

AIR QUALITY IN PARIS REGION

Summary 2015

June 2016





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Summary

April 2016

This report is an English summary of the annual report on ambient air quality in the Paris region. It gives an overview of the concentrations for the European Union regulated pollutants during the year 2015.

The complete report in French can be downloaded on AIRPARIF website:
http://www.airparif.asso.fr/_pdf/publications/bilan-2014.pdf

Air quality full data set in the Paris region can be downloaded at
<http://www.airparif.asso.fr/telechargement/telechargement-statistique>

Annual pollution maps are available at <http://www.airparif.asso.fr/etat-air/bilan-annuel-cartes>

All data, reports and studies made by AIRPARIF are publicly available. Full and free access is granted on AIRPARIF website.

Any use of part of this report should mention "AIRPARIF the Observatory of Air Quality in the Paris Region".

Cover illustration: map of the hourly NO₂ concentration on the 1st of July 2015 at 10am (Airparif – Google Earth & Landsat)

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1. KEY FACTS FOR 2015

In 2015, particulate matter and nitrogen dioxide levels within the Paris region remain an issue, with substantial exceedances of EU limit values. However a decrease of chronic pollution levels for these pollutants is confirmed this year. As for ozone, a slight rise of exceedances is observed due to a warm and sunny summer. Yet it stays in the average levels generally observed.

With regards to meteorological conditions, 2015 was globally a warm year, as 2014 had been. It differentiated by temperatures above normal throughout the year, especially during winter (except in February). June and July were very summery, as opposed to what happened in 2014. This particular weather has hugely impacted Paris region air quality (reduction of emissions linked to heating in winter, presence of photochemistry in summer).

On a trend line basis, mean levels in 2015 were slightly lower than those in 2014.

→ Daily and annual limit values for PM₁₀ particles are still greatly exceeded on roadside sites. In 2015, **around 300 000 inhabitants in the agglomeration and living close to main roads were potentially affected by the PM₁₀ exceedance of the daily limit value.** This is slightly less than in 2014 and it is related to a few less exceedances of the PM₁₀ 50 µg/m³ daily threshold than the previous year.

For fine particles (PM_{2.5}), **in 2015, 11.5 million inhabitants of Paris Region were potentially affected by air quality objective exceedances.** Background levels away from road traffic were, on average, 1.5 times higher than the objective and up to 2.5 higher on roadside situations. In 2015, the limit value is met, for the first time, everywhere in the Paris region.

→ **The slight decrease of nitrogen dioxide (NO₂) levels is confirmed** in the greater Paris urban agglomeration. This observation is consistent with the known decrease of nitrogen oxide emissions in the region from road traffic, industries and heating.

Along the main roads, average levels remain twice the annual limit. Nonetheless, they are slightly below 2014 levels on most measurement sites. **All in all, in 2015, around 1.6 million inhabitants of the Paris region, among which more than one Parisian out of two, were potentially exposed to NO₂ levels exceeding the annual limit value.**

→ Regarding ozone (O₃) levels, **as every year, the quality objective is exceeded in all parts of the region, and especially in sub-urban and rural areas.**

→ After a long period of sharp decrease which began at the end of the 1990's, benzene (C₆H₆) levels continue to decline slightly on the whole region, and especially near traffic. However, **almost 100 000 inhabitants, in the agglomeration and at roadside situations, are potentially exposed to an exceedance of the annual quality objective for benzene.**

→ **Regarding pollution episodes, the information and warning procedure was triggered 16 days in 2015, exactly as in 2014.**

Almost all of these episodes are due to PM₁₀: 8 days of exceedances of the information warning threshold and 4 days for the alert threshold were registered. Due to a favorable summery weather during June and July, 4 days of exceedances of the information warning threshold were also registered for ozone. As for nitrogen dioxide no exceedance was observed during 2015.

The following table provides a summary of the global trend and the situation of 2015 relating to pollution standards :

	Standards to be met	Non-binding standards		Trend
	Limit value	Target value	Quality objective	2005-2015
PM ₁₀	Exceeded		Exceeded	↘
PM _{2.5}	Met	Met	Exceeded	↘
NO ₂	Exceeded		Exceeded	↘
O ₃		Met	Exceeded	→
Benzène	Met		Exceeded	↘

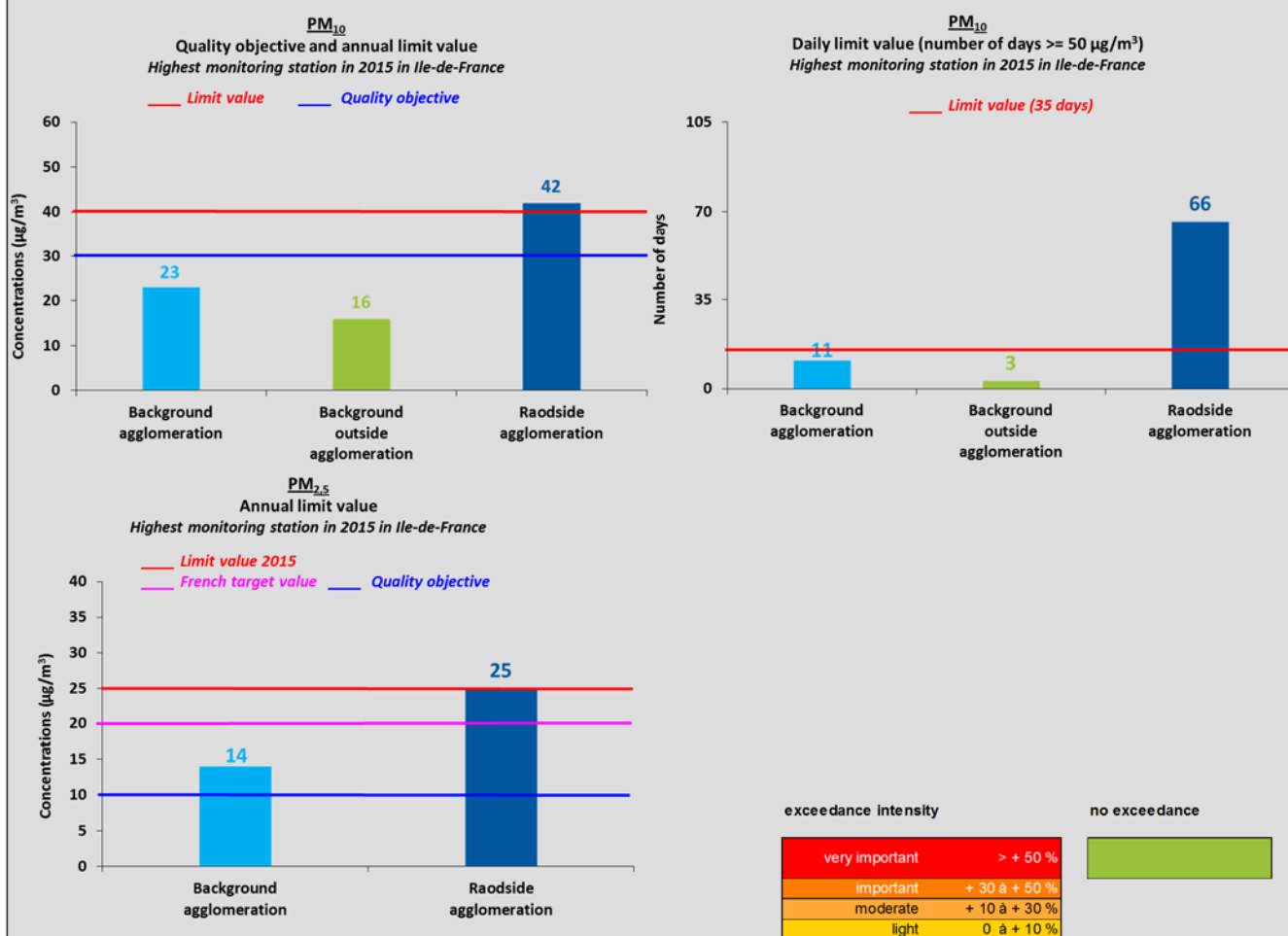
2. POLLUTANTS EXCEEDING AIR QUALITY STANDARDS

Particulate matter in brief

300 000 inhabitants are potentially exposed to an exceedance of the PM₁₀ EU daily limit value.

Recurrent and severe exceedances of PM₁₀ EU limit values are observed near road traffic.

PM_{2.5} levels are 1.2 to 1.4 times higher than the quality objective threshold in background situation, and more than twice higher near road traffic. Almost 95 % in the Paris region inhabitants, that is to say 11.5 million persons would be exposed to an exceedance of this threshold. Nonetheless, a decrease trend seems to appear, particularly at roadside situation where the EU annual limit has not been exceeded for the second year in a row.



Particulate Matter (PM ₁₀)	2015			2005-2014		
	Background agglomeration	Rural background	Roadside	Background agglomeration	Rural background	Roadside
Annual quality objective exceedance	light	light	very important	light	light	very important
Annual limit value exceedance	light	light	very important	light	light	very important
Daily limit value exceedance	light	light	very important	2007 : station max = threshold	light	very important

Particulate Matter (PM _{2.5})	2015			2005-2014		
	Background agglomeration	Rural background	Roadside	Background agglomeration	Rural background	Roadside
Quality objective exceedance	very important	important	very important	very important	measured since 2013	very important
French target value exceedance	light	light	light	2007, 2009	light	light
Limit value (2015) exceedance	light	light	light	light	light	every year

Summary of air quality standards exceedances for particulate matter (PM₁₀ and PM_{2.5}) in the Paris region

2.1 PM₁₀ particles

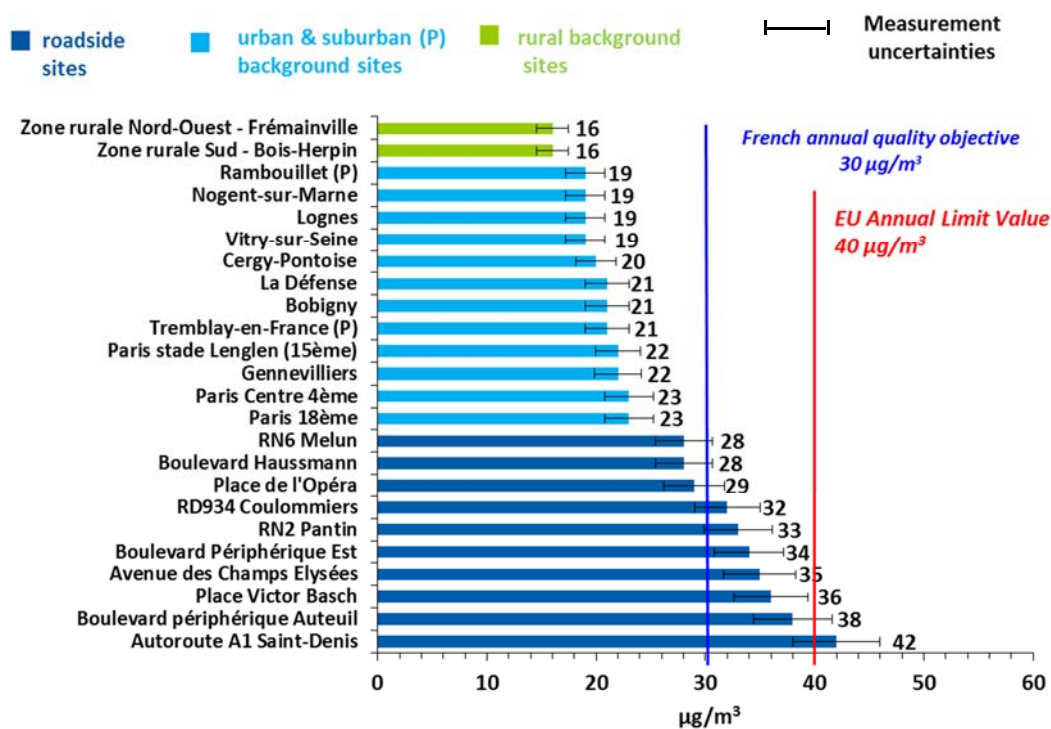


Figure 1 : PM₁₀ annual mean concentration for all continuous monitoring sites (TEOM FDMS / BAM) in the Paris region in 2015

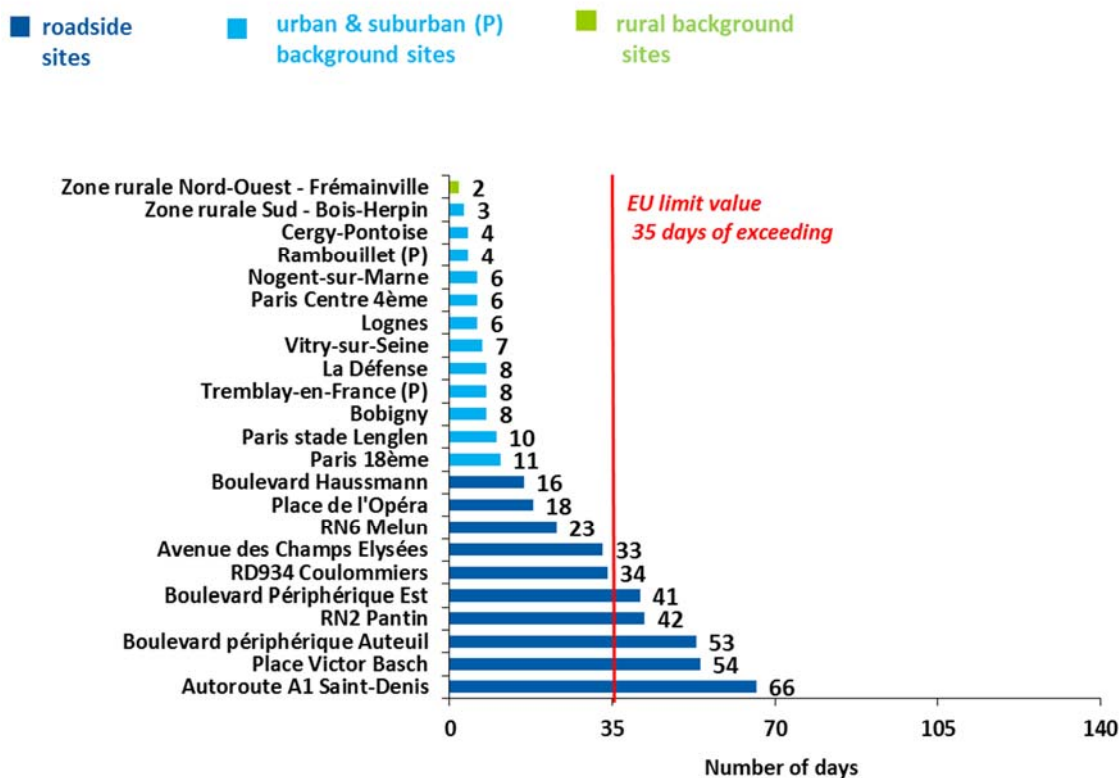


Figure 2 : PM₁₀ annual number of days exceeding the 50 µg/m³ EU threshold for all continuous monitoring sites (TEOM FDMS / BAM) in the Paris region in 2015

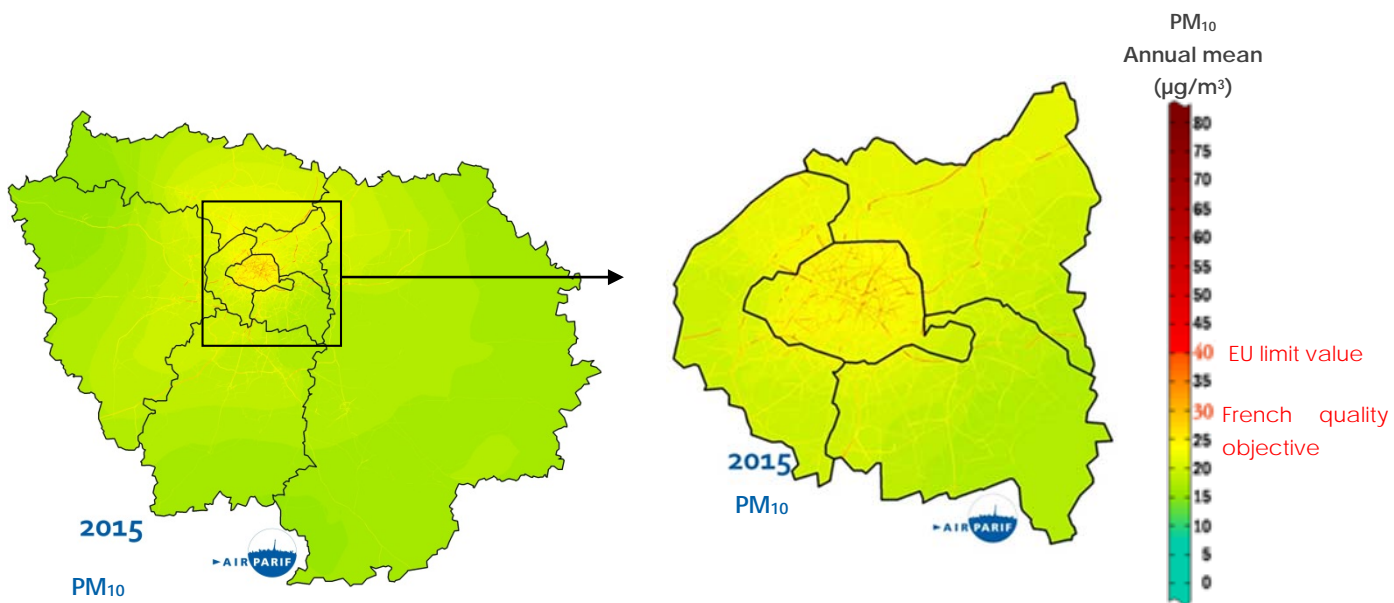
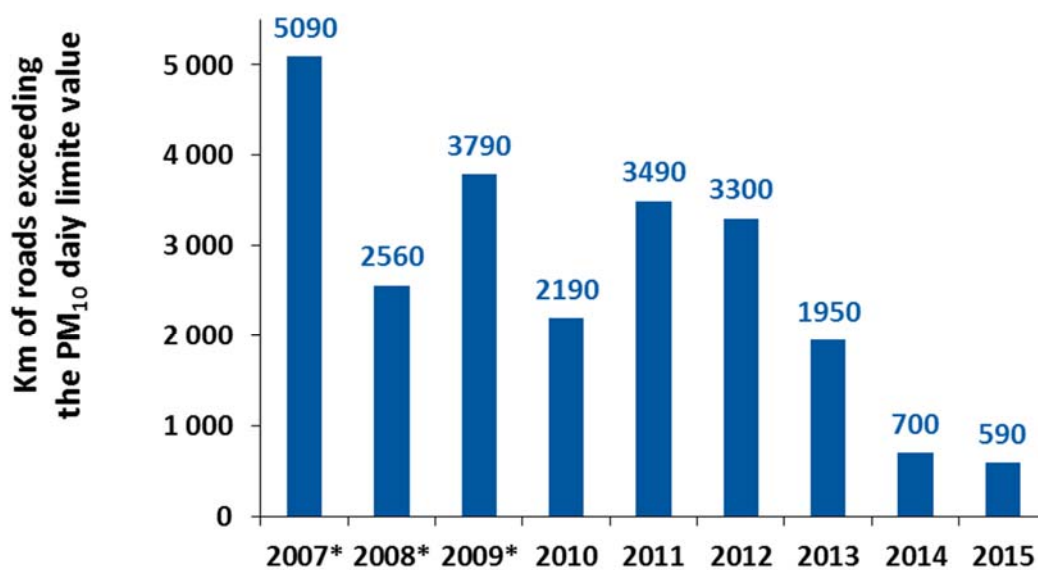
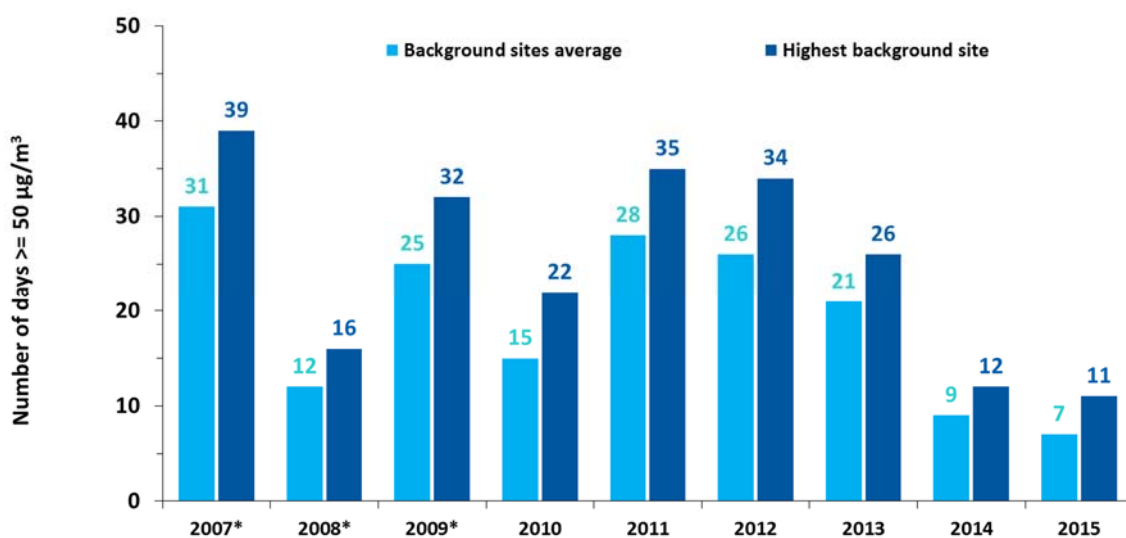


Figure 3 : PM₁₀ annual mean concentration in the Paris region, background and roadside, focus on Paris and near suburbs, 2015



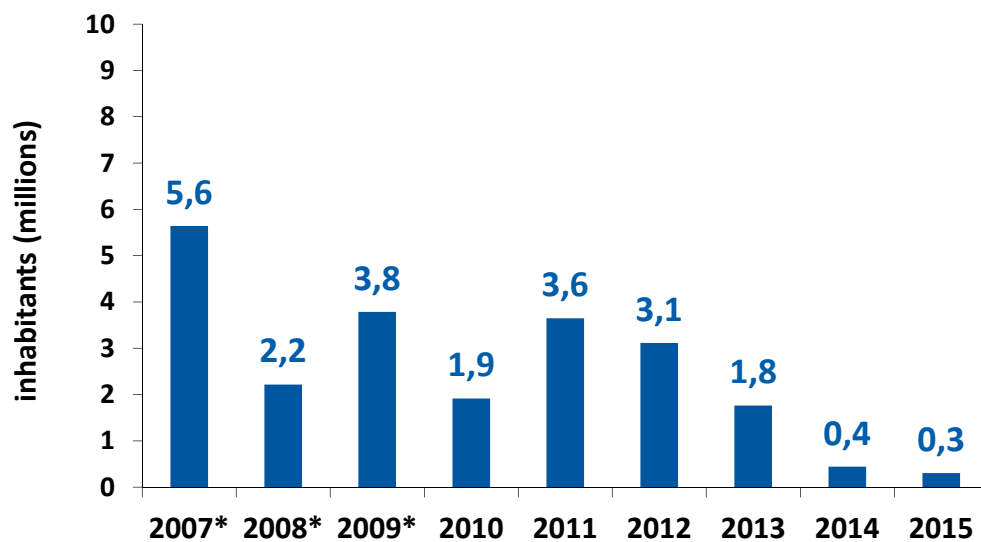
* exceedance calculated with included threshold

Figure 4 : Kilometres of roads exceeding the PM₁₀ daily limit value in the Paris region, 2007 to 2015



* exceedance calculated with excluded threshold

Figure 5 : Number of days exceeding PM₁₀ 50 µg/m³ threshold, average and highest background site, 2007 to 2015



* exceedance calculated with included threshold

Figure 8 : Millions of inhabitants potentially exposed to PM₁₀ level exceeding the EU daily limit value in the Paris region, 2007 to 2015

2.2 PM_{2.5} particles

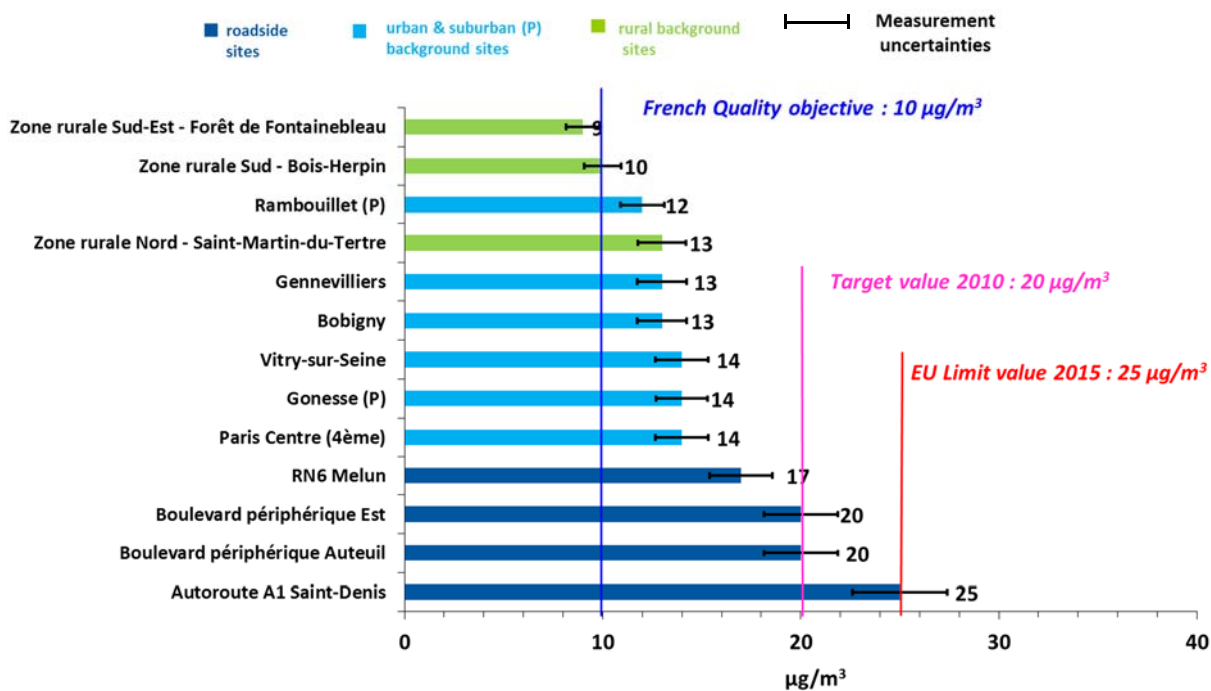


Figure 9 : PM_{2.5} annual mean concentration for all continuous monitoring sites (TEOM FDMS) in the Paris region in 2015

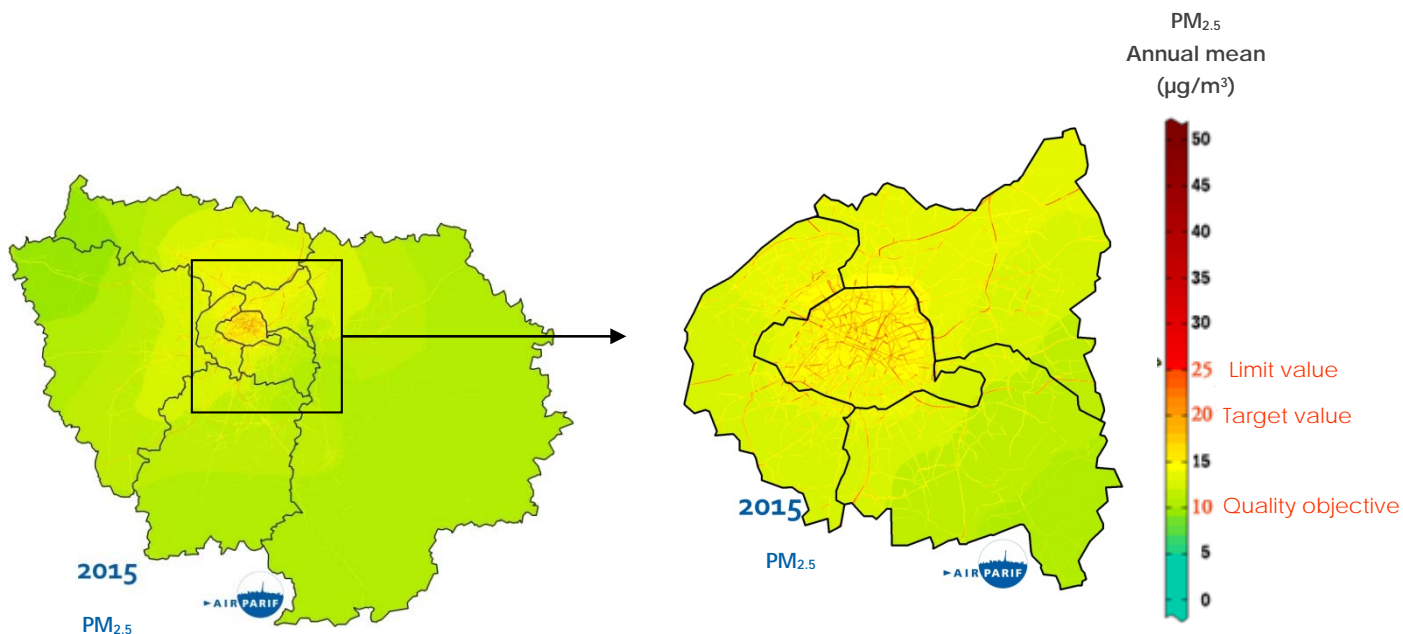


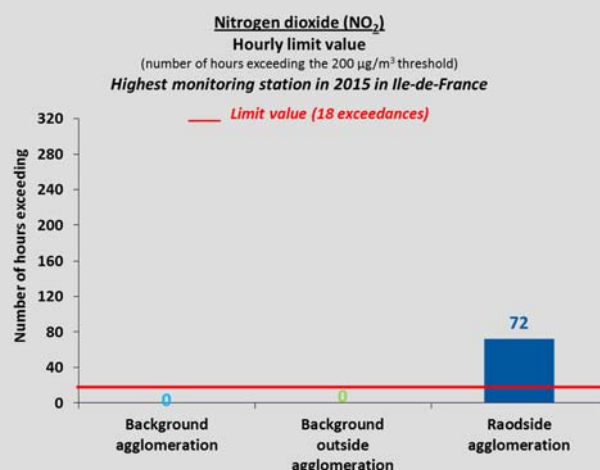
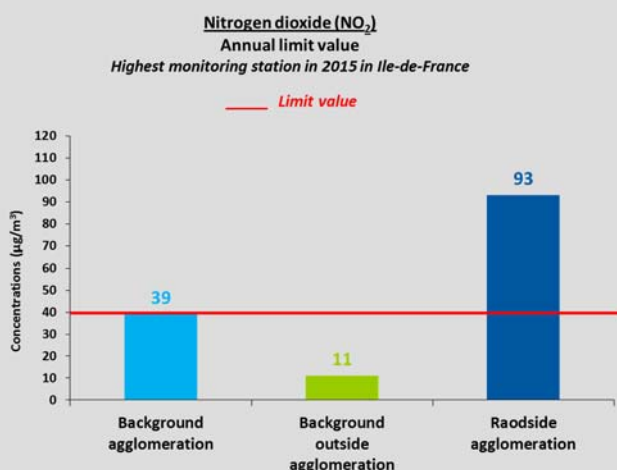
Figure 10 : Annual mean concentration of fine particles PM_{2.5} in the Paris region and focus on Paris and suburbs, background and roadside in 2015

Nitrogen dioxide in brief

Nitrogen dioxide remains an important issue in the Paris region:
in 2015, around 1.6 million inhabitants living in the centre of the agglomeration were potentially exposed to an exceedance of the EU annual limit value.

After a stabilisation in 2013 and 2014, the decrease trend of the background level observed within the agglomeration since the beginning of the 2000's goes on between 2014 and 2015.

The main source of nitrogen dioxide remains road traffic, levels along major roads can be twice higher than the EU limit value.



exceedance intensity

very important	> + 50 %
important	+ 30 à + 50 %
moderate	+ 10 à + 30 %
light	0 à + 10 %

no exceedance



Nitrogen dioxide (NO ₂)	2015			2005-2014		
	Background agglomeration	Rural background	Roadside	Background agglomeration	Rural background	Roadside
Annual limit value exceedance *				2003, 2007, 2009, 2010, 2011, 2012, 2013, 2014		tous les ans
Hourly limit value exceedance *						depuis 2006

* considering margins of tolerance decreasing from year to year

Summary of air quality standards exceedances for nitrogen dioxide (NO₂) in the Paris region

2.3 Nitrogen dioxyde (NO₂)

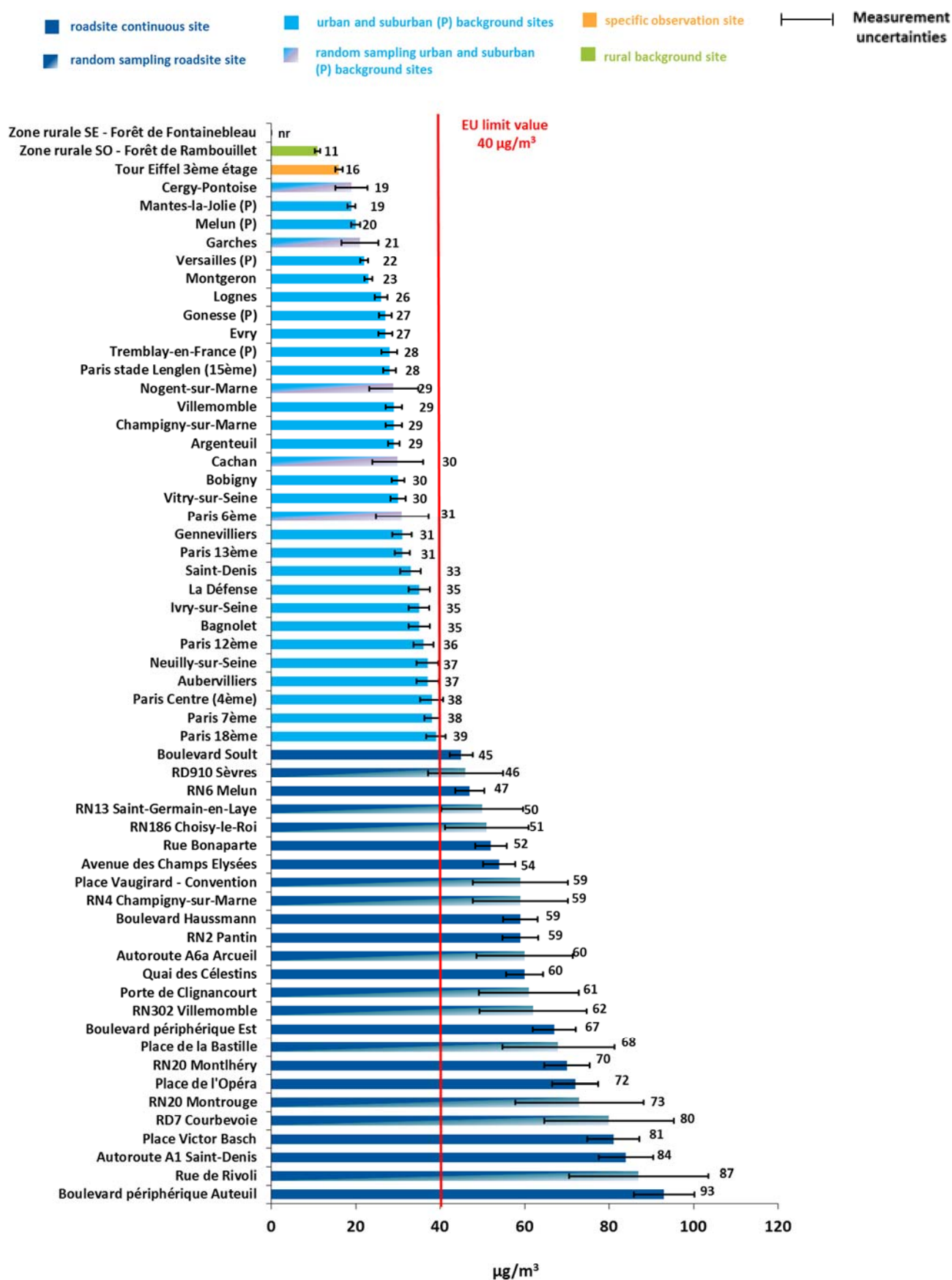


Figure 11 : Nitrogen dioxide (NO₂) annual mean concentration for all monitoring sites in the Paris region in 2015

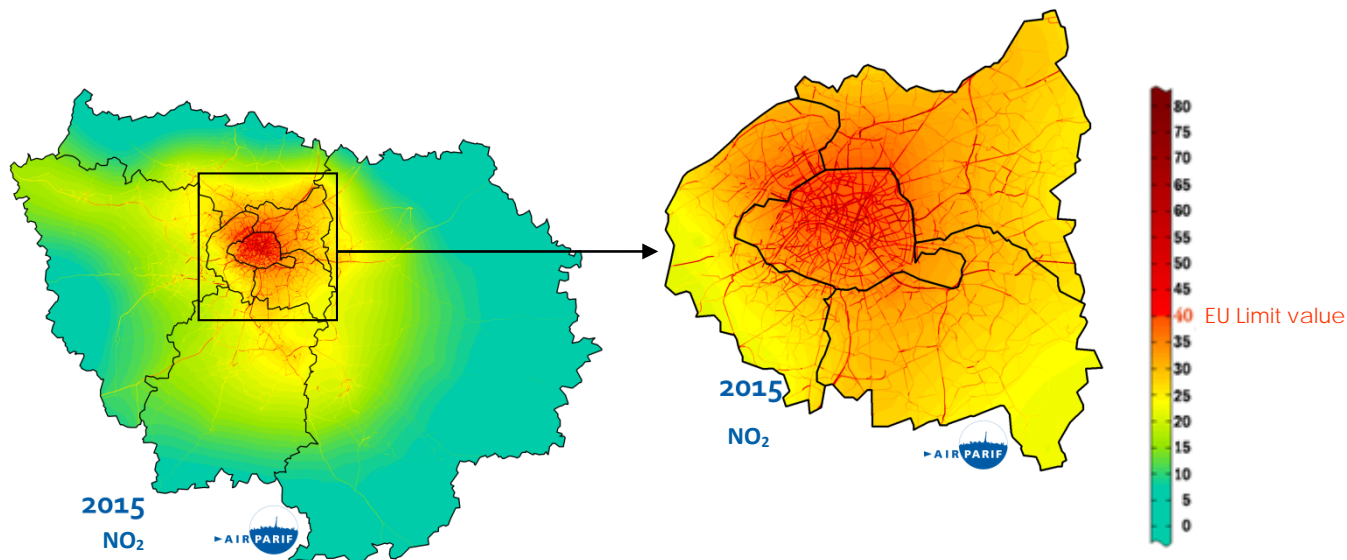
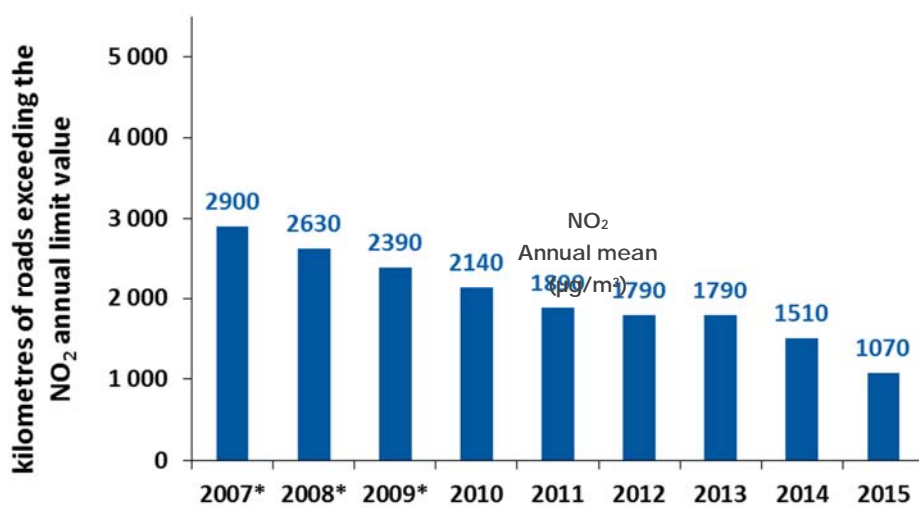
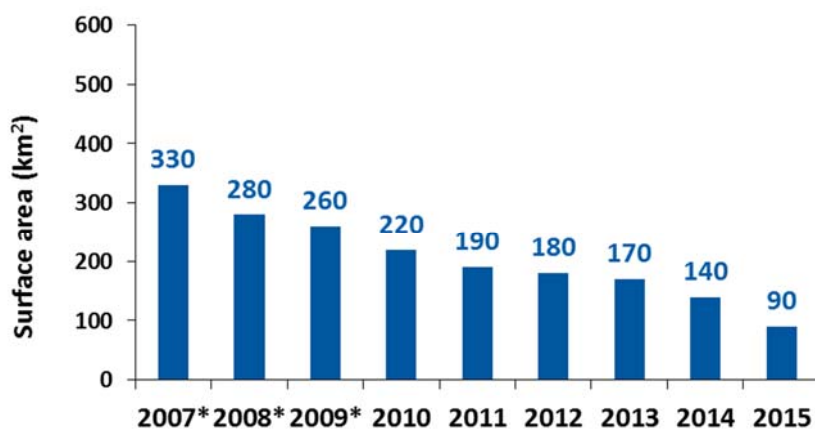


Figure 12 : Nitrogen dioxide (NO₂) annual mean concentration in the Paris region, background and roadside, focus on Paris and near suburbs, 2015



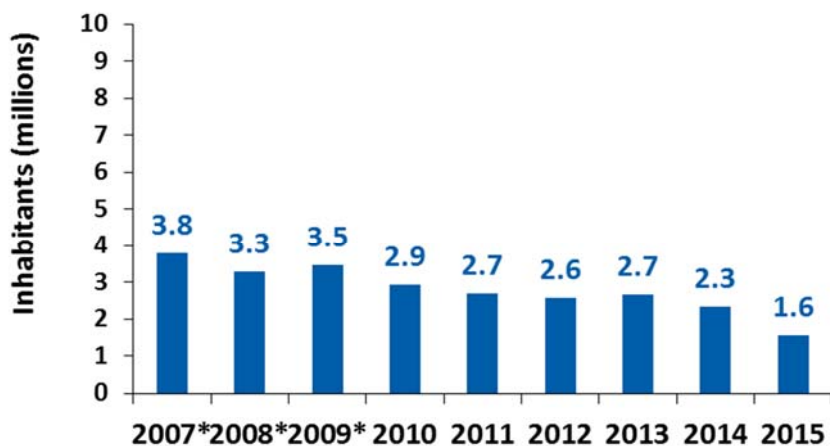
* exceedances calculated with included threshold

Figure 13 : Kilometres of main road network exceeding the nitrogen dioxide (NO₂) EU annual limit value in the Paris region, 2007 to 2015



* exceedances calculated with included threshold

Figure 14 : Trend in surface area exceeding the annual limit value (40 µg/m³) in nitrogen dioxide (NO₂) in the Paris region, 2007 to 2015



* exceedances calculated with included threshold

Figure 15 : Millions of inhabitants potentially exposed to nitrogen dioxide (NO₂) level exceeding EU annual limit value in the Paris region, 2007 to 2015

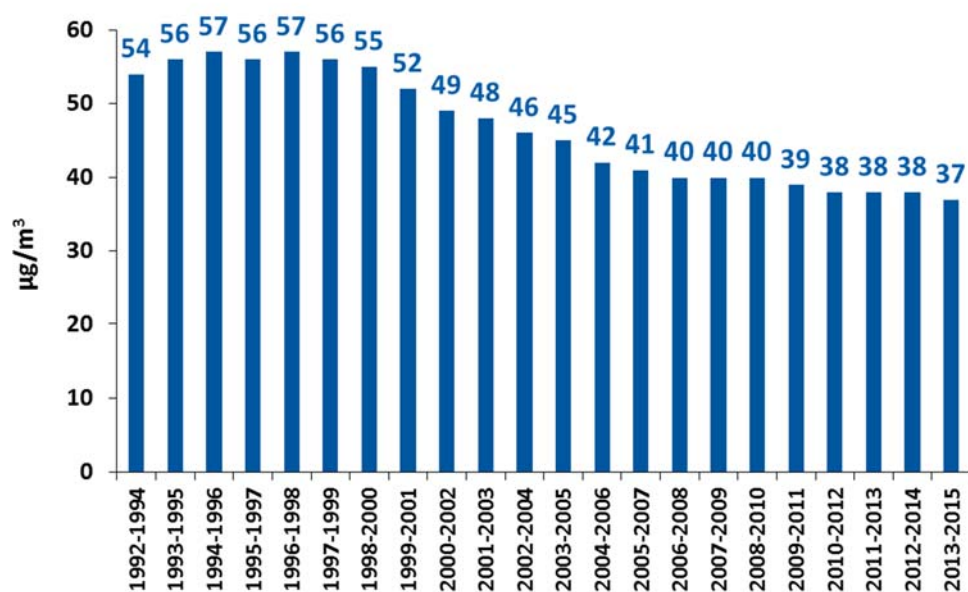


Figure 16 : Trend in the nitrogen dioxide (NO₂) tri-annual mean concentration, sample of the same six urban background sites in the Paris agglomeration, 1992-1994 to 2013- 2015

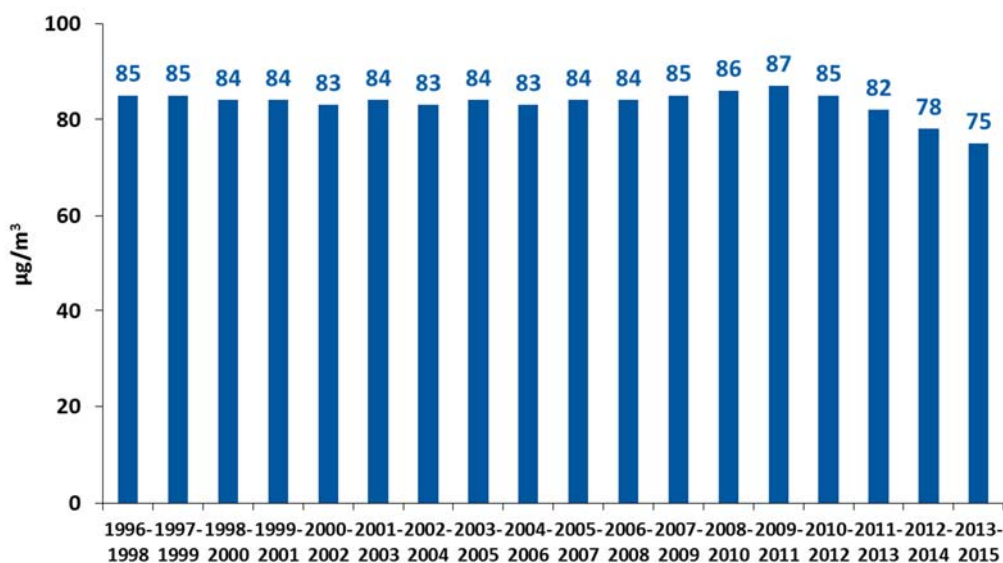


Figure 17 : Trend in the nitrogen dioxide (NO₂) tri-annual mean concentration, sample of the same five roadside sites in the Paris agglomeration, 1996-1998 to 2013- 2015

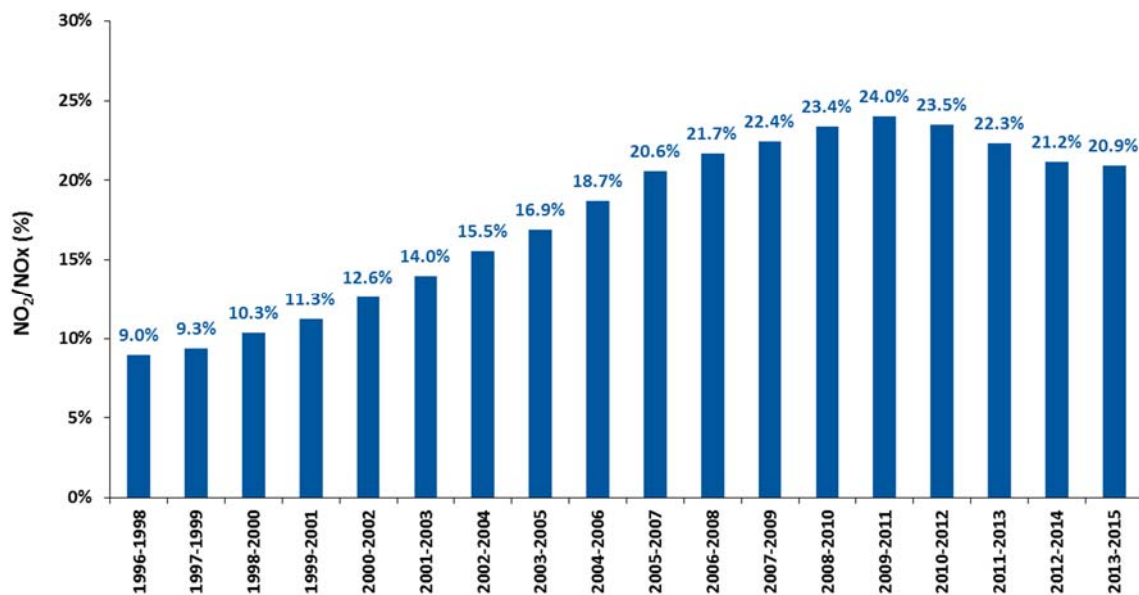


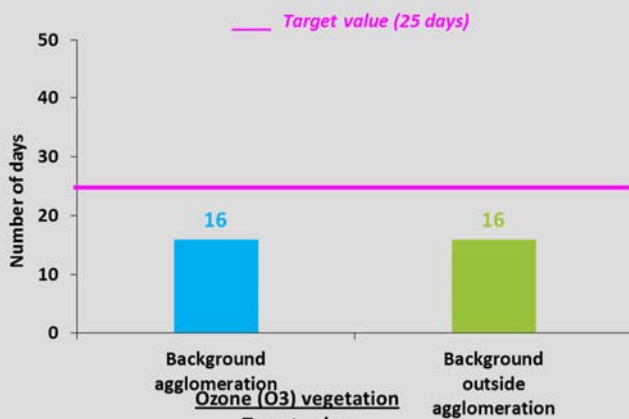
Figure 18 : [NO₂]/[NO_x] ratio trend, averaged roadside sites in the Paris agglomeration (background level subtracted), 1998 to 2015

Ozone in brief

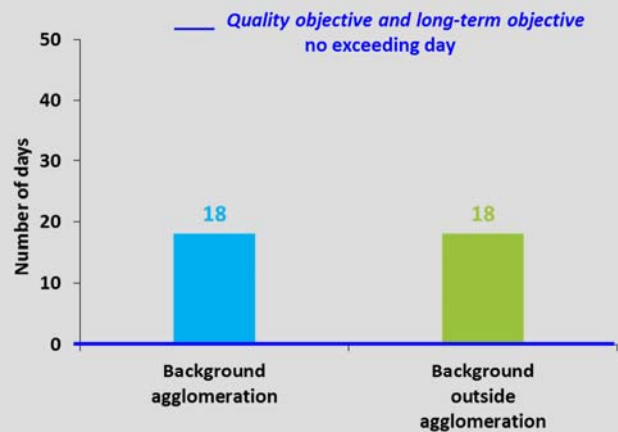
Stabilization of the mean levels.

Exceedances of the quality objective are still numerous in 2015 due to a sunny and hot summer. Yet their number is not significantly different from average.

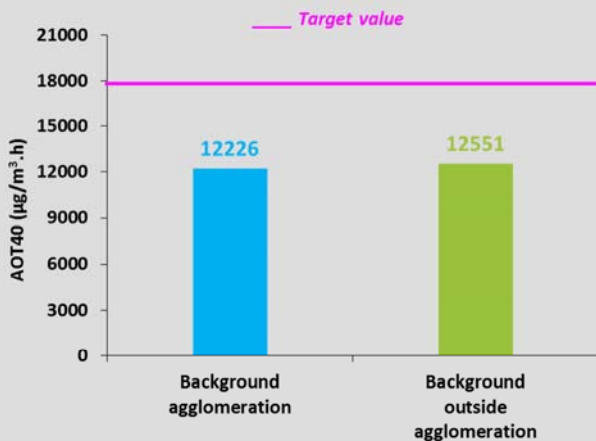
Ozone (O₃) health
Target value
Highest monitoring station in 2015 in Ile-de-France



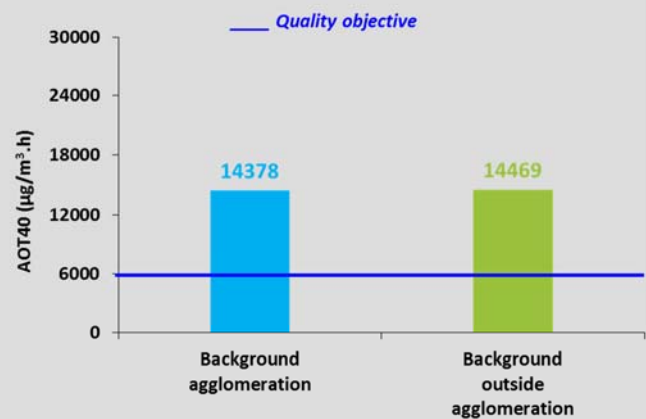
Ozone (O₃) health
Quality objective and long-term objective
Highest monitoring station in 2015 in Ile-de-France



Ozone (O₃) vegetation
Target value
Highest monitoring station in 2015 in Ile-de-France



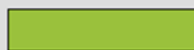
Ozone (O₃) vegetation
Quality objective and long-term objective
Highest monitoring station in 2015 in Ile-de-France



exceedance intensity

very important	> + 50 %
important	+ 30 à + 50 %
moderate	+ 10 à + 30 %
light	0 à + 10 %

no exceedance



Ozone (O ₃)	2015		
	Background agglomeration	Rural background	Roadside
Quality objective exceedance (health)			no measurement
Long term objective applicable in 2020 (health)			no measurement
Target value exceedance applicable in 2015 (health)			no measurement
Quality objective exceedance (vegetation)			no measurement
Long term objective applicable in 2020 (vegetation)			no measurement
Target value exceedance applicable in 2015 (vegetation)			no measurement

2005-2014		
Background agglomeration	Rural background	Roadside
every year	every year	no measurement
every year until 2006	every year until 2006	no measurement
every year	every year	no measurement
		no measurement

Summary of air quality standards exceedances for ozone (O₃) the Paris region

2.4 Ozone (O₃)

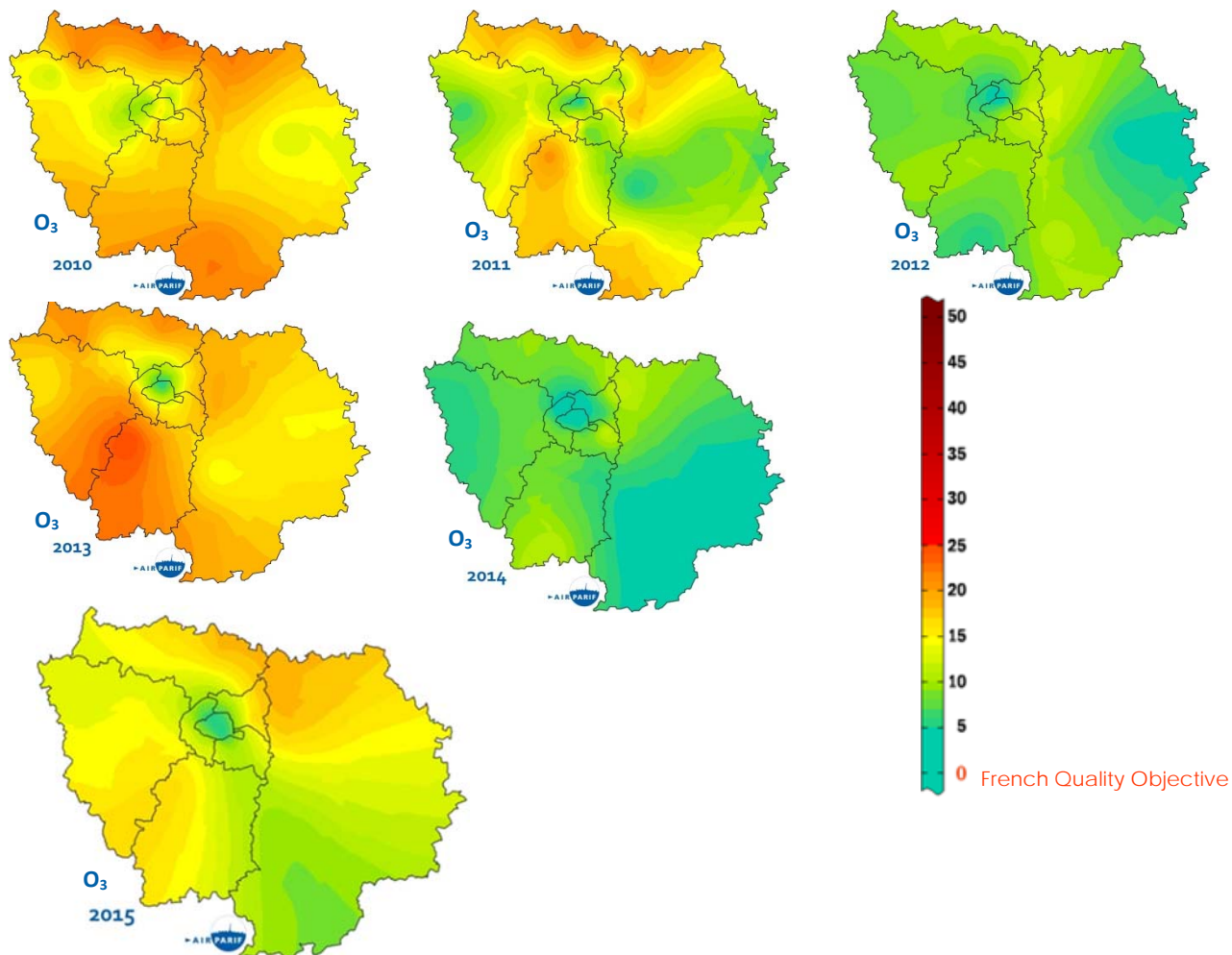


Figure 19 : Number of days exceeding the French quality objective (=EU long-term objective), threshold 120 µg/m³ 8-hour mean, objective = no exceeding) for ozone (O₃) in the Paris region, 2002 to 2015

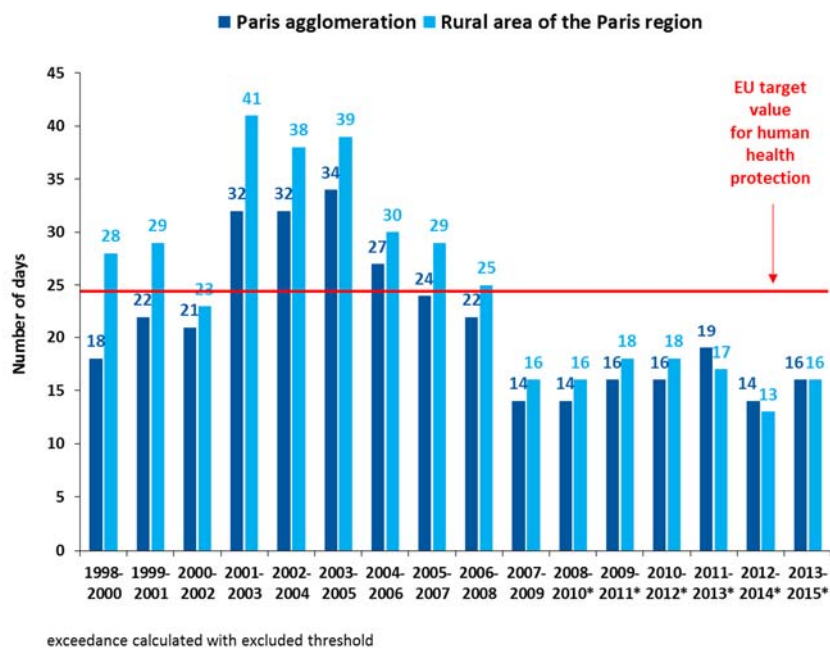


Figure 20 : Number of days exceeding the threshold of the EU target value for protection of human health (120 µg/m³ 8-hour average, not over 25 days of exceeding on a 3 years period) in the Paris region, for the highest monitoring site in urban and rural parts of the region, 1998-2000 to 2013-2015

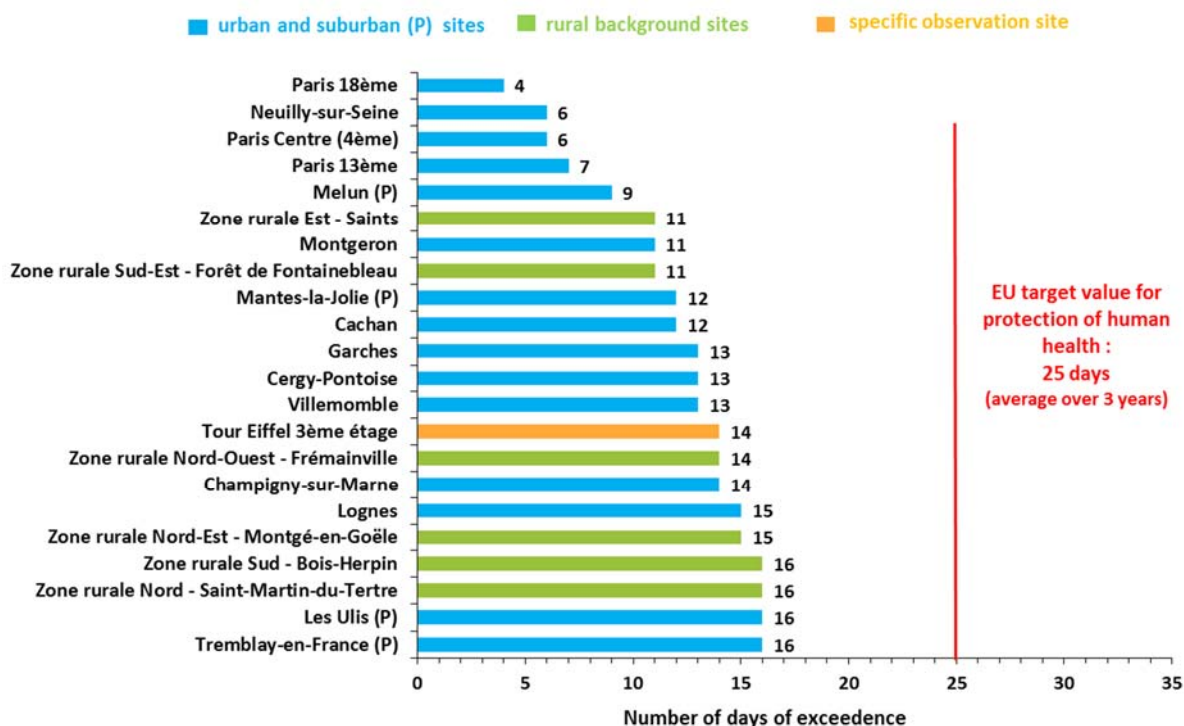


Figure 21 : Number of days exceeding the threshold of the EU target value for protection of human health (120 µg/m³ 8-hour average) in the Paris region (3 years average 2013-2015)

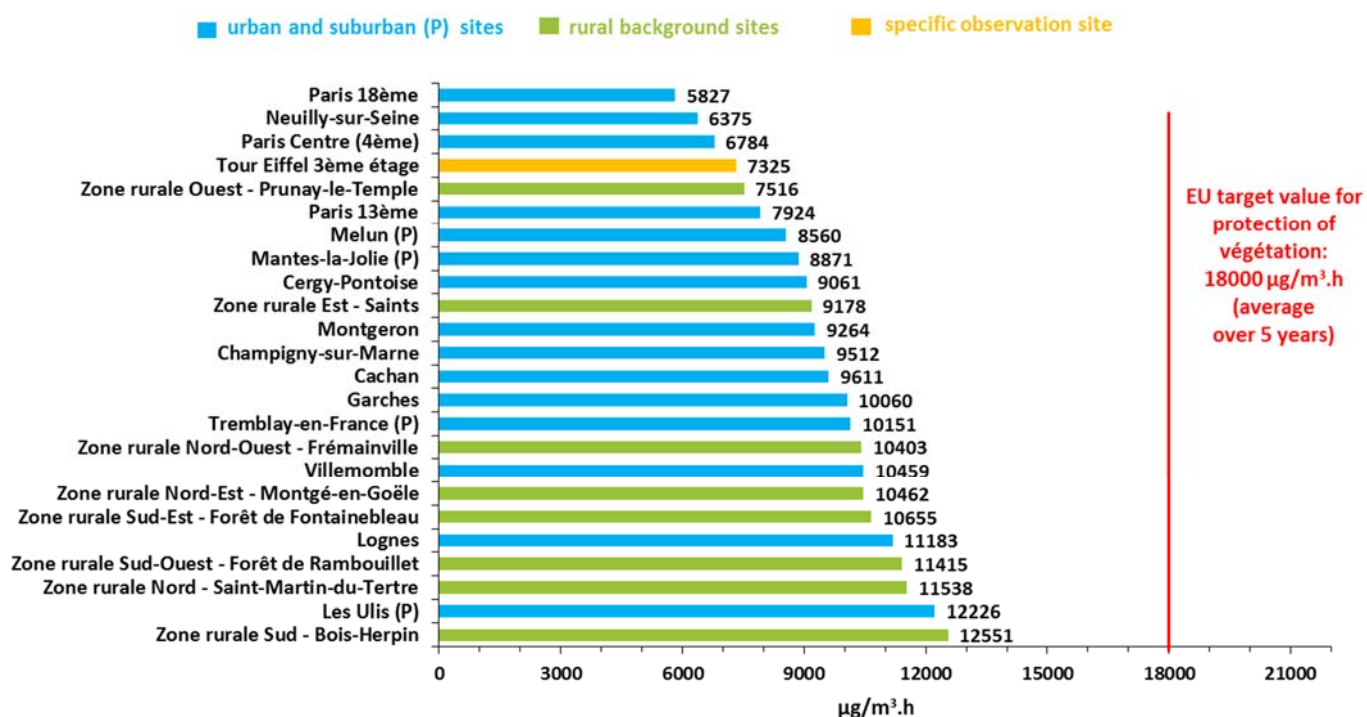


Figure 22 : Target value in ozone for the protection of vegetation (AOT40, threshold of 18000 µg/m³.h) in the Paris region (average 2011-2015)

■ urban and suburban (P) sites ■ rural background sites ■ specific observation site

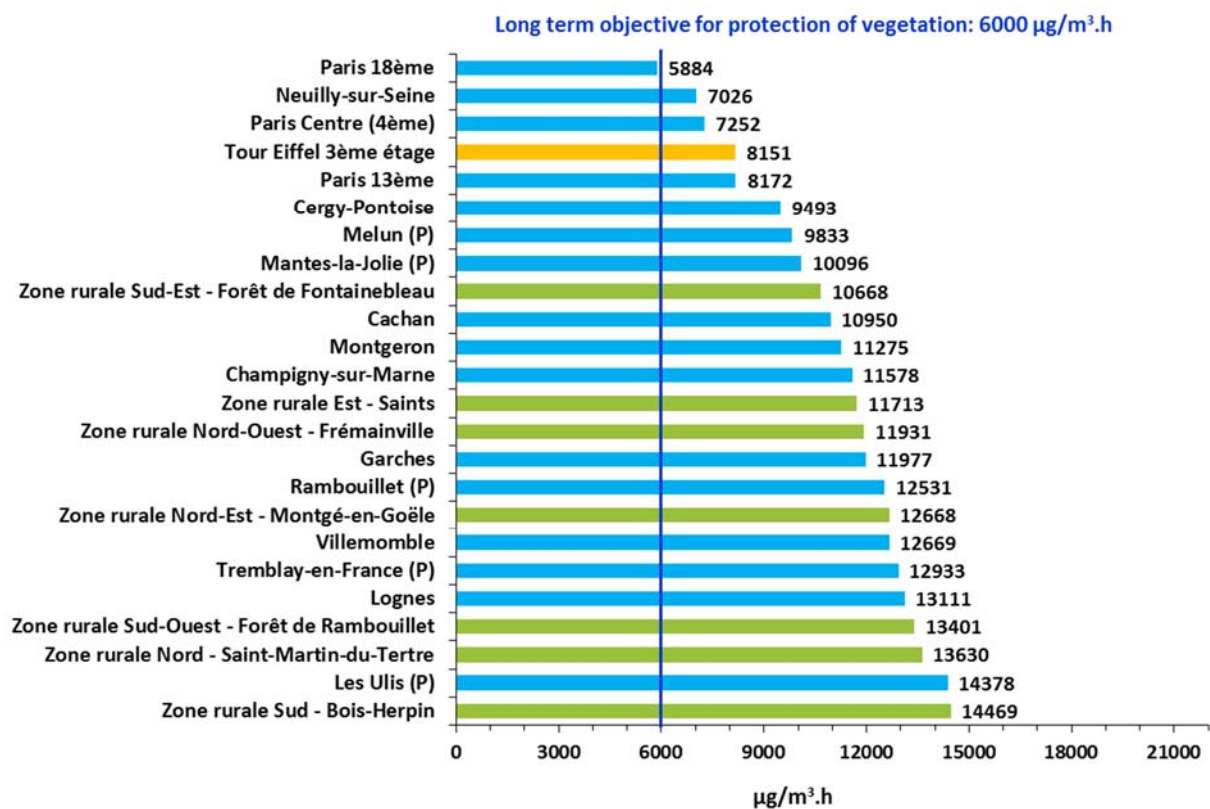


Figure 23 : Long-term objective in ozone (O_3) for the protection of vegetation (AOT40, threshold of 6000 $\mu\text{g}/\text{m}^3\cdot\text{h}$) in the Paris region in 2015

2.5 Benzene (C₆H₆)

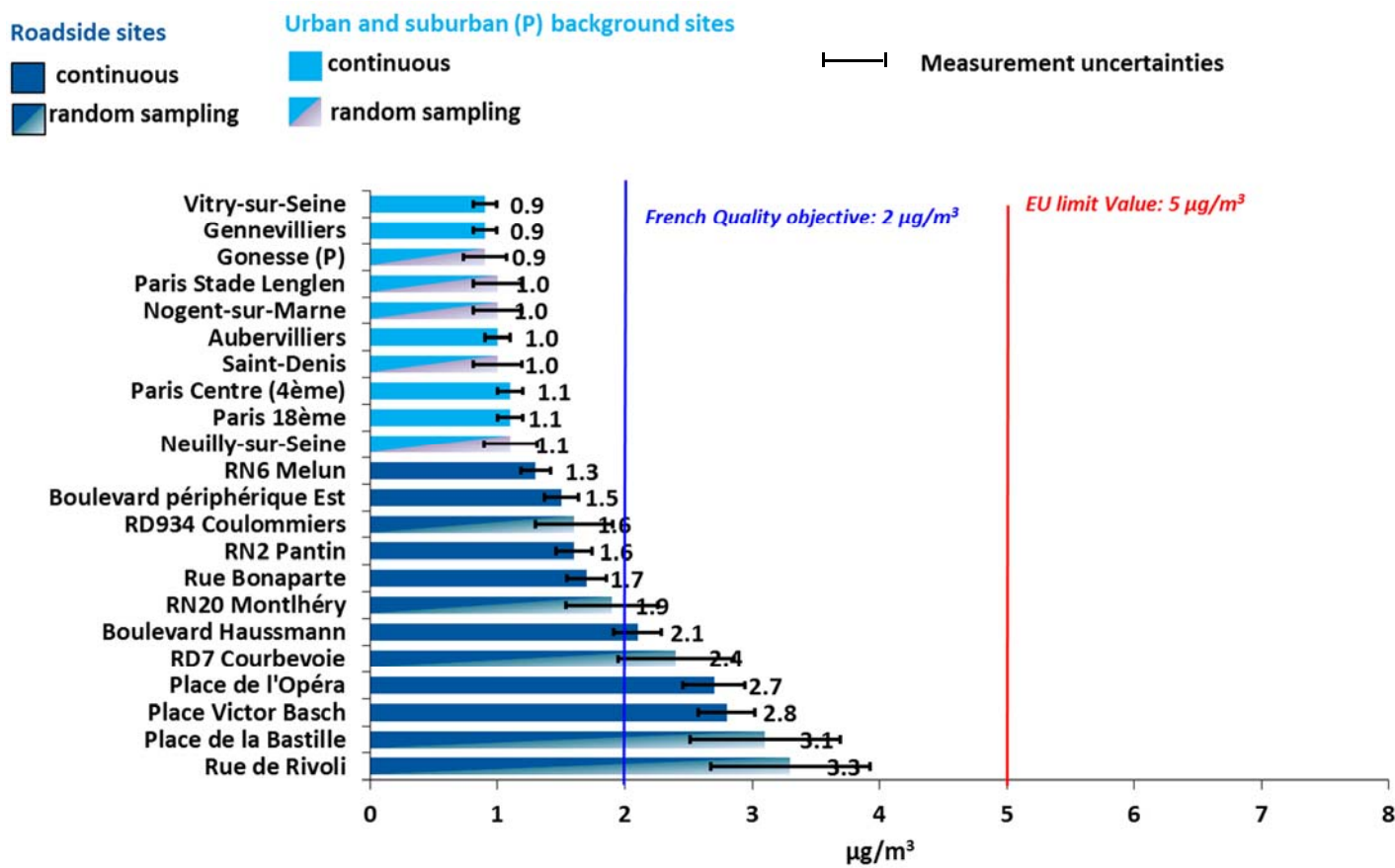


Figure 24 : Annual mean concentration of benzene in the Paris region in 2015

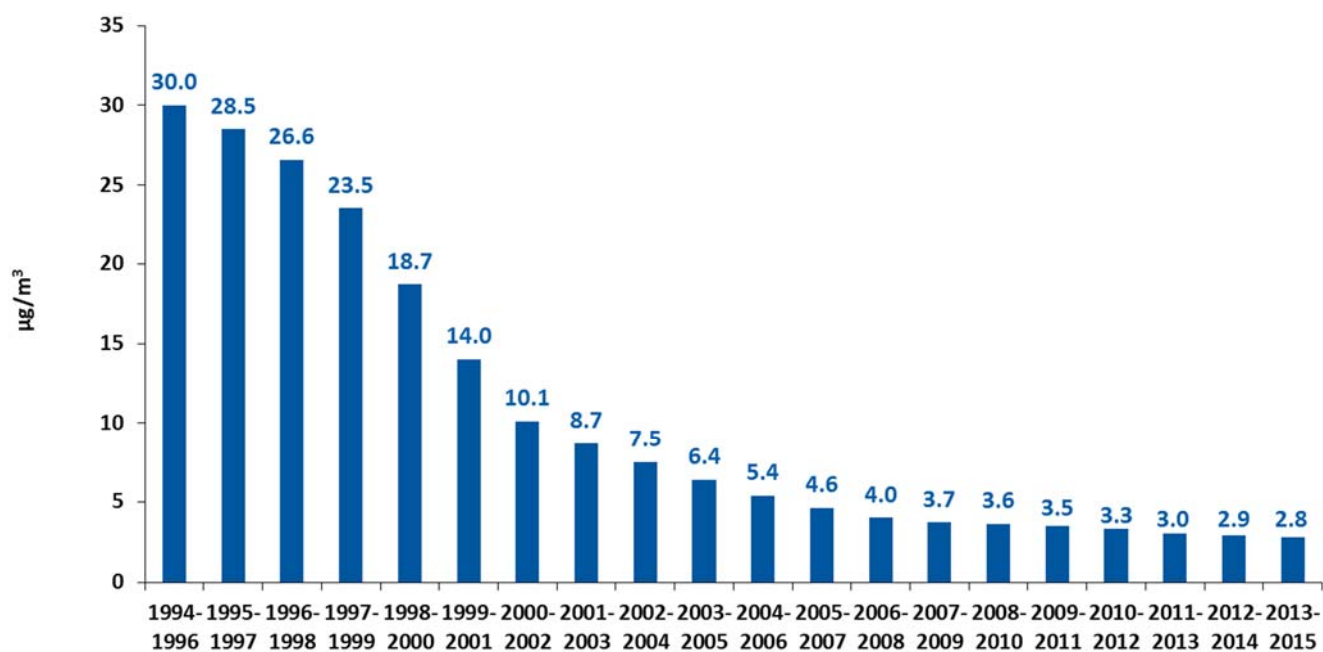


Figure 25 : Trend in the benzene annual mean concentration on Place Victor Basch Paris roadside monitoring site, 1994 to 2015

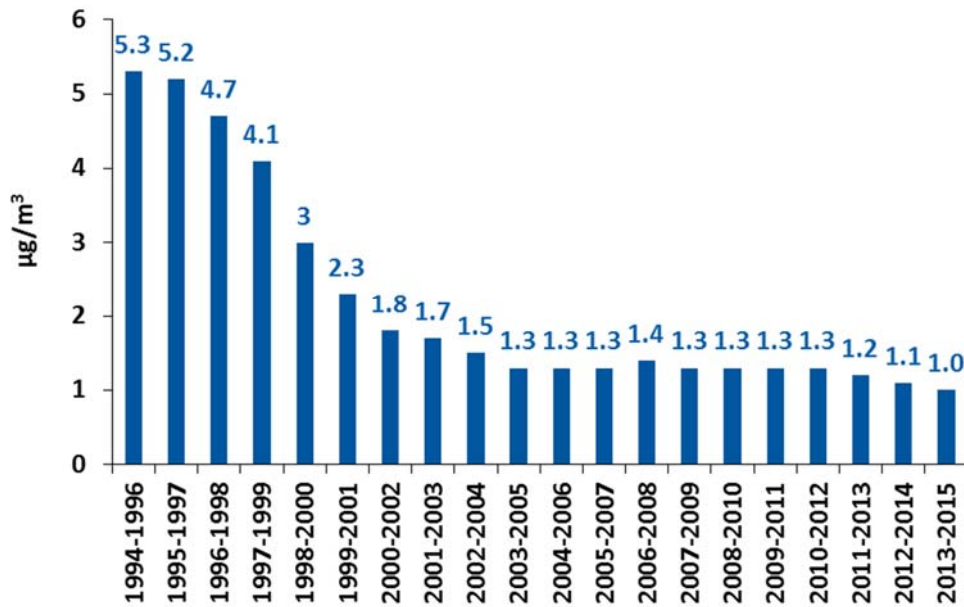


Figure 26 : Trend in the benzene tri-annual mean concentration, sample of five to ten urban background sites in the Paris agglomeration, 1994-1996 to 2013- 2015

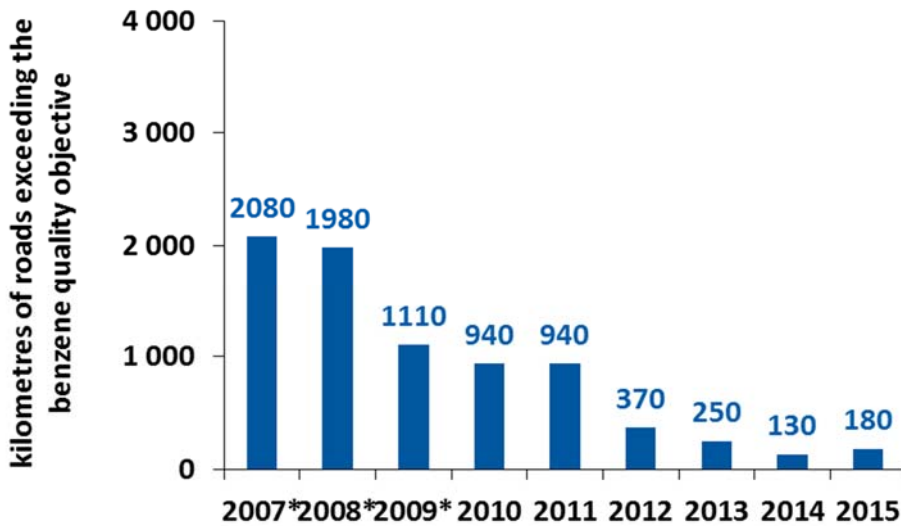


Figure 27 : Kilometres of main road network exceeding the benzene French quality objective (2 µg/m³) in the Paris region, 2007 to 2015

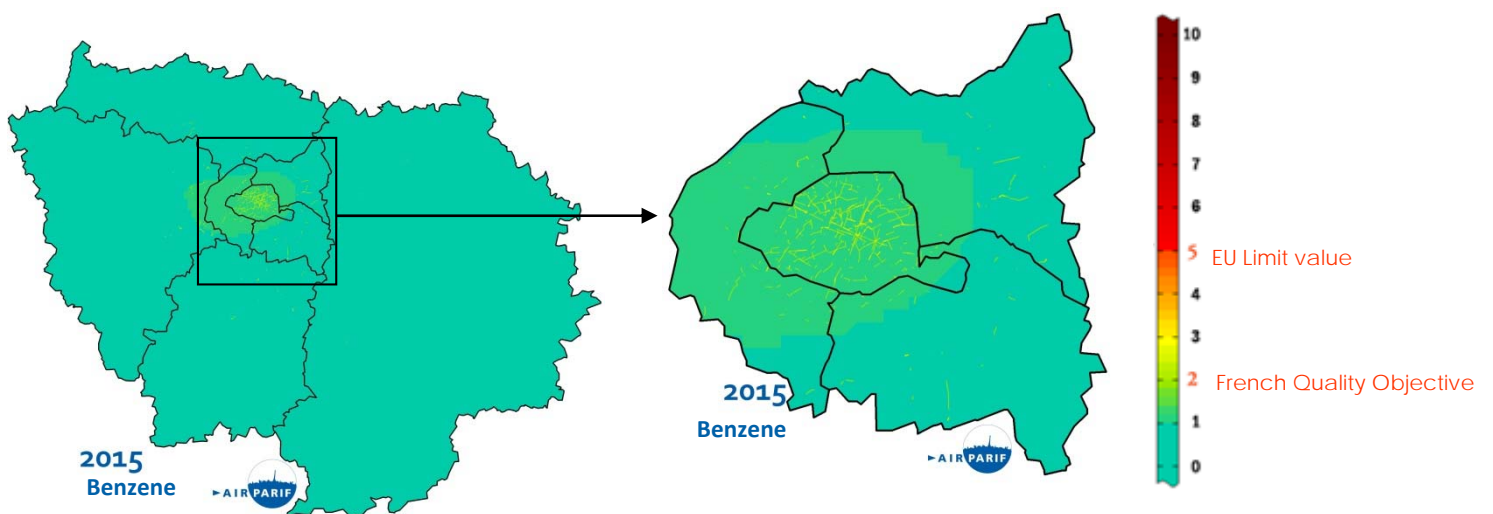


Figure 28 : Benzene annual mean concentration in the Paris region, background and roadside, focus on Paris and near suburbs, 2015

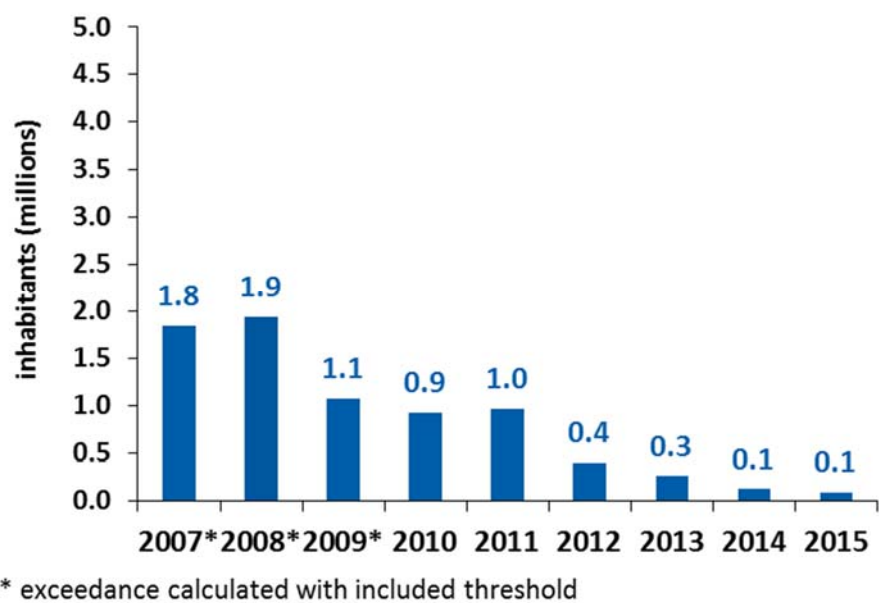


Figure 29 : Millions of inhabitants potentially exposed to an exceeding of the benzene French quality objective (2 µg/m³) in the Paris region, 2008 to 2015

3. Pollutants meeting air quality standards

exceedance intensity		no exceedance		
very important	> + 50 %			
important	+ 30 à + 50 %			
moderate	+ 10 à + 30 %			
light	0 à + 10 %			

Carbon monoxide (CO)	2015			2005-2014		
	Background agglomeration	Rural background	Roadside	Background agglomeration	Rural background	Roadside
Quality objective exceedance		no measurement			no measurement	
Limit value exceedance		no measurement			no measurement	

Sulfur dioxide (SO ₂)	2015			2005-2014		
	Background agglomeration	Rural background	Roadside	Background agglomeration	Rural background	Roadside
Quality objective exceedance						
Hourly limit value exceedance						
Daily limit value exceedance						

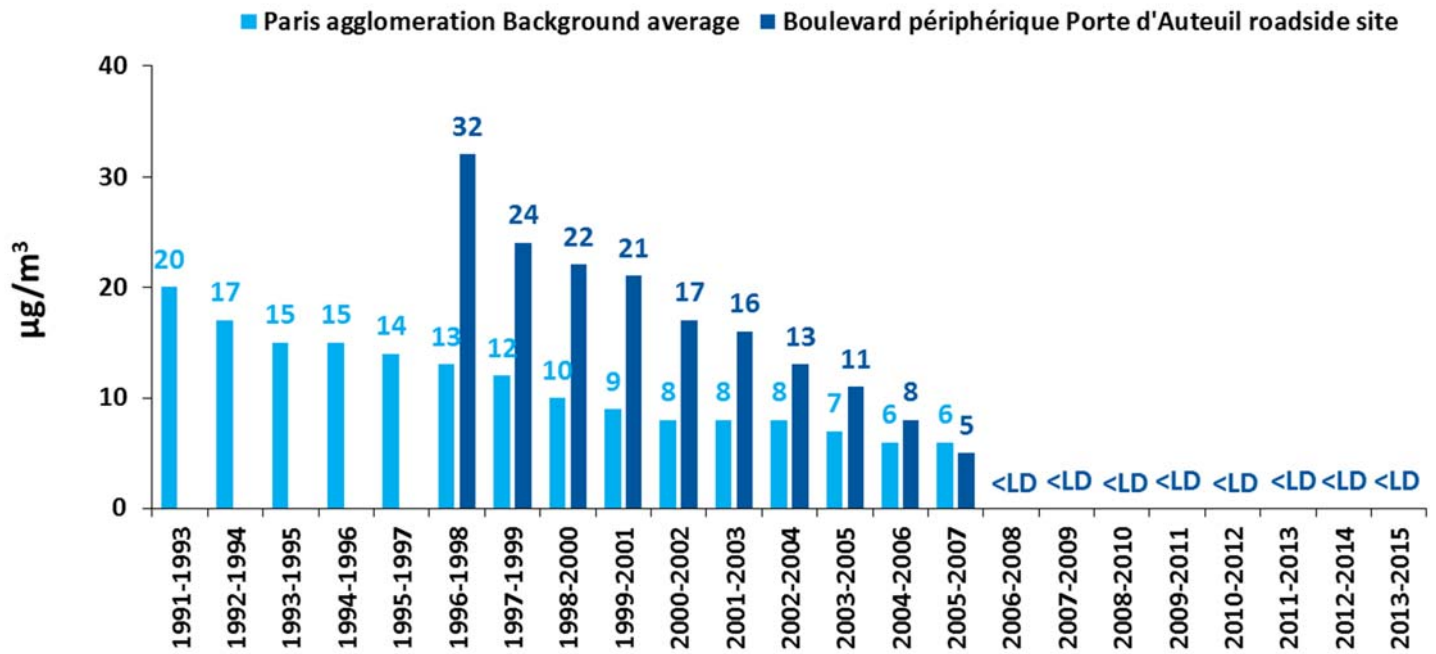
Benzo(a)pyrene	2015			2005-2014		
	Background agglomeration	Rural background	Roadside	Background agglomeration	Rural background	Roadside
Target value (2013) exceedance		no measurement			no measurement	

Lead	2015			2005-2014		
	Background agglomeration	Rural background	Roadside	Background agglomeration	Rural background	Roadside
Quality objective exceedance		no measurement			no measurement	
Limit value exceedance		no measurement			no measurement	

Arsenic, Cadmium, Nickel	2015			2005-2014		
	Background agglomeration	Rural background	Roadside	Background agglomeration	Rural background	Roadside
Target value (2015) exceedance		no measurement	no measurement		no measurement	

Summary of air quality standards exceedances for CO, SO₂, metals and B(a)P

3.1 Sulfur dioxide (SO₂)



<LD: under the detection limit

Figure 30 : Trend in the sulphur dioxide (SO₂) tri-annual mean concentration, changing sample of urban background sites in the Paris agglomeration and roadside site on Paris ring road, 1991-1993 to 2013- 2015

3.2 Carbon monoxide (CO)

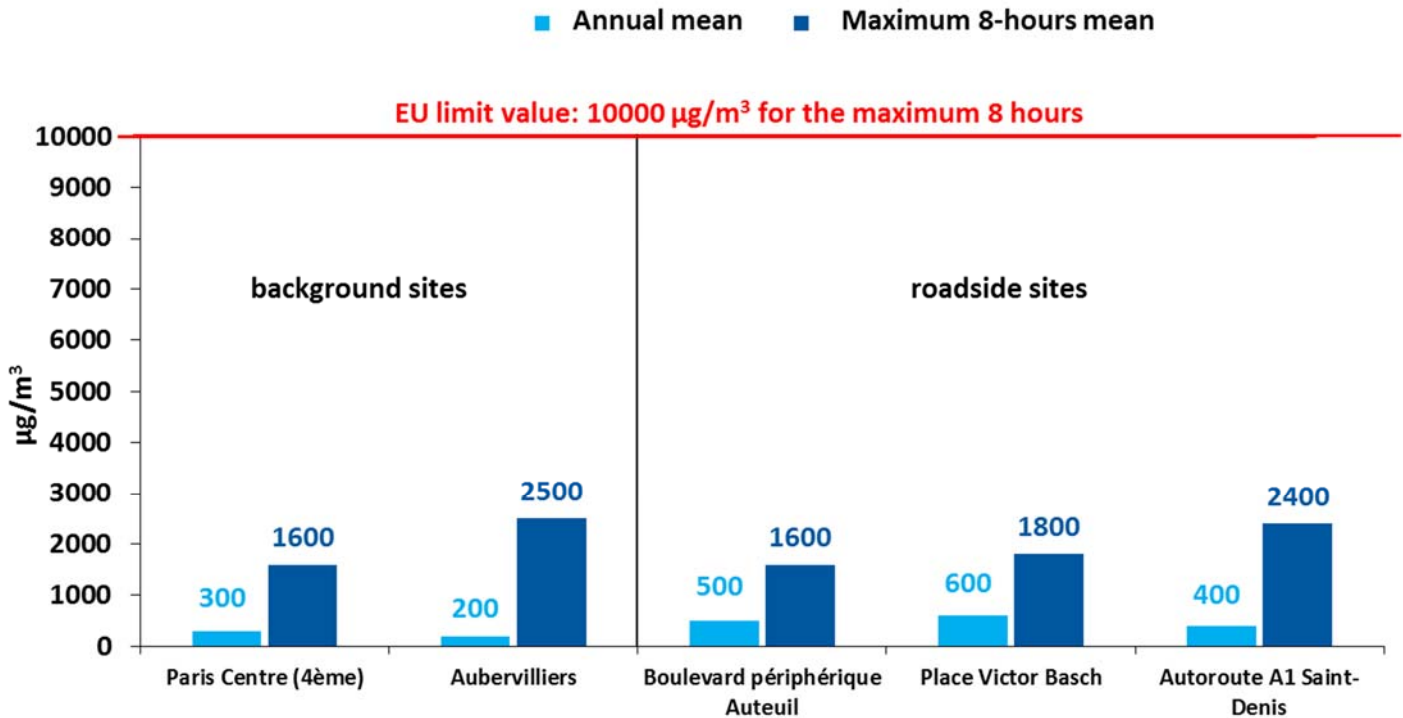


Figure 31 : Carbon monoxide (CO) annual mean and annual maximum 8-hour mean concentration for all continuous monitoring sites in the Paris region in 2015

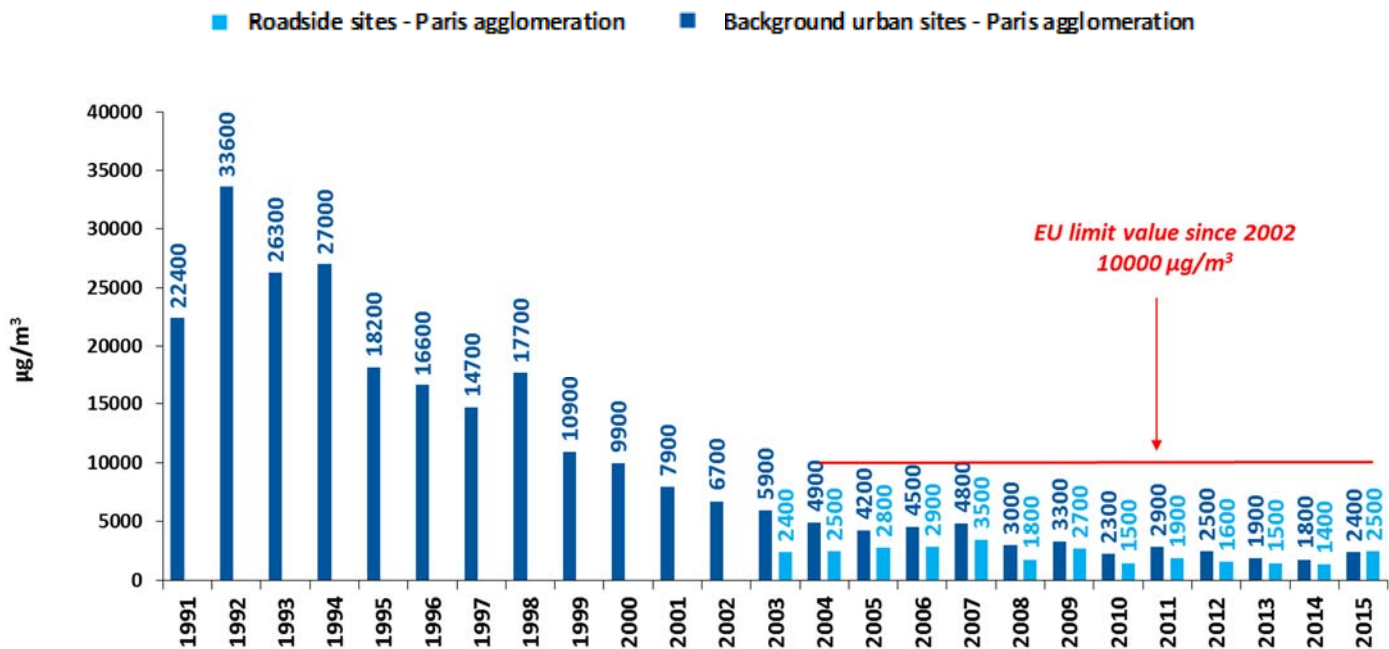
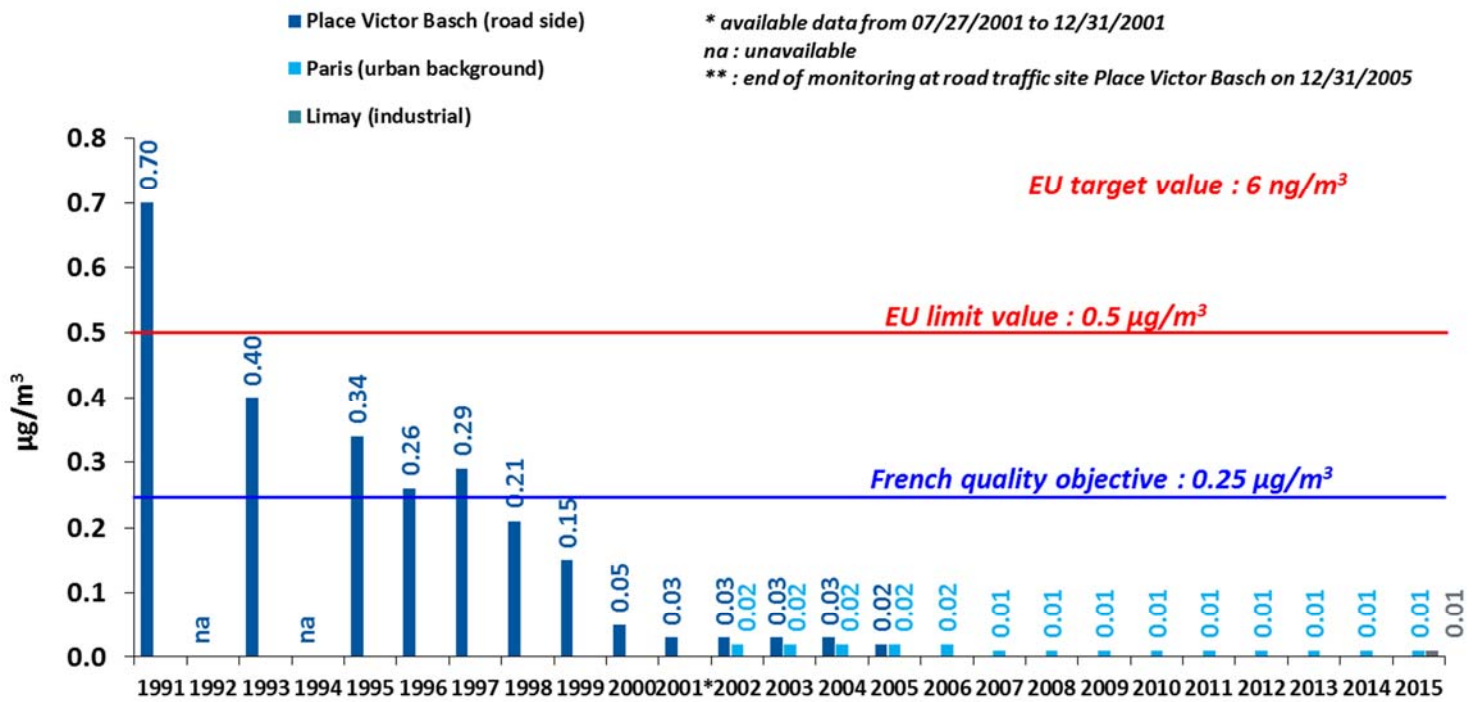


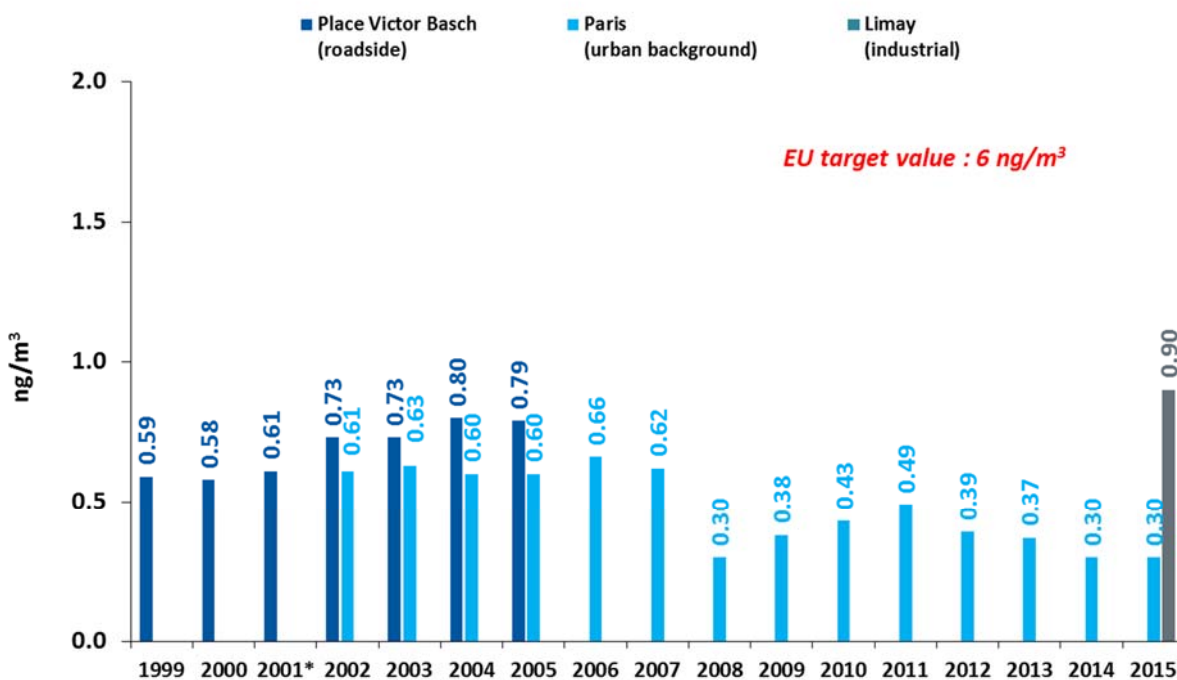
Figure 32 : Trend in the carbon monoxide (CO) annual maximum 8-hour mean concentration, urban background sites and roadside sites in the Paris agglomeration, 1991 to 2015

3.2 Metals (Lead, Arsenic, Cadmium and Nickel)



* available data from 07/27/2001 to 12/31/2001

Figure 33 : Trends in the lead annual mean concentration, urban background and roadside sites in Paris, 1991 to 2015



* available data from 07/27/2001 to 12/31/2001

Figure 34 : Trends in the arsenic annual mean concentration, urban background and roadside sites in the Paris region, 1999 to 2015

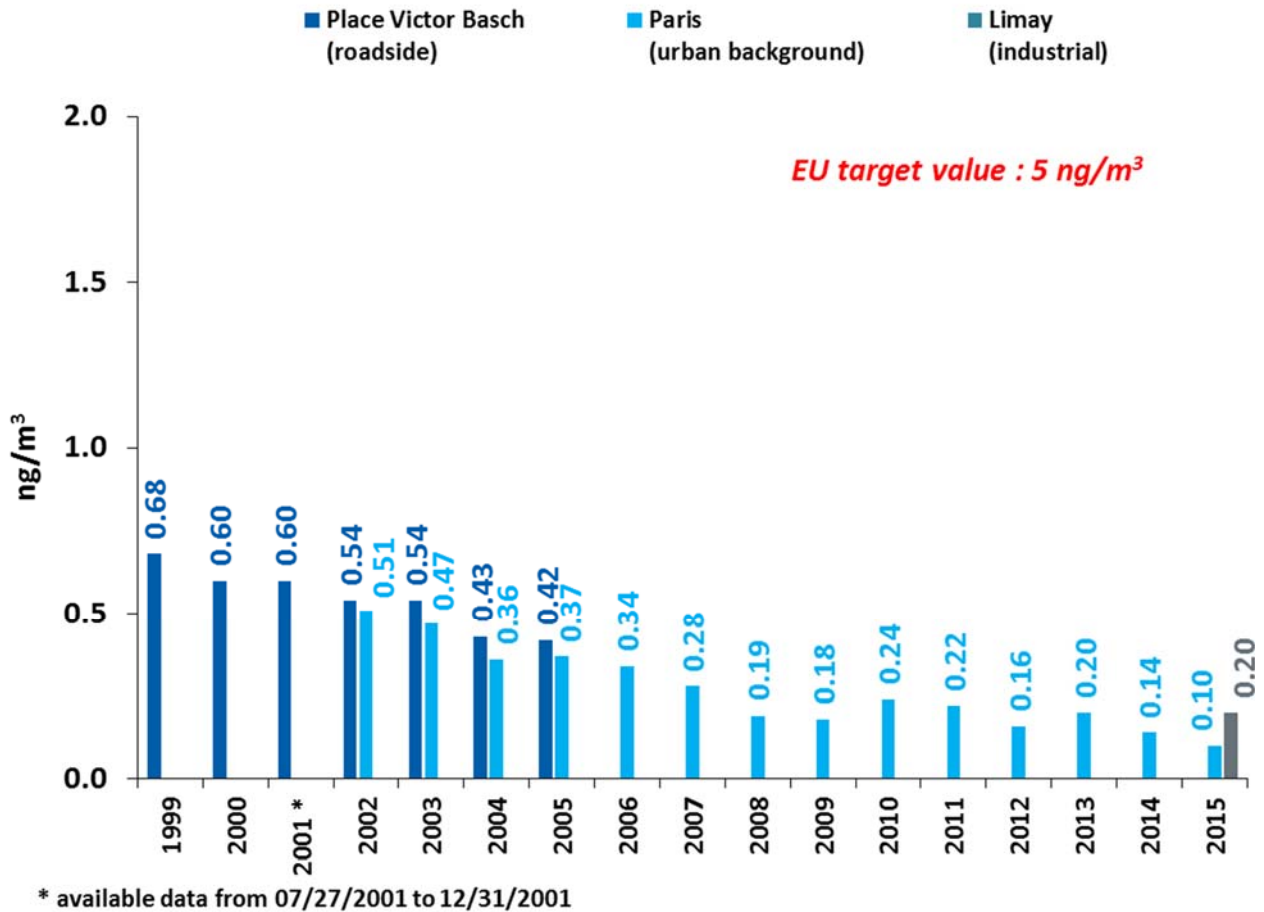


Figure 35 : Trends in the cadmium annual mean concentration, urban background and roadside sites in the Paris region, 1999 to 2015

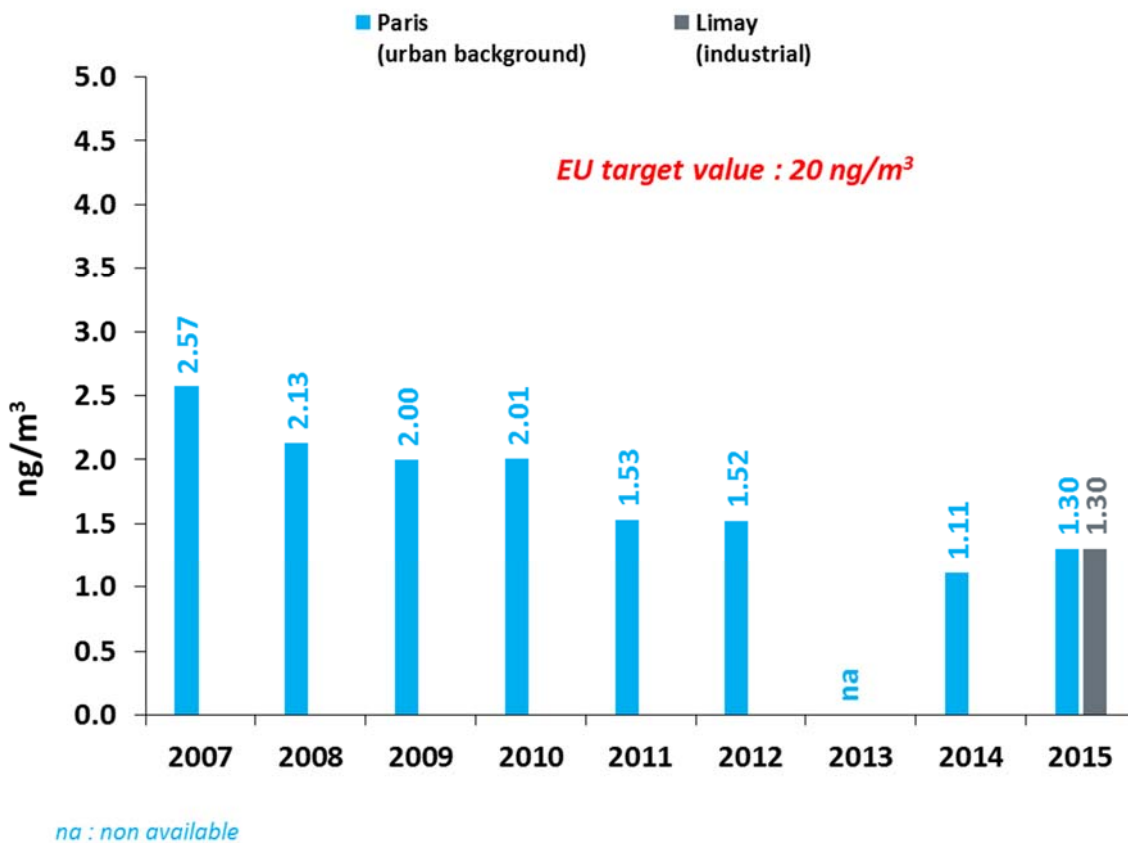


Figure 36 : Nickel annual mean concentration, urban background site in Paris, 2007 to 2015

3.3 Benzo(a)pyrene

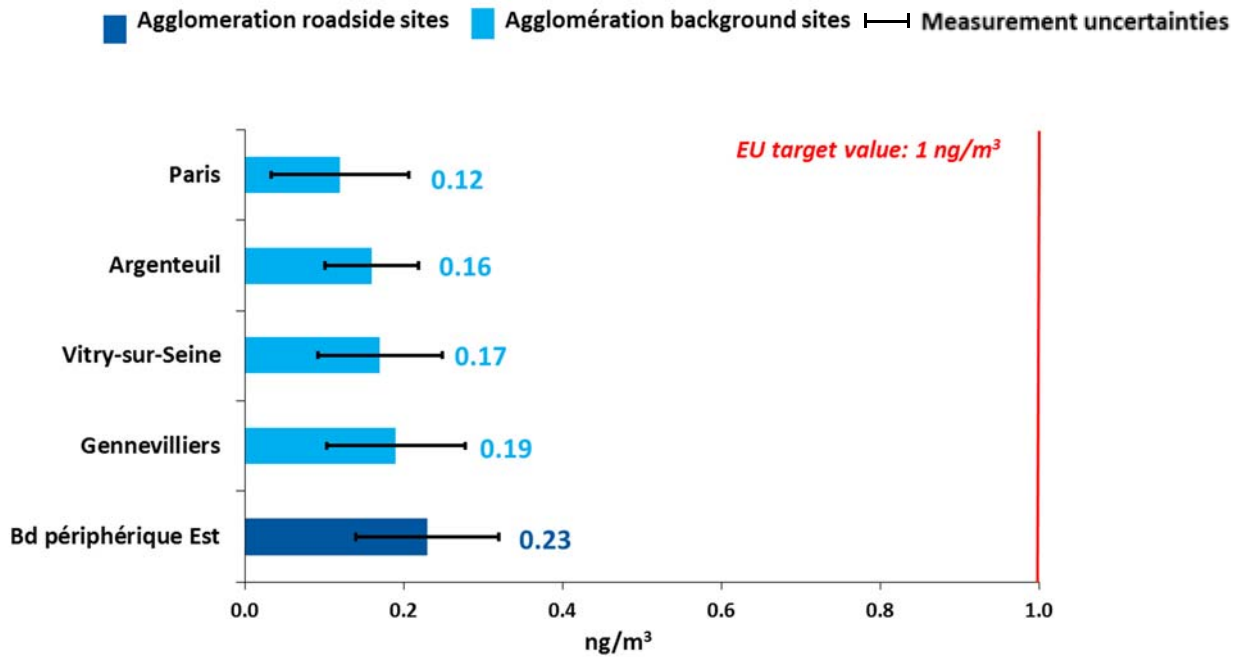


Figure 37 : Benzo(a)pyrene annual mean concentration for all monitoring sites in the Paris region in 2015

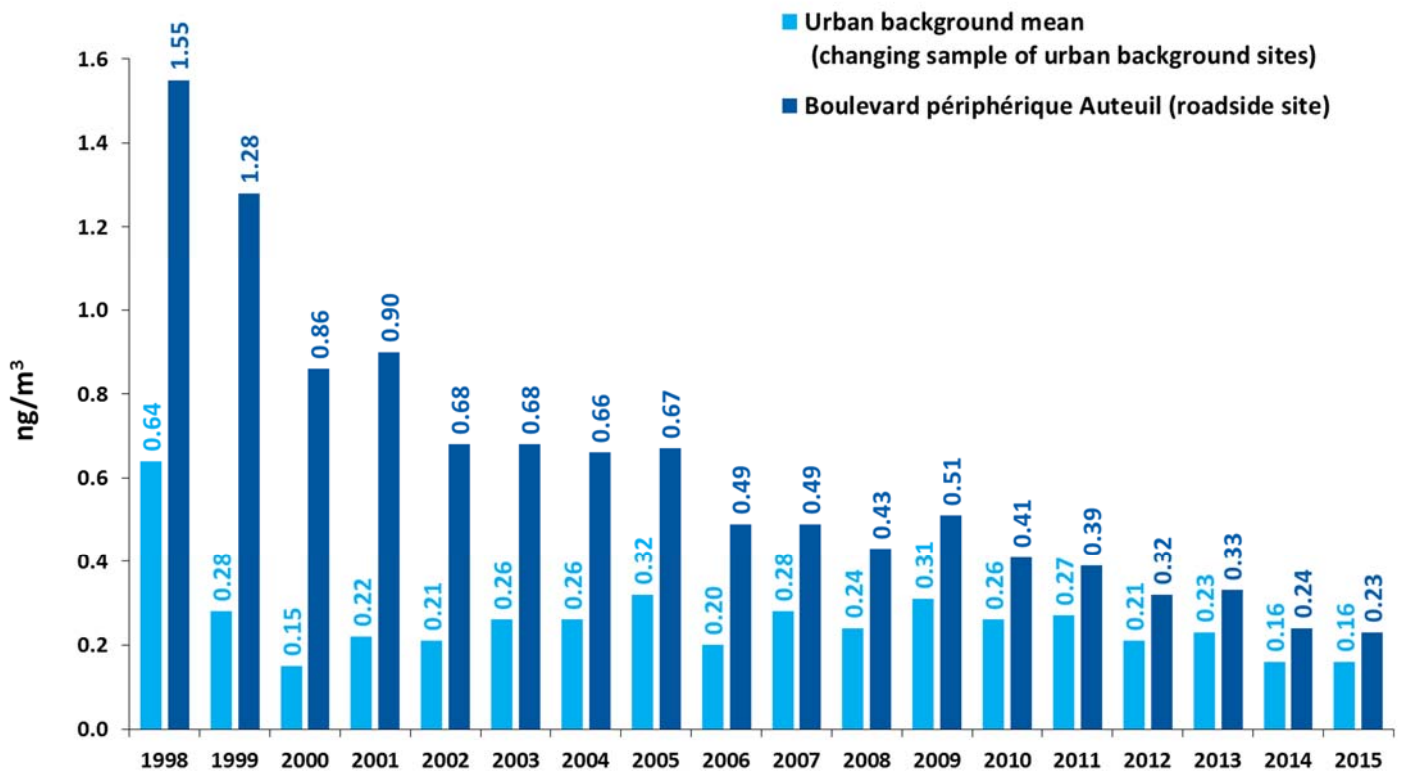


Figure 38 : Trend in the benzo(a)pyrene annual mean concentration, urban background sites mean and roadside site in the Paris agglomeration, 1998 to 2015