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Gauja Koiva

Assessment of the baseline scenario at the harmonising of the national approaches between Estonia and Latvia

ESTONIAN STUDY REPORT

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1. General

Objectives of the task can be formulated as follows:

1. To describe the methodology used for preparation baseline scenario in river basin management plans for Gauja/Koiva river basin;
2. To elaborate a common proposal for methodology and criteria for preparation of baseline scenarios for both countries;
3. To elaborate an overview on baseline scenarios in the Koiva river basin district.

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2. Key issues for preparation of baseline scenarios

According to WATECO preparation of baseline scenario must fullfill following criterias. Feeding into the identification of significant water management issues for 2007, the analysis needs to complement the characterisation of the river basin today by an assessment of its future likely trends and baseline scenarios. This assessment is the basis for analysing the gap between likely water status and good water status (risk of non-compliance) and for undertaking the subsequent cost-effectiveness analysis of measures.

Being a joint activity between different expertise and disciplines, the specific role of the economic analysis in the development of baseline scenarios and the analysis of the dynamics of the river basin is the assessment of forecasts in key (non-water related) policy and economic drivers likely to influence pressures and thus water status.

Focus is likely to be on foreseen trends in:

- General socio-economic indicators and variables (e.g. population growth);
- Key sector policies that influence the significant water uses identified in the river basin investigated (e.g. agricultural policy);
- Production or turnover of main economic sectors/significant water uses in the river basin;
- Land planning and its effects on the spatial allocation of pressures and economic sectors;
- Implementation of existing water sector regulation and directives; or
- Implementation of environmental policies likely to affect water (e.g. NATURA 2000).

The general principles of analysis can be met in different ways, therefore national analysis vary significantly in different countries. The overall approach used in Estonia and in Latvia is largly same.

3. Methodologies used in preparation of baseline scenarios

3.1. The methodology for baseline scenario prepared for Gauja RBMP

3.1.1. Aim of the analysis

To assess future changes in economic and policy drivers and factors determining size (thus changes) of pressures. These assessments were used then for assessing expected changes of pressures. The BS was relevant part of the "risk assessment" (risk of failing GES), since the "risk assessment" must consider expected state of water bodies in 2015 (for the 1st RBMP, timescale of achieving the WFD objectives).

3.1.2. The main elements/steps of the analysis

The analysis was done separately for each sector with considerable contribution into significant pressures in the RBD. It was conducted in the frame of the "risk assessment" procedure, which included the following steps: 1) identification of relevant sectors/activities causing significant pressures on water status; 2) identification, analysis and assessment of likely future development of the drivers and factors influencing pressures from these sectors/activities (the "Baseline scenario"); 3) integration of the future estimates of factors into likely changes of pressure (and assessment of expected changes in the state till 2015).

Changes in the factors determining size of pressures were assessed by analysing future development of their driving forces. These drivers relate to:

- future development of economic sectors (causing the pressures),
- planned policy measures/projects for reducing the pressures and protection of water resources (so called "basic measures").

3.1.3. Specific methodological issues

The BS was developed only in relation to significant pressures in the RB and for sectors giving relevant contribution into these pressures. The expected changes were assessed up to 2015.

The assessment of likely changes in the drivers and factors determining size of pressures was elaborated for each sector. These assessments were developed by analysing existing (official) forecasts, information from policy planning documents and data on past trends.

For assessments of changes of the factors, concerning the nutrients' pollution caused by agriculture and forestry – the assessments were prepared on the district scale and then adjusted to the water body scale. Concerning the centralised sewage sector the factors (e.g. proportion of population served with centralized sewage services, treatment level of WW) were assessed on the agglomeration scale.

Development trends for other economic sectors and pressures (hydro-morphological pressure caused by agriculture, forestry, HPP and harbour activities) were analysed on the national scale. It was done by reviewing the overall development trends of the sectors and their operation and analysing information about specific planned activities where available.

3.1.4.The main data sources

Available (official) forecasts (demographic forecast at administrative district level, national macroeconomic forecasts); sectoral strategies, programs and development plans (e.g. for agriculture, energy production, industry, etc.); statistical data for analysis of past trends (data sources from assessing the socioeconomic significance of water use); policy planning documents in relation to the environmental protection (implementation plans of the EU directives e.g. UWWTD, Nitrates and IPPC directives in Latvia and related Latvian laws and regulations).

3.1.5.The main outcomes

For each sector: future development of the main socioeconomic drivers influencing its development (e.g. number of inhabitants, economic development of agriculture and changes in its production, demand for electricity); review of environmental policies (requirements, measures) aiming to reduce the pressure. Output results include assessment of likely changes in the factors determining size of the pressure (specific for each sector) up to 2015.

The likely future development was assessed for the following sectors (in relation to specific pressure) and the factors influencing size of their pressures:

- Households/centralised sewage services' sector (nutrients' pollution): number of inhabitants served and not served with centralized sewage services, treatment level of wastewaters (WW). The environmental policy drivers relate to the policy requirements for the WW treatment level, investment plans and projects for development of the sewage infrastructure as well as funding for implementing them;
- Agriculture (nutrients' pollution): arable land and perennial plant land area, pasture and meadow area, "winter green" land area, use of fertilizers, animal units, dairy cow units, use of fertilisers, manure management (animal unit % ensured with required manure storage). The environmental policy drivers relate to implementing requirements and measures of the Nitrate directive;
- Agriculture (hydro-morphological pressure): melioration of agricultural land (overall future trend);

- Forestry (nutrients' pollution): forest area, clear-cut area (overall future trend); forestry (hydro-morphological pressure): melioration of forest lands (overall future trend);
- Industry (pollution from wastewater): economic development (overall future trend). The environmental policy drivers relate to implementing requirements of the IPPC directive;
- Hydropower production (hydro-morphological pressure): trend in energy production. The environmental policy drivers relate to restrictions for building small HPP on specified rivers.
- Harbours (hydro-morphological pressure): development of harbours' infrastructure –development plans/projects in each harbour.

3.2. The methodology for baseline scenario prepared for Koiva RBMP

3.2.1. Aim of the analysis

The aim of the analysis was to estimate pressures from three major categories:

- Households (with collective and without collective wastewater systems);
- Industry (stand alone and collective systems);
- Agriculture (stand alone systems).

3.2.2. The main elements/steps of the analysis

Three main sectors- households agriculture and industries were included into analysis as three major sources of pressures for water. The analysis excluded sectors what have likely loads on environment but the data is not presented (forestry for example).

Data used in the analysis was collected on the administrative level (i.e parishes, towns). All pressures were connected to settlement and based on settlements included into specific river bassin. Given analysis allowed more specific and easily followed methodology in order to locate pressures. Pressures were not connected to water bodies as specific data base was not available at the time.

3.2.3. Specific methodological issues

The analysis for household consumption of water services was prepared on settlement level and separately for households with collective systems and households with non-collective systems. The analysis included all settlements with more than 500 inhabitants in Estonia. For each settlement inhabitants with collective and non-collective treatment was estimated and based on that overall trends of water consumption and wastewater discharge was estimated. In settlements with less than 100 inhabitants is assumed that non-collective system is used.   For each settlement separate population estimates were prepared and speficic wastewater loads calculated. Based on those analysis consolidated water use and water loads for river basin were estimated.

3.2.4.Baseline for industrial consumption

Industrial consumption includes both stand alone and collective water consumption. Stand alone water consumption was estimated based on water permits, therefore only relatively large industrial entities were included. The analysis included both water abstraction and wastewater discharge data.

3.2.5.Baseline for agricultural consumption

Baseline analysis for agriculture is based on point sources of water abstraction and discharge, i.e. agricultural entities with water permits are only included. Majority of water abstraction and discharge is made by busineses with water permits.

3.2.6.The main data sources

Available (official) forecasts (demographic forecast at administrative district level, national macroeconomic forecasts); sectoral strategies, programs and development plans (e.g. for agriculture, energy production, industry, etc.); statistical data for analysis of past trends (data sources from assessing the socioeconomic significance of water use); policy planning documents in relation to the environmental protection (implementation plans of the EU directives e.g. UWWTD, Nitrates and IPPC directives.

3.2.7.The main outcomes

For each sector: future development of the main socioeconomic drivers influencing its development (e.g. number of inhabitants, economic development of agriculture and changes in its production, demand for electricity); review of environmental policies (requirements, measures) aiming to reduce the pressure. Output results include assessment of likely changes in the factors determining size of the pressure (specific for each sector) up to 2015.

The likely future development was assessed for the following sectors (in relation to specific pressure) and the factors influencing size of their pressures:

- Households/centralised sewage services' sector (nutrients' pollution): number of inhabitants served and not served with centralized sewage services, treatment level of wastewaters (WW). The environmental policy drivers relate to the policy requirements for the WW treatment level, investment plans and projects for development of the sewage infrastructure as well as funding for implementing them;
- Industry (pollution from wastewater): economic development (overall future trend). The environmental policy drivers relate to implementing requirements of the IPPC directive;
- Amount of wastewater discharge of agricultural entities.

4. Results from the initial RBMPs

4.1. The analysis prepared in Koiva

There are three major categories of water users included into analysis:

- households
- agriculture;
- industries.

Trends of water usage have been estimated based on those three approaches. The analysis has its limitations as data regarding water uses in different areas is limited.

4.1.1.Trends of water usage of households

Water usage of households connected to collective systems has been reduced over the last decade considerably. The average usage of water per inhabitant does not exceed 100 liter per day (2003.data) The overall consumption of water of Estonian household is well below European average (150 litres per day per inhabitant) (Wieland, Eurostat, 2003). Consumption is less than half of that of Nordic countries, for example in Finland consumption is 200 litres per day per inhabitant (et.al). In European countries water usage has been increased by annual rate of 5 per cent and in developing Europe it has decreased by some 1.5 per cent per annum (et.al).

The consumption in Estonia has stabilised in around 100 litres per day per inhabitant during last 5 years.

It is estimated that consuption of water will increase to some 110 litres per day per inhabitant in the future due to increased income in areas of collective systems and will remain the same in areas of non-collective systems.

Estimated consumption of water usage in Estonia by households

	2003	2015
Number of people living in Estonia	1 356 045	1 356 045
Population connected to public system	83%	90%
Average water consumption in collective system– l/d/in	100	110
Population not connected to public system	17%	10%
Average water consumption in non-collective system – l/d/in	100	110
Water consumption in collective system- mln m^3/a	40,5	48,8
Water consumption in non-collective system- mln m^3/a	9,2	5,4
Total water consumption- mln m^3/a	49,7	54,2

Source: Statistical Board of Estonia, Ministry of Environment of Estonia

Estimates for household water usage is based on following assumptions:

- Population will continue to move to areas with collective systems (towns);
- Water consumption in larger towns is higher compared to small settlements;
- Revenues of population continues to increase and it will cause the reduction of part of water related expenditures in household income..

Based on assumption that average water consumption will increase by some 1 % per inhabitant and increase in number of population connected to collective system from current level of 83% to 90% in 2015 total consumption would increase from 59.7 million cubic meters to 54,2 cubic meters.

4.1.2.Water usage of industry

Industrial water usage was 1 275 million cubic meters in 2003 (Ministry of Environment, 2004). Cooling water used by power plants consists of 1 220 million cubic meters or 88 per cent of total water usage. Therefore any change in water consumtion of power plants will have major impact on overall water usage of industry. There is no reliable data regarding water usage changes of industrial sector, therefore preparation of reliable estimates is complicated.

Based on national development plan for structural funds for 2007-2013 (Ministry of Finance, 2004) it is expected that average increase in electricity production will be 3 per cent annually. Based on assumption that production structure remains largely same it is assumed that water usage in power generation remains the same.

Estimation of water consumption of industry in Estonia

	2004	2015
Water consumption of industrial sector- mln m^3/y	1 275	1 713
Annual change	3%	

Source: Ministy of Environment 2004

Based on those estimates annual industrial water consumption will increase by 30% to 1 713 million cubic meters by 2015.

4.1.3.Water usage in agricultural sector

There is no reliable growth estimates for water consumption in agricultural sector in Estonia. According to state development plan for rural development for 2004-2006 (Ministry of Agriculture, 2004) it is stated that average increase of population working in agriculture should increase from 5 to 7 per cent in 2015. This assumption gives broad estimate that agricultural production must increase by 40% between 2005 and 2015, on average the annual growth rate should be 3 per cent. If assumed that no major structural nor technological changes takes place in sector water consumption should increase in similar rate.

Estimation of water consumption of agricultural sector in Estonia

	2004	2015
Water consumption of agricultural sector in Estonia, mln m^3/y	4 ,1	5,5
Annual change	3%	

Source : Ministry of Environment of Estonia, 2004

Based on given assumptions it is assumed that agricultural annual water consumption will increase to 5,5 million cubic meters. Given data is based only in large water users, who must obtain water permits for production, i.e. some part of small farming is not included.

4.1.4.Water usage in Koiva River Bassin

Population in Koiva river bassin has some 7700 inhabitants and it has area of 1330 sq.km. The population in the area is decreasing and there is no industrial activities which would affect the water consumption. According to Ministry of Environment the number of cattle in the area is 8982 in 2004 and it is decreasing. The agricultural land is 26,7 thousand hectars.

5. Methodology for baseline scenario for updated river management plan in Koiva

The purpose of evaluating the development trends of the field of the water management is to find out how the load on water environment would change in the near future – if the load increases, decreases or remains the same, whether measures to reduce the load help to achieve the environmental goals set on bodies of water and what are the alternative development scenarios that would meet environmental goals, or put achieving the environmental goals in risk instead.

For evaluating the development trends of the field of the water management an analysis was compiled where the following aspects influencing development trends were studied and the following was established:

1. The most important aspects, and indicators describing them, that influence the strain on water environment;
2. The prognosis of development trends of the field of the water management based on loads and the probability of the occurrence of its alternatives;
3. The main investments and the cost of the most common measures planned to be used for reducing the load.

The identification of important aspects (and indicators describing them) and assessment of the trend of loads tendency.

For assessing the developing trends of the water environment the political, economic, social and technical factors' influence on loads was analyzed. In the analysis numerical measurable indicators were used to describe the factors and aspects (based mainly on data from Statistics Estonia). Based on value of indicators it is possible to describe a current trend, also thanks to values of different indicators we get a ground for predicting the near future. For example, for evaluating the influence the political factors the change in environmental taxes was used, for economic factors it was change in output, for social indicators the describing factor was population change, and an indicator showing technical influence was government spending on research and development in environmental protection. The following table shows the aspects influencing load used in the analysis and the list of indicators numerically describing them within four factors surveyed.

Table 3. Factors, aspects and indicators

Factors examined in the analysis	**Aspects examined in the study**	**Measurable indicators describing aspects used in the study**
Political factors	Tax legislation: environmental legislation,	Tax changes (e.g. pollution charges, charges

Factors examined in the analysis	Aspects examined in the study	Measurable indicators describing aspects used in the study
	labor legislation, state benefits, other possibilities (e.g. elections).	for special use of water, fines, etc.), the amount of benefits.
Economic factors	Gross domestic product, the overall level of income and income inequality, unemployment, the saving and loan burden of population, regional differences in economic development, other aspects (e.g. inflation), shipping, agricultural development.	Output, the average gross wage, unemployment rate, percentage of people having savings and loans compared to total population, connectivity to public water supply and sewerage, the consumer price index, the budget deficit volume, shipping in Estonian ports, the number of animals, the volume of fertilizers, agricultural output
Social factors	Change in the number of residents, birthrate and population's age composition, lifestyle changes, other aspects.	Number of residents, the percentage of residents aged over 64 and under 16 compared to total population, connectivity to public water supply and sewerage, self-employed people engaged in agriculture
Technical factors	Implementation of new technologies, changes in productivity, the process and level of costs of research and development, other (development of patent protection and the number of patents, levels and trends of standardization, new products and materials)	Revenue of innovative businesses in industry sector, the change in output, government spending on research and development in environmental protection, number of environmental patents and utility models registered, output in forestry and agriculture, cooling capacity

In determining the value of indicators the data publicly available from Statistics Estonia database was used. In the following analysis the most important indicators' values in the near future and the prognosis up to 2021 is shown by main loads (in Appendix 1.7. all important indicators' values in 2011 and the prognosis up to 2021 is shown).

For determining the development trends of loads a PEST-analysis (Political, Economic, Social and Technological analysi) was conducted. Changes in indicator trends were assessed, and the most likely trend of load on water environment was identified. In order to find the most likely trend of load on water environment the trends of indicators were assessed based on three development trends:

- Negative Scenario – the influence of load on water environment resulting from indicator's development trends increases compared to current trend;

- Ordinary Scenario – the load tendency remains the same level (in English the methodology is often defined as a "*business-as-usual*");
- Positive Scenario - the influence of load on water environment resulting from indicator's development trends decreases compared to current trend;

The following figure gives an overview of the scenarios' nature defined in PEST analysis.

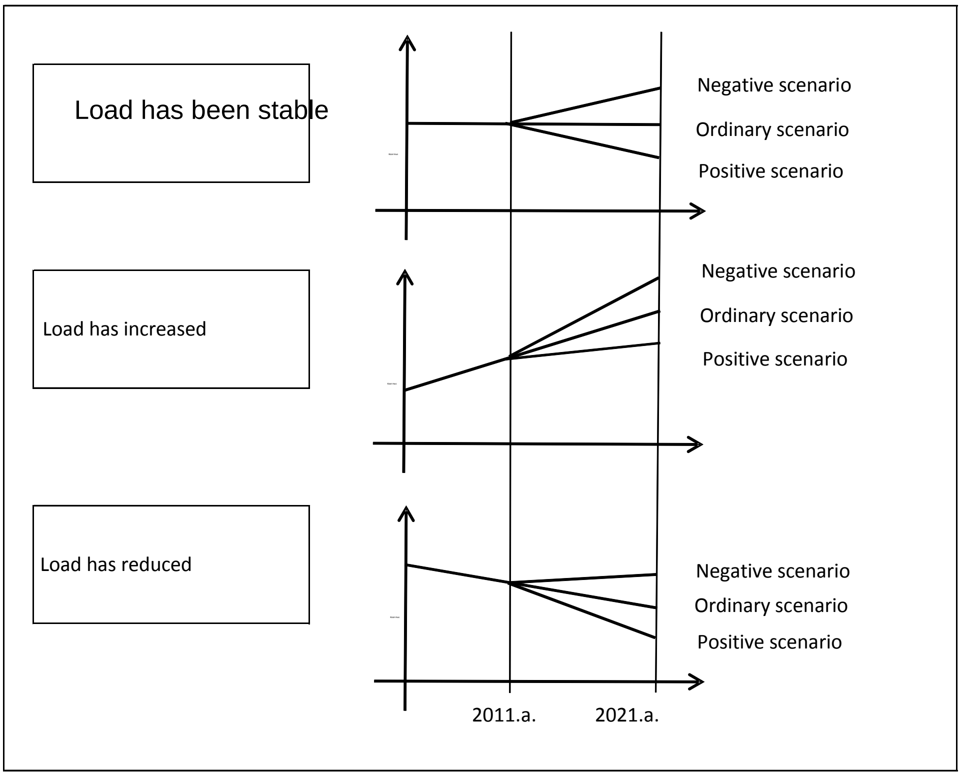

Figure 3.1 The change in current trend of loads, defined by scenarios

With the analysis the likelihood of previously defined scenarios was found by following loads: point load; diffuse load; load due to water abstraction; loads of flow; use of watercourse; use of transfer coastal water. In the following table the results can be seen (see detailed tables of analysis by loads in Appendix 1).

Table 3.2 The likelihood of further development trends of the current load tendency

LOAD	The likelihood of current load tendency's development scenarios **(%)**		
	NEGATIVE SCENARIO	**ORDINARY SCENARIO**	**POSITIVE SCENARIO**
Point load	27,48%	**49,60%**	22,93%
Diffuse load	21,63%	**48,30%**	30,08%
Load due to water abstraction	19,90%	**48,85%**	31,25%

Load due to changing the flow or hydro-morphological deviations	22,55%	**47,40%**	30,05%
Load from using the watercourse	21,40%	**54,80%**	23,80%
Load from using the transfer or coastal waters	29,20%	**41,40%**	29,40%

Most likely all the loads continue to influence the water environment in the same way as now. Hereinafter comes a more detailed analysis of development trends on load basis.

Results of updated baseline analysis are given in the table below.

Load	**Tendency**	**Explanation**	**Measure for reduction of load**
Point source	↓	The expexted load from point sources is reducing as amount of untreated wastewater is reducing. Expected reduction is ca 1-2 per cent per annum.	Reduction of wastwater treatment plants which do not meet the requirements.
Diffused pollution	↔	There is no significant chage	Improvement of land management systems and manure management facilities.
Water abstraction related load	↑	There is expected increase in water abstraction in following years mostly due to production and manufacturing. Expected increase is ca 3 per cent per annum	-
Load caused by change of amount of water flow or morphological changes	↑	Increasing production of hydropower stations will likely increase the load.	Measures are following: Liquidation of dams; Constructiuon of fish ladders; Reduction of number of beavers.
Load from usage of water bodies	↔	There has not been any significant changes in loads in recent years.	Improvement of water quality for fishing purposes.
Load on seawater	↑	Due to increase in number of visits of	Research studies and

Load	Tendency	Explanation	Measure for reduction of load
		vessels in harbours the load on seawater increases by 1,2-1,4 per cent annually.	administative measures for reduction of load.

6. Literature sources.

[1] Directive 2000/60/EC establishing a framework for Community action in the field of water policy (WFD).

[2] WATECO (2003) Economics and the environment. The implementation Challenge of the Water Framework Directive. Guidance document and accompanying documents to the guidance.

[3] Koiva RB Management Plan (2010)