



# **Uncertainties implied in the country specific baselines caused by different approaches applied for recalculating the NMVOC emissions into CO<sub>2</sub> equivalents**

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## Focus

- Consideration of differences in the country specific recalculations of Non-Methane Volatile Organic Compounds (NMVOC) emissions from solvent use into CO<sub>2</sub> equivalents
- Specific implications onto the baseline emissions which are the basis for the Kyoto and post Kyoto reductions targets.
- Make the recalculation approach in principal a sense, if we taking into account the atmospheric fate of NMVOC`s and their contribution to the greenhouse gas effect?

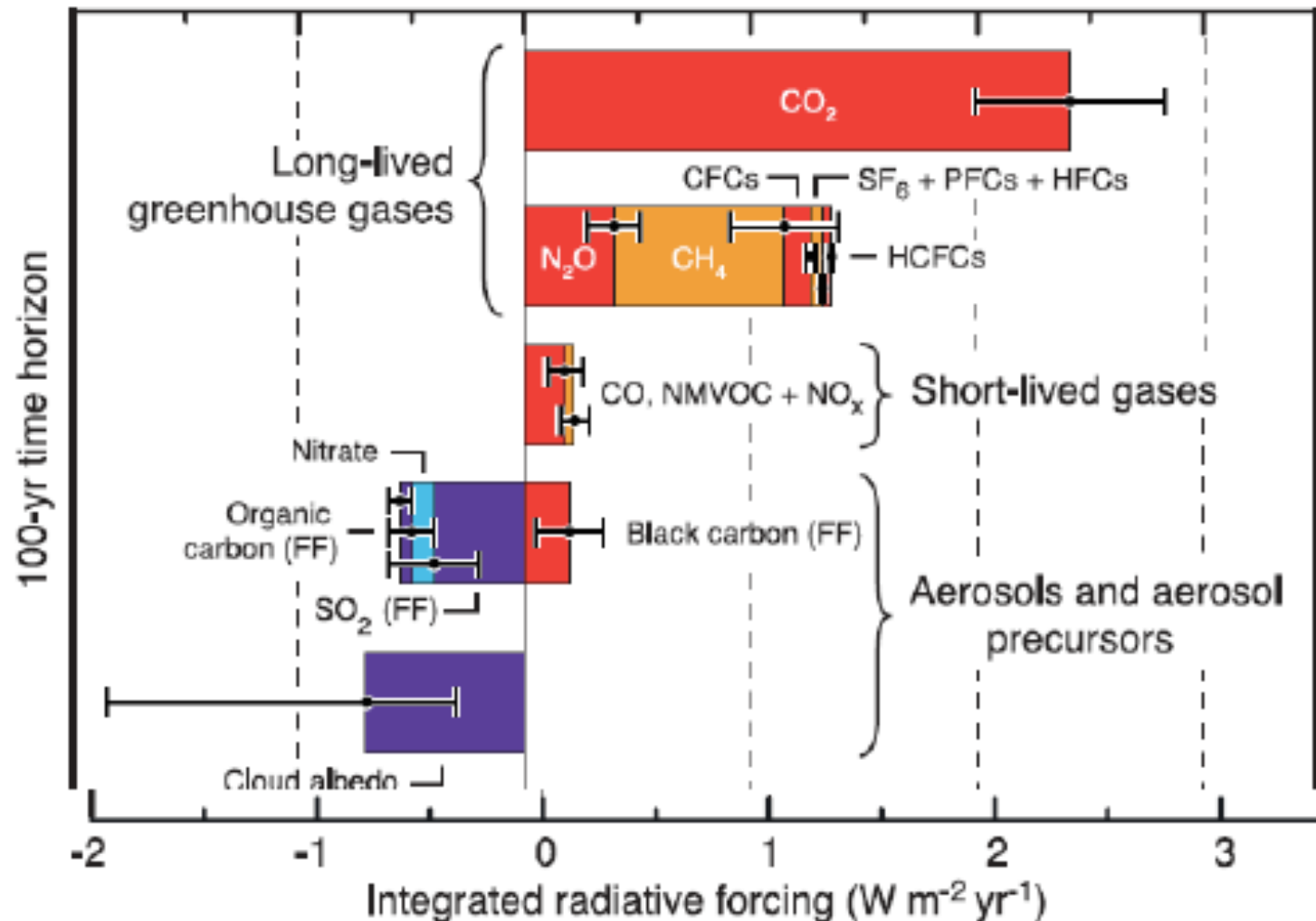


# Introduction

- All countries are obliged to recalculate the emissions of non-methane volatile organic compounds (NMVOC) into CO<sub>2</sub> equivalents in the greenhouse gas (GHG) emission data sets officially reported to UNFCCC.
- NMVOCs are a mix of several hundred species which vary different numbers of carbon. The quantitative speciation of this substance class is mainly unknown.
- In principle NMVOC need to be reported as an indirect GHG, because ozone is a GHG and NO<sub>x</sub> as well as NMVOC are precursors of this short lived species.
- NMVOC emissions are caused mainly by solvent use and on-road as well as off-road activities.
- A minor share of NMVOC comes from several combustions processes as well as mining and extraction of fuels.



# 100-yr integrated radiative forcing for year 2000 global emissions





## NM VOC definitions

Definition	Source
Boiling point (1013 hPa): 25°-300°C	Bräutigam/Kruse (1992)
T=293,15 K;p=0,1 hPa (vapour pressure)	EU-VOC Directive (1999)
T=293,15 K;p=1,3 hPa(vapour pressure)	Obermeier/Berner (1995/1996)
Boiling point (1013 hPa): 250°C	Paint industry (1998)
Boiling point (1013 hPa): 200°C	Adhesvie industrty (1999)

### **UN-VOC Protocol (1991):**

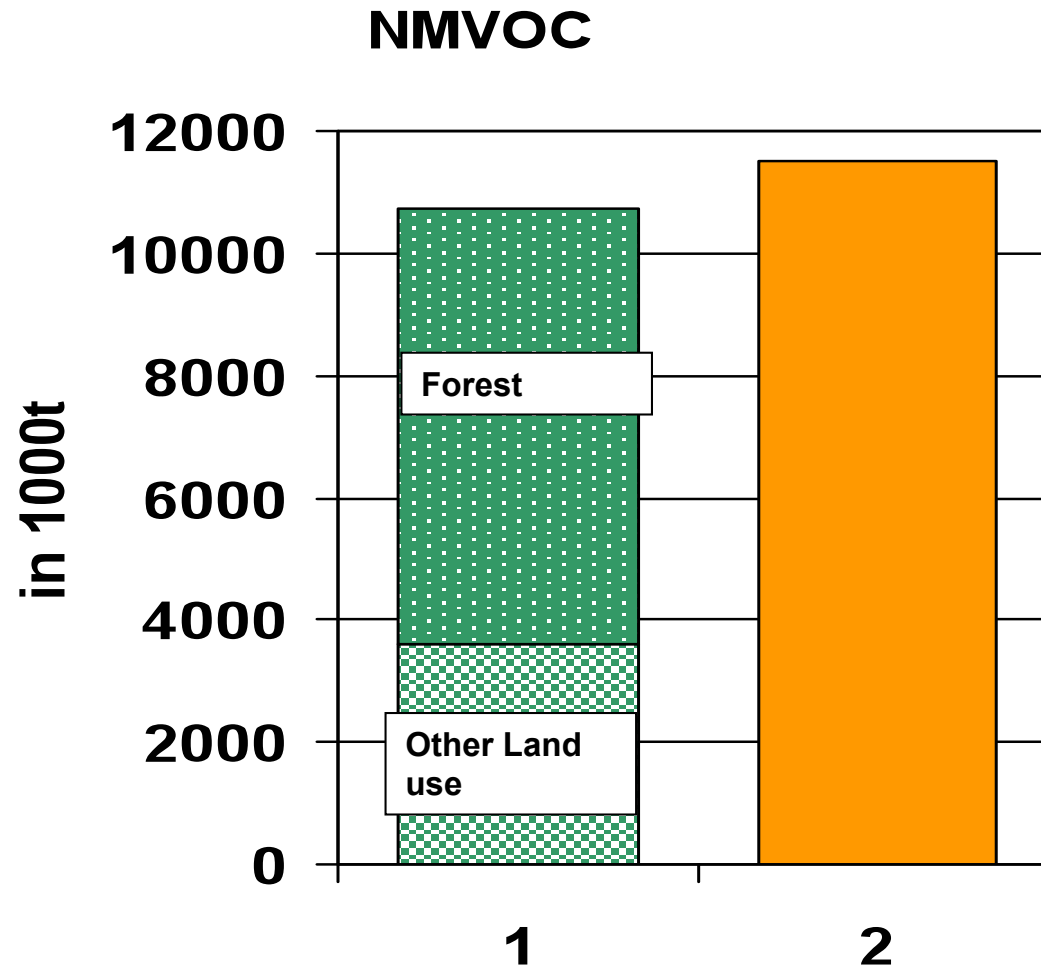
**VOC`s means all organic Compounds of anthropogenic nature- other than methane-that are capable of producing photochemical oxidants by reactions with nitrogen oxides in the presence of sunlight**

### **EU-VOC Directive (1999):**

**VOC shall mean any organic compound having at 293,15 K a vapour pressure of 0,01 kPa or more, or having a corresponding volatility under the particular conditions off use.**



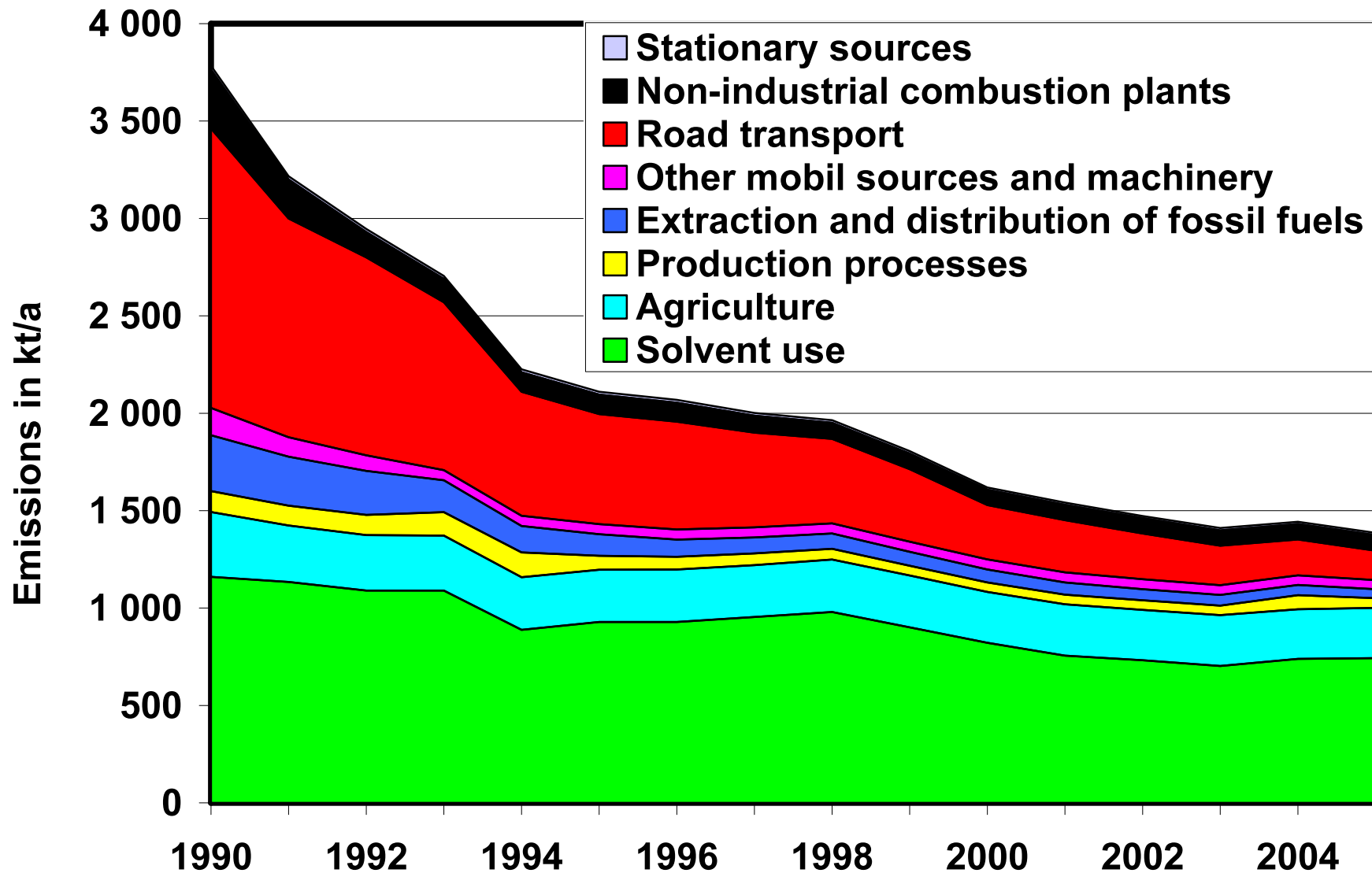
## Sources of NMVOC



- Biomass Burning (open fires)
- Forest and Other Land use
- Antropogenic

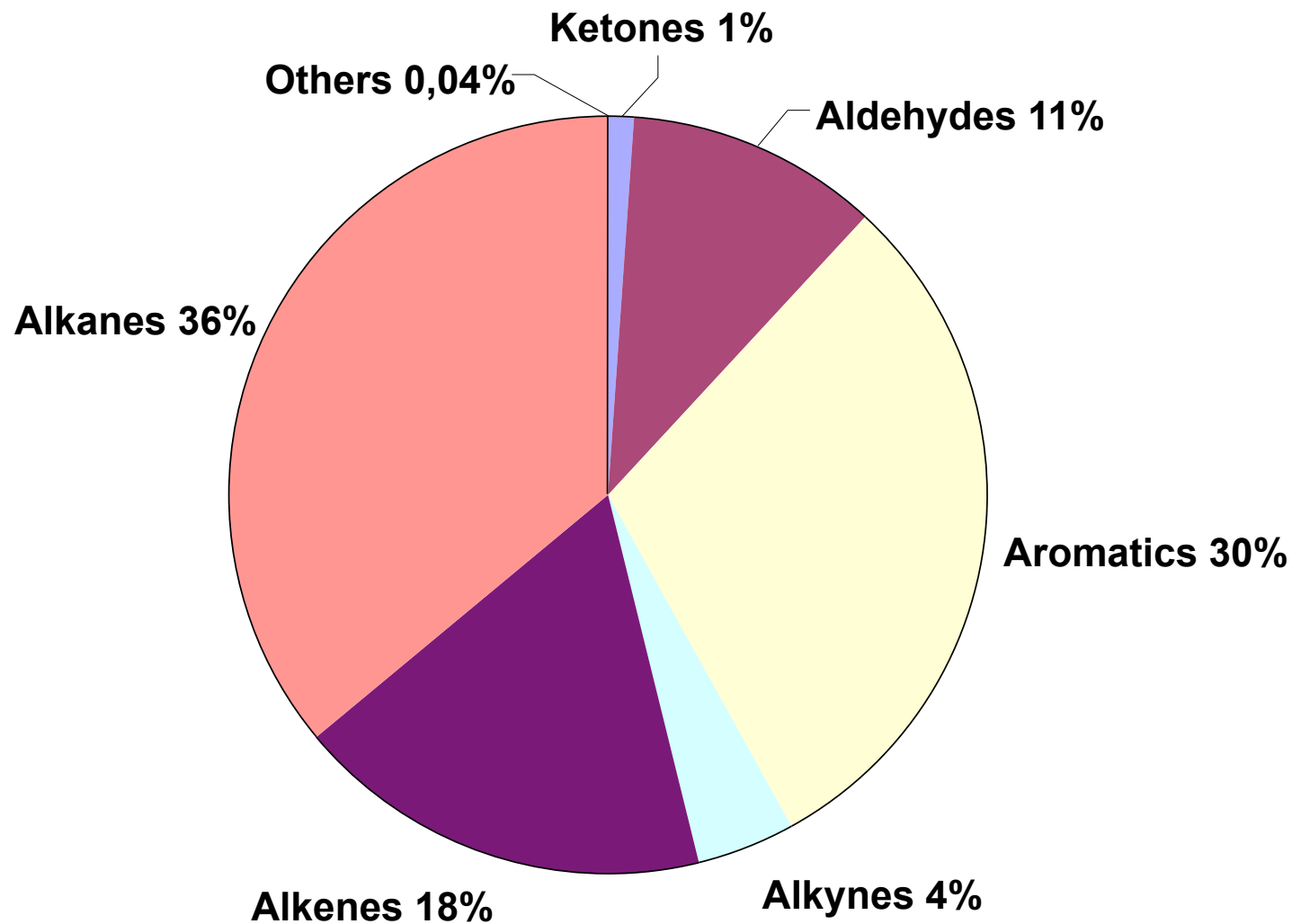


## Anthropogenic Sources of NMVOC (Germany)



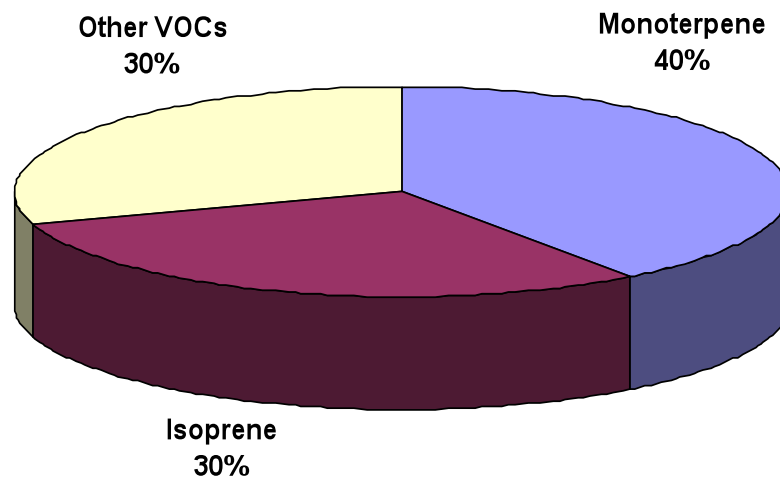


## VOC split for traffic in Germany 1998

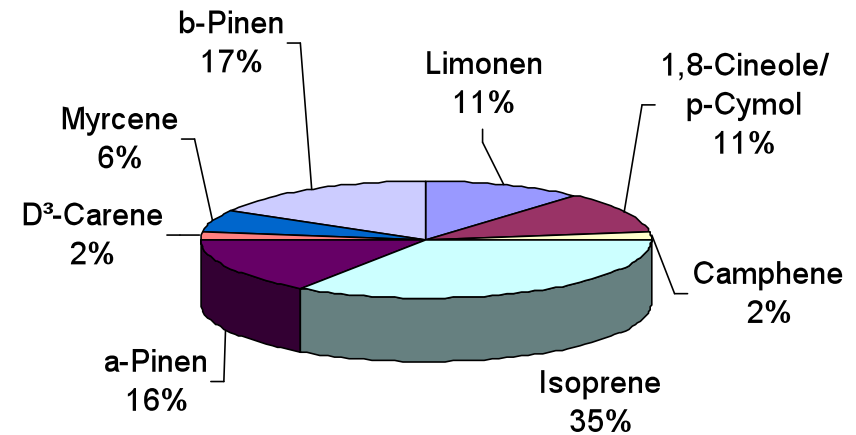




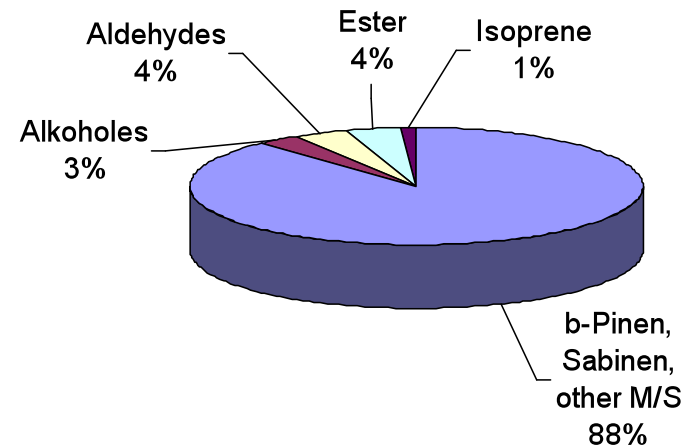
## NMVOC split for woods



*Picea abies* ssp. *abies*



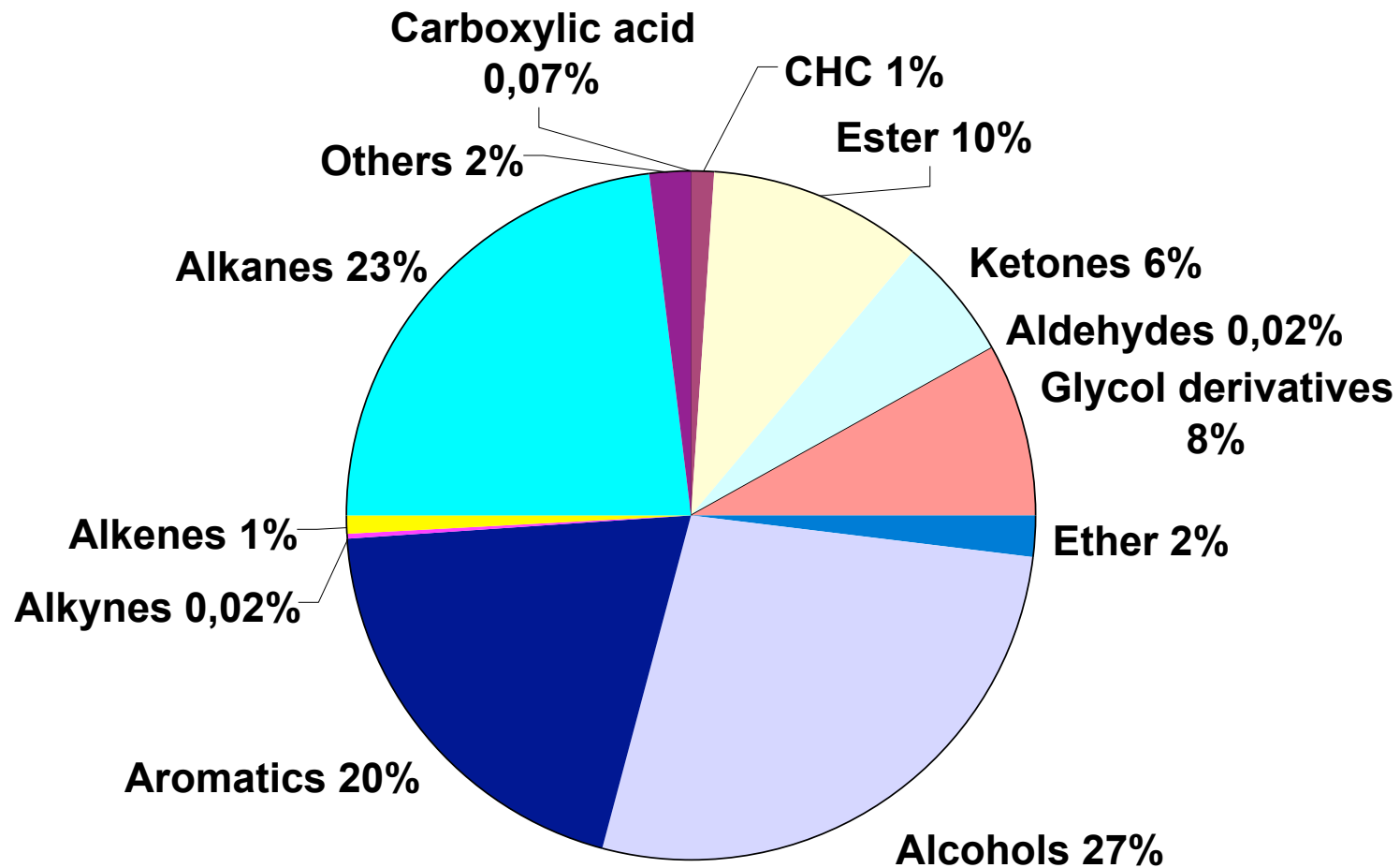
*Fagus sylvatica*



Source: Fraunhofer Institute



## VOC split for solvent use in Germany 1998





## Methodology for recalculating

In Volume 1, Chapter 7 of the 2006 IPCC Guidelines is a methodology for the solvent use sector described:

Calculating CO<sub>2</sub> inputs to the atmosphere from emissions of carbon containing compounds from NMVOC:

$$\text{Inputs CO}_2 = \text{Emissions NMVOC} * C * 44/12 = 2.2 * \text{Emissions NMVOC}$$

Where C is the fraction carbon in NMVOC by mass (default = 0.6)

The default factor is derived from fossil fuels and can not applied to solvents. This methodology let at least a large space for interpretation.



2008

Party	NMVOC [kt]	CO2 [kt]	CO2 Calculation on base of the IPCC methodology [kt]	Correlation between country specific and IPCC methodology	CO2 to NMVOC Relation
Liechtenstein	0,2	0,8	0,5	72,8%	3,8
Luxembourg	4,5	10,8	9,8	9,6%	2,4
Latvia	15,8	49,1	34,7	41,4%	3,1
Finland	23,5	51,8	51,8	0,0%	2,2
Hungary	23,4	65,4	51,6	26,8%	2,8
Ireland	27,6	86,0	60,7	41,7%	3,1
Denmark	27,5	65,0	60,5	7,5%	2,4
Norway	48,9	146,8	107,6	36,4%	3,0
Sweden	75,0	169,0	165,0	2,5%	2,3
Netherlands	59,1	130,0	130,1	-0,1%	2,2
Greece	54,0	160,7	118,8	35,2%	3,0
Switzerland	41,4	162,1	91,1	77,8%	3,9
Austria	97,1	231,9	213,6	8,5%	2,4
Romania	69,2	134,7	152,3	-11,5%	1,9
Czech Republic	90,0	282,8	197,9	42,9%	3,1
Portugal	76,5	230,6	168,3	37,0%	3,0
Spain	465,8	1138,3	1024,8	11,1%	2,4
Italy	483,1	1272,2	1062,9	19,7%	2,6
France	382,0	1190,6	840,4	41,7%	3,1
European Community	3424,1	8134,7	7532,9	8,0%	2,4

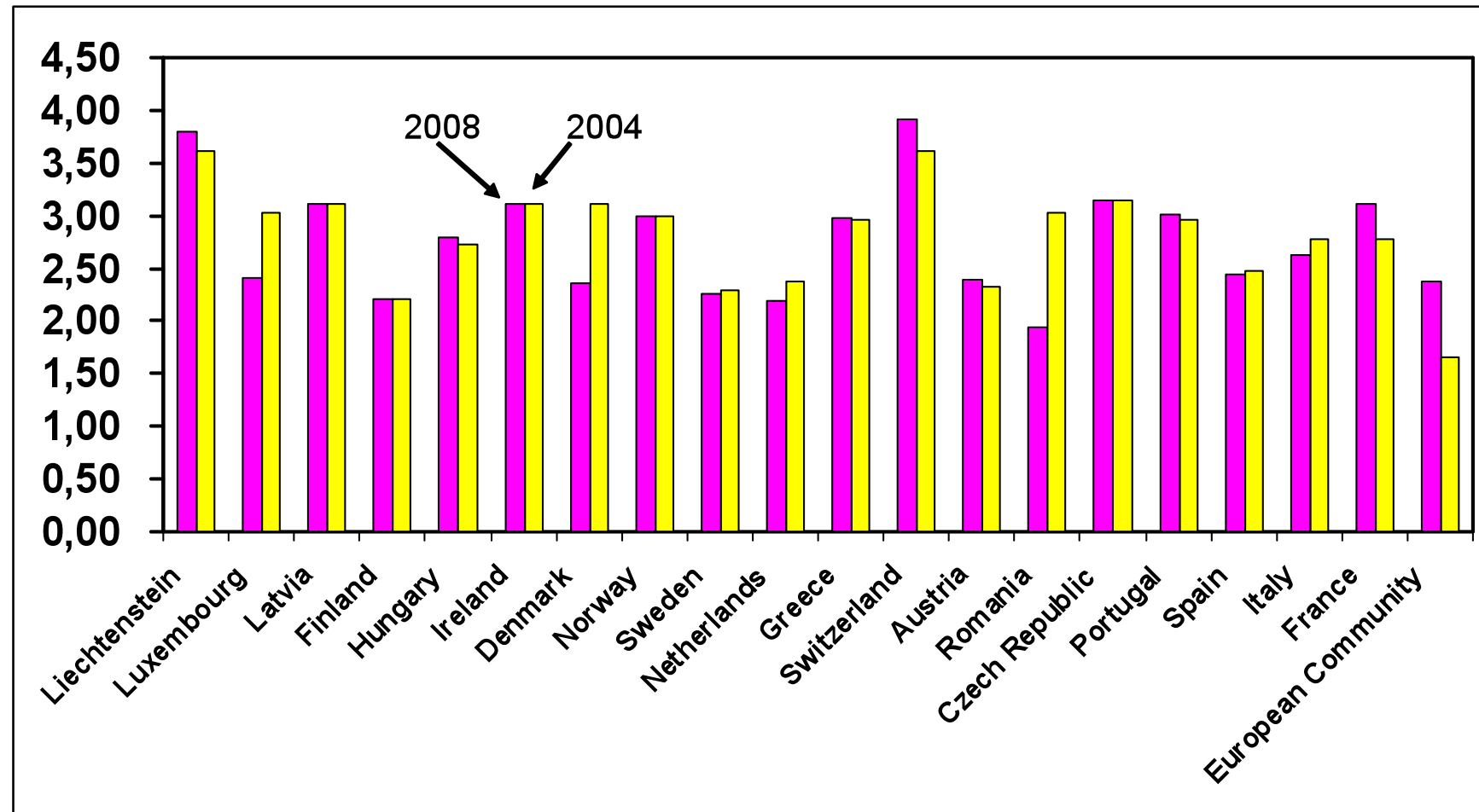


2008

Party	NMVOC [kt]	CO2 [kt]	CO2 Calculation on base of the IPCC methodology [kt]	Correlation between country specific and IPCC methodology	CO2 to NMVOC Relation
Belarus	54,0	NA	0,0		
Belgium	55,2	IE,NA	0,0		
Bulgaria	15,4	11,4	33,9	-66,3%	<b>0,7</b>
Canada	IE,NA	NA,NE	0,0		
Croatia	74,4	218,0	163,7	33,2%	<b>2,9</b>
Estonia	NA,NE	NA,NE	0,0		
Germany	714,1	2142,4	1571,1	36,4%	<b>3,0</b>
Iceland	1,9	5,8	4,1	41,7%	<b>3,1</b>
Japan	1204,9	NA,NE	0,0		
Lithuania	29,3	91,2	64,4	41,7%	<b>3,1</b>
Monaco	0,0	NE	0,0		
New Zealand	34,8	NA,NE	0,0		
Russian Federation	1704,1	NA,NE	0,0		
Slovakia	34,0	0,1	74,7	-99,9%	<b>0,0</b>
Slovenia	12,8	NA,NE,NO	0,0		
Turkey	NA,NE	NA,NE	0,0		
Ukraine	120,2	NA,NE	0,0		
United Kingdom	386,5	NE	0,0		
USA	3833,8	NA,NE	0,0		
Malta	1,5	NA	0,0		
Poland	198,3	618,0	436,3	41,7%	<b>3,1</b>
Cyprus	4,7	3,0	10,3	-70,6%	<b>0,6</b>
Australia	155,8	NA	0,0		
Kazachstan	NA,NE	NA,NE	0,0		



## Comparison of 2004 with 2008





## Implications

For the recalculation of NMVOC emissions from solvent use to CO<sub>2</sub> emissions the countries apply country specific estimations which differ extremely from country to country.

This could have implications to the country specific baselines.

(If a country estimate higher C-content for the solvent used in the base year as in the reporting year is the result a contribution to mitigation due to different assumptions about the country specific C-content of applied solvents in different years and vice versa)



## Conclusion

- All countries are obliged to recalculate the emissions of non-methane volatile organic compounds (NMVOC) into CO<sub>2</sub> equivalents in the greenhouse gas (GHG) emission data sets officially reported to UNFCCC.
- NMVOCs are a mix of several hundred species which vary different numbers of carbon.
- NMVOC emissions are caused mainly by solvent use and on-road as well as off-road activities.
- The quantitative speciation of this substance class is mainly unknown.
- NMVOC need to be reported as an indirect GHG, because ozone is a GHG and NO<sub>x</sub> as well as NMVOC are precursors
- The applied recalculations approaches differ from country to country.
- The official IPCC default methodology is derived from fossil fuels and does not taken into account the high diversity of the applied solvents.
- The described situation could have also an impact to the country specific mitigation targets in relation to the base year.



**Thank you for your attention**