



Regulations for Vehicle Emissions and Ambient Air Quality – Is there a Need for Harmonization?

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Regulations for ambient air quality

Air quality standards (AQS)

- are important tools for air pollution control
- are *quality criteria* for ambient air
- are set to provide adequate protection for human health (and the environment)
- are (should be) based on scientific evidence
- are periodically reviewed and revised (review of the science upon which they are based)
- are legally binding

Regulations for ambient air quality (examples and simplified)

Air quality standards AQS (limit values and target values)

Country/region	CO	SO ₂	NO ₂	O ₃	PM10	PM2.5	Pb	Cd	As	Ni	BaP	C ₆ H ₆
Switzerland	X	X	X	X	X	X	X	X				
Europe	X	X	X	X	X	X	X	X	X	X	X	X
US	X	X	X	X	X	X	X					
WHO AQGs		X	X	X	X	X						

Directive 2008/50/EC :

Measurement obligation for EC, OC, SO₄²⁻, NO₃⁻, NH₄⁺, K⁺, Ca²⁺, Mg²⁺, Na⁺, Cl⁻ in PM2.5 in rural background locations

See Kutlar Joss et al. (2017) for air quality standards by countries

Regulations for ambient air quality

Important:

- Regulations for ambient air quality (air quality standards) are mostly targeting on «classical» or «criteria» air pollutants
- There are many more important air pollutants than the ones regulated by air quality standards!
- In Switzerland, emissions of carcinogenic species are regulated based on the precautionary principle (environmental protection act USG Art. 11)

Regulations for emissions

Reduction of emissions is the **only** way to improve air quality and to achieve compliance with air quality standards !

Regulations for emissions

Emission standards

- are important instruments for improving ambient air quality
- are the quality criteria for the exhaust of emission sources
- are **not** the only instruments for improving air quality

Precautionary principle

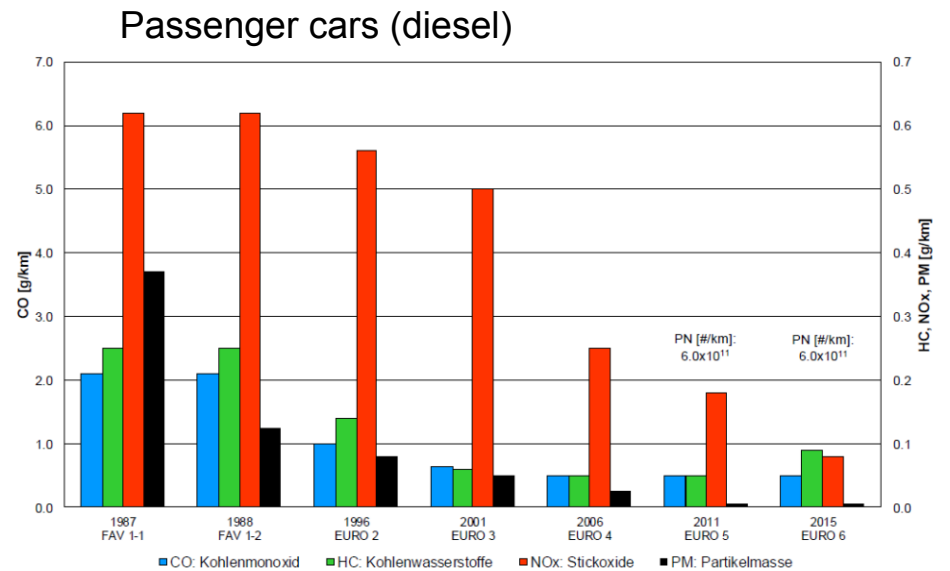
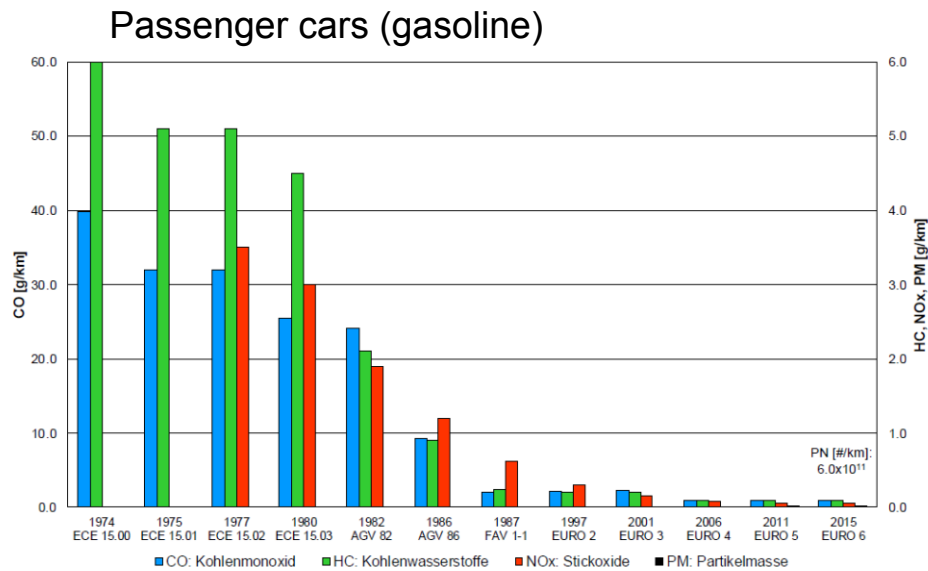
- is adopted in many legal systems (EU, US, CH, ...)
- Swiss environmental protection act (USG) requires that emissions from sources are generally reduced as far as technically feasible and economically justifiable (USG Art. 11)
- if precautionary principle does not prevent from harmful effects, regulations for emissions must be tightened

Regulations for vehicle emissions (examples and simplified)

Vehicle	Emission Standard	CO	THC	NMHC	NO _x	THC+NO _x	NH ₃	PM	PN	HCHO
Passenger cars (gasoline)	EURO 6	X	X		X			X	X	
Passenger cars (diesel)	EURO 6	X			X	X		X	X	
Heavy duty diesel	EURO VI	X	X		X		X	X	X	
Passenger cars	California	X		X	X			X		X
Medium duty vehicles	California	X		X	X			X		X
Heavy duty vehicles	California	X	X		X			X		

from <https://dieselnet.com/standards> and BAFU (2019)

Development of emission standards for vehicles in



from BAFU (2019)



Note:

Vehicles are important sources of air pollutants. However, they are only one out of many emission sources !

Is there a need for harmonization of standards?

Emission standards for vehicles



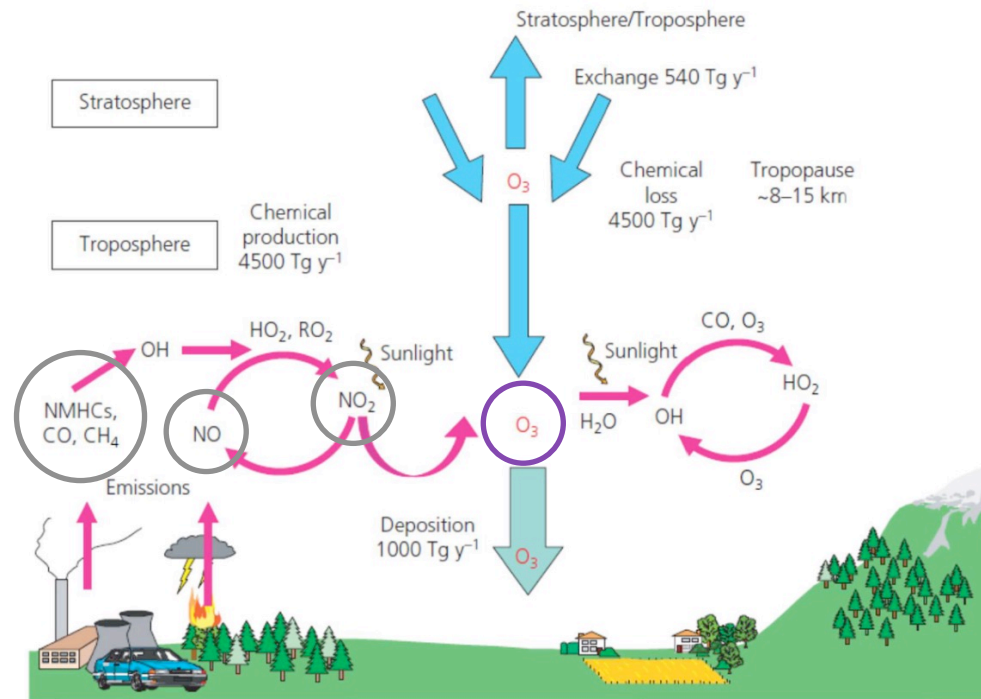
Air quality standards



No need for harmonization of standards

Example ozone – a secondary air pollutant

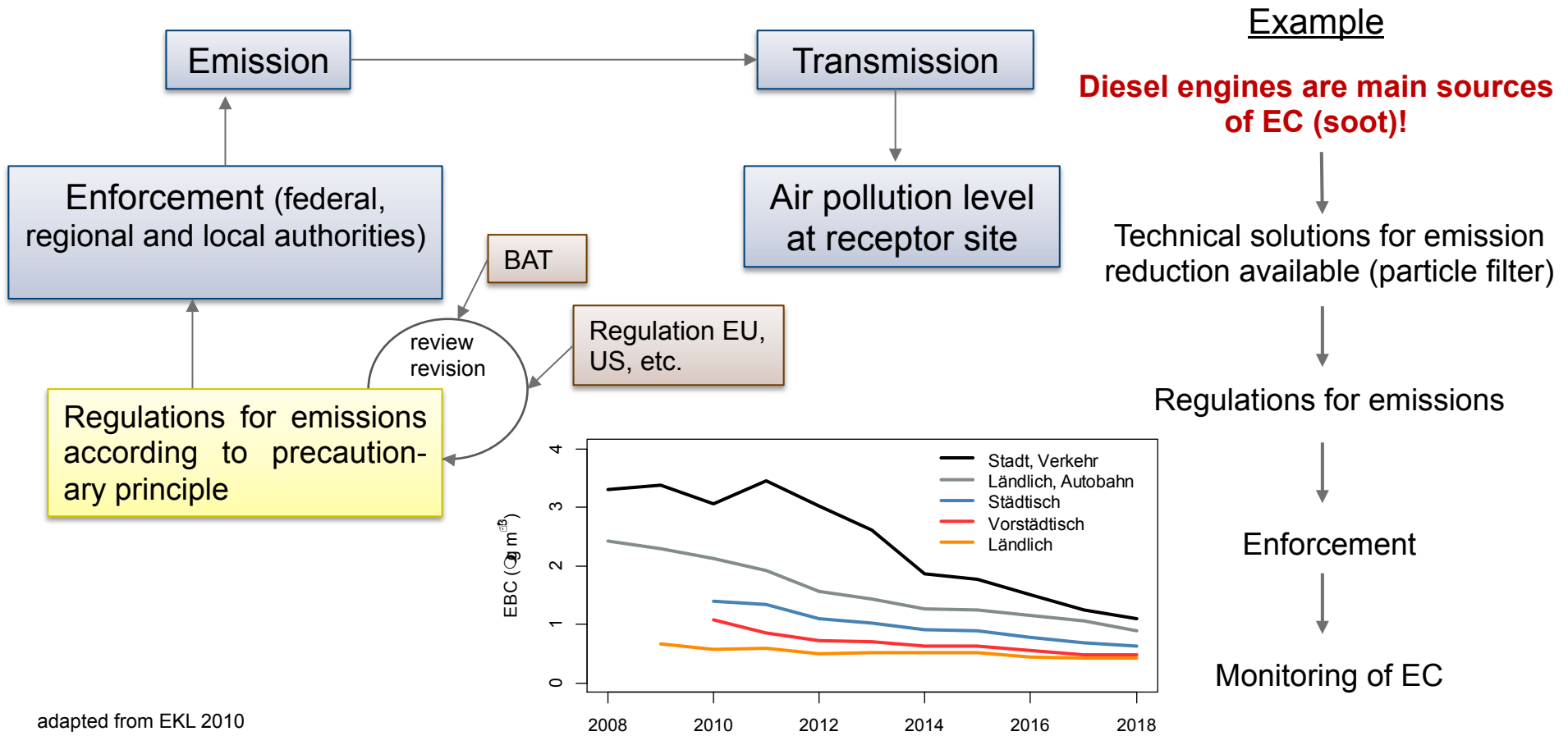
Regulations for emissions should target at ozone precursors



Regulations for air quality targets at ozone

(Denman et al., 2007)

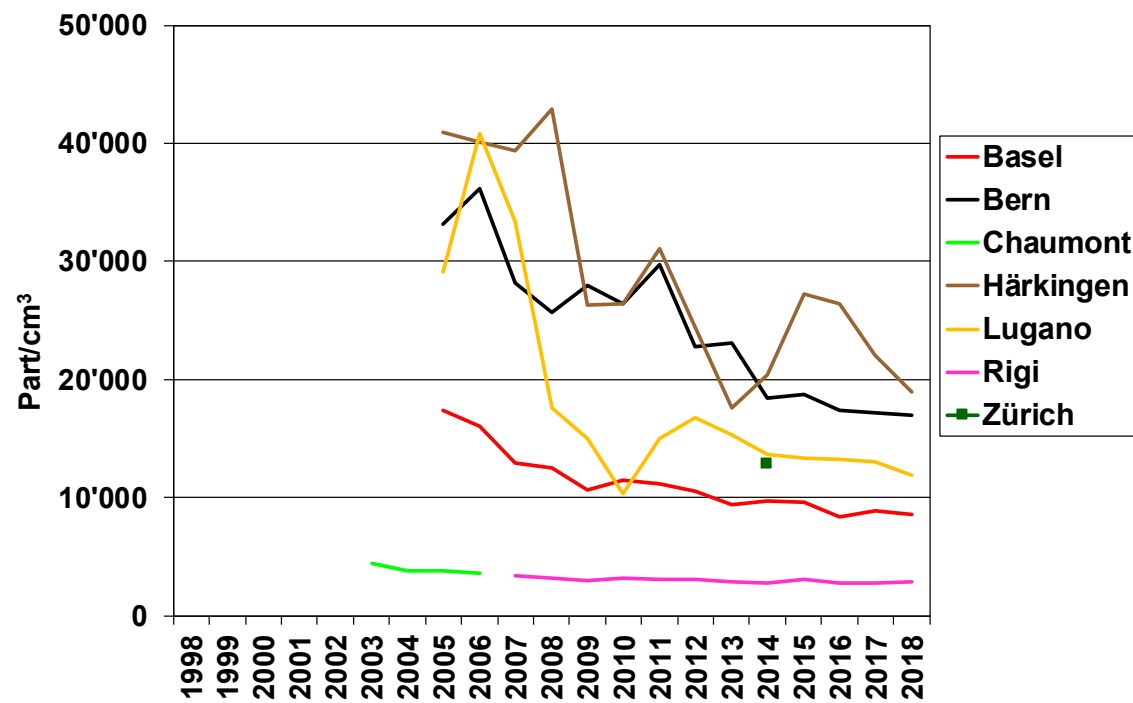
Precautionary principle according to the Swiss Environmental Protection



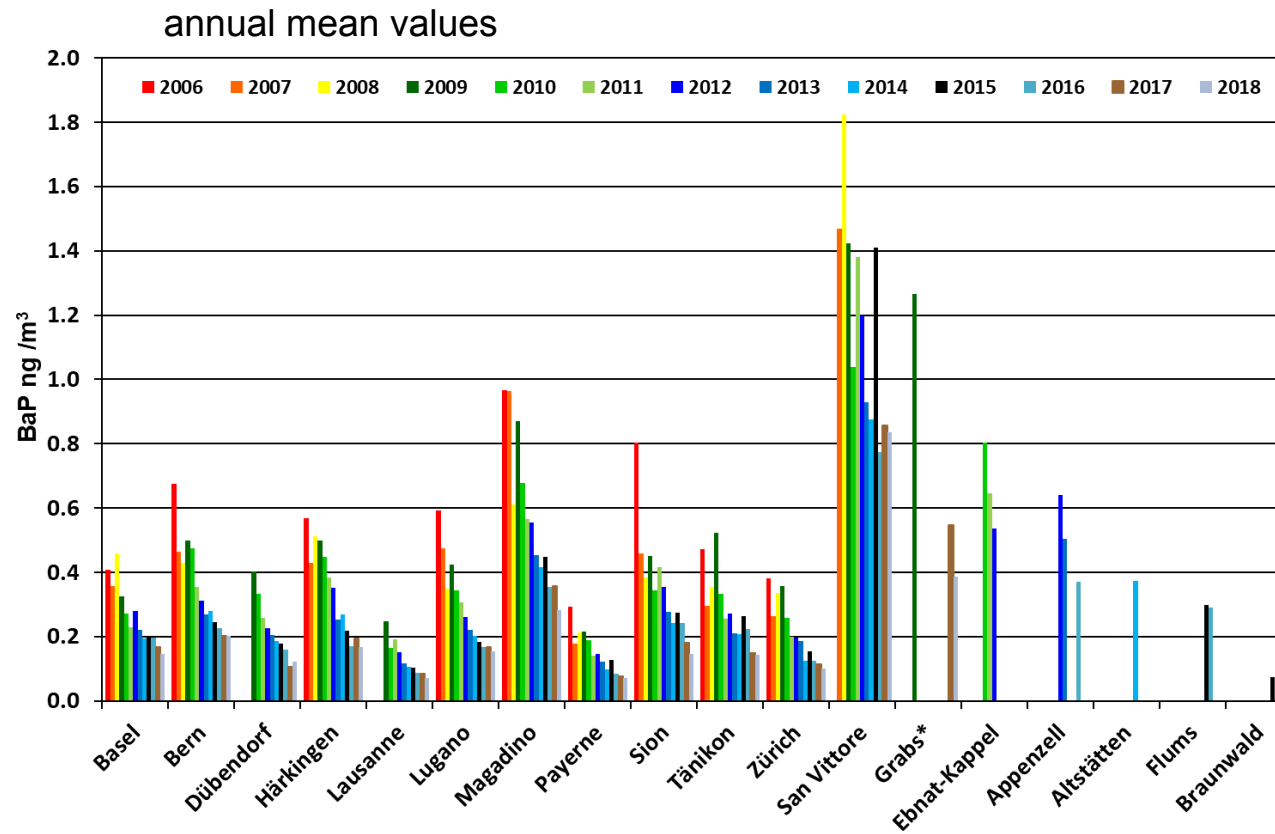
adapted from EKL 2010

Particle number concentration at Swiss sites

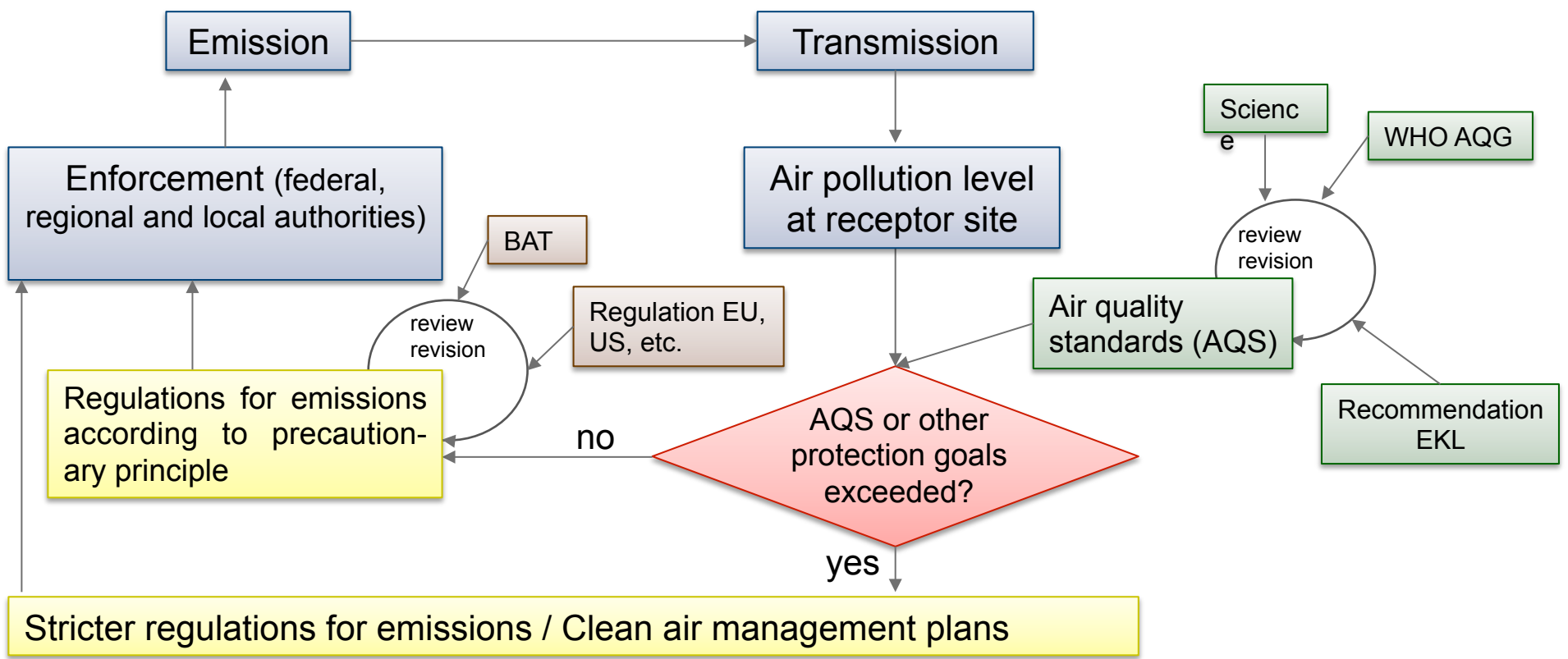
Trend of an air pollutant not regulated by an air quality standard



Trend of Benzo[a]pyrene at Swiss sites



Air pollution control according to the Swiss Environmental Protection



adapted from EKL 2010

Conclusions

- Instruments for efficient clean air policies are available and implemented (e.g. legal framework in Switzerland)
- The enforcement of strict clean air policies is crucial
- Emissions must be reduced at sources (emission standards)
- Air quality standards are protection goals and important quality criteria for ambient air. They must be science-based
- There are additional protection goals such as critical loads and tolerable risks
- Emission standards and air quality standards are important but different tools aiming at the same goal: **Clean air**. Targeting at same pollutants is not always meaningful or necessary
- Air quality measurements and assessment should not be limited to air pollutants regulated by air quality standards

Thank you !

