Emission inventory system in Latvia

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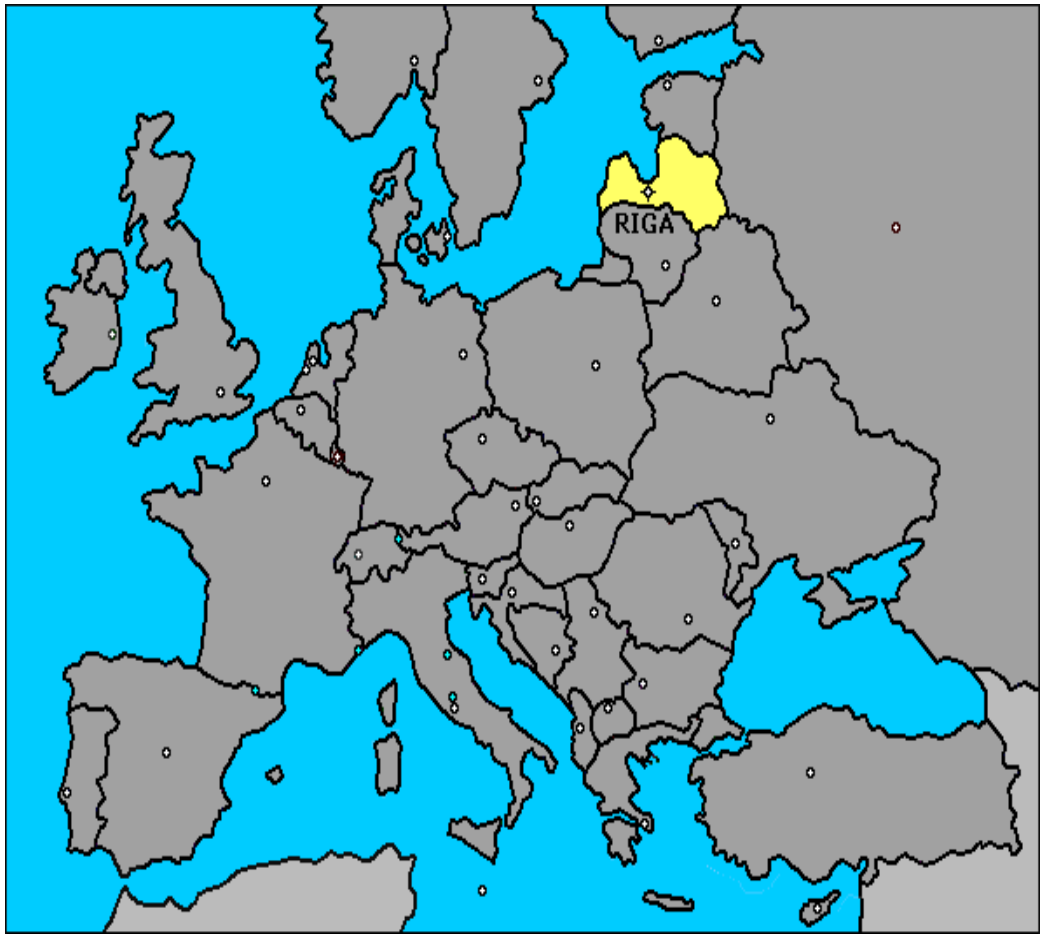
Content

- Some information about Latvia,
- Legal background;
- Roles;
- Resources;
- Practical examples (key categories, uncertainties);
- Trends;
- Projections.

Some facts about Latvia



- Total area: 64,589 km^2
- Population: 2.3 million
- Capital: Rīga (population 0.8 million with district)

- EU Candidate Country1997
- EU Member State since 2004

Legal background

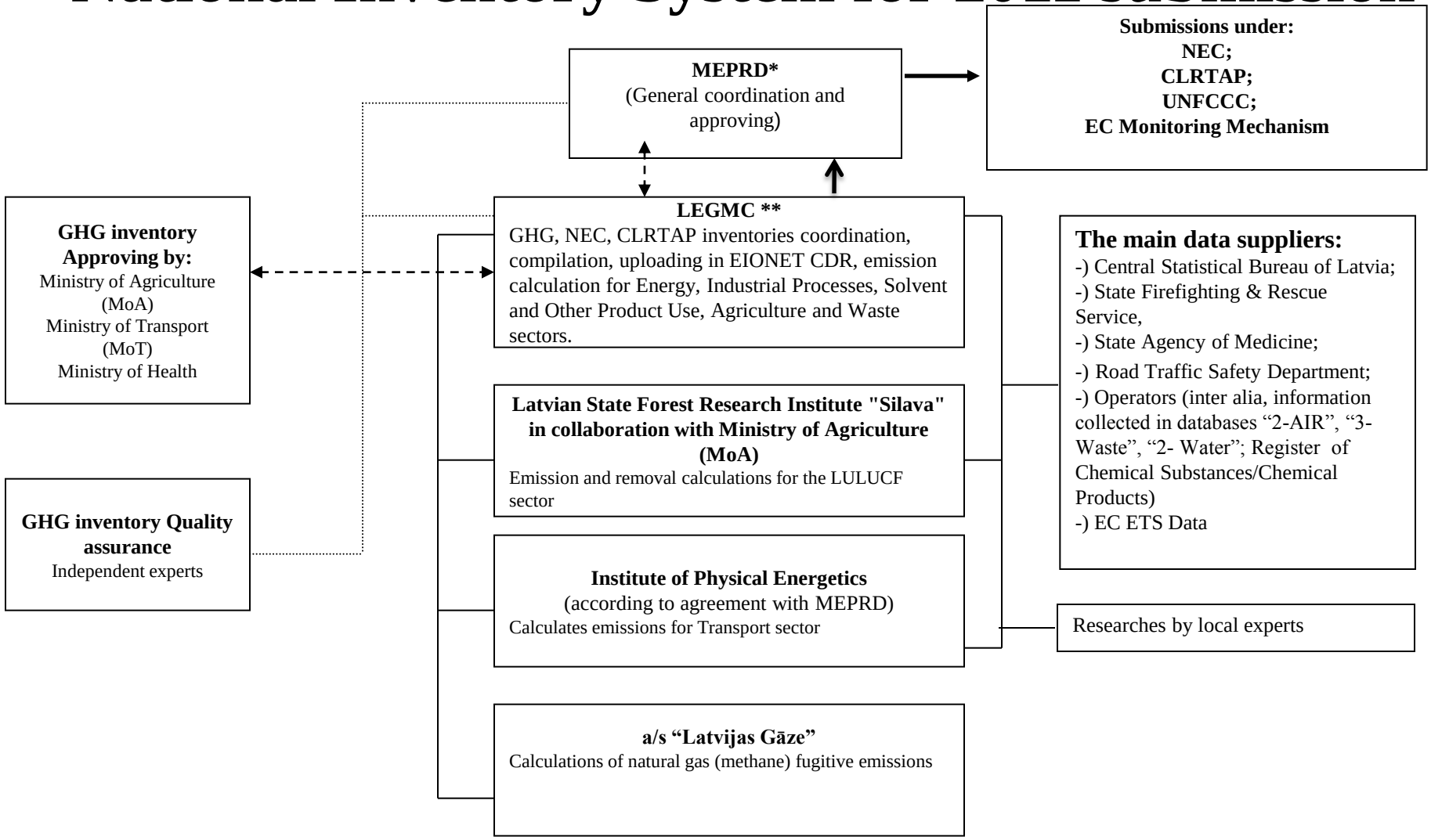
Nationally approved Regulations:

- Action program on total air emission reduction (2007);
- No 419 “Total national emission ceilings for air” (on 31 May 2011) – previously No 507, on 9 September 2003;
- No 157 “Greenhouse gas emission inventory national system” (on 17 February 2009).

Regulations define:

- the institutions that are responsible for air and GHG inventory preparation;
- the designation of an institutions controlling the QA/QC procedures;
- reporting process.

National Inventory System for 2011 submission



Responsibility of Institutions [1]

The **Latvian Ministry of the Environmental Protection and Regional Development** is responsible for:

- Informing the inventory compilers about the requirements of the national system;
- Formal agreements with inventory experts regarding Transport sector and for experts that evaluate quality assurance process;
- Final checking and approving the inventory before official submission to the EC, CLRTAP and UNFCCC.

Responsibility of Institutions [2]

Latvian Environment, Geology and Meteorology Centre:

- prepares final Air Pollutant Inventory and Greenhouse Gas Inventories;
- coordinates the overall inventory preparation process together with MEPRD;
- collects an activity data - activity data are mainly collected from other institutions and LEGMC uses it to calculate emissions;
- prepares the emission estimates for the Energy, Industrial Processes, Agriculture, Waste;
- prepares sectoral parts of the IIR and NIR and compiles the final IIR and NIR;
- fills in the sectoral data to the NFR and CRF Reporter (for relevant sectors);
- prepares QC procedures;
- documents and archives the prepared inventories.

Responsibility of Institutions [3]

Central Statistical Bureau (CSB) is the main data supplier for the Latvian Air and GHG emission inventories.

Latvian State Forest Research Institute "Silava“ in collaboration with **Ministry of the Agriculture** are responsible for emission calculations for the LULUCF sector.

Institute of Physical Energetic (FEI) calculates emissions for Transport sector according to agreement with MEPRD .

Deadlines and process of inventory preparation [1]

Reporting under CLRTAP - IIR – 15.03

Reporting under NEC – NFR + short IIR 31.12

Reporting under CLRTAP - NFR– 15.02

March-April-May	June-July-August	September-October	November-December	January-February

Collection of data from Statistics (Energy balance, number of livestock etc.)

Documentation, archiving

Comments/Answers on submitted inventory (EC, CLRTAP)

Inventory compilation:
Consideration of methodological changes;
Emission calculation
QA/QC

Collection of enterprises data in national databases regarding used water amounts and emissions, wastes amounts and emissions in air

Preparation of IIR

NEC:
LEGMC till **15 December** send to the MEPRD data in NFR and short information (IIR) for approval;
After approving of data LEGMC uploaded information in the EIONET CDR
MEPRD till **31 December** electronically send notification to EC about uploading of NEC data as well as informed EC through the Permanent Representation.

CLRTAP:
LEGMC compiles NFR (till 5 of February), IIR (till 28 of February) and send to the MEPRD for approving. After approving LEGMC send to CLRTAP secretariat, EC NFR tables and IIR.
LEGMC uploaded NFR tables, IIR in the EIONET CDR.
If information regarding NEC changed MEPRD electronically sent to EC notification about uploaded corrected data.

Process of inventory preparation [2]

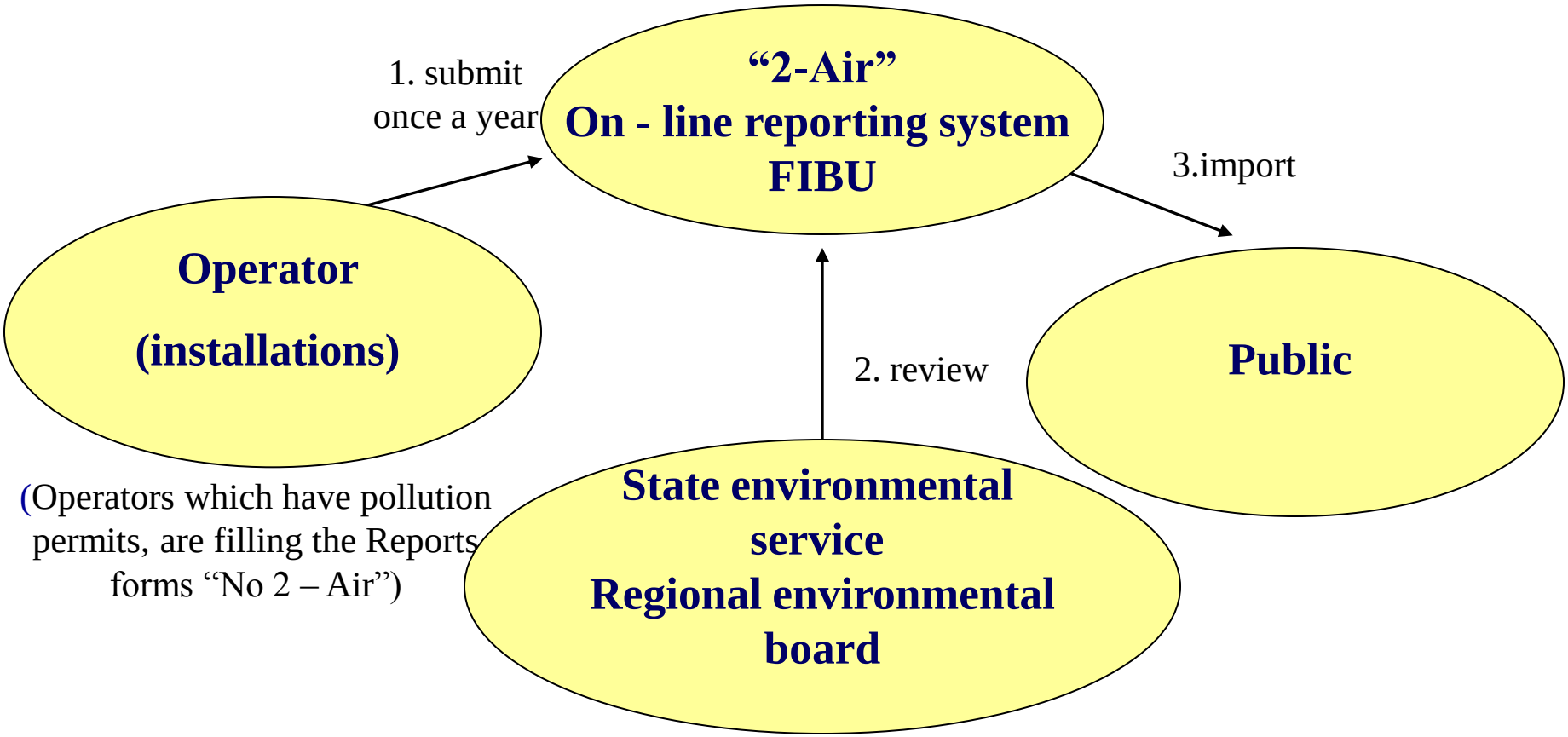
Example: *Annual Governmental statistical report "2-Air"*
(emissions from stationary sources) - for NEC, CLRTAP and GHG data only from biggest facilities is used as data quality is low!

Data reporting

- The operator of facility of pollution who has a pollution permit have to report on the activities related to pollution of the ambient air:
- Once a year;
- Web-based reporting system FIBU (air emission data system for the stationary sources https://arcims.lvgma.gov.lv:8081/gaiss/code/index.php
- Data about operator and 6 tables: facility characteristics; limited and actual emissions, exhaust gases removal efficiency in the treatment plants, fuel use, and working duration.

Process of inventory preparation [3]

Example: *Annual Governmental statistical report "2 - Air"*



Process of inventory preparation [4]

Inventory activities include:

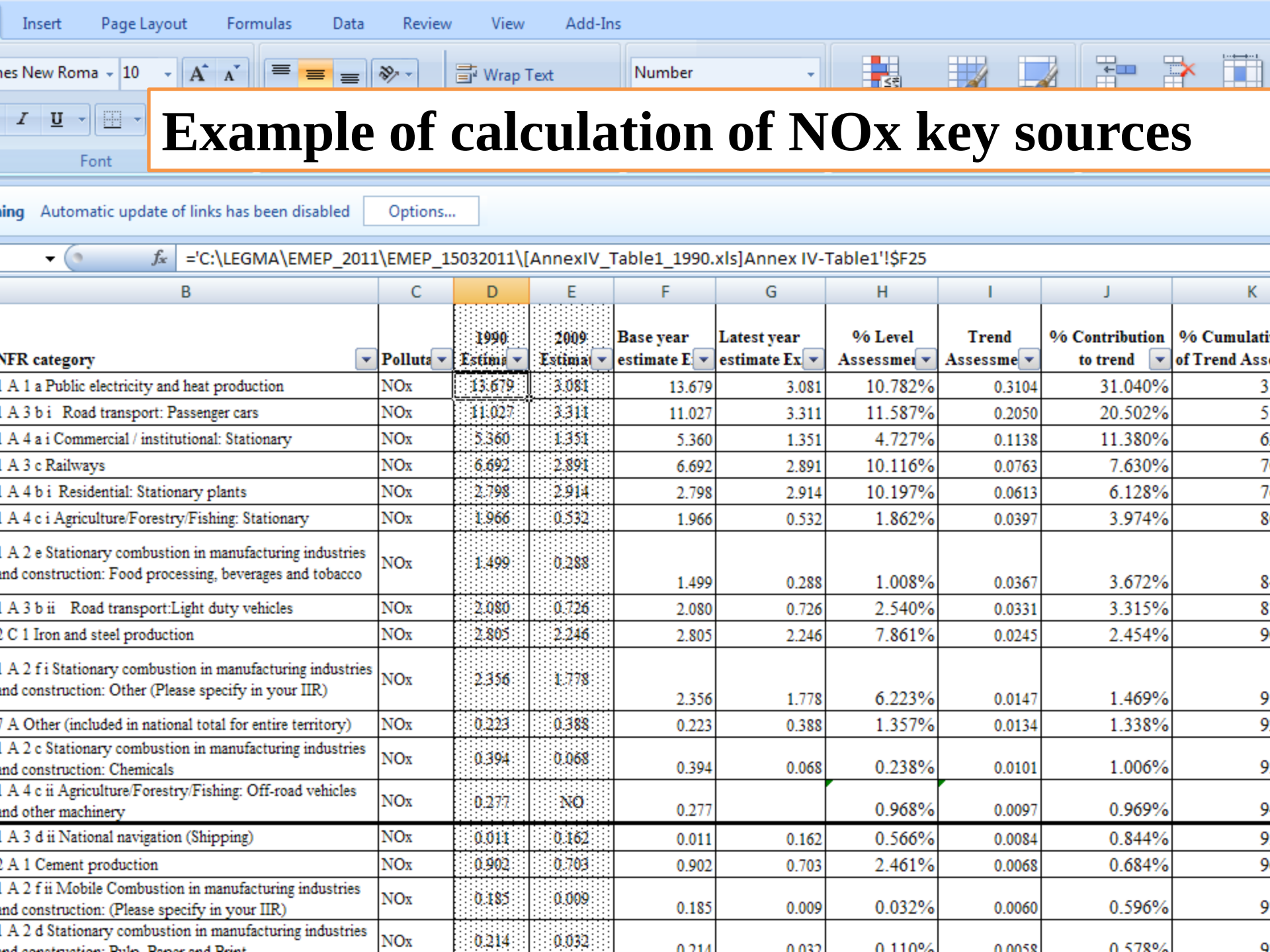
- Planning;
- Preparation;
- Management.
- **In the first stage (October)** specific responsibilities are defined and allocated, for example: how data will be filed in the NFR (Experts enter data in the NFR by sending each other - in a circle to avoid copying errors);
- **In the second stage (October, November, December)** the inventory compilation process.

Process of inventory preparation [5]

- Latvia's emissions inventory is based on the EMEP/EEA 2009, IPCC 1996 and IPCC GPG 2000 methodologies.
- NFR format is used for emission and data reporting.
- To calculate emissions, supplemental locally developed database in Excel format was used for all sectors except Road Transport. A special Computer Programme for Road Transportation (COPERT IV) was used.
- National researches (average N excretions per head of animal, distribution different manure management systems, etc) are used.

Key source [1]

- The Key source analysis for 1990 and 2009 years was done by LEGMC according to EMEP/EEA 2009 Level and Trend assessment.
- The lists of the Key source analysis emission sources that contributed to 95 % of the total national emissions are reported.
- The Key source analysis was performed for each reported pollutant separately in the Excel format with the links to actual data files.



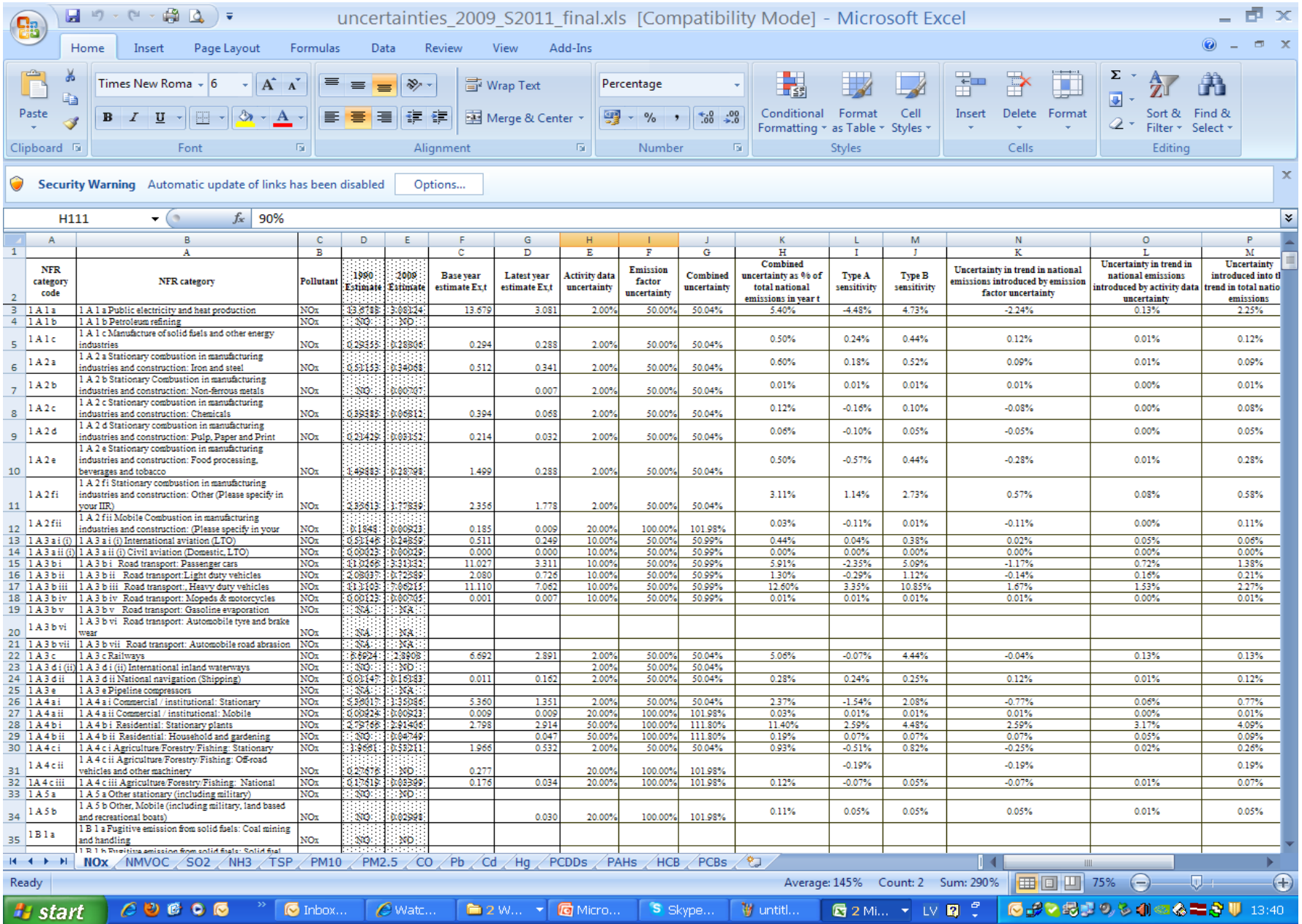
Example of calculation of NOx key sources

B	C	D	E	F	G	H	I	J	K
NFR category	Polluta	1990 Estima	2009 Estima	Base year estimate E	Latest year estimate Ex	% Level Assessmer	Trend Assessme	% Contribution to trend	% Cumulati of Trend Ass
1 A 1 a Public electricity and heat production	NOx	13.679	3.081	13.679	3.081	10.782%	0.3104	31.040%	3
1 A 3 b i Road transport: Passenger cars	NOx	11.027	3.311	11.027	3.311	11.587%	0.2050	20.502%	5
1 A 4 a i Commercial / institutional: Stationary	NOx	5.360	1.351	5.360	1.351	4.727%	0.1138	11.380%	6
1 A 3 c Railways	NOx	6.692	2.891	6.692	2.891	10.116%	0.0763	7.630%	7
1 A 4 b i Residential: Stationary plants	NOx	2.798	2.914	2.798	2.914	10.197%	0.0613	6.128%	7
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	NOx	1.966	0.532	1.966	0.532	1.862%	0.0397	3.974%	8
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	NOx	1.499	0.288	1.499	0.288	1.008%	0.0367	3.672%	8
1 A 3 b ii Road transport:Light duty vehicles	NOx	2.080	0.726	2.080	0.726	2.540%	0.0331	3.315%	8
2 C 1 Iron and steel production	NOx	2.805	2.246	2.805	2.246	7.861%	0.0245	2.454%	9
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	NOx	2.356	1.778	2.356	1.778	6.223%	0.0147	1.469%	9
7 A Other (included in national total for entire territory)	NOx	0.223	0.388	0.223	0.388	1.357%	0.0134	1.338%	9
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	NOx	0.394	0.068	0.394	0.068	0.238%	0.0101	1.006%	9
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	NOx	0.277	NO	0.277		0.968%	0.0097	0.969%	9
1 A 3 d ii National navigation (Shipping)	NOx	0.011	0.162	0.011	0.162	0.566%	0.0084	0.844%	9
2 A 1 Cement production	NOx	0.902	0.703	0.902	0.703	2.461%	0.0068	0.684%	9
1 A 2 f ii Mobile Combustion in manufacturing industries and construction: (Please specify in your IIR)	NOx	0.185	0.009	0.185	0.009	0.032%	0.0060	0.596%	9
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	NOx	0.214	0.032	0.214	0.032	0.110%	0.0058	0.578%	9

Uncertainties

- The calculation of uncertainty estimates was made according to the Tier 1 method presented by the **EMEP/EEA emission inventory guidebook 2009 (**EMEP/EEA 2009) **in** Excel format with the links to actual data files;
- The Tier 1 method is based on emission estimates and uncertainty coefficients for activity data and emission factors;
- Uncertainty coefficients have been assigned based on expert judgement or on default uncertainty estimates according to EMEP/EEA 2009 **Table 3-1 Indicative error ranges for uncertainty analysis** (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009/part-a-general-guidance-chapters/5-uncertainties-tfeip-endorsed-draft.pdf**)**;
- For each source, the uncertainty for activity data and emission factors was estimated and given in per cent;
- Uncertainties are estimated only for main pollutants - NOx, CO, NMVOC, SOx and $NH_{3;}$
- The overall uncertainty for NOx is 75%, for CO – 104%, for NMVOC – 90%, for SOx – 67.7% and for NH_3 – 93.3%. The trend uncertainty is calculated for NOx – 39%, for CO – 84%, for NMVOC – 80%, for SOx – 12.8% and for NH_3 – 28.7%;
- Uncertainties for these pollutants are high basically due to use default emission factors.

Example of calculation of NOx uncertainties



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NFR category code	NFR category	Pollutant	1990 Estimate	2009 Estimate	Base year estimate Ex,t	Latest year estimate Ex,t	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into tl trend in total natio emissions
1 A 1 a	1 A 1 a Public electricity and heat production	NOx	13.6718	3.08124	13.679	3.081	2.00%	50.00%	50.04%	5.40%	-4.48%	4.73%	-2.24%	0.13%	2.25%
1 A 1 b	1 A 1 b Petroleum refining	NOx	NO	NO											
1 A 1 c	1 A 1 c Manufacture of solid fuels and other energy industries	NOx	0.29355	0.28806	0.294	0.288	2.00%	50.00%	50.04%	0.50%	0.24%	0.44%	0.12%	0.01%	0.12%
1 A 2 a	1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	NOx	0.51153	0.34068	0.512	0.341	2.00%	50.00%	50.04%	0.60%	0.18%	0.52%	0.09%	0.01%	0.09%
1 A 2 b	1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	NOx	NO	0.00707		0.007	2.00%	50.00%	50.04%	0.01%	0.01%	0.01%	0.01%	0.00%	0.01%
1 A 2 c	1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	NOx	0.39385	0.06812	0.394	0.068	2.00%	50.00%	50.04%	0.12%	-0.16%	0.10%	-0.08%	0.00%	0.08%
1 A 2 d	1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	NOx	0.21429	0.03152	0.214	0.032	2.00%	50.00%	50.04%	0.06%	-0.10%	0.05%	-0.05%	0.00%	0.05%
1 A 2 e	1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	NOx	1.49883	0.28798	1.499	0.288	2.00%	50.00%	50.04%	0.50%	-0.57%	0.44%	-0.28%	0.01%	0.28%
1 A 2 fi	1 A 2 fi Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	NOx	2.35613	1.77839	2.356	1.778	2.00%	50.00%	50.04%	3.11%	1.14%	2.73%	0.57%	0.08%	0.58%
1 A 2 fii	1 A 2 fii Mobile Combustion in manufacturing industries and construction: (Please specify in your	NOx	0.1848	0.00923	0.185	0.009	20.00%	100.00%	101.98%	0.03%	-0.11%	0.01%	-0.11%	0.00%	0.11%
1 A 3 a i (i)	1 A 3 a i (i) International aviation (LTO)	NOx	0.51148	0.24859	0.511	0.249	10.00%	50.00%	50.99%	0.44%	0.04%	0.38%	0.02%	0.05%	0.06%
1 A 3 a ii (i)	1 A 3 a ii (i) Civil aviation (Domestic, LTO)	NOx	0.00023	0.00029	0.000	0.000	10.00%	50.00%	50.99%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1 A 3 b i	1 A 3 b i Road transport: Passenger cars	NOx	11.0268	3.31132	11.027	3.311	10.00%	50.00%	50.99%	5.91%	-2.35%	5.09%	-1.17%	0.72%	1.38%
1 A 3 b ii	1 A 3 b ii Road transport:Light duty vehicles	NOx	2.08037	0.72589	2.080	0.726	10.00%	50.00%	50.99%	1.30%	-0.29%	1.12%	-0.14%	0.16%	0.21%
1 A 3 b iii	1 A 3 b iii Road transport:, Heavy duty vehicles	NOx	11.1102	7.06215	11.110	7.062	10.00%	50.00%	50.99%	12.60%	3.35%	10.85%	1.67%	1.53%	2.27%
1 A 3 b iv	1 A 3 b iv Road transport: Mopeds & motorcycles	NOx	0.00123	0.00707	0.001	0.007	10.00%	50.00%	50.99%	0.01%	0.01%	0.01%	0.01%	0.00%	0.01%
1 A 3 b v	1 A 3 b v Road transport: Gasoline evaporation	NOx	NA	NA											
1 A 3 b vi	1 A 3 b vi Road transport: Automobile tyre and brake wear	NOx	NA	NA											
1 A 3 b vii	1 A 3 b vii Road transport: Automobile road abrasion	NOx	NA	NA											
1 A 3 c	1 A 3 c Railways	NOx	6.6924	2.8908	6.692	2.891	2.00%	50.00%	50.04%	5.06%	-0.07%	4.44%	-0.04%	0.13%	0.13%
1 A 3 d i (ii)	1 A 3 d i (ii) International inland waterways	NOx	NO	NO			2.00%	50.00%	50.04%						
1 A 3 d ii	1 A 3 d ii National navigation (Shipping)	NOx	0.0147	0.16183	0.011	0.162	2.00%	50.00%	50.04%	0.28%	0.24%	0.25%	0.12%	0.01%	0.12%
1 A 3 e	1 A 3 e Pipeline compressors	NOx	NA	NA											
1 A 4 a i	1 A 4 a i Commercial / institutional: Stationary	NOx	5.36017	1.35086	5.360	1.351	2.00%	50.00%	50.04%	2.37%	-1.54%	2.08%	-0.77%	0.06%	0.77%
1 A 4 a ii	1 A 4 a ii Commercial / institutional: Mobile	NOx	0.00924	0.00923	0.009	0.009	20.00%	100.00%	101.98%	0.03%	0.01%	0.01%	0.00%	0.00%	0.01%
1 A 4 b i	1 A 4 b i Residential: Stationary plants	NOx	2.79768	2.91405	2.798	2.914	50.00%	100.00%	111.80%	11.40%	2.59%	4.48%	2.59%	3.17%	4.09%
1 A 4 b ii	1 A 4 b ii Residential: Household and gardening	NOx	NO	0.04749		0.047	50.00%	100.00%	111.80%	0.19%	0.07%	0.07%	0.07%	0.05%	0.09%
1 A 4 c i	1 A 4 c i Agriculture/Forestry/Fishing: Stationary	NOx	1.9661	0.53211	1.966	0.532	2.00%	50.00%	50.04%	0.93%	-0.51%	0.82%	-0.25%	0.02%	0.26%
1 A 4 c ii	1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	NOx	0.27478	NO	0.277		20.00%	100.00%	101.98%		-0.19%		-0.19%		0.19%
1A 4 c iii	1 A 4 c iii Agriculture/Forestry/Fishing: National	NOx	0.17419	0.03599	0.176	0.034	20.00%	100.00%	101.98%	0.12%	-0.07%	0.05%	-0.07%	0.01%	0.07%
1 A 5 a	1 A 5 a Other stationary (including military)	NOx	NO	NO											
1 A 5 b	1 A 5 b Other, Mobile (including military, land based and recreational boats)	NOx	NO	0.02998		0.030	20.00%	100.00%	101.98%	0.11%	0.05%	0.05%	0.05%	0.01%	0.05%
1 B 1 a	1 B 1 a Fugitive emission from solid fuels: Coal mining and handling	NOx	NO	NO											
	1 B 1 b Fugitive emission from solid fuels: Solid fuel														

NOx NMVOC SO2 NH3 TSP PM10 PM2.5 CO Pb Cd Hg PCDDs PAHs HCB PCBs

Ready Average: 145% Count: 2 Sum: 290% 75%

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Quality Assurance/Quality Control [1]

Quality Control (QC) - is a system of routine technical activities, to measure and control the quality of the inventory as it is being developed.

The QC system is designed to:

- Provide routine and consistent checks to ensure data correctness and completeness;
- Identify and address errors and omissions;
- Document and archive inventory material.

QC activities include general methods such as accuracy checks on data acquisition and calculations and the use of approved standardized procedures for emission calculations, measurements, estimating uncertainties, archiving information and reporting.

These activities are implemented by sector experts and national inventory compiler.

Before submitting data to CEIP/EEA NFR formats have to been checked with RepDab and compared with GHG inventory.

Quality Assurance/Quality Control [2]

- **Quality assurance (QA) -** activities include a planned system of review procedures conducted by personnel not directly involved in the inventory compilation/development process.
- In the inventory preparation process, general quality control procedures have been applied.
- Some specific quality control procedures related to check of activity data and emission factors was carried out.
- Before submitting data and IIR to CEIP/EEA they were approved by The Ministry of the Environmental Protection and Regional Development.

Quality Assurance/Quality Control [3]

The following Quality control (QA/QC) activities were carried out in the inventory preparation process:

- Processing;
- Handling;
- Documentation;
- Recalculations;
- Cross – checking.

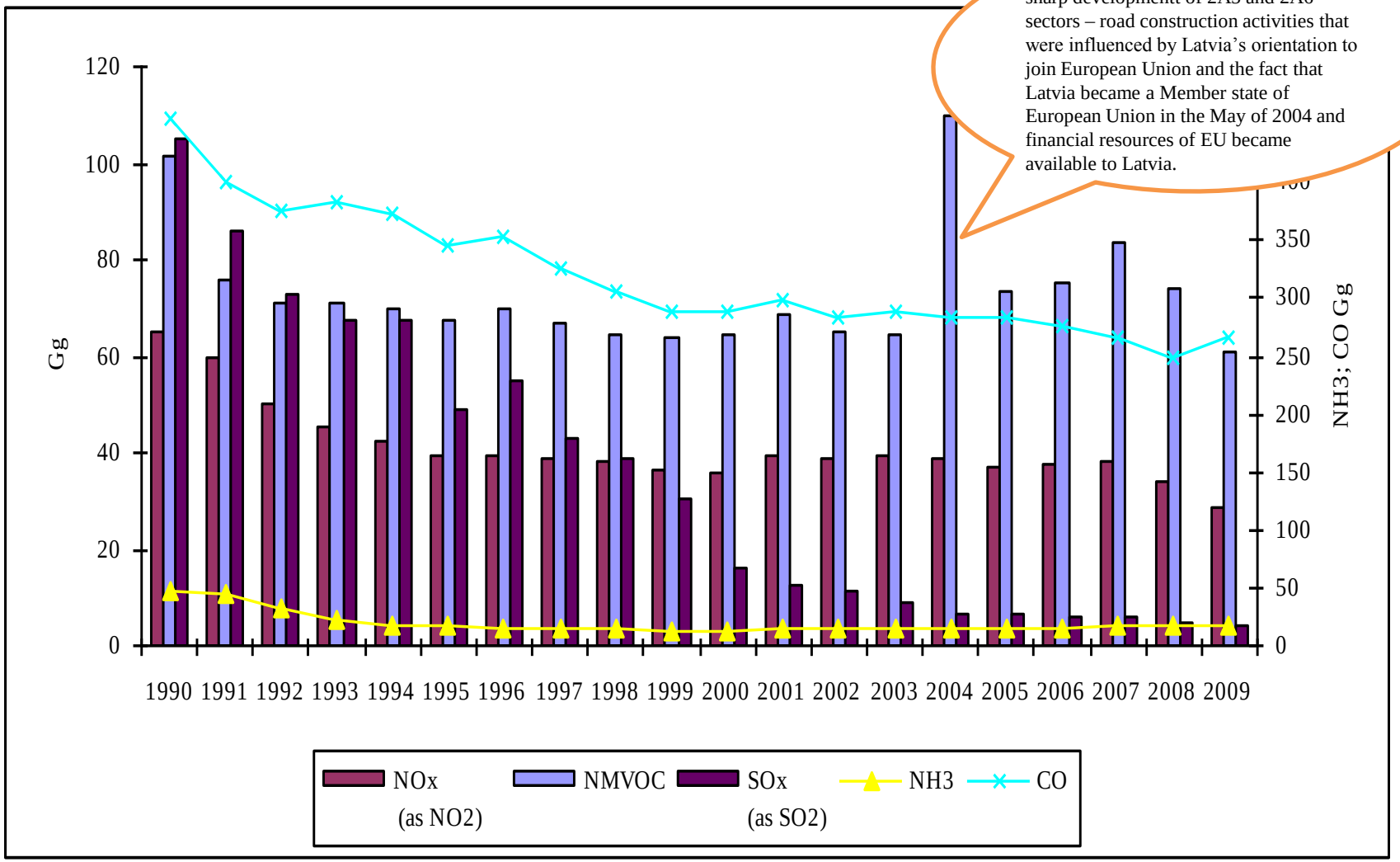
Each year inventory is archived and it is possible regenerate information.

Air pollutants emission trends

- The emission estimates of air pollutants in Latvia include following emissions sulphur dioxide, nitrogen oxides, carbon monoxide, non-methane volatile organic compounds, ammonia, particulates (TSP, $PM_{10,}$ $PM_{2.5}$), heavy metals (lead, cadmium, mercury, arsenic, chromium, copper, nickel, vanadium, zinc), PAHs, PCBs and DIOX.
- Judging from the present trends, Latvia can meet these international commitments without any additional options for SO_x emissions.
- Latvia will be able to meet NO_x international commitments for 2010 with currently projected development rate.

Emission trends [1]

SO_2, NOx, CO, NMVOC, NH_3 emissions in 1990-2009 (Gg)

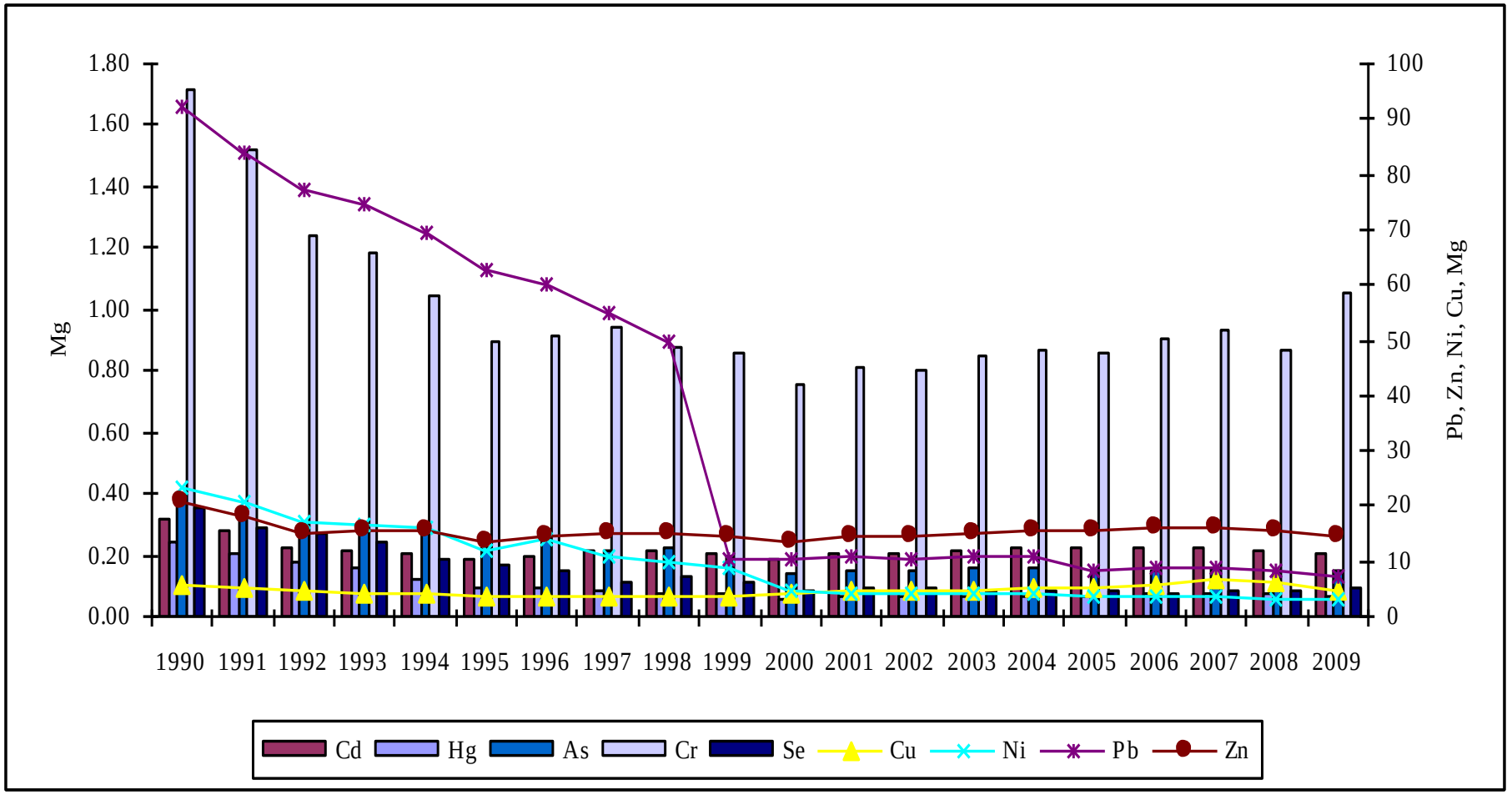


Emission trends [2]
SO_2, NOx, CO, NMVOC, NH_3 emissions in 2009 (Gg)

- Most of the SO_2 emissions were from Cement production (2A1 – 43%), then Public electricity and heat production (1A1a – 18%);
- The biggest part of NOx emissions come from Transport (1A3biii – 25%; 1A3bi – 12%);
- Agriculture is general source for NH_3 emissions (4D1a-31%; 4B1a-22%);
- Residential sector is the main generator of NMVOC and CO – 52% and 69% respectively, then Road paving with asphalt with 20%.

Emission trends [3]

Emissions of heavy metals in 2000-2009 (Mg)



Projections [1]

Previously the data and emission projections are being prepared based on contract (MEPRD with certain institution).

Now the institutions involved in preparation of projection as well as roles are determined according to new regulation (No 419, 2011) .

Projections [2]

- **For Energy -** the **MARKAL model**, which describes the whole energy supply system is used.

MARKAL is an optimization model, which usually describes development of a particular energy branch during a period of 40 – 50 years on the national or regional model depending on the input data. Results obtained with MARKAL model depend on input parameters and algorithm of the model. The main paradigms of the model are the perfect market (competitive partial equilibrium) and visibility of development of technologies during a period of several decades.

Projections [3]

The structure of the model is adapted, so that emissions can be calculated not only based upon the type of fuel, but also based upon the sector and corresponding technologies, which is important for NMVOC and NOx calculations. For the performance of diverse analysis the energy and environment system analysis tool has been created and is based upon the structure of the Latvian energy, possible future technologies, emissions reduction possibilities and energy development scenarios, taking into account the following:

- The environment factor - NOx, SO_2, NMVOC, GHG emissions restrictions;
- Broader use of renewable and local resources - a bigger share of RES in the total national electricity demand; broader use of wood in district heating production;
- Emissions reduction possibilities by implementing energy efficiency measures;
- Security of electricity supply in the country - import of electricity;
- Regional trade possibilities - electricity and emissions markets;
- Uncertainty factor of emissions reduction goals.

Projections [4]

- **For Transport -** A set of models consisting of two individual models was used for projecting fuel consumption and emissions.
- For quantitative and qualitative projection of the fleet of vehicles dynamic model is applied. The results obtained from it then are used for projecting of fuel consumption and emissions. COPERT model is used for projections.

Projections [5]

- For **industrial processes** the combined method of time lines and impact of macroeconomic indices was applied.
- For **agriculture** the long-term macroeconomic projection and trends in relation to the projected amount of production in each individual sub-sector of agriculture was used.
- For **waste disposal and composting**, amounts from State planning documents are used.
- For **wastewater management -** on population and production projections are based.

Main problems

- One team for Air and GHG inventories – a lot of work in small period;
- Restriction of financial resources for national researches.

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