

## Annex A

## MODELING RESULTS ON TRANSPORT OF PCB-28, 118 AND 180

This annex contains the calculated data on contamination levels of PCB-28, 118 and 180 in 1996. At first the contamination of the whole hemisphere is considered, then pollution levels of the Russian North are presented. The last section is devoted to source-receptor relationships for the selected regions of the Russian North.

## PCB-28

*Contamination of the North Hemisphere*

This section presents the model results on contamination levels of PCB-28 in the Northern Hemisphere in 1996. The spatial distributions of annual emission and deposition fluxes as well as mean annual concentrations in the air surface layer and soil concentrations averaged over the whole depth of soil calculation domain are given in Figure A.1. Depositions mean the sum of wet and dry particle deposition and wet gas depositions.

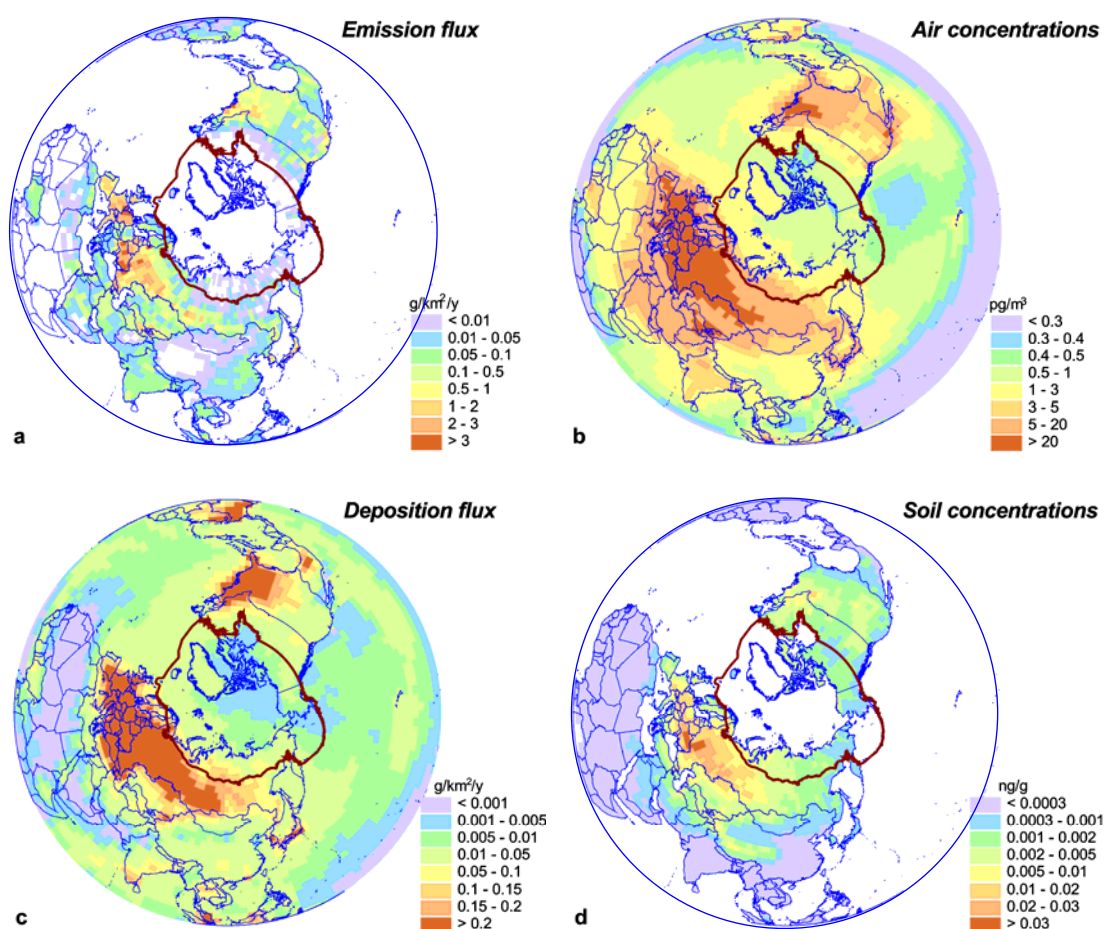
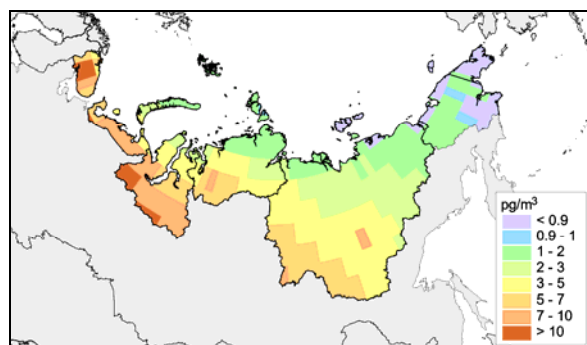


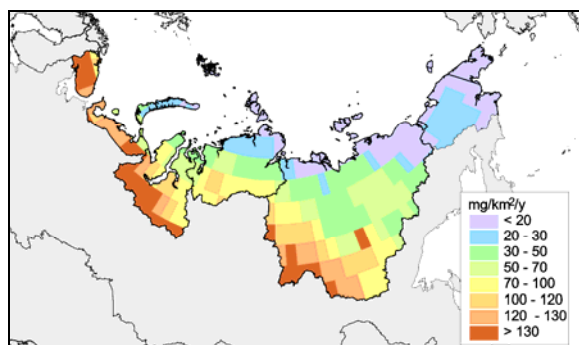
Figure A.1. PCB-28 emissions and contamination levels in 1996

## Concentrations and depositions in the Russian North

In this section, spatial distributions of annual mean air concentrations and annual depositions of PCB-28 in the Russian North in 1996 are presented (Figs. A.2, A.3). Table A.1 contains the information on annual contamination levels in the regions of the Russian North and their spatial variations.



**Figure A.2.** Mean annual air concentrations of PCB-28 in the Russian North,  $\text{pg/m}^3$



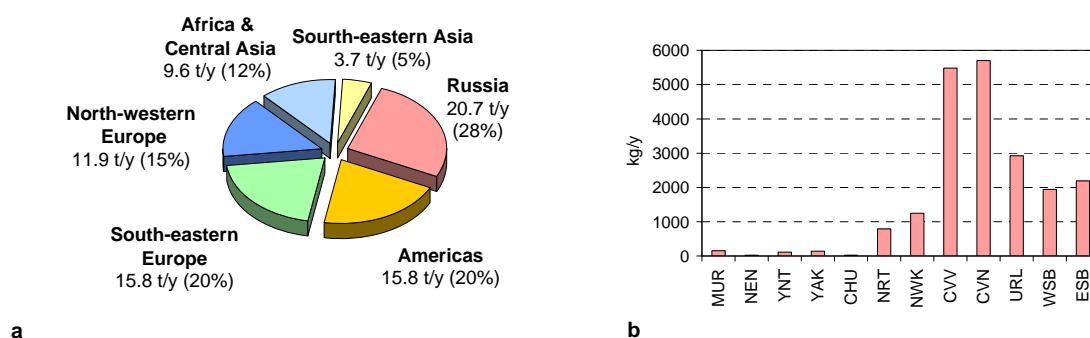
**Figure A.3.** Deposition of PCB-28 in the Russian North calculated for 1996,  $\text{mg/km}^2/\text{y}$

**Table A.1.** Annual contamination levels of the Russian North regions by PCB-28 in 1996 and their spatial variations

Region	Air concentration, $\text{pg/m}^3$			Depositions, $\text{mg/km}^2/\text{y}$			Gas exchange, $\text{mg/km}^2/\text{y}$		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Murmansk Oblast	3.4	18.6	8.2	61	320.1	164.7	113	1496.8	528.1
Nenets AO	1.2	15.2	5.7	11.7	284.4	86.1	9.2	1021.9	395.5
Yamalo-Nenets AO and Taimyr AO	1	13.1	5.2	8.6	220.8	82.1	-38.8	787.9	119.2
Sakha Republic	0.7	7.2	3.4	6	157.3	66.4	-77.3	125	-11.5
Chukotka AO	0.5	1.3	0.9	5.3	27.6	18.4	-21.1	90.8	13.1

## Contributions of different emission sources to the pollution of the Russian Arctic

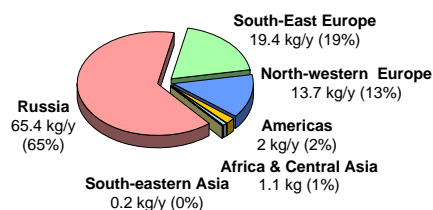
In this section contributions of different emission sources to the PCB-28 emissions in the Northern Hemisphere and Russia in 1996 are presented in Figure A.4. Figure A.5 depicts contributions of these sources to depositions to the regions of the Russian North and to the Arctic region as a whole.



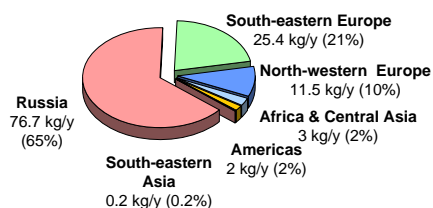
**Figure A.4.** Contributions of different emission source groups of PCB-28 to the hemispheric emissions in 1996: source regions in the Northern Hemisphere (a), detailed splitting of Russian sources (b)

### Contributions of the Northern Hemisphere sources to depositions

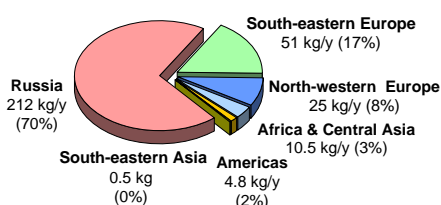
#### Murmansk Oblast



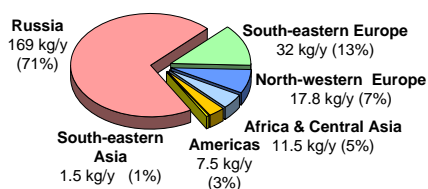
#### Nenets AO



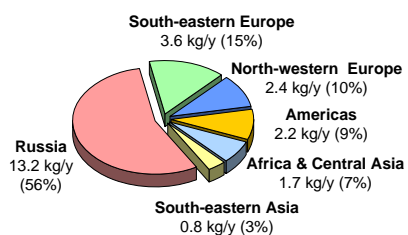
#### Yamalo-Nenets AO and Taimyr AO



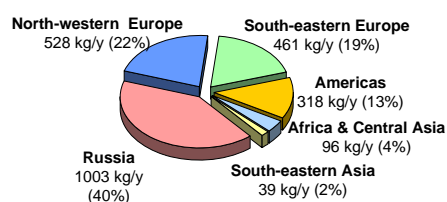
#### Sakha Republic (Yakutia)



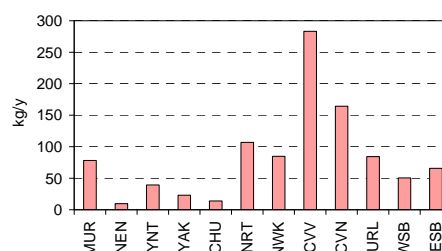
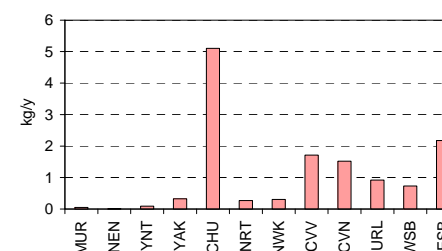
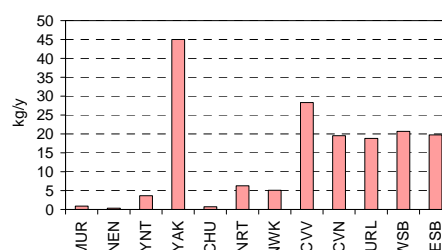
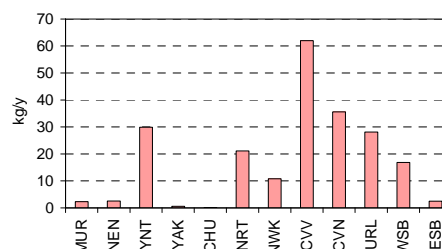
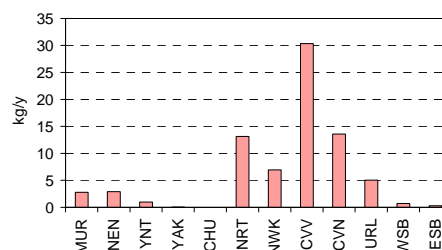
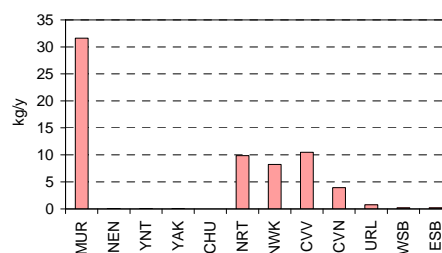
#### Chukotka AO



#### the Arctic



### Contributions of Russian sources to depositions

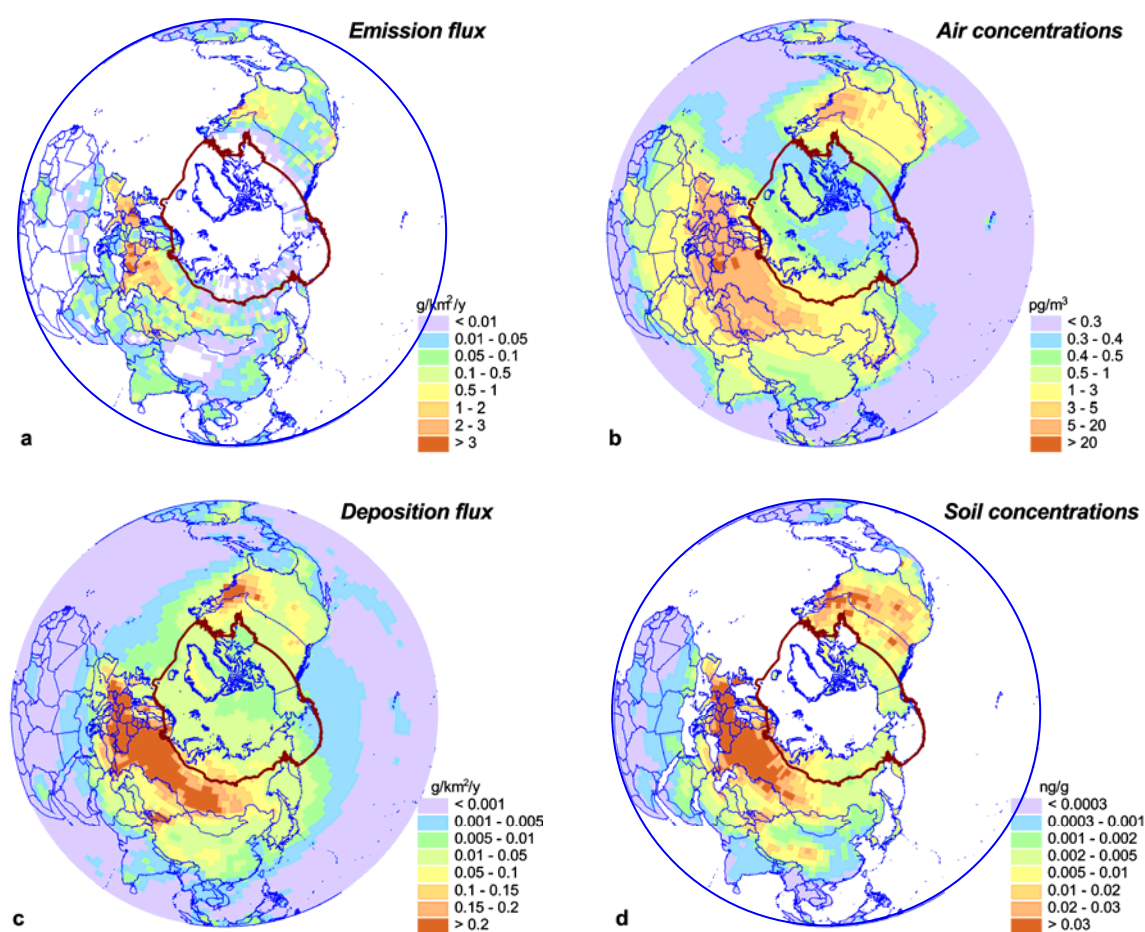


**Figure A.5.** Contributions of different emission sources to PCB-28 depositions to regions of Russian North and to the Arctic as a whole in 1996

## PCB-118

### *Contamination of the North Hemisphere*

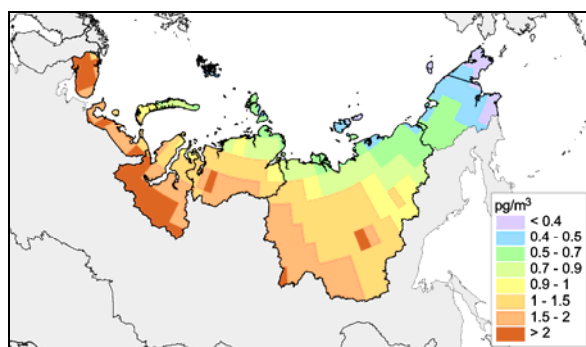
This section presents the model results on contamination levels of PCB-118 in the Northern Hemisphere in 1996. The spatial distributions of annual emission and deposition fluxes as well as mean annual concentrations in the air surface layer and soil concentrations averaged over the whole depth of soil calculation domain are given in Figure A.6. Depositions mean the sum of wet and dry particle deposition and wet gas depositions.



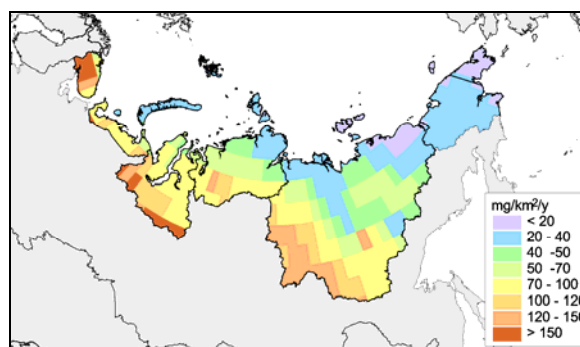
**Figure A.6.** PCB-118 emissions and contamination levels in 1996

### *Concentrations and depositions in the Russian North*

In this section, spatial distributions of annual mean air concentrations and annual depositions of PCB-118 in the Russian North in 1996 are presented (Figs. A.7, A.8). Table A.2 contains the information on annual contamination levels in the regions of the Russian North and their spatial variations.



**Figure A.7.** Mean annual air concentrations of PCB-118 in the Russian North in 1996,  $\text{pg}/\text{m}^3$



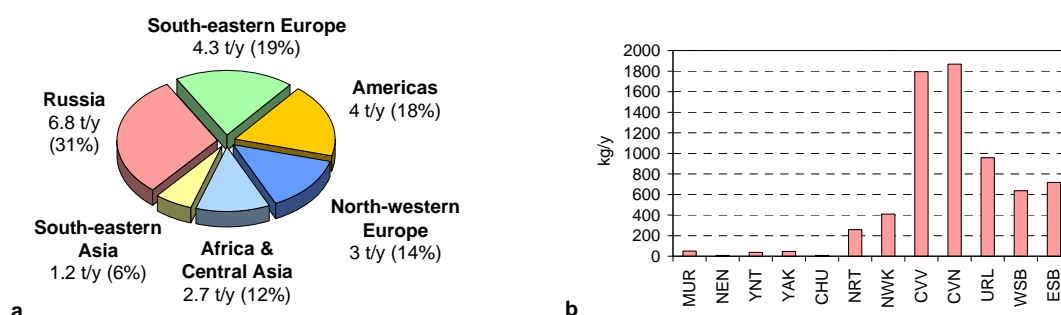
**Figure A.8.** Deposition of PCB-118 in the Russian North in 1996,  $\text{mg}/\text{km}^2/\text{y}$

**Table A.2.** Annual contamination of the Russian North regions by PCB-118 in 1996 and their spatial variations

Region	Air concentration, $\text{pg}/\text{m}^3$			Depositions, $\text{mg}/\text{km}^2/\text{y}$			Gas exchange, $\text{mg}/\text{km}^2/\text{y}$		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Murmansk Oblast	1.1	5.7	2.6	48.2	376.6	169.2	-59.4	274.8	67.4
Nenets AO	0.4	4	1.5	19.6	335.4	72.2	-113	244.4	100.3
Yamalo-Nenets AO and Taimyr AO	0.4	3.5	1.6	19.1	189.1	81.8	-85	152.9	10.2
Sakha Republic	0.3	2.5	1.2	11.8	176.9	66.7	-136.9	17.9	-36.1
Chukotka AO	0.3	0.6	0.5	9	39.5	28.3	-23	24	-8.3

### *Contributions of different emission sources to the pollution of the Russian Arctic*

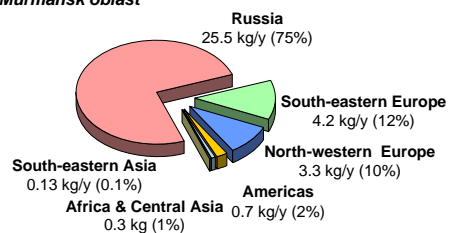
In this section, contributions of different emission sources to the PCB-118 emissions in the North Hemisphere in 1996 is presented in Figure A.4. Figure A.5 depicts contributions of these emission sources to depositions to the regions of the Russian North and to the Arctic as a whole.



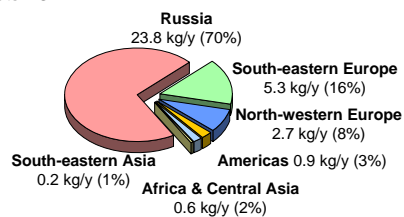
**Figure A.9.** Contributions of different emission source groups of PCB-118 to the hemispheric emissions in 1996: source-regions in the Northern Hemisphere (a), detailed splitting of Russian sources (b)

### Contributions of the Northern Hemisphere sources to depositions

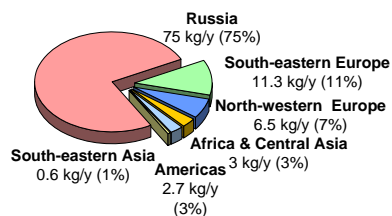
#### Murmansk oblast



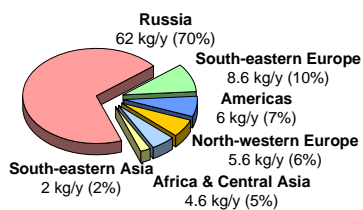
#### Nenets AO



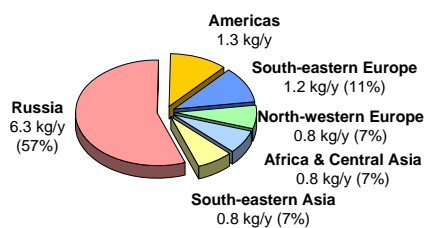
#### Yamalo-Nenets AO and Taimyr AO



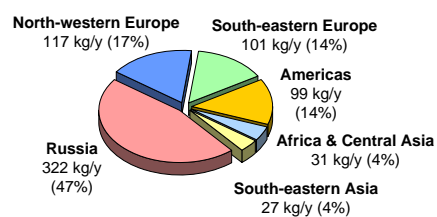
#### Sakha Republic (Yakutia)



#### Chukotka AO



#### the Arctic



### Contributions of Russian sources to depositions

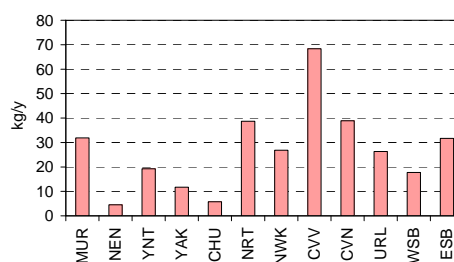
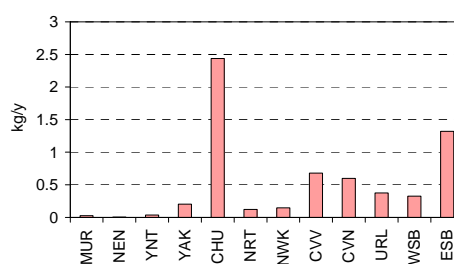
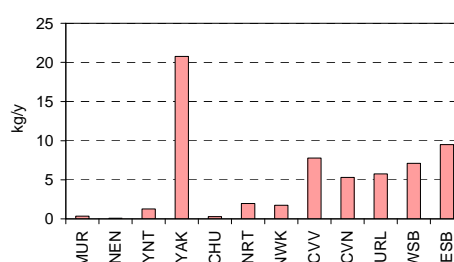
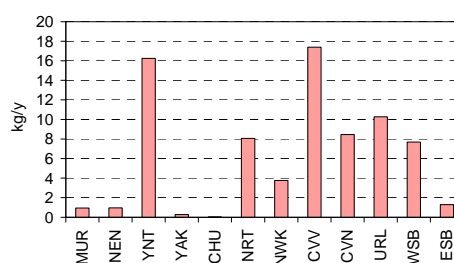
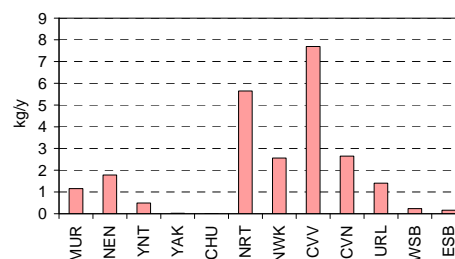
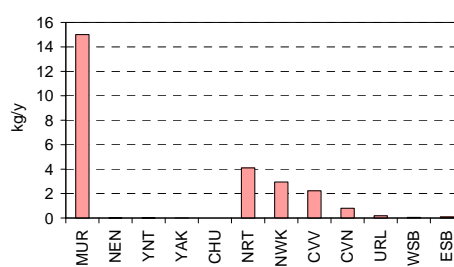


Figure A.10. Contributions of different emission sources to PCB-118 depositions to regions of Russian North and to the Arctic as a whole in 1996



## PCB-180

### *Contamination of the North Hemisphere*

This section presents the model results on contamination levels of PCB-180 in the Northern Hemisphere in 1996. The spatial distributions of annual emission and deposition fluxes as well as mean annual concentrations in the air surface layer and soil concentrations averaged over the whole depth of soil calculation domain are given in Figure A.11. Depositions mean the sum of wet and dry particle deposition and wet gas depositions.

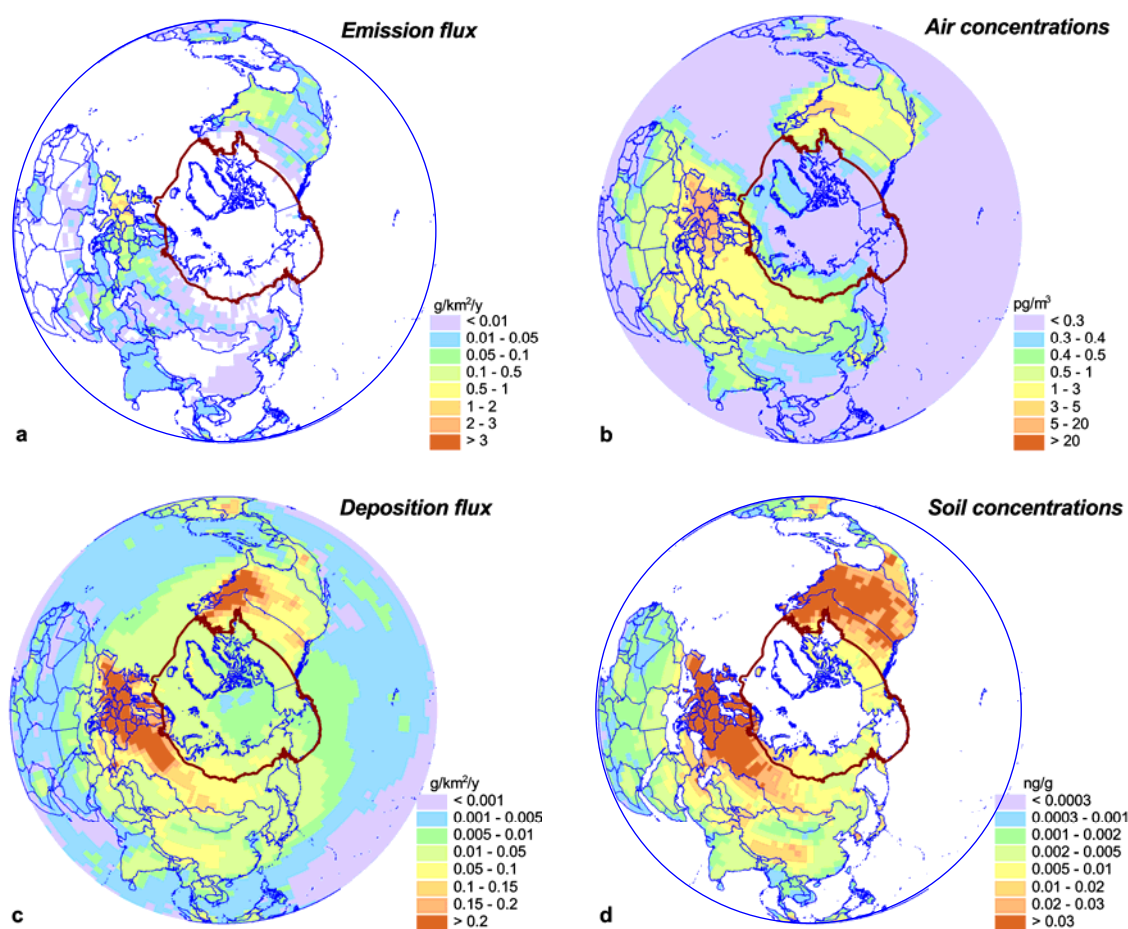


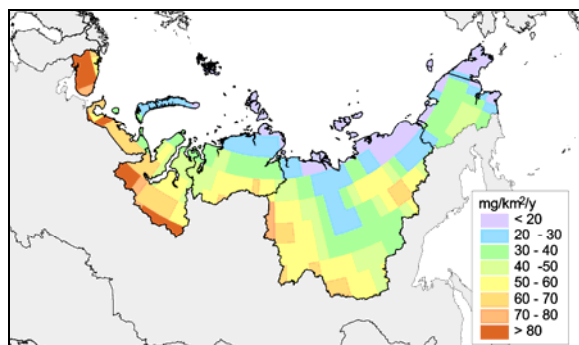
Figure A.11. PCB-180 emissions and contamination levels in 1996

### *Concentrations and depositions in the Russian North*

In this section, spatial distributions of annual mean air concentrations and annual depositions of PCB-180 in the Russian North in 1996 are presented (Figs A.12, A.13). Table A.3 contains the information on annual contamination levels in the regions of the Russian North and their spatial variations.



**Figure A.12.** Mean annual air concentrations of PCB-180 in the Russian North in 1996,  $\text{pg}/\text{m}^3$



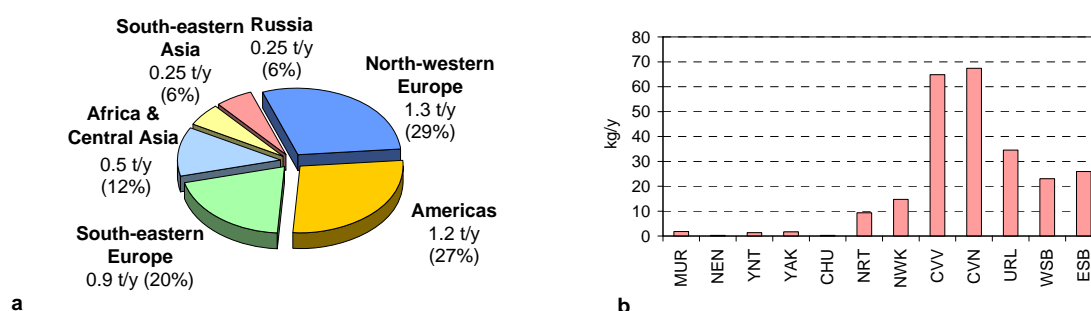
**Figure A.13.** Deposition of PCB-180 in the Russian North in 1996,  $\text{mg}/\text{km}^2/\text{y}$

**Table A.3.** Annual contamination of the Russian North regions by PCB-180 in 1996 and their spatial variations

Region	Air concentration, $\text{pg}/\text{m}^3$			Depositions, $\text{mg}/\text{km}^2/\text{y}$			Gas exchange, $\text{mg}/\text{km}^2/\text{y}$		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Murmansk oblast	0.5	1.2	0.9	47	188	123	-160	9.4	-70
Nenets AO	0.2	1.1	0.6	12	204	53	-168	8	-20
Yamalo-Nenets AO and Taimyr AO	0.2	0.9	0.6	12	114	52	-90	0.8	-29
Sakha Republic	0.1	0.7	0.5	6.9	96	43	-92	1.2	-38
Chukotka AO	0.1	0.4	0.3	9	48	32	-40	2.6	-23

### *Contributions of different emission sources to the pollution of the Russian Arctic*

In this section, contributions of different emission sources to the PCB-180 emissions in the North Hemisphere in 1996 is presented in Figure A.14. Figure A.15 depicts contributions of these emission sources to depositions to the regions of the Russian North and to the Arctic as a whole.

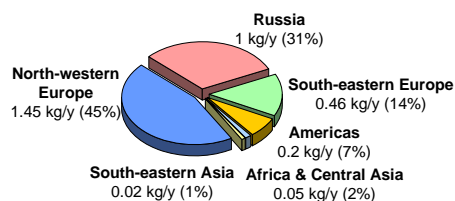


**Figure A.14.** Contributions of different emission source groups of PCB-180 to the hemispheric emissions in 1996: source-regions in the Northern Hemisphere (a), detailed splitting of Russian sources (b)

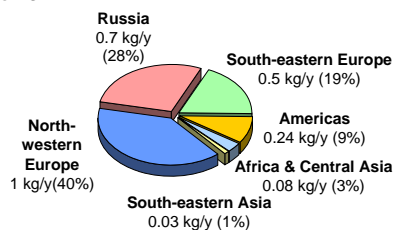


### Contributions of the Northern Hemisphere sources to depositions

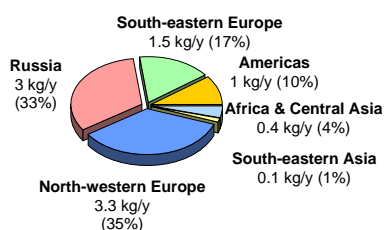
#### Murmansk oblast



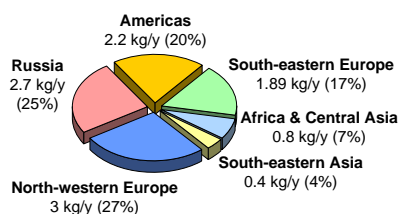
#### Nenets AO



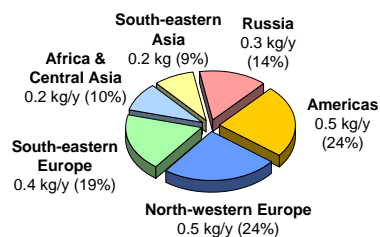
#### Yamalo-Nenets AO and Taimyr AO



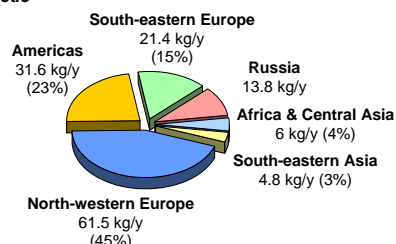
#### Republic of Sakha (Yakutia)



#### Chukotka AO



#### the Arctic



### Contributions of Russian sources to depositions

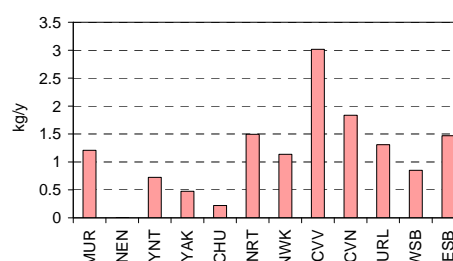
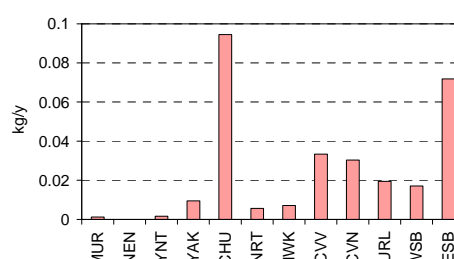
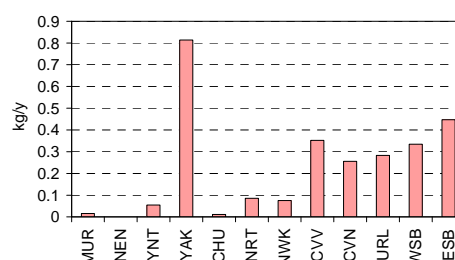
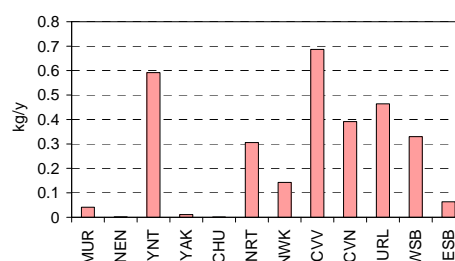
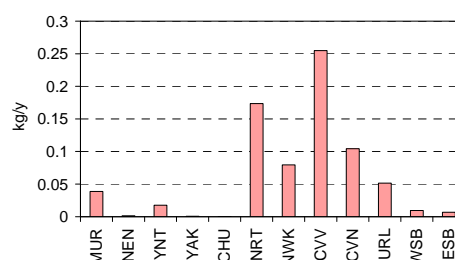
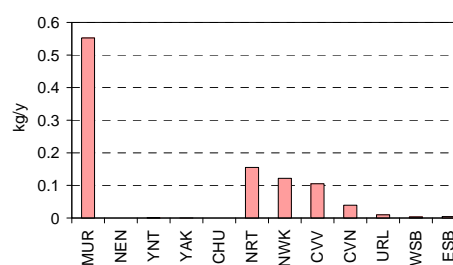


Figure A.15. Contributions of different emission sources to PCB-180 depositions to regions of Russian North and to the Arctic as a whole in 1996

