Baltic Marine Environment Protection Commission

Seventh Baltic Sea Pollution Load Compilation
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Background

This document contains notes with supporting information for the step-by-step exercise for national CART follow-up to been demonstrated during the project meeting.

Action required

The Meeting is invited to make use of this information during the exercise.

Example 1: Evaluation of progress, Gulf of Riga – Phosphorus

This is a good example because it includes all complications of transboundary waterborne inputs. The situation according to the reference data set is shown in Figure 1 and Table 1.

Figure 1: Phosphorus inputs to Gulf of Riga. In the left panel it is indicated that 93 t/yr is received from the atmosphere and 2235 t/yr from waterborne inputs. Of the waterborne input at the river mouth, 277 t/yr enters from Estonia and 1959 t/yr from the Latvia. However, the Latvian contribution is not only caused by Latvian sources but also comprise of transboundary inputs from Russia, Belarus and Lithuania. The rightmost pie chart illustrates the estimate on how large these contributions to the inputs to the sea are.

	NW	*NA*	*NB*	*R*	*Sum NT*	*NL*	*CART*	*NC*
EE	277					277	38	239
LV	1959				-1332	627	86	541
LT			282	0.32	192	192	26	166
RU			734	0.71	215	215	30	185
BY			1360	0.32	925	925	128	797
Other		93				93		93

Table 1: Summary of various terms in the phosphorus inputs to the Gulf of Riga in the reference period 1997-2003 according to the original PLC5.5 data set.

Status 2010-2012

Estimations of transboundary contributions is done using the Case 1 formula:

$$NT_{!,!,n} = NT^{ref}_{!,!,n} \frac{NW_{!,n}}{NW^{ref}_{!,n}}$$

Using that the waterborne inputs through LV was $NW_{LV,GR}$ = 2065 in the 2010-2012 period and 1980 in the reference period using the updated data set, the transboundary contributions become

$$NT_{RU,LV,GR} = NT^{ref}_{RU,LV,GR}\frac{NW_{LV,GR}}{NW^{ref}_{LV,GR}} = 215\frac{2065}{1980} = 224 \text{ t/yr}$$

$$NT_{LT,LV,GR} = NT^{ref}_{LT,LV,GR}\frac{NW_{LV,GR}}{NW^{ref}_{LV,GR}} = 192\frac{2065}{1980} = 200 \text{ t/yr}$$

$$NT_{BY,LV,GR} = NT^{ref}_{BY,LV,GR}\frac{NW_{LV,GR}}{NW^{ref}_{LV,GR}} = 925\frac{2065}{1980} = 965 \text{ t/yr}$$

	NW	*NA*	*Sum NT*	*NL*	*NC*
EE	183			183	239
LV	2065		-1389	676	541
LT			200	200	166
RU			224	224	185
BY			965	965	797
Other		93		93	93

Table 2: Calculation of the national inputs to Gulf of Riga in the 2010-2012 period.

Example 2: New data on border loads, Gulf of Riga – phosphorus

Taking the example from above but *assuming* that new data shows that border loads from Lithuania to Latvia decreased to $NB_{LT,LV,GR}$ = 200 t/yr in the 2010-2012 period. Case 2 above would then apply to calculate the transboundary contribution from LT, i.e.,

$$NT_{LT,LV,GR} = \left(1 - R^{ref}_{LV,n}\right)NB_{LT,LV,GR} = (1 - 0.32)200 = 136 \text{ t/yr}$$

We know that the total land inputs via Latvia to Gulf of Riga was 2065 t/yr, however, with a smaller contribution from LT than using the *Case 1* calculation, the remaining 2065 – 136 = 1929 t/yr need to distributed to the other countries. In this particular example it would be natural that the difference between the transboundary input from LT calculated using the formula in Case 1, and the one calculated using new observations (Case 2) (200 – 136 =64 t/yr) is added on the national inputs of the downstream country Latvia. This would result in the evaluation for Gulf of Riga shown in Table 3.

However, if new border inputs were used for Russian inputs to Belarus, it would be natural to distribute a difference between Belarus and Latvia using proportionality.

	NW	*NA*	*Sum NT*	*NL*	*NC*
EE	183			183	239
LV	2065		-1325	740	541
LT			136	136	166
RU			224	224	185
BY			965	965	797
Other		93		93	93

Table 3: Calculation of the national inputs to Gulf of Riga in the 2010-2012 period with the assumption of new data on border loads from Lithuania to Latvia.

Example 3: National inputs Lithuania to Baltic Proper - phosphorus

We take here an example with a country that both receive and emit transboundary inputs, Lithuania to Baltic proper. In the calculation of CART, the following were used

$$NT^{ref}_{LT,LV,BP} = 66 \text{ t/yr}$$

$$NT^{ref}_{BY,LT,BP} = 430 \text{ t/yr}$$

Further, waterborne inputs from LT and LV in the updated data set for 1997-2003 and 2010-2012, respectively, were

$$NW^{ref}_{LT,BP} = 2667 \text{ t/yr}$$

$$NW^{ref}_{LV,BP} = 275 \text{ t/yr}$$

$$NW_{LT,BP} = 1787 \text{ t/yr}$$

$$NW_{LV,BP} = 390 \text{ t/yr}$$

Using these the transboundary contributions for 2010-2012 are estimated according to

$$NT_{LT,LV,BP} = NT^{ref}_{LT,LV,BP} \frac{NW_{LV,BP}}{NW^{ref}_{LV,BP}} = 66 \frac{390}{275} = 94 \text{ t/yr}$$

$$NT_{BY,LT,BP} = NT^{ref}_{BY,LT,BP} \frac{NW_{LT,BP}}{NW^{ref}_{LT,BP}} = 430 \frac{1787}{2667} = 288 \text{ t/yr}$$

Thus the national inputs from Lithuania to Baltic Proper (2010-2012) become

$$NL_{LT,BP} = NW_{LT,BP} + NT_{LT,LV,BP} - NT_{BY,LT,BP} = 1787 + 94 - 288 = 1593 \text{ t/yr}$$