Ambient Air Quality
Regulation in Europe

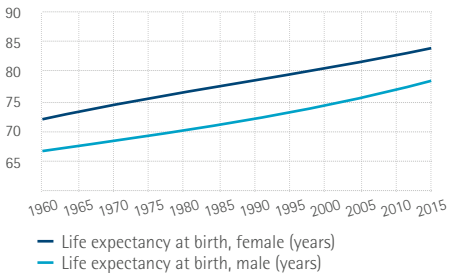
Economic and local perspectives

EU Ambient Air Quality Directives provide the framework

During recent decades, life expectancy has increased continuously in Europe. Besides a healthier diet and a lower consumption of tobacco and alcohol, better air quality has had a positive impact on human health. Consequently, it is one of the key objectives of EU environmental regulation to further reduce air pollution and to comply with the ambitious air quality guidelines set by the World Health Organisation (WHO). Since introduction of the Ambient Air Quality Directives (AAQ), significant emission reductions of air pollutants could be achieved. In order to reflect on the performance of the AAQ Directives (Directives 2008/50/EC and 2004/107/EC), the European Commission has in 2017 launched a fitness check of the EU Ambient Air Quality Directives.

The **Association of the Bavarian Chambers of Commerce and Industry (BIHK)** welcomes the Commission's effort to analyse the performance of both AAQ Directives. Several cases of non-compliance with current EU-regulation indicate the need to evaluate its relevance, effectiveness and efficiency. Moreover, internal coherence as well as within the overarching EU Clean Air policy framework has to be analysed. The current standard procedure of prosecuting cases of non-compliance causes a lot of friction in the member states. By providing economic and local perspectives on current regulation, the BIHK would like to contribute constructively to this effort.

Figure 1: Life expectancy at birth, EU-28, 1960 - 2015



Source: The World Bank, DataBank: World Development Indicators
Created on: 09.02.2018

Challenges for local companies

Nowadays, healthy living conditions are an important factor for a company's choice of location. Also for this reason, businesses and regions unambiguously support effective action to reduce the impacts of air pollution. Nevertheless, reaching the ambitious targets set by the directives pose several challenges for companies:

- **Driving bans:** Keeping passenger cars or heavy goods vehicles out of inner cities will threaten local businesses. Immediate driving bans would not only cause a breakdown of city logistics and call for high investments in new cars, but generate a waste of resources.
- **Disproportionate burden-sharing:** Geographic conditions (e.g. unfavourable wind dispersion, location in valleys) or historically established technologies for energy and heat production are not taken into account with general air quality limit values. Some regions have geographical disadvantages not accounted for in the current EU Ambient Air Quality Directives.
- **Severe measures:** In order to immediately meet EU limit values, closing down or modernizing a high number of combustion plants, oil and gas heating installations as well as power plants might have to take place. The economic ill-effects created hereby would be disproportionate to the intended positive effect on human health and the environment.

It has to be kept in mind that immediate action for strict compliance with all limit values incorporates also negative effects on the environment. An abrupt renewal of vehicles or power plants is highly cost-intensive and consumes resources in an unsustainable way.

At a glance

Two complementary EU Ambient Air Quality Directives (Directives 2008/50/EC and 2004/107/EC) are defining air quality standards in Member States. The fitness check does also consider Implementing Decision 2011/850/EC and Commission Directive EU/2015/1480.

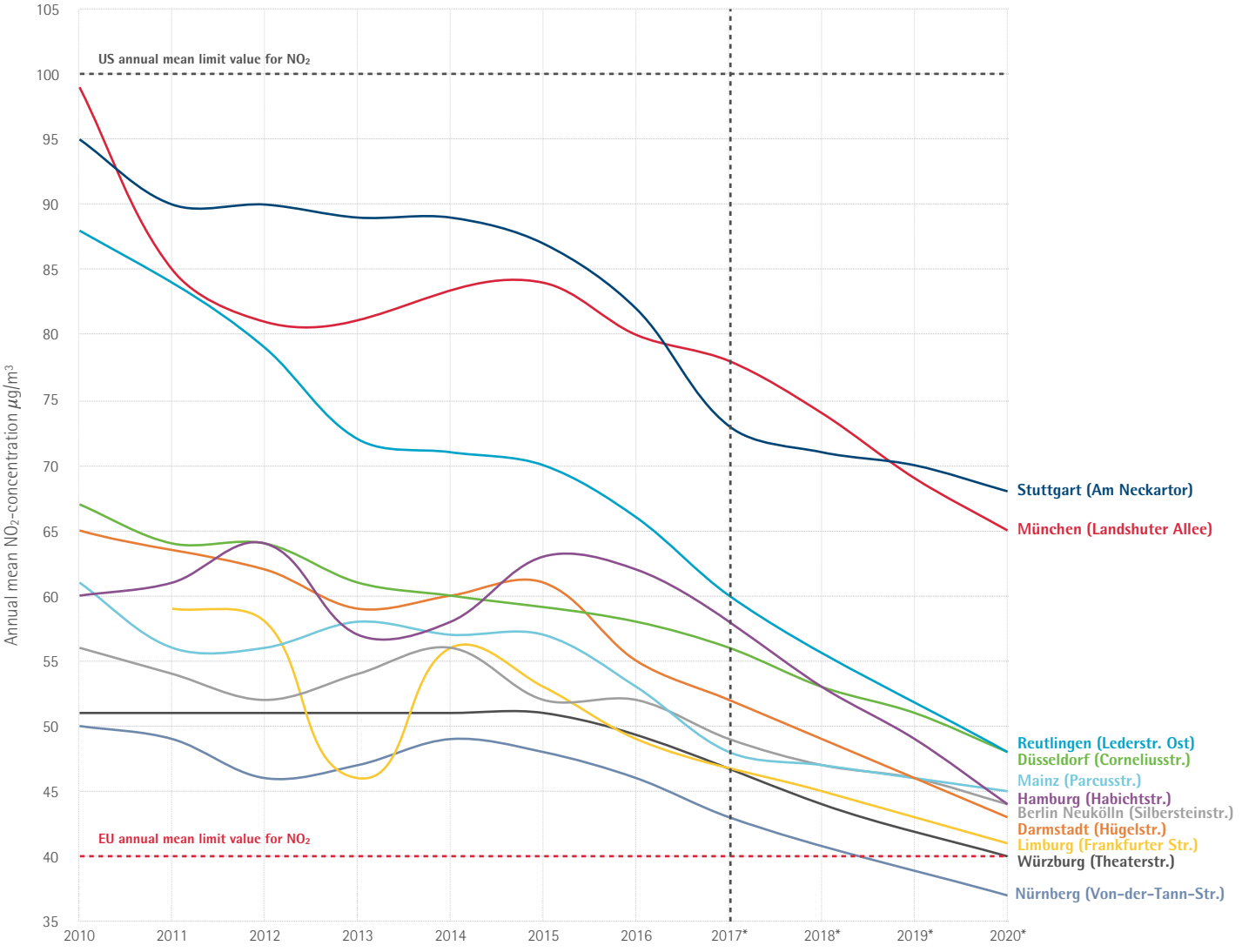
IHK Chambers of Commerce and Industry in Bavaria

Towards clean air

With infringement procedures against 22 Member States, exceedances of limit and target values are common in large European cities. Looking at nitrogen dioxide in Germany, the NO_2 emissions were significantly reduced over the years and the hourly mean value is now below the maximum allowed 200 µg/m³ at any measurement station. A major reason for this development is the regular replacement of cars, lorries and busses with new vehicles. Due to technological improvements, fewer pollutants are emitted locally. With the new EU type approval guidelines, adopted in September 2017, this trend will continue. However, many large cities in Germany and Europe don't comply with the much lower EU limit for the annual mean NO_2 value of only 40 µg/m³.

Figure 8 illustrates the general decline of NO_2 in a couple of German cities currently exceeding NO_2 limit values. While none of the listed cities has been able to achieve European limit values by 2015, it is predicted that almost two-thirds of the monitoring stations will not measure exceedances in NO_2 by 2020. This is a result of the continuing regular replacement of cars. However, the remaining cities can reach European limit values only in combination with additional measures. Figure 8 also shows the maximum allowed annual limit value in the United States of America, which is significantly above the EU limit.

Figure 8: Forecast of NO_2 development in 10 German cities with high concentration of NO_2

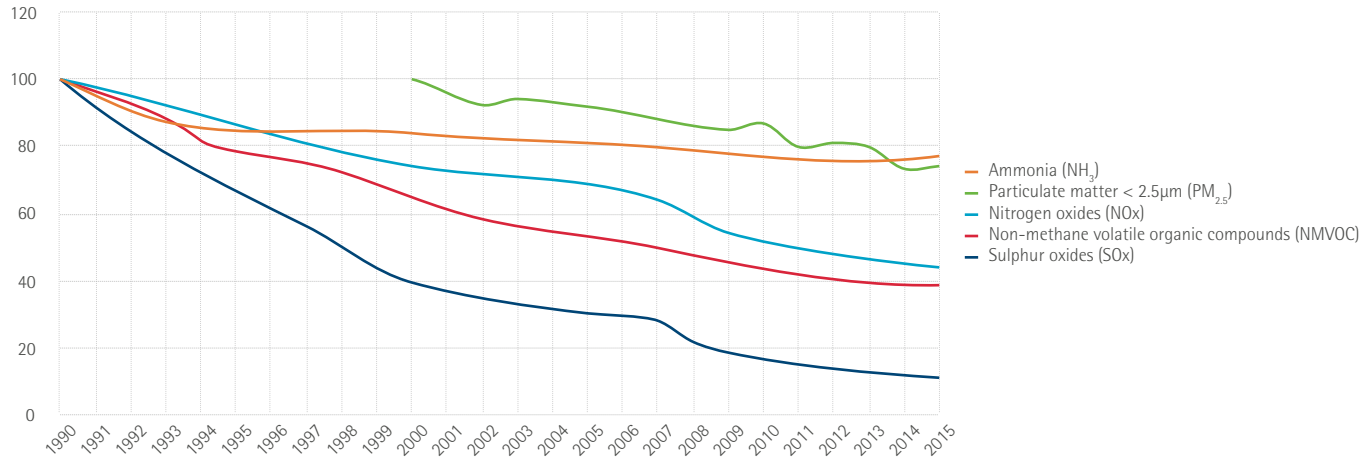


Source: DIHK – Deutscher Industrie- und Handelskammertag, Faktenpapier Saubere Luft bis 2020, January 2018; ** forecast*

Development of Ambient Air Quality in Europe

In general, air pollution has decreased significantly since 1990, the baseline year for the measurement of air pollution (figure 2). Nowadays, the majority of emissions from pollutants monitored via Ambient Air Quality Directive 2008/50/EC and 2004/107/EC is at a level well below EU recommendations. The rise in Ammonia (NH_3) – regulated via the National Emission Ceilings (NEC) Directive – constitutes the exemption rather than the norm.

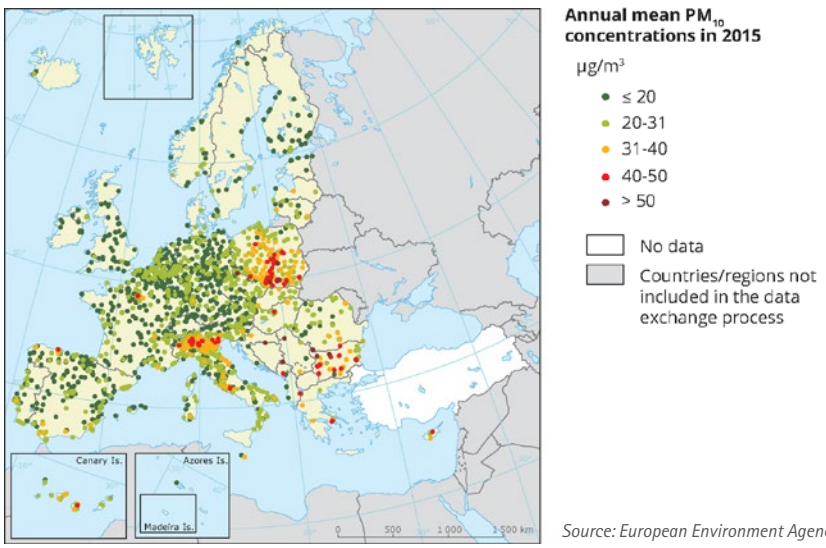
Figure 2: Emissions of selected air pollutants, EU-28, 1990-2017



Source: European Environment Agency (EEA), Air pollutants by source sector, European Union (28 countries), retrieved on: 26.07.2017

Due to EU requirements, information on air quality has become more transparent and accessible for European companies and citizens. For instance, the European Environment Agency's European Air Quality Index mapping accurate air quality data, ranging from daily to long-term analysis (figure 3). Companies have become better informed about air pollution and those seeking emission control permits for their plants have now access to detailed emission predictions. Nevertheless, a lack of official evaluations following the measurement of exceedances, does lead to uncertainty of how serious a health hazard those pollutants actually represent. Unable to interpret the risks, wrong conclusions can be drawn, e.g. that areas with high traffic volumes need to be avoided under any circumstances. A drop in value or losses in sales for companies operating in such locations can be the result. Emission reducing measures, implemented via both EU directives, have to a certain degree contributed to the general reduction of emissions. In Germany, reductions did mainly result from stricter emission-limiting standards in combustion plants, vehicles and domestic heating. The major contributions of both Ambient Air Quality Directives can be seen in the general improvement and availability of air quality data.

Figure 3: Annual mean PM10 concentrations in 2015 pollutants, EU-28, 1990-2017



Source: European Environment Agency, Air Quality in Europe 2017

European limit values and regional conditions

Ambient Air Quality Directive 2008/50/EC sets limit- and target values for concentrations of selected air pollutants. Legally binding limit values are defined for sulphur dioxide (SO_2), lead (Pb), particulate matter (PM 2.5 and 10), nitrogen dioxide (NO_2), benzene (C_6H_6) and carbon monoxide (CO). Target values are set for ozone (O_3), arsenic (As), cadmium (Cd), nickel (Ni) and benzo(a)pyrene. Whereas Member States are obliged to comply with limit values until a pre-defined date, target values are less strict by only demanding necessary measures not entailing disproportionate costs to ensure that the target is attained.

Figure 4: Current EU limit and target values for the protection of human health

	SUBSTANCE	ONE HOUR	ONE DAY	ANNUAL MEAN	COMMENTS
LIMIT VALUES	SO_2	350 µg/m³	125 µg/m³		Exceedences allowed on 24 hours / 3 days per year
	Pb			0,5 µg/m³	Measured as content in PM_{10}
	PM_{10}		50 µg/m³	40 µg/m³	Exceedences allowed on 35 days per year
	$PM_{2.5}$			25 µg/m³	
	NO_2	200 µg/m³		40 µg/m³	Exceedences allowed on 18 hours per year
	C_6H_6			5 µg/m³	
	CO		10 mg/m³ (8 hour)		
TARGET VALUES	O_3		120 µg/m³ (8 hour)		Exceedences allowed on 25 days per year
	As			6 ng/m³	Measured as content in PM_{10}
	Cd			5 ng/m³	Measured as content in PM_{10}
	Ni			20 ng/m³	Measured as content in PM_{10}
	BaP			1 ng/m³	Measured as content in PM_{10}

Source: Directive 2008/50/EC, Annex XI, Limit values for the protection of human health

Although based on WHO recommendations, the majority of EU limit values are noticeably higher, up to a factor of 8.33 (figure 5). For example, the EU limit value for benzo(a)pyrene is more than eight times higher than recommended by WHO. Nitrogen dioxide, however, has an EU limit value that is in line with the WHO recommendation. For the 1-hour mean, nitrogen dioxide has a maximum allowed concentration of 200 µg/m³. The annual mean limit value is set much lower, at only 40 µg/m³.

Figure 5: EU limit values in correspondence to WHO guidelines / reference levels

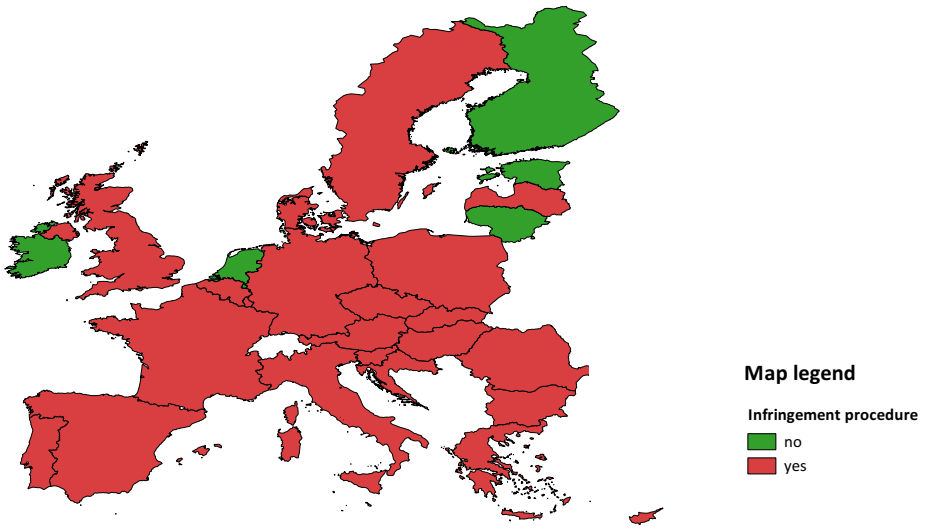
		MEASUREMENT STATIONS IN EU 28 (2015)			
SUBSTANCE	EU/WHO	TOTAL NUMBER	ABOVE EU	ABOVE WHO	MS CONCERNED
BaP <year> (T, RL)	8,33	657	32 %	84 %	21
SO_2 <day>	6,25	1332	4 Stations	30 %	N.A.
C_6H_6 <year> (RL)	2,94	586	2 Stations	50 %	15
$PM_{2.5}$ <year>	2,5	1103	6 %	75 %	N.A.
PM_{10} <day>	1	2380	19 %	19 %	20
PM_{10} <year>	2	2380	3 %	54 %	26
NO_2 <hour>	1	2680	<1 %	<1 %	7
NO_2 <year>	1	2680	10 %	10 %	22
O_3 <8 hours> (T)	1,2	1814	41 %	96 %	28

Source: Based on own research and EEA Report | No 13/2017 (Air quality in Europe – 2017 report); *T: target value; RL: reference level; MS: member states*

Figure 5 shows the substances covered by AAQDs with concentrations exeeding WHO guidelines or reference levels, representing long term EU-targets. The other substances (Pb, CO, As, Cd, Ni) comply already now – with very few exeptions.

EU limit and target values do not take particular regional circumstances into account. The same limit or target values apply to all European cities and regions. Thus, regions with a historically high amount of wood combustion capacities are often not able to keep up with current legislation. Similarly, countries that are located centrally in Europe are disadvantaged compared to those with long coast lines, certainly when it comes to particulate matter pollution. Cities are concerned most from exceedences, whereas the air quality in rural areas generally comply with the current EU directives.

Figure 6: Infringement procedures in EU-28



Note: Map concerns Member States having received at least a letter of formal notice from the EU Commission. There are currently infringement procedures due to limit value exceedances in 22 Member States.
Source: European Commission, ec.europa.eu/atwork

EU regulation in a broader context

Comparing air quality regulation across the globe, WHO guidelines are in most regions used as a reference. Usually, pollution reduction strategies aim at specific air pollutants by setting legally binding limit values. For instance, the United States Environmental Protection Agency (EPA) monitors 7 pollutants; the EU focuses in total even on 12 air pollutants. Here, differences exist mainly on the implementation level. While US air quality is of federal concern, European air quality policies are based on standards set by the EU Commission. EU Member States have to establish their own strategies in order to meet these targets. Hence, those European municipalities not reaching all limit values have to establish ambitious ambient air quality plans.

Additionally, US EPA is providing an easily understandable air quality guide addressing citizens directly. With adequate margins of safety, this guide provides a precise categorization of air pollutants and conducts recommendations for older adults, children and asthmatics. This enables US citizens and companies to judge their individual risks (based on individual health condition) and consequences of air pollution. The US Air Quality Guide for Nitrogen dioxide is provided in figure 7. A comparable tool does not exist on EU level.

Figure 7: US Air Quality Guide for Nitrogen Dioxide

AIR QUALITY INDEX	PROTECT YOUR HEALTH NEAR ROADWAYS
Good (0-50) 0 – 100 µg/m³	No health impacts are expected when air quality is in this range
Moderate (51-100) 101 – 188 µg/m³	Individuals who are unusually sensitive to nitrogen dioxide should consider limiting prolonged outdoor exertion.
Unhealthy for Sensitive Groups (101-150) 189 – 677 µg/m³	The following groups should limit prolonged outdoor exertion: ▪ People with lung disease, such as asthma ▪ Children and older adults
Unhealthy (151-200) 678 – 1220 µg/m³	The following groups should avoid prolonged outdoor exertion: ▪ People with lung disease, such as asthma ▪ Children and older adults Everyone should limit prolonged outdoor exertion.
Very Unhealthy (201-300) 1221 – 2348 µg/m³	The following groups should avoid all outdoor exertion: ▪ People with lung disease, such as asthma ▪ Children and older adults Everyone should limit outdoor exertion.

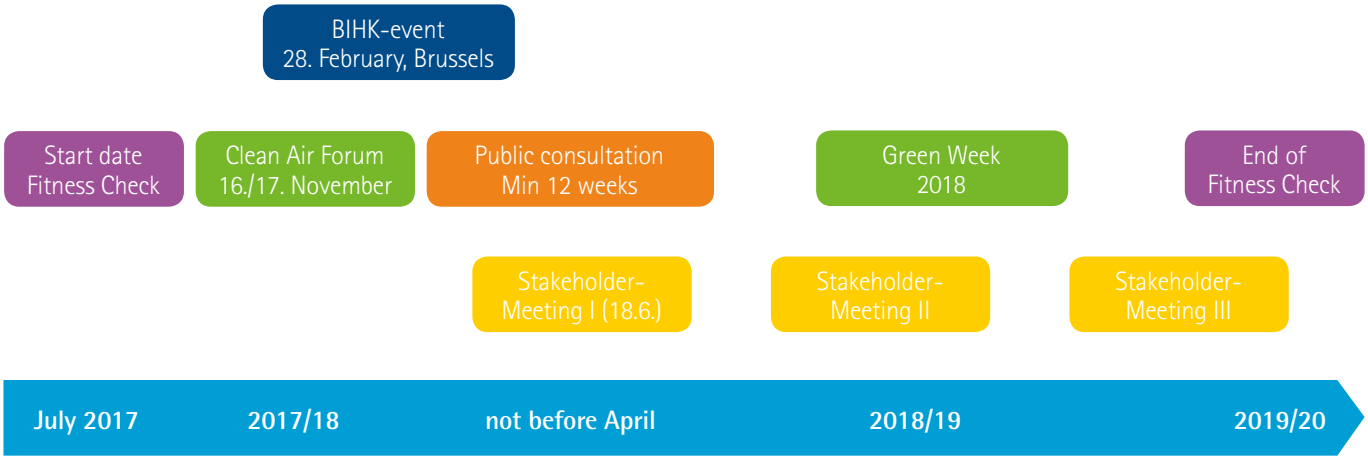
Note: Index values are applied on all regulated pollutants, not only nitrogen dioxide.
Source: EPA, United States Environmental Protection Agency

EU Ambient Air Directives: Better regulation

Ambient air quality in Europe has improved significantly during the last three decades. In 2017, the lowest levels for particulate matter and nitrogen dioxide had been measured since record began. Companies around Europe have realised the importance of clean air as a crucial location factor and a company's image. Thus, despite continuing efforts to lower emissions, many regions and cities are incapable of meeting the ambitious limit values within current regulation. The high number of 22 Member States presently in breach with directives 2008/50/EC and 2004/107/EC indicates the need for revision. From the perspective of BIHK, the following issues should be taken into consideration:

- The knowledge of the quality and quantities of pollution sources has improved continuously. By displaying up-to-date data for all Member States, citizens and companies can gain insights into air quality on the spot. The lack of an understandable air quality guide, enabling for adequate risk assessment based on individual health conditions, makes it difficult for EU citizens to evaluate health risks. The US Air Quality guide of the United States Environment Protection Agency (EPA) provides a good example.
- WHO recommendations are defined as the ultimate target for EU ambient air regulation. However, there is no coherent concept, describing the various steps to be taken on the road to clean air. While there are less strict limit values for most pollutants, a ratio of 1 to 1 had been imposed on nitrogen dioxide (including a WHO recommendation directly into EU law).
- Generalised limit values are not taking regional conditions into consideration. For example, EU Member States with long coastlines have a clear advantage compared to those that are located inland. Not taking account of natural boundaries and allowing sufficient leeway for municipalities to comply with regulation does have an attenuating effect on efforts made by regional authorities. With limit values being set, additional time to comply with EU legislation on air quality should be given.

Figure 9: Roadmap EU Fitness Check



Literature

Dierks, Hauke. 2018. Faktenpapier Saubere Luft bis 2020. Berlin: Deutscher Industrie- und Handelskammertag

DIHK-Opinion for roadmap for a Fitness Check of the EU Air Quality Directive

EU – Europäische Union:

Directive 2004/107/EC of the European Parliament and the European Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air

Directive 2008/50/EC of the European Parliament and the European Council of 21 May 2008 on ambient air quality and cleaner air for Europe

Evaluation and Fitness Check (FC) Roadmap. July 2017. Brussels: European Commission

Straff, Wolfgang & Becker, Kerstin. 2017. EU-Grenzwerte für Stickstoffdioxid (NO_2) – Ihre Bedeutung für den Schutz der Gesundheit. Berlin: Umweltbundesamt

United States Environmental Protection Agency. January 2016. Integrated Science Assessment for Oxides of Nitrogen – Health Criteria. New York: EPA/600/R-15/068

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