

Analysis of CIAM Scenarios (with Emphasis on Key Measures): Belarus

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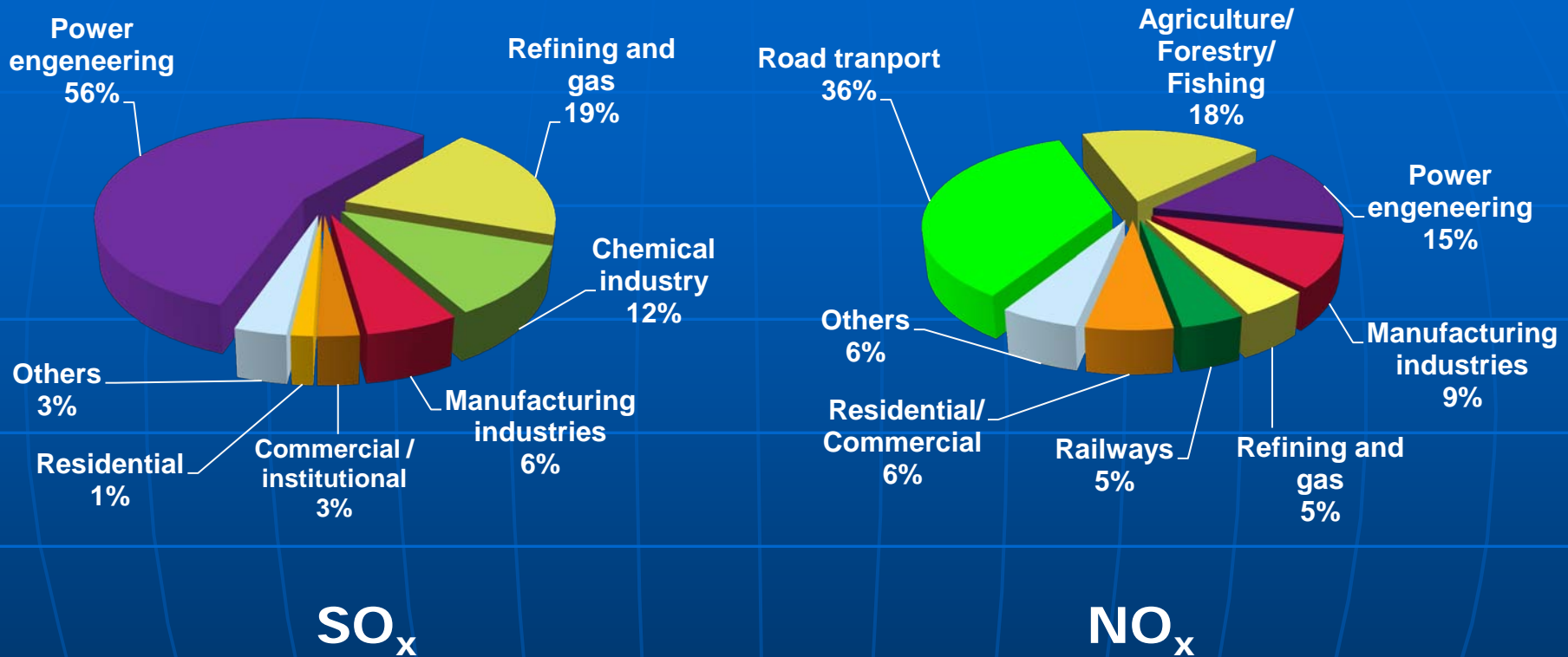
*40th session of the TFIAM,
18-20 May 2011,
Oslo, Norway*

Included into presentation:

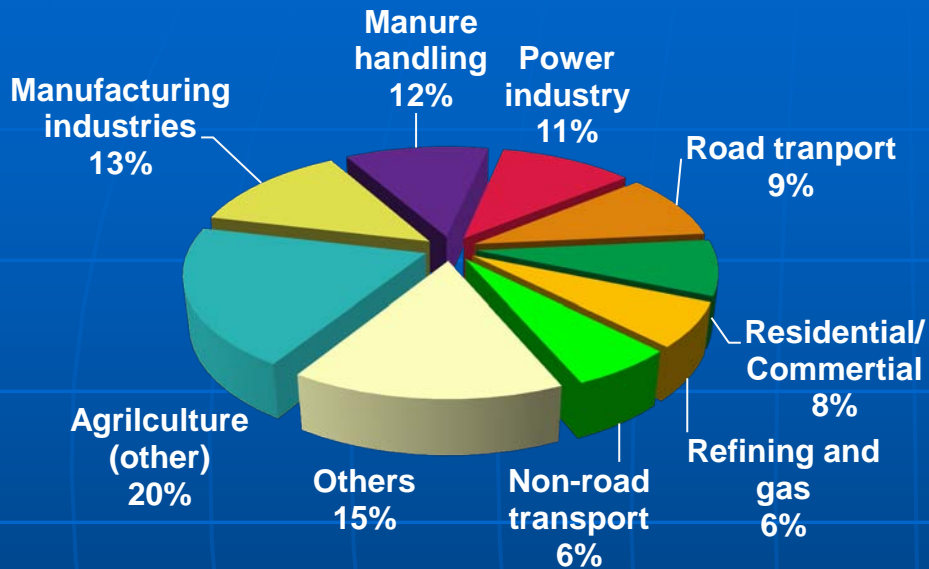
1. Baseline of analysis;
 - emission levels;
 - emission trends;
 - abatement costs;
2. National emission scenarios;
3. CIAM scenario of key measures analysis;
 - impact of additional measures if implemented;
4. CIAM scenarios of different ambitious levels (brief comments);
5. Conclusions and proposals.

1. Baseline

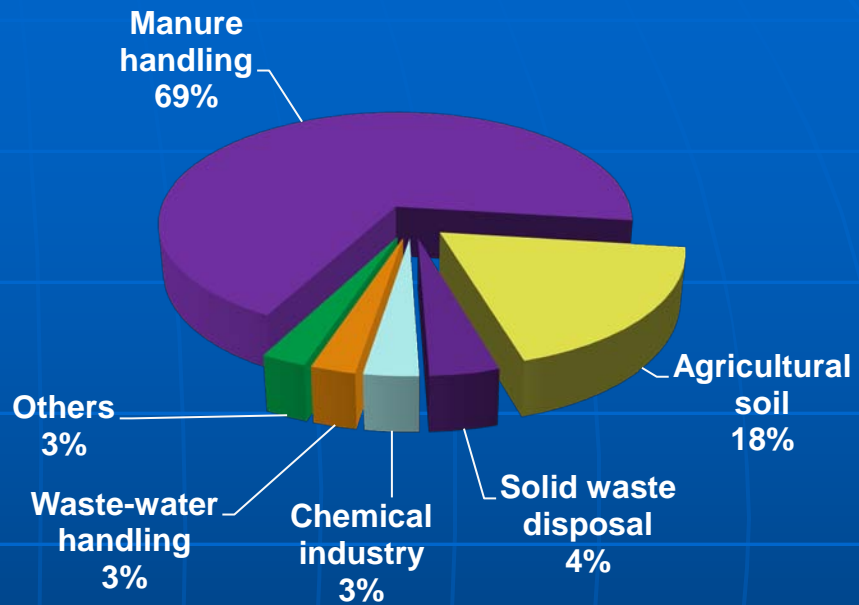
Inventory of sources of emission in Belarus



Sources of emission identification and assessment, trends detection - starting points for further IAM.
Different approaches – top-down and bottom-up are used.



PM



NH₃

2. National emission scenarios

Emission projection using technological approach started 2007.

a) Main pollutants 2007 emission scenario for 2010, 2015 and 2020.

Emission abatement due to control measures penetration was accounted by application of coefficients to emission factors;

b) GAINS-based PM emission, abatement costs and health impacts: 2010 scenarios.

3. CIAM scenario of key measures analysis

Methods of scenarios analysis:

a) understanding of scenarios input data and parametrisation including:

- economic pathways;
- control strategies and approaches to their generation from legislation limits which are often very uncertain;
- technologies parameterization;

b) comparison with national scenarios (work is on-going);

c) expert estimates of key measures impact using various data.

Impact of key measures if they were added and implemented by 2020-2025 ..

General comments on key measures:

- as a rule same technology emission is abated by abatement equipment of similar efficiency...
- most of key measures not included directly into strategies and plans at national level. These measures are more applicable for sector and facility programs of modernization and their implementation need to be controlled...

SO₂

SO ₂ :	
Power plants - existing	FGD on 50 % capacities of coal and lignite plants Low sulfur (1% S) residual oil
Power plants - new(1)	FGD on coal lignite and oil plants
Combustion in refineries and manufacturing industry	Low sulfur (1% S) residual oil Low sulfur (0.1% S) light fuel oil
Process sources in industry	50% reduction
Combustion in residential and commercial sector	Low sulfur (1% S) residual oil Low sulfur (0.1% S) light fuel oil
Road transport	Low sulfur (0.05% S) diesel oil
Non-road mobile sources	Low sulfur (0.1% S) diesel oil

- SO₂ emission in Belarus are mainly due to fuel oil combustion (second source – oil refining), and emission fluctuations from year to year because of variations of volumes of its utilization. Production of low-sulfur oil demands significant costs which are not assessed in CIAM scenario;
- expected 50% FGD at coal-fueled power plants in Belarus are real, such power plants are planned only; what is for Russia and the Ukraine? low-sulfur fuel oil – in Belarus technically is possible (modernization in petrochemical industry is necessary);
- low-sulfur fuel for mobile sources: implemented for diesel oil.

NO_x

NO_x:

Power plants - existing

Primary measures (combustion modification) on all plant types

Power plants - new

Primary measures (combustion modification) on all plant types(2)

Combustion in refineries and manufacturing industry

Primary measures (combustion modification) on new plant (about 1/3 of total by 2020)

Process sources in industry

40% reduction

Combustion in residential and commercial sector

No measures

Road transport (3)

Stage 2 controls on motorcycles and mopeds

Euro 4 standards for cars and light-duty trucks

Euro IV standards for heavy-duty trucks and buses

- NO_x emission scenario looks too optimistic, especially for stationary sources.. Significant reduction can be expected in transport sector; emission standards for new sources can also impact emission; for existing sources situation is problematic.
- Primary measures at power plants: possible in principal.
- 40% reduction of emission in industry: how to get?
- Stage 2 controls on motorcycles and mopeds: will not give significant impact on emission – these vehicles are lesser in Belarus

PM

PM:

Stationary combustion sources in power plants and industry

Process sources in industry

Road transport (3)

Upgrade to the current standards in the new EU Member States

Upgrade to the current standards and practices in the new EU Member States

Stage 2 controls on motorcycles and mopeds

Euro 4 standards for cars and light-duty trucks

Euro IV standards for heavy-duty trucks and buses

- Fuel combustion: upgrade to the current standards in the new EU Member States : realistic for new sources, for existing...??;
- Industry: upgrade to the current standards in the new EU Member States: comments is necessary; probably applicable;
- Stage 2 controls on motorcycles and mopeds, Euro-4 (IV) standard for vehicles – see comment for NOx;
- PM2.5 key measures emission scenario can hardly be realised taking into account numerous sources of PM emission and significant deviation of real abatement efficiency from expected (declared) levels. Potential of PM2.5 emission reduction exists (cement, foundries, lime, fertilizers etc. but not clearly show due to also bias of GAINS parametrisation (abatement efficiencies etc.).

.... Do countries for key measures see significant disagreement with the cost-estimates by CIAM?

Preliminary comments on costs in CIAM 2011:

- costs estimates are generally more uncertain in comparison with emission;
- costs are highly variable depending on technology applied, interest rate etc.;
- some sector costs in CIAM scenarios looks overestimated;
- total costs estimates are not the main issue: impact of abatement costs on net cost, ways of measures implementation, maintenance of achieved level of abatement etc to be accounted.

4. CIAM scenarios of different ambitious levels

Pollutant	baseline	low	low*	medium	high*	high	MTFR
SO2	89.4	81.8	86.2	73.7	47.9	49.7	33.8
NOx	150.1	129.3	129.0	123.2	121.3	99.9	95.6
PM2.5	51.9	31.7	34.0	31.0	29.1	28.6	16.1
NH3	150.4	139.4	113.5	113.1	107.0	113.4	100.0
VOC	178.4	160.1	162.3	159.8	159.1	140.9	108.5

emission

costs

Pollutant	baseline	low	low*	medium	high*	high	MTFR
SO2	77.6	79.6	78.3	83.3	100.7	98.6	150.4
NOx	124.3	131.9	132.1	137.6	140.9	242.3	310.9
PM2.5	140.0	141.3	141.2	141.5	143.3	147.7	814.6
NH3	0.0	2.4	16.3	16.7	32.4	16.7	283.6
VOC	-18.0	-17.6	-17.9	-17.5	-17.1	4.1	208.1
TOTAL	323.9	337.6	350.0	361.7	400.1	509.5	1767.6
beyond baseline	0.0	13.7	26.0	37.8	76.2	185.5	1443.7

Only very brief analysis of CIAM scenarios of different ambitious levels was made

SO₂

- Greatest source of emission in all scenarios - residential commercial etc. its input is overestimated;
- Costs: main costs – trucks, rail transport, transport in agriculture and forestry...?

Summary: *improvements in scenarios are necessary*

NO_x

- Greatest emission reduction expected – in power plants sector (costs included into PM emission reduction - but technologies are different...);
- No emission reduction expected for mobile sources but emission reduction costs estimated.

Main costs: LDV, trucks, PP-existing, PP_new, nitric acid, crude oil.

Summary: *scenarios need to be commented; too great expectations of emission reduction from stationary sources..*

PM2.5

- Greatest contributors into emission by CIAM: fertilizer production (with sharp reduction in most scenarios), agricultural waste burning (in baseline scenario - with reduction to zero in other scenarios), heating stoves (no reduction in all scenarios);
- Cement production: reduction only in high scenario;
- Cast iron: zero emissions and reduction;
- No emission reduction for mobile sources except MTR.

Main costs: heating stoves (half of total costs), small industrial and business facilities; significant costs: fertilizer production, combustion in boilers, power plant, agricultural products, storage of fertilizers.

Summary: *scenarios need improvement.*

5. Conclusions

Key measures scenarios

- CIAM scenario of key measures is useful background for further analysis;
- reliability is different for different pollutants and sectors: more reliable for pollutants which can be deleted from fuel before combustion (sulfur), for rather simple technical devices regulated directly by standards and with rather short period of exploitation (vehicles);
- suggested measures for complex multi-stage processes in industry can hardly be realised without account of real situation;
- CIAM scenario of key measures need/can be improved; key measures can be adopted with account of applicability in real conditions..

CIAM ambitious scenarios

- emission estimates are overall of higher accuracy than costs;
- NO_x sector emission/costs seem of higher accuracy than SO_x and esp. PM_{2.5}.

Overview of scenarios:

- some not understandable sector emissions (fertilizer production, waste burning, small industry...) and reduction costs (heating stoves, small industry, fertilizer production);
- no reduction potential for some important emission sources shown (foundries, cement..);
- how these issues affect emission and costs totals? – need to be tested.

Proposals/further steps

- further scenarios improvement for their usage in Gothenburg Protocol discussion;
- national scenarios incl. cross-check within certain region (for instance EECCA) analysis to made;
- other ambitious levels scenarios analysis; other scenarios (for instance with other key measures..);
- methodology of abatement analysis widening: in line with GAINS as a top-down approach for emission ceilings and abatement measures selection bottom-up approach (model facilities, key sectors..) to be used...

Thank you for your attention!