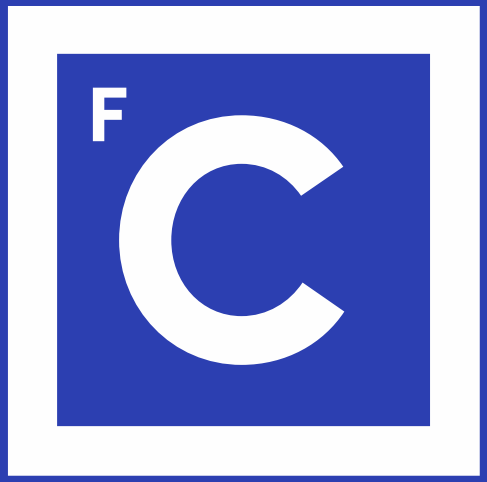
Assignment #2 and Assignment #3

Deadline: 22 March

Use the same excel then Assignment #1
Presentation with radar for the chosen cities

Send via e-mail : camsilva@fc.ul.pt

Thanks



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