WP3.2 Development of a regional "business-as-usual" scenario (BAU) to be used as a baseline in the integrated assessment of the marine environment

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List of abbreviations

BAU	"Business-as-usual" scenario
BSAP	HELCOM Baltic Sea Action Plan
BSPII	Baltic Sea Pressures and Impact Index
CoD	Cost of Degradation
ES	Ecosystem Services
ESA	Economic and Social Analysis
GES	Good Environmental Status (MSFD) and good status (HOLAS)
HELCOM	Baltic Marine Environment Protection Commission - Helsinki Commission
HOLAS	HELCOM holistic assessment
IA	Initial Assessment
MSFD	Marine Strategy Framework Directive
PoM	Programme of Measures

1   Summary

This chapter presents the development of a regional "business-as-usual" scenario (BAU), which can be used as the baseline for assessing changes in pressures and state, progress towards achieving good status, as well as for the regional economic and social analysis (ESA). The work aims at assessing the possibilities, challenges and approaches for developing such a baseline as well as guiding the future work on developing the regional BAU for the HELCOM HOLAS III assessment.

Section 2 introduces and justifies the need for a regional BAU and describes the main elements of the BAU development. The need for trans-disciplinary expertise, specifically socio-economic expertise, is also justified for each relevant element in section 2.2. Section 2.3 compares how national level BAUs performed in the Initial Assessment and Programme of Measures for the MSFD in the previous round identifying what Sweden, Finland, Latvia and Estonia focused on. Section 3 builds on the comparison across countries and explains how the regional business-as-usual scenario (BAU) can be used in the economic and social analyses and in the planning of future policy measures in the HELCOM BSAP and EU MSFD. Methodological principles for developing the regional BAU in the Baltic Sea region are presented in section 4. Section 5 summarizes the proposed steps towards regional BAU for upcoming revision of BSAP.

2   The "business-as-usual" scenario (BAU)

2.1   The business-as-usual scenario – what it is and why it is needed?

According to the EU recommendations[1] the BAU is seen as "a scenario that describes the anticipated evolution in the environmental, social, economic and legislative situation in the marine environment over the agreed time horizon in the absence of the policy under consideration" (i.e. if the HELCOM Baltic Sea Action Plan was not implemented). The BAU describes how the state of the marine environment would change over time due to the future changes in marine uses and the implementation of the existing legislative and regulatory frameworks impacting the marine environment.

As the BAU is needed for the assessment of reaching good environmental status (GES) by a target year it is a key element for the development of the Programme of Measures (PoM) in the MSFD. The regional BAU can be used as the baseline for assessing regional changes in pressures and state, progress towards achieving good status, as well as for the regional economic and social analysis (ESA). If a gap between the state in BAU and good status is identified, additional measures are needed. Moreover, the cost of degradation for such a gap can be assessed to show benefits of these measures, or more accurately the benefits forgone if GES is not reached. Specifically the estimation of the gap is useful in the definition of the valuation scenarios related to non-market valuation. Figure 1 presents a simple illustration for the use of the BAU in the gap analysis. For a discussion on how the gap analysis could be conducted using the Baltic Sea Pressure and Impact indices, please see Deliverable 3.4, Figure 5, p. 6 and the following paragraphs.

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[1] WG ESA (2010) *"Economic and social analysis for the Initial Assessment of MSFD: A Guidance document."* MSFD CIS.
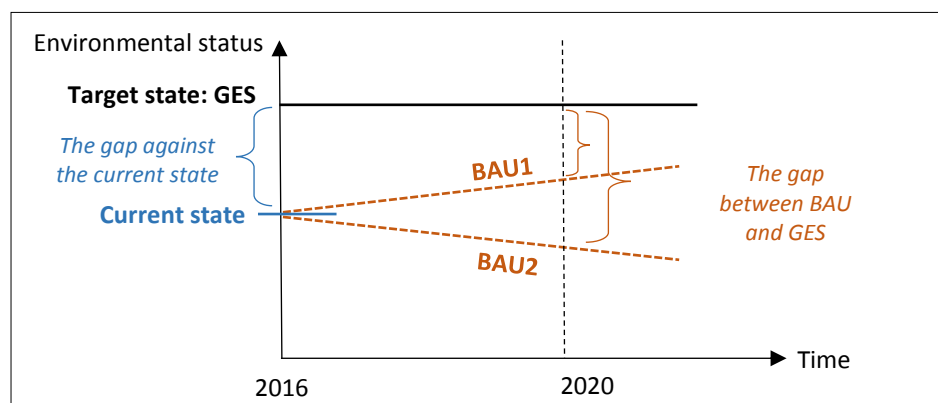
Figure 1. Illustration on the use of the BAU in the policy gap analysis (relevant for the cost of degradation analysis and planning of future policy measures). BAU1 and BAU2 illustrate possible future states of the marine environment. (Source: adapted from WG ESA (2010).)

A regional definition of the BAU supports coherence of the national economic and social analyses in the Baltic Sea region, increases the synergy between the work on the national and regional scales, provides input to HELCOM work on the holistic assessment and updating the Baltic Sea Action Plan (BSAP), and supports coherence of the national assessments for the MSFD Initial Assessment and Programme of Measures. The main elements of the BAU are listed below and shown in Figure 2. They are described more fully in section 4. Figure 2 depicts the links between the BAU elements and the Drivers – Pressures – State – Impact – Response (DPSIR) framework. It also indicates various types of expertise needed for developing the BAU as explained in more detail in section 2.2.
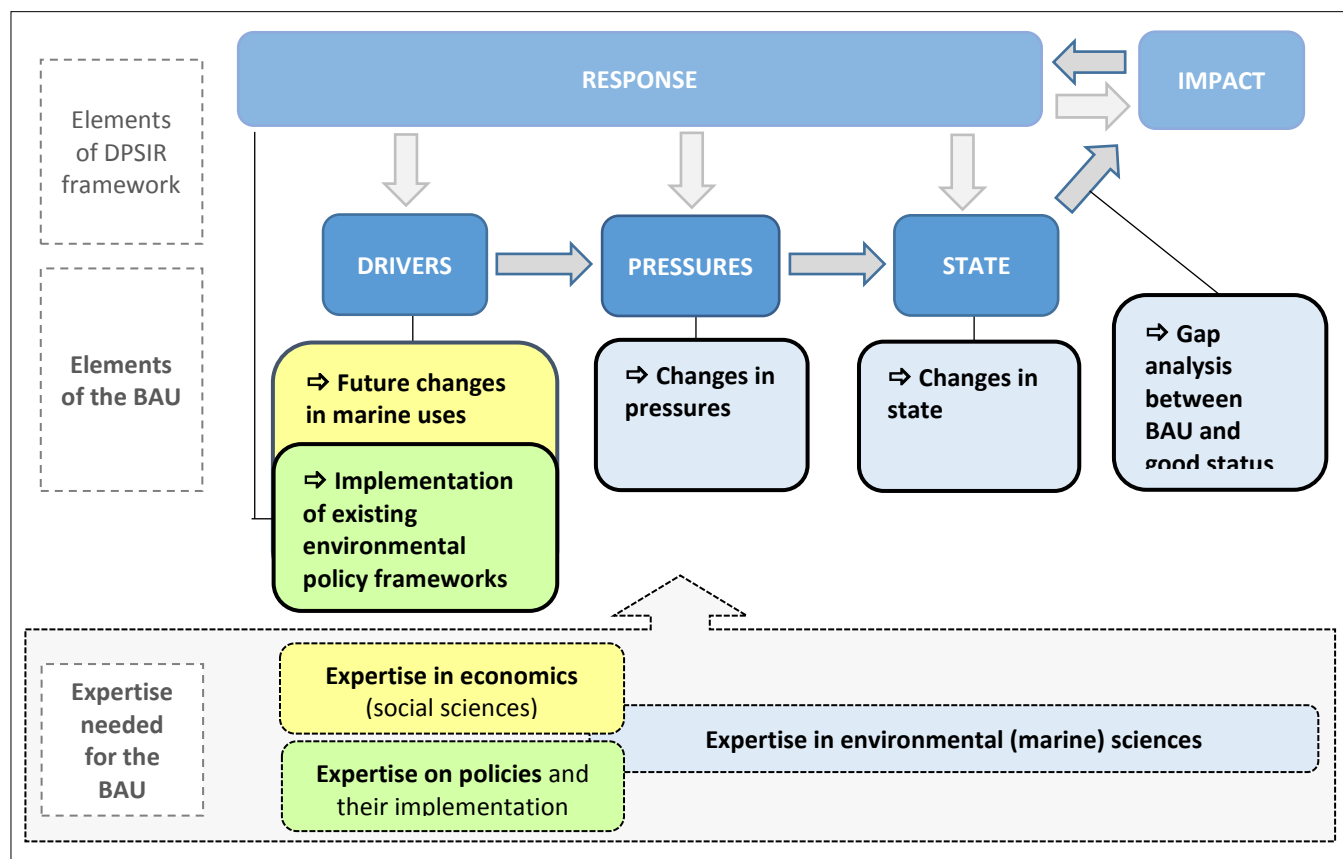
Figure 2. The main elements of BAU, their links to DPSIR framework and expertize needed for developing the BAU.

The main elements of the BAU include: (1) assessment of future **changes in marine uses** creating pressures on the marine environment, (2) implementation of **measures of existing policy frameworks** which have an impact on the marine environment, (3) expected **changes in the pressures** due to the changes in marine uses and existing policy frameworks, (4) expected **changes in the state** of the marine environment due to the changes in the pressures and exogenous environmental changes, such as climate change, and (5) an assessment of whether a **gap** exists between the state in BAU and good status.

The results of the BAU analysis are expected to vary according to the availability of quantitative data and knowledge about uses, pressures and state. The analysis should indicate the direction of future changes; whether the pressures and impacts resulting from the changing use of marine waters are leading to deterioration, improvement, or no change in the environmental state as described by the good status descriptors. The results of the gap analysis should indicate whether, according to the trends identified, good status is likely to be achieved in relation to selected descriptor by the target year (WG ESA Guidance, 2010).

There are challenges associated with the above listed BAU elements, which are highlighted by the WG ESA Guidance (2010). They include, for instance, uncertainty around the future changes in uses of marine waters and expected changes in pressures and state, accounting irreversible effects and impact of exogenous environmental drivers. These challenges are inherently part of the process of assessing the future changes. The challenges can be overcome to some extent by transparency of the used assumptions, approaches used, acknowledging data gaps and targeted work for filling them in the future. The key to success for the BAU development is utilisation of trans-disciplinary knowledge and expertise. Recent literature discusses how to account for uncertainty in the cumulative effects assessment (Stelzenmüller *et al.*, 2018) and the findings may facilitate the interdisciplinary collaboration.

2.2   Development of the BAU as a trans-disciplinary exercise

Developing a credible and policy-relevant BAU requires the integration of expertise and methods from several different disciplines, and supplementing this with the views and knowledge from ministerial advisors and other experts. Thus, the BAU needs to be viewed as a trans-disciplinary process. Figure 2 illustrates the expertise needed for developing various elements of the BAU.

Involvement of economists is needed in two of the BAU elements. First, they are needed to assess the future changes in marine uses, i.e. economic sectors and activities using the marine environment. Economic analysis explores the socio-economic, global market and other sectorial drivers behind these changes. Second, economists, together with policy scientists and advisors, are involved in the assessment of the effect of existing policy frameworks and measures impacting the marine environment. Policy experts assess implementation status of the existing policies and, together with economists, can provide useful input for assessing their expected impact Marine scientists assess the resulting changes in the pressures and marine environment, as well as the gap between BAU and good status. Economists use this result afterwards for economic assessment of the impact on human welfare as part of the cost of degradation analysis. The gap assessment also forms basis for subsequent identification of additional measures and their economic analysis by policy specialists and economists

So far, the HELCOM holistic assessments (HOLAS I and HOLAS II) have developed and applied methods to assess the status of pressures affecting the Baltic Sea, and of Baltic Sea species, by comparing the situation during the years to be assessed in relation to agreed definitions of good status. Thus, the current state has been used as a baseline against which to compare the good status. Using the BAU for the baseline would require assessing future changes in the pressures and state. It requires the trans-disciplinary work as described above. The result would indicate whether additional measures are needed to achieve good status

for an update of the HELCOM Baltic Sea Action Plan (BSAP). Further, such a trans-disciplinary process would facilitate the regional ESA of new measures to achieve good status, and would pave the way for improving ESA in the HOLAS III.

2.3 Comparative analysis of the national BAUs in the previous round of MSFD Initial Assessment and Programme of Measures

This section aims to identify how the BAUs were defined and used in the national level MSFD processes, namely the Initial Assessment (IA) (due by 2012) and Programme of Measures (PoMs) (due by 2016) in Sweden, Finland, Latvia and Estonia. Different practices exist in these various countries for the BAU development and its use in the MSFD ESA as well as in the development of the Programmes of Measures. The comparison showed that the BAU was not systematically developed in the countries during the first MSFD Initial Assessment, and assessments for the BAU were further elaborated during the PoM development in some countries (for example, Latvia and Estonia).

The analysis of IA is based on Pakalniete and Murasko (2012) and the PoMs are analysed as part of the SPICE project. Further details per country are available in Annex 1, Table 1. The issues deemed most relevant for BAU development based on the IA and PoM work at the national level are as follows:

1) Assessment of future changes in marine uses creating pressures on the marine environment

Countries have carried out the assessment of future changes for different human activities or economic sectors. Sweden focused on marine based sectors and excluded land based sectors affecting the sea. Latvia analysed relevant land and marine based sectors creating significant pressures on the national marine waters. Finland analysed sectors benefitting from the use of the sea and having an impact on the sea. Estonia analysed all economic sectors benefitting from the use of the sea and having impact on the sea. The future changes in marine use have been assessed mainly based on experts' judgements, analysis of past development trends, available future development projections, and strategic sectorial policy documents and approved regulations.

2) Review and consideration of the measures of existing policy frameworks in the BAU

The effectiveness of policies regarded as significant was assessed in Sweden. In Finland, the existing policies were partially considered, focusing only on eutrophication. In Estonia, the existing policies were reviewed for all relevant pressures and their effect assessed during the PoM development. Also in Latvia the main work was done for the PoM, when all relevant existing policy frameworks, requirements and measures for improving the state by 2020 are reviewed and their effect on changes in pressures and state assessed.

3) Assessment of the changes in the pressures

Changes in pressures were assessed in all countries, but to different extents. The nutrient pollution has been covered by all the countries. In Finland, the changes were only assessed for a single pressure (the nutrient pollution), while in Sweden several relevant pressures were assessed. In Estonia, the changes in all pressures were assessed during the PoM process. In Latvia, few pressures were covered during the IA and all pressures were covered during the PoM development.

4) Assessment of the changes in the state in the BAU

Changes in the state were assessed by descriptors in all countries. Eutrophication (D5) is a commonly assessed descriptor in all the countries and is the only descriptor assessed in Finland. Range of descriptors is assessed in Sweden. Most of the descriptors were assessed in Latvia and Estonia for the PoM development.

5) Whether and how the BAU has been used for the CoD

CoD is interpreted as a gap between the BAU and good status in all the countries.

6) How the gap between BAU and good status has been assessed for developing PoM

The BAU has been used as a baseline in the gap analysis for the PoM development in all the countries. Qualitative assessments based on expert opinion were used in all countries, but the gap assessment approaches differ.

In conclusion, the BAU was not systematically developed and the approaches differ across the countries in the first round of the MSFD assessments. In Finland, the BAU was not explicitly done. In other countries the BAU has been mainly based on qualitative assessment approaches using expert opinion, however specific approaches for various BAU assessments differ across the countries. The effect of the existing policies has been accounted to varying degrees and in various stages of the MSFD process. This experience shows that regional information exchange on the BAU and guidance on principles for the regional BAU is needed for improving coherence of the national approaches and developing regional BAU in the future.

3   Use of the regional business-as-usual scenario for the regional cost of degradation analysis and planning of future policy measures

Section 3 describes how the regional BAU can be used in the regional ESA (section 3.1) and in the planning of future policy measures for the HELCOM BSAP and the EU MSFD (section 3.2). If the BAU is used as a baseline for defining the gap to good status in the cost of degradation analysis, the obtained welfare estimates can be used to characterise benefits of implementing additional measures for achieving good status. Section 3.3 also demonstrates the use of the BAU as the baseline for the ESA with an example based on the introduction of non-indigenous species and their negative impacts on the ecosystem and humans. Finally, in section 3.4 recommendations are provided to facilitate use of BAU for the regional cost of degradation analysis and planning of future policy measures.

3.1   Use of the BAU in the regional cost of degradation analysis

The cost of degradation analysis requires defining a baseline state against which the good status is compared to assess whether there is a gap and, hence, the degradation of the marine environment. For the regional cost of degradation analysis relevant to the HOLAS II, two approaches for defining the baseline state for the analysis with differing levels of ambition have been identified.

1) The current state as a baseline

The current state approach uses the current state of the marine environment as the baseline as defined in HOLAS II. The gap for the cost of degradation assessment is defined as the difference between the current state and the good status (or good environmental status (GES) in the MSFD) threshold (see Figure 1.) In addition, the future changes in the BAU can be described at least qualitatively (deteriorating, improving or no change in the state). It would provide general information on how the gap and the cost of degradation would change when accounting the future changes in marine uses and the implementation of existing policy frameworks. Use of the current state as a baseline corresponds to the "thematic approach" for the cost of degradation analysis (WG ESA 2010). However, the current state can be used as basis for the gap analysis also under the "ecosystem services approach" for the cost of degradation analysis.

2) The BAU as a baseline accounting for future changes

Use of the BAU as a baseline is a more advanced approach in which the change in the state of the marine environment at a future point in time is projected. The used timeframe needs to be consistent with relevant target years of the HELCOM BSAP and the MSFD (e.g. 2021/2020 for achieving the good status). The future changes in marine uses and the impact of implementation of the existing policy frameworks, which affect the pressures, are assessed and several scenarios for the development of the marine environment are generated. Of these, most probable BAU is identified. The gap is identified as the difference between the BAU state and good status in the target year, see also the Figure 1. This corresponds to the "ecosystem service approach" for the cost of degradation analysis (WG ESA 2010). However, the BAU can be used as basis for the gap analysis also under the "thematic approach" for the cost of degradation analysis.

As presented in Figure 1, the baseline approach chosen for the gap analysis can change the outcome. The risk of under- or overestimating the gap between BAU and GES increases with the time span for the assessment. While the current state approach could be used for relatively short periods of time, the BAU approach could be advantageous when considering a target year farther in the future.

For the HOLAS II 2018 assessment, the BAU approach accounting for future changes and the BAU as the baseline in the gap analysis may not be feasible as the assessment is already on-going, and this approach was not planned into the assessment. Moreover, the cost of degradation assessments rely largely on estimates from available economic valuation studies. For assessing the consequences to human well-being (costs of degradation) in monetary terms, the valuation studies assess the benefits (or damages) from achieving a certain change in the state of the marine environment. This change is derived from comparing two scenarios. When using available studies, the scenarios are defined in each study often differ from what is needed for the regional assessment (the BAU and good status). Comparing the definitions of the scenarios used in the available valuation studies and the HOLAS II (the current state, the BAU, good status) can help in the evaluation of the suitability of the available benefit estimates for the regional cost of degradation analysis and selection of a possible approach for defining the gap. There are only a limited number of valuation studies available currently for the HOLAS II assessments. New valuation studies would be needed and could be feasible for the next HOLAS III assessment.

The cost of degradation assessment can also be utilised for the ESA of the MSFD Programme of Measures to support the cost-benefit analysis of new measures. If the cost of degradation estimates were to be used later for this purpose, then these estimates should value the difference between the BAU (including, considering implementation of measures of the existing policy frameworks) and GES.

It should be noted that it takes substantial work to develop the regional BAU. In addition, it could be challenging to adjust the value estimates from existing valuation studies (valuing study-specific scenarios) to correspond to the gap between the BAU and the good status/GES. Hence, it is important to prioritise environmental themes where the BAU work can be really useful for the future policy-making, as well as to implement new valuation studies applying the scenarios which are suitable for the policy needs.

3.2   Use of the BAU for the planning of future policy measures

The role of the BAU in developing the programme of measures for achieving good status is illustrated in Figure 4. If the gap between baseline and good status is assessed against the current state of the marine environment, it does not take into account the future changes of uses of the marine waters, which may lead to a decrease or increase in the pressures on the marine environment and the associated changes in the state. It also does not account for the on-going and planned implementation of the measures of existing policy frameworks which can improve the state and, hence, reduce the expected gap between the baseline

and good status. As a result, the gap may be under- or overestimated, which may have considerable socioeconomic implications. For example, an overestimation of the gap leads to costs of unnecessary measures, whereas an underestimation of the gap leads to insufficient measures with the result that good status is not achieved. Hence, there are costs to society due to degradation of the marine environment. Thus, the BAU is crucial for developing an appropriate programme of measures for achieving good status of the marine environment.
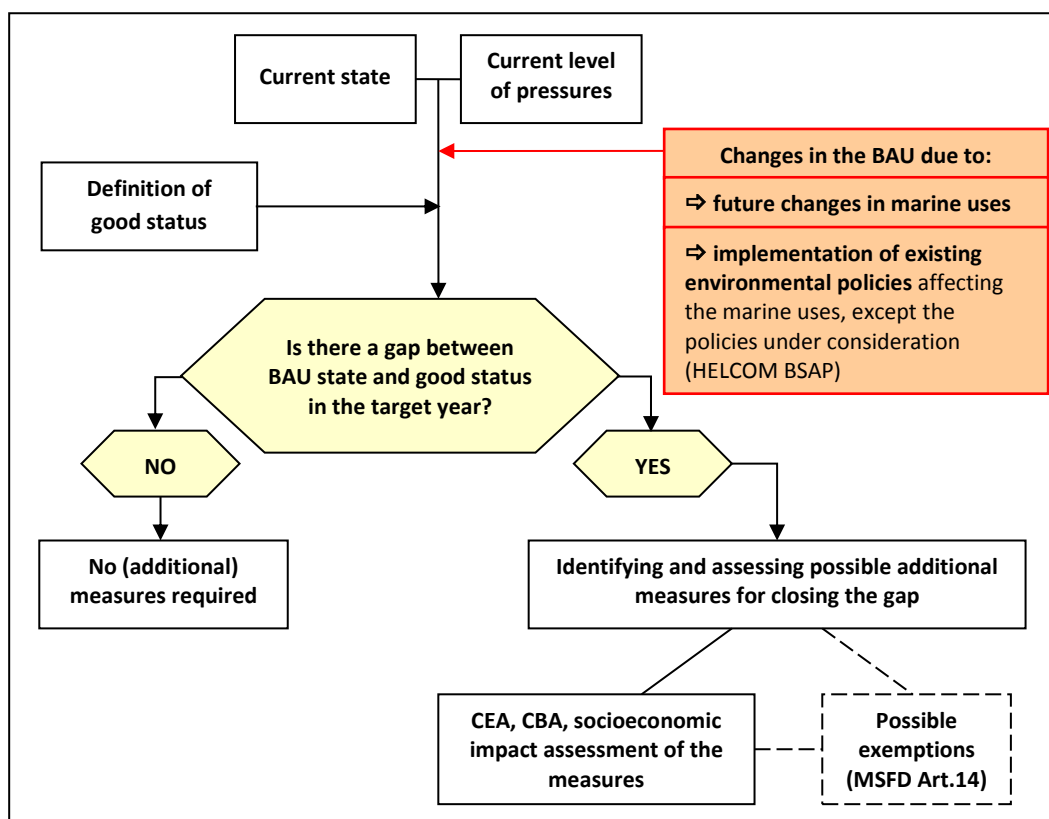
Figure 4. Role of the BAU in planning of future policy measures. (Source: adapted from K.Pakalniete (2013c).) Abbreviations: BAU – the "business-as-usual" scenario, CBA – cost-benefit analysis, CEA – cost-effectiveness analysis.

Considering the substantial work necessary for developing the regional BAU, it would be important to set the thematic scope for the regional BAU work. The number of the descriptors of good status for the assessment, and the related pressures and activities, can be reduced by selecting those descriptors which are relevant for future regional policy-making. The BAU development is most relevant for the descriptors where (re)assessment of the gap is important for deciding whether existing policies (including the measures with planned implementation) are sufficient or whether additional measures need to be set in order to achieve good status. Also, for the descriptors for which measures are still under development, proper gap assessment can help to identify an appropriate set of measures to ensure that good status is achieved.

The previous research has shown that the activities, the pressures and the state indicators form an interlinked matrix, where a single activity can cause several pressures and affect even more state indicators. Thus, in practice it is not reasonable to plan the necessary measures for each of the GES gaps separately but a more integrated approach would help to avoid over-estimating the need for pressure reductions. The integrated approach is further described in Deliverable 3.4.

In order to describe the BAU development process and its use for the cost of degradation analysis and planning of future measures the case of non-indigenous species is presented in the next sub-section.

3.3   Illustration on the use of the BAU in relation to non-indigenous species

The illustration aims to demonstrate use of the BAU (instead of the current state baseline) as the baseline for the ESA and planning of future policy measures, as well as outline the information and assessments required for such analyses. The example is based on a significant environmental problem in the Baltic Sea – the introduction of non-indigenous species and their negative impacts on the ecosystem and humans. The introduction of non-indigenous species is addressed by one of the HELCOM core indicators included in the holistic assessment of ecosystem health, as well as by one of 11 descriptors of good environmental status of the EU MSFD. Summary information on the current environmental pressure, state and target, which forms basis for the BAU development, is provided in Table 1.

Table 1. Summary information on the environmental pressure, state and target. (Source: based on information in the HELCOM HOLAS II (HELCOM 2017))

Pressure and activities	Introduction of non-indigenous species. Among the pressures causing the most significant negative impacts in the Baltic Sea region and also among the most widely distributed pressures at the regional scale. Main sources: shipping and aquaculture are the most likely vectors of the introductions and spread, shipping and boating is the main vector transporting the species in ballast water tanks (of cargo ships) or on ship hulls.
Good status	No primary introductions of non-indigenous species due to human activities during a six year assessment period.
Current state	Around 140 non-indigenous species in the Baltic Sea up to now and 14 new introductions in the period 2011–2016. Rate of introductions has increased in recent decades.
Current status assessment	Failing good status

### 3.3.1   BAU for the activities, pressure and state

The results of the BAU are described following the main elements of the BAU, which include assessment of the future changes in marine uses creating the pressures, the impact of implementation of measures of existing policy frameworks and the resulting changes in the pressures and state.

1)   Future changes in the marine uses creating the pressure

It is expected that the marine shipping, the main activity which creates the pressure, will increase in the Baltic Sea region in the future.[2] The shipping market is highly dependent on the global and regional economic development. In the future ship traffic is likely to increase on an intra- as well as on an extra-European scale due to global population growth, economic growth and effects of increasing globalization. An important driver is also the EU policy[3] aiming to reduce greenhouse gas emissions from the transport sector by moving road freight to other transport modes (rail and waterborne). Figure 5 shows expected marine transport growth in the EU until 2050.

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[2] The future changes in the marine shipping for the Baltic Sea (on the sea regional scale) are characterised based on results of an INTERREG Baltic Sea Region project "Baltic LINes". See the report Baltic LINes (2016).

[3] White Paper "Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system" published by the European Commission in 2011.
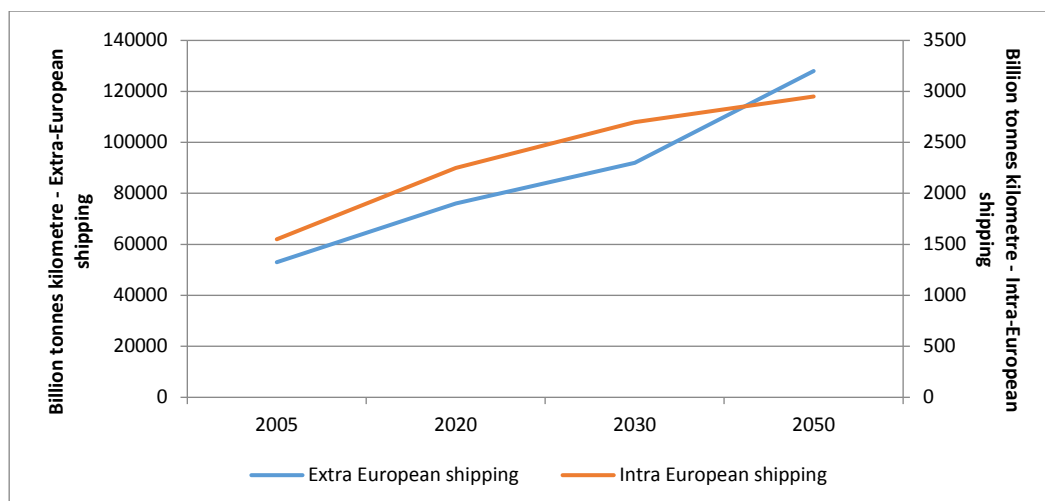
Figure 5. Expected maritime transport growth for the EU until 2050 *(Source: Baltic LINes (2016).)*

2)   Implementation of measures of existing policy frameworks

Once a non-indigenous species has become established and spread to a wide area, eradication is not a viable management option. Hence, management should primarily aim to prevent further introductions, along with minimizing the negative effects of the already introduced non-indigenous species. Existing policy measures whose impact should be accounted for in the BAU scenario are summarised in Table 2.[4]

Table 2. Existing policies and their measures included in the BAU scenario. (Source: based on information in (HELCOM (2017), HELCOM explorer (2016), LHEI, AKTiiVS (2014).)

[1] *Categories of the measures (according to the MSFD): 1a measures – the measures that have been adopted under other policies and are implemented; 1b measures – the measures that have been adopted under other policies but that have not yet been implemented or fully implemented.*

Policy frameworks	Description of the prescribed measures	Implementation status of the measures [1]
Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora	Regulation (e.g. by permitting system) for intentional introductions on non-indigenous species.	Implemented (1a measures)
EU Regulation No 708/2007 concerning use of alien and locally absent species in aquaculture	Regulatory measures for aquaculture practices to avoid adverse effects to biodiversity, which may be expected to arise from the introduction or translocation of aquatic organisms and non-target species in aquaculture and from the spreading of these species into the wild, including among other, permits, quarantine and pilot releases, contingency plans, monitoring.	Implemented (1a measures)
EU Regulation No 1143/2014 on the prevention and management of the	A set of measures to be taken in relation to IAS of Union concern (a list), including, among other, national surveillance systems, national action plan to address the priority pathways and to prevent introductions and	Depending on the measure – implemented recently (1a) and not yet (fully) implemented, will

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[4] The proposed principles and approach for identifying measures to be included in the BAU scenario and assessing their impact (effect) are described in section 4.

introduction and spread of invasive alien species (IAS)	spread of IAS, controlling systems, implementing early detection and rapid eradication measures to detect presence and prevent establishment of IAS, management measures for established IAS to prevent further spread and minimize the harm.	be implemented in the BAU timeframe (1b measures)
International Convention for the Control and Management of Ships Ballast Water and Sediments (BWMC)	Measures for BWM on ships (also if the Convention is not ratified in a country): BWM certificate, a BWM plan, a BW record book, measures to comply with BMW standards, BW sediment management. Measures implemented by Member States (if the Convention is ratified in a country): national strategy or program for BWM, ensuring reception facilities of BW sediments in ports, surveying and certifying ships, inspections of ships and applying penalties for infringements, monitoring of the effect of BWM.	Not yet implemented, will be implemented in the BAU timeframe (1b measures) BWMC entered into force in September of 2017.
HELCOM Baltic Sea Action Plan (BSAP): Road map towards ratification and harmonised implementation of the BWMC	Measures to be implemented by the Contracting Parties: Ratification of the BWMC. Joint actions at HELCOM level: research and informational measures, regional regulatory initiatives. (Only those measures of the BSAP are accounted in the BAU that are already implemented.)	Implemented (1a measures) Germany, Russia, Denmark, Sweden and Finland have ratified the BWMC. In Estonia and Latvia ratification is included as a new measure in MSFD PoM (accounted for in BAU).

The impact of the existing policies was assessed qualitatively using expert judgement (the approach is explained in section 4). The effect of recently implemented measures and the measures with planned future implementation in the BAU timeframe was analysed in order to further assess the expected future changes in the pressure and state in the BAU. It is concluded that these measures address all relevant sources (activities) of the pressure not sufficiently covered by already implemented measures. The measures also create an effective "policy mix" to reduce the pressure from these sources (activities), and they are expected to be implemented by the target year (2020). As the good status is specified as "no new introductions of non-indigenous species due to human activities," considerable improvement towards the good status can be expected due to implementing the measures included in the BAU.

3) Future changes in the pressures and state

Although an increase in the marine use (marine shipping) is expected in the future, the measures accounted for in the BAU will reduce the pressure and improve the state. Some of these measures are at the beginning of their implementation. Hence, their implementation will improve the state by 2020, but the full effect of the measures on the state could be observed in next assessment period (2021-2027).

3.3.2   Gap assessment using the BAU as a baseline

Assessment of the gap between the BAU state and good status is illustrated with a qualitative assessment approach involving expert judgement.[5] It assesses the risk of failing the good environmental status (GES)

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[5] The approach has been developed in Latvia for the 1st MSFD PoM and it builds on an approach developed by the EU research project ODEMM "Options for Delivering Ecosystem Based Marine Management" (www.liv.ac.uk/odemm). See

according to the MSFD GES Descriptors, as well as the confidence of the risk assessment. The assessment categories are specified in Table 3 and the result is provided in Table 4.

The risk assessment result demonstrates the difference between the current state and the BAU state – there is moderate to low risk of failing good status when accounting for the impact of the planned policy measures. The confidence of the risk assessment could be increased by improving the assessment of the BAU state. This requires more accurate, and preferably quantitative, assessment of the impact of the planned BAU policies.

Table 3. Categories used for assessing the risk of failing GES and confidence of the risk assessment. (Source: LHEI, AKTiiVS (2014).)

Categories of risk assessment	Description of categories
Low risk	Current status is close to GES and there is (or expected) positive change or trend towards GES from implementing the BAU policies
Moderate risk	Current status is not close to GES, and there is no positive trend (or not expected) towards GES from implementing the BAU policies
High risk	Current status is not close to GES and inspite of implementing the BAU policies there is negative trend away from GES
Categories of confidence of the risk assessment	**Description of categories**
Low confidence	GES value is not defined and the risk assessment is not based on observation data (such data are not available)
Moderate confidence	GES value is defined conceptually and the risk assessment is based on observation data
High confidence	GES value is defined quantitatively (for concrete indicators) and the risk assessment is based on analysis of observation data

Table 4. Assessment of the risk of failing GES for D2 on non-indigenous species for the Baltic Sea (Source: expert assessment, SPICE project.)

Note: Definition of GES is based on HELCOM CORE indicator for D2 – no primary introductions of non-indigenous species due to human activities during a six year assessment period.

Assessment of the current state	Risk assessment for the BAU state	Explanation for the risk assessment	Confidence of the risk assessment	Explanation of the confidence assessment
Failing GES (14 new species in the previous assessment period)	Moderate-Low	The current state is far from good status, but a positive trend is expected due to implementing the planned (BAU) measures.	Moderate	Quantitative good status definition exists. The risk assessment is only partly based on observation data (no quantitative assessment for the BAU state).

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also *Breen P. et al. (2012) „An environmental assessment of risk in achieving good environmental status to support regional prioritisation of management in Europe." // Marine Policy. Vol.36: 1033-1043.*

3.3.3 BAU as a baseline for the assessment of the cost of degradation

When the BAU is used as a baseline for assessing the cost of degradation, the welfare impacts from the difference between good status and state of the marine environment in the BAU (accounting for effect of existing policies) are assessed. If there is difference between these two states, the estimated cost of degradation can be used for justifying benefits of implementing further measures for achieving good status.

Non-indigenous species pose a threat to the marine environment as they may induce changes in the structure and dynamics of the ecosystem. Those species creating negative impacts on the ecosystem and humans are called invasive non-indigenous species. The economic impacts may occur due to loss of fishing possibilities, expenses incurred by industries to clean intake or outflow pipes, and bio-fouling. Public health impacts can arise from the introduction of pathogens or toxic algae. The impacts depend on the introduced species and need to be taken into account for assessing the welfare impacts.[6] In general, however, the impacts of non-indigenous species in marine ecosystems are poorly documented (HELCOM 2017).

Various economic valuation methods can be used for the monetary estimation of the cost of degradation (e.g. cost-based methods, stated preference methods eliciting citizens' willingness to pay). No such valuation studies have been conducted covering the whole Baltic Sea region. National scale studies have been conducted in some countries. There is also an on-going international study as part of BONUS BALTICAPP project[7] (covering Finland, Germany and Latvia) which could provide usable monetary estimates in the future. An illustration from a national scale study in Latvia applying the choice experiment method and conducted in 2013 is used to demonstrate the monetary assessment of the cost of degradation. A similar study was carried out in Estonia. Table 5 describes the environmental scenarios used for the valuation in the Latvian study. The moderate improvement scenario reflects the BAU (according to the national assessments in 2013) and could be considered close to the regional BAU as described earlier in this section. It should be noted that the scenarios are built based on the number of new species introduced in order to be consistent with the definition of the good status. The research showed that the number of species as such does not convince people that this is a problem, but rather the negative impacts of the species need to be characterised. Thus, improving knowledge on the impacts of the non-indigenous species is important for the economic valuation of welfare changes.

Table 5. Description of the scenarios used for valuing welfare impacts of achieving good status. (Source: Pakalniete K. et al. (2013d).)

Note: The "no additional actions" scenario reflects the current state and the "planned additional actions" scenario – the BAU according to national assessments (in 2013).

	Alternative scenarios for changes in state of the marine environment by 2020		
	"No additional actions"	**"Planned additional actions"**	**"Action plan for reaching good status"**
New invasive alien species establishing	**often**	**rarely**	**in exceptional cases***
1 new species on average	(in) 5 years	(in) 15-20 years	not more often as (in) 50 years

* The used definition of good status was "no new introductions due to human activities", and the initial formulation for the valuation was that new invasive species are "Not introduced". The research showed that people might not perceive such scenario as realistic (*"nothing is so certain in real life"*), which could constrain the valuation. Hence, the scenario was reformulated slightly as presented here.

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[6] See Pakalniete et al. (2013d) for illustration on types of welfare impacts created by selected invasive species.

[7] "Wellbeing from the Baltic Sea – applications combining natural science and economics" (2015-2018), https://www.bonusportal.org/balticapp.

The study results showed that the Latvian citizens were willing to pay around 1.5 EUR (1-2 EUR) per person per year for improving the state from the current to the good status (Pakalniete et al., 2013d). The similar study carried out in Estonia showed, that Estonian citizens are willing to pay 4.9 EUR (3.3-5.4 EUR) on average per person per year for the same improvement (Tuhkanen et al., 2016). However, it should be noted that in both studies the largest part of this value is attributed to the improvement achieved in the BAU. There is uncertainty of the additional benefits from improving the state further above the BAU to achieve good status.

This example demonstrates the difference in the cost of degradation when the assessment of the welfare losses due to failing good status utilizes the BAU instead of the current state. When the current state is used as the baseline, there are considerable costs of degradation from failing good status. However, the resulting costs could be minimal or non-existent when using the BAU state as the baseline, since it is closer to the good status.

3.4 Recommendations on use of the BAU for the regional cost of degradation analysis and planning of future measures

The BAU is an important instrument for the proper assessment of the gap to good status, as well as for the need for additional measures to achieve the good status. The BAU highlights the effect of existing policies and the environmental problems for which additional measures are needed. It also indicates areas where the information base needs to be improved for informed decision making. The following list of recommendations would facilitate use of the BAU for the regional cost of degradation analysis and planning of future policy measures.

1) Use the BAU as a baseline in the future regional ESA.

The regional BAU would be useful for the regional cost of degradation analysis and cost-benefit analysis of future regional policy measures. When the BAU is used as the baseline in the cost of degradation analysis, the welfare losses from the difference between the BAU state and good status are estimated. This estimate shows benefits of implementing additional measures for achieving good status. It can be used for the cost-benefit analysis of these measures, which aims to support selection and justification of the additional measures.

2) Develop appropriate information base for proper assessment of the BAU state and gap to good status.

The cost of degradation analysis relies on appropriate assessment of the BAU state and the gap to good status, and both should be specified quantitatively as much as possible for valuing the welfare impacts. As demonstrated with the illustration on non-indigenous species, an approach that is more refined than qualitative assessment is needed for accurate gap assessment. In particular, more accurate, and preferably quantitative, assessment of the effectiveness of the planned policies in achieving good status is needed. The need for more accurate estimates of the foreseen effect of the planned measures and their sufficiency to reach good status is put forward in the HOLAS II (2017) report.

3) Conduct new fit-for-purpose international valuation studies.

Previous experience with the cost of degradation analysis has revealed important knowledge gaps, in terms of environmental themes and ecosystem services where the state of the environment is below good status, which have not been covered by previous valuation research. Moreover, the valuation scenarios used in the existing valuation studies can differ from the regional assessments of the BAU state and good status. New coordinated international valuation studies should be conducted for selected degradation themes/ecosystem services and using appropriate valuation scenarios. Such studies could be conducted

either in all coastal countries or at least in selected countries representing diversity of sea region countries, which allows for results to be transferred with some reliability. One option is to cover several degradation themes/ecosystem services relevant for the marine policies in a single study.

4) Characterise the valuation scenarios in terms of impacts on the ecosystem and humans.

In order to assess changes in the human welfare due to the changes in state of the marine environment, the various states of the marine environment, which are used as basis for the valuation scenarios, need to be characterised in terms of impacts on the ecosystem and humans. For instance, concerning the non-indigenous species, the status indicator, which is sometimes used as basis for building the valuation scenarios, considers new introductions in terms of number of species. However, it is important to improve knowledge on impacts of the non-indigenous species in order to assess better their impact on human welfare (including by monetary valuation of these impacts).

5) Utilise multiple improvement scenarios when conducting a valuation study.

The valuation should include at least two improvement scenarios, where one corresponds to the BAU and one to good status. This will allow separating benefits of the BAU measures and further additional measures for achieving good status, as well as to account for non-linear changes in the welfare value.

4   Principles and approaches for developing the regional BAU

This section proposes methodological principles and approaches for developing the regional BAU in the Baltic Sea region. It identifies relevant methodological issues and possible methods for developing the regional BAU (sub-sections 4.1-4.4) following the main elements of the BAU development as described in section 2.

The overall aim is to guide the future work of developing the regional BAU to be used in the regional policy-making, for example, the HELCOM HOLAS III assessment. This would allow for the necessary preparation and coordination as currently there is a diversity of national practices for BAU development, limited availability of information, as well as limited resources to develop a holistic regional BAU for the Baltic Sea region for the on-going HELCOM HOLAS II assessment in 2018.

4.1   Future changes in marine uses

The assessment of future changes in human activities using the marine environment requires the identification the links between the activities, pressures and state, selection of the human activities to be included in the analysis, and development of an approach for assessing future changes in the marine uses. More detailed information for each element of the assessment is provided in subsequent sub-sections.

4.1.1   Establishing the links between the activities, pressures and impact on state

The links between the activities, pressures and impact on state form the basis for the identification of the human activities relevant for the regional BAU analysis, and support the later assessment of the expected changes in the pressures and state due to the changes in marine uses and implementation of existing policies.

Text Box 4.2.1 Establishing links between the activities, pressures and impact on GES Descriptors

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Tasks

⇨ Describe the links between activities and pressures and between pressures and state, based on scientific information and expert judgement.

⇨ Provide (semi-)quantitative assessments of the links to measure the impact of activities on pressures, and impact of pressures on ecosystem components (state), based on expert judgement using separate assessment methods or elements incorporated in impact assessment tools (e.g. the HELCOM BSPII).

Information sources

⇨ Qualitative description of the links with linkage tables or matrixes:

Linkage table of the TAPAS project is provided in Annex 1, which shows the linkages between the human activities and pressures according to the MSFD Annex III in the Baltic Sea.

Linkage framework of the ODEMM research project connects pressures to ecological components and MSFD GES descriptors (available at http://odemm.com/content/linkage-framework).

⇨ Semi-quantitative assessment approaches:

Approach for assessing linkages between activities and pressures, their significance and impact on environmental targets (linked to GES descriptors). Developed for the MSFD PoM in Latvia, adapting approaches used in other EU countries (NL, BE) (available at http://www.lhei.lv/attachments/article/133/Projekti-Prieksizpete_JSD_PP_Nosleguma%20atskaite_20141222_gala.pdf).

In HELCOM BSPII tool the links between pressures and ecosystem components are assessed with "sensitivity scores", derived from literature and expert opinion (available at http://stateofthebalticsea.helcom.fi/about-helcom-and-the-assessment/downloads-and-data/).

In Symphony tool the links between pressures and ecosystem components are assessed in a "sensitivity matrix" describing how sensitive each ecosystem component is to each of the pressures, the matrix is based on expert opinion (available at http://www.msp-platform.eu/practices/symphony-tool-estimate-cumulative-impacts, https://www.havochvatten.se/en/swam/eu--international/marine-spatial-planning/symphony---a-tool-for-ecosystem-based-marine-spatial-planning.html).

4.1.2   Selecting activities to be included in the regional BAU analysis

As the BAU involves assessing expected changes in the pressures and state, the human activities behind the pressures are relevant for the BAU analysis. As the general criteria for selecting the activities (see text box 4.1.2.) results in a large number of activities, setting a thematic scope for the regional BAU work in terms of state descriptors and pressures to be included is recommended. The state descriptors and related pressures and activities for which the BAU is to be developed could be narrowed down according to their relevance for the regional policy-making, e.g. only including descriptors where reassessment of the gap to good status and sufficiency of existing measure is needed, and for which measures are still under development.

Text Box 4.1.2. Selecting the activities to be included in the regional BAU analysis

Tasks

⇨ Provide a list of significant pressures for the Baltic Sea, i.e. those pressures that cause failure of good status, based on the regional assessment of current pressures and state and compliance of the current status to good status (according to the regional indicators).

⇨ Agree on criteria for selecting the activities to be included in the regional BAU, e.g. activities causing significant pressure today and activities with expected significant future development, potentially leading to an increase in the pressure.

⇨ Agree on the thematic scope for the regional BAU work in terms of state descriptors and pressures to be included, based on relevance for the regional policy-making, e.g. there is need for reassessment of the gap to good status and sufficiency of existing measures, or measures are still under development.

Information sources

⇨ Regional assessment of the current pressures and state and compliance of the current status to good status – HELCOM HOLAS II assessment (available at http://stateofthebalticsea.helcom.fi/about-helcom-and-the-assessment/downloads-and-data/).

⇨ List of activities creating pressures on the marine environment: the list in the MSFD Annex III (Table 2b) (available at http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017L0845&from=EN), the list of activities in HELCOM HOLAS II assessment ("State of the Baltic Sea" report) (available at http://stateofthebalticsea.helcom.fi/humans-and-the-ecosystem/activities-pressures-and-welfare-impacts/#human-activities-and-pressures).

4.1.3   Assessing the future changes in the activities

The method used for assessing future changes in marine uses depends on a number of issues: the information availability, the specific character of the analysed activity (for instance, present or future activity), as well as the ways how the assessment will be used to further assess changes in the pressures and state. For instance, the tools and approaches used for assessing the pressures and state determine the type of input information necessary for them on the changes in activities.

As a minimum, **qualitative assessments** of the expected future changes in marine uses, e.g. based on literature review of sea region studies, sectoral programs and development plans, as well as expert knowledge, are needed. For current activities, an analysis of past trends in activities could be performed using quantitative data on selected indicator(s) characterising the activity. Indicators related to the extent of the activity[8] are better suited for the analysis of trends in marine uses (linked with pressures) than the socioeconomic indicators. The approach and data sources could be similar to those used in the regional ESA of the use of marine waters in the HOLAS II.

Quantitative assessments on future changes in human activities should be explored. The results could be used to assess expected changes in the pressures and state with specific approaches and tools, which may require numerical input information on the changes in the activities. Joint work with environmental experts

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[8] For instance, number of recreational days/trips for the tourism and recreation activity, number and capacity of installed off-shore wind turbines, weight of transported goods by marine shipping, volume of landings (by species?) for fisheries.

is needed to investigate and determine the most appropriate input information for the regional assessment of changes in the pressures and state.

Future projections always include uncertainty. It is important to describe transparently the main uncertainties related to the used assumptions and assessments. If uncertainty in the future changes in marine uses is perceived as high, alternative scenarios of possible future development should be constructed and the most likely scenario indicated. In order to deal with uncertainty, scenario building performed in the sea region projects, such as BONUS BalticAPP, probabilities or sensitivity analysis could potentially be applied.

Text Box 4.1.3. Assessing the future changes in the activities

Tasks

⇨ Develop qualitative assessments on the future changes in the activities, based on literature review, available information collection, consultations with stakeholders and expert opinions. The assessment may include characterisation of the past development trend, qualitative description of their expected future development, qualitative assessment of the future changes using simple categories (e.g. whether the activity would decrease/remain at the current level/increase). It is important to describe the assumptions and uncertainties in the assessment, if necessary, elaborate alternative and the most likely future development scenarios.

⇨ Investigate the need for quantitative assessments on the future changes in the activities, taking into account methods and tools used for the regional assessment of pressures and state.

⇨ Develop methods and tools for the quantitative assessments and prepare such assessments where relevant.

Information sources

⇨ Available studies and assessments for the Baltic Sea region on future changes of marine uses. Examples for marine shipping:

Technical reports (2012) of the BRISK project providing forecasts for goods and passenger transport for the Baltic Sea for 2020 (available at http://www.brisk.helcom.fi/publications/en_GB/publications/, see for instance the reports *Model report (Part 1)_Appendix 1_Goods transport prognosis for 2020.pdf*, *Model report (Part 1)_Appendix 2_Passenger transport prognosis for 2020.pdf*).

Baltic LINes (2016): *Shipping in the Baltic Sea – Past, present and future developments relevant for Maritime Spatial Planning.* Project Report I (available at http://www.vasab.org/index.php/documents/doc_download/1275-baltic-lines-report-on-shipping-in-the-baltic-sea).

⇨ Scenario studies from research projects, e.g.:

Shared socioeconomic pathways (SSPs) developed in the BONUS BALTICAPP project to evaluate how varying levels of climate change and policies affect the socioeconomic and environmental conditions in the Baltic Sea Region. The five SSPs developed in the project describe what happens to agriculture, wastewater treatment and fisheries under each alternative scenario (available at https://portal.helcom.fi/meetings/HELCOM%20–%20BONUS%20BALTICAPP%20WS-415/Documents/Scenarios_Zandersen_BALTICAPP.pdf).

⇨ Economic models for specific sectors of the economy, e.g.:

The model for agriculture developed by project AGMEMOD2020 (in 2006-2008) is an econometric, dynamic, multi-product partial equilibrium model that allows making projections and simulations on agricultural production in order to evaluate impact of policies in *agriculture* at the EU as well as national level (it incorporates 27 individual country models). In the current model program version the indicators of agricultural production are estimated until 2025. (https://www.agmemod.eu/, http://cordis.europa.eu/publication/rcn/11078_en.html).

⇨ Overview of integrated modelling briefly introducing: bioeconomic modelling, ecological-economic modelling, input-output modelling, general equilibrium modelling and index-based approaches as described in Deliverable 3.4.

4.2 Existing policy frameworks and approaches for assessing their impact

In order to assess properly the gap between the BAU and good status, it is important to identify the existing policy frameworks and measures impacting the marine environment and to assess their effectiveness. More detailed information for each element of the assessment is provided in subsequent sub-sections.

4.2.1 Identification of policy frameworks and measures to be included in the regional BAU

Existing policy frameworks range from national legislation, regional agreements and recommendations to European directives and global conventions. Relevant policy frameworks and measures to be included in the BAU need to be identified.

The BAU analysis requires a clear separation between the measures of existing policies and the "policy under consideration", or in the terminology of the MSFD – between existing measures (1a and 1b) and new measures (2a and 2b). According to the BAU definition, the HELCOM BSAP is "a policy under consideration" and, thus, not included in the BAU as an existing policy framework. However, in reality its implementation has been on-going since 2007, with many measures implemented already.

There has been no consistency in the national approaches as to how the HELCOM BSAP and its measures are included in the 1st national MSFD Programmes of Measures. BSAP measures are treated as existing or new measures depending on the country. The differences may be explained with the diverse implementation status of the BSAP measures in the countries.[9]

For the regional BAU development, it would be useful to separate the BSAP measures already implemented from those where implementation is on-going or planned in the future. The impact of the former measures could be assumed to be reflected in the present or BAU state of the marine environment. The latter measures could be taken as "policies under consideration" and excluded from the BAU. Such an approach requires analysis of implementation status of the BSAP measures in each country, such as the one performed at an overview level by HELCOM. The next such overview is planned for the Ministerial Meeting in 2018.

Concerning other existing policy frameworks (other than the BSAP), the implemented, on-going and planned measures (1a and 1b) should be considered in the BAU. It could be assumed that the effect of measures already implemented is reflected in current state of the marine environment (some caution should be given for this assumption as there can be significant delays between implementation of measures and the effect of the state). Thus, on-going and planned measures are of particular importance for the BAU analysis since they may change the pressures and the state in the future.

The review of the national implementation situation of such existing policies is necessary for identifying measures corresponding to the implemented, on-going and planned measures. Common "check-lists" of international policy frameworks could be developed for each relevant pressure to facilitate consistency of the national analyses.[10] Since the policies are continuously evolving, with revisions of existing international policy frameworks and introductions of new policy frameworks, the lists should be updated at the beginning of the regional BAU assessment.

Assessing the effect of these policies (described in the next step) requires analysis of the implementation status of the measures (implemented, partially implemented, not yet implemented), as well as evaluation of certainty of their implementation in the BAU timeframe. As the implementation situation of the measures

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[9] See assessment of implementation status of the BSAP in 2016 in the HELCOM Explorer, available at http://maps.helcom.fi/website/HELCOMexplorer/index.html

[10] A database of these policies and measures has been developed (reflecting situation for May 2013) as a part of the INTERREG GES-REG project. (Pakalniete K. (2013a), available at http://gesreg.msi.ttu.ee/en/results).

differs across countries, the analysis needs to be done at the national scale. Review of the implementation status of the existing policies has been conducted by the countries to various extents for the development of the 1st MSFD Programme of Measures. The EU also requires for Member States to report on the national implementation of these policies. Thus, the assessment of the policies' implementation status can, to a certain extent, be considered existing practice. Regional guidance and support (e.g. "check-lists" or databases of measures) can improve the consistency of the results and ensure their usefulness for the regional BAU.

Text Box 4.2.1. Identification of policy frameworks and measures to be included in the regional BAU

Tasks

⇨ Prepare a list of existing policy frameworks and measures impacting the marine environment in the Baltic Sea, based on existing inventories, databases and reviews. All environmental policy frameworks with an impact on the marine environment are listed (by relevant pressures), including the BSAP, the Ministerial Declarations and the national MSFD PoMs.

⇨ Review national implementation situation of the measures of these policies in the Baltic Sea countries, based on information at the HELCOM level on the implementation of the BSAP, and at the national level from national implementation of the EU environmental policies, including the MSFD. It includes collecting information on the implementation status of the measures (implemented, partly or not yet implemented) and other aspects to evaluate certainty of their implementation in the BAU timeframe.

⇨ Develop the list of measures of the existing policies to be included in the regional BAU following a regionally agreed approach, based on the analysis above, including:
  o implemented measures of the BSAP, the Ministerial Declarations and other policies (1a measures)
  o measures of other policies that have not yet been (fully) implemented but can be assumed to be implemented in the BAU timeframe with high confidence (political decision on the implementation has been made, mandatory legal status, content of the measure is clear, no significant obstacles for its implementation) (1b measures)
  o new measures of the 1st MSFD PoMs where they correspond to the characteristics of the measures above (1b measures).

Information sources

⇨ Inventories and databases of the international policy frameworks and their measures with an impact on the marine environment. Examples:
GES-REG Pakalniete K., Muraško A. (2013a) "*Database-tool on "baseline policies" for the MSFD Program of measures".* Output of the project of the Central Baltic INTERREG IV A Programme 2007-2013 "Good environmental status through regional coordination and capacity building" (GES-REG) (available at http://gesreg.msi.ttu.ee/en/results).

Results of an on-going EC project "BLUE2" on a database of policy measures for protection of inland and marine waters in Europe (available at http://ec.europa.eu/environment/blue2_en.htm).

⇨ Information on national implementation status of the measures of the BSAP and Ministerial Declarations:
HELCOM Explorer – an internet portal How far have we come in implementing the Baltic Sea Action Plan? (2016) (available at http://maps.helcom.fi/website/HELCOMexplorer/index.html).
On-going review at HELCOM for the Ministerial Meeting in 2018.

⇨ Information on national implementation situation of the existing policies:
Information from the Member States' work on development of the MSFD Programmes of Measures.

4.2.2 Assessing the effect of existing policies

The assessment of the effect of the existing policies needs to be conducted separately for each relevant pressure included in the regional BAU analysis according to the agreed thematic scope. The effect of recently

implemented, on-going and planned measures should be evaluated (including the new measures of the 1st MSFD PoMs corresponding to on-going/planned measures). The following aspects could be considered in assessing the policy effectiveness:

- addressing relevant pressure sources: whether the set of measures addresses the relevant sources of the pressure (human activities) which are not sufficiently covered by already implemented measures (according to the linkages between activities and pressures, see section 4.2),
- effective "policy mix": whether and to what extent the set of measures for the given pressure create an effective policy mix to reduce the pressure from these sources/activities (e.g. technical measures with concrete effect in terms of reduction of pressure, controlling measures, informational and awareness raising measures – effective mix can be source- and pressure-specific), and
- implementation effectiveness of the measures: whether the measures are expected to be implemented by the target year, or whether there is an indication of possible implementation gaps necessitating improvements in the implementation.

Evaluation based on the aspects above enables the assessment of the joint effect of these measures in terms of expected changes in the pressure. The effects should be assessed at least qualitatively based on expert judgement (e.g. no changes, slight improvement, and considerable improvement). Such evaluation of the policies requires input from wide range of specialists, such as policy specialists, environmental experts, economists, and stakeholders. The evaluation could be supported also by summarised information of the effect of individual measures and the policy frameworks based on previous studies e.g. from existing literature, studies, and policy assessments. More advanced approaches for assessing the effect of the measures include semi-quantitative assessment (e.g. using categories with specified percentage intervals) and quantitative assessments using models or tools for assessing changes in the pressures and state.

Full implementation of the existing policies (accounted in the BAU) would result in a state that is close to good status for many descriptors. Thus, more accurate approaches are needed for assessing the effect of these measures to properly estimate the gap between the BAU and good status, as well as the need for additional measures.

Text Box 4.2.2. Assessing the effect of the existing policies

Tasks

⇨ Investigate the needs for quantitative assessments of the effect of measures of the existing policies and develop methods and tools for the quantitative assessments. The pressures where accurate assessments are relevant can be identified based on the gap assessment results using the BAU as the baseline.

⇨ Assess the effect of measures of the existing policies accounted in the regional BAU (implemented, on-going and planned measures) using qualitative or (semi-)quantitative approaches separately for each pressure. The assessment approach may differ across pressures, depending on the availability of information and quantitative assessment tools.

    o Qualitative assessment approach for assessing the effect of the measures can be based on literature review and expert opinion. Structured procedure for eliciting expert judgement is suggested (e.g. specifying relevant aspects of the measures that need to be evaluated by experts for deriving the assessment). The evaluation can be supported by summarised information (knowledge base) from literature and studies. The effect of measures can be assessed using qualitative categories, and describing transparently the used assumptions and uncertainties in the assessment.

    o More advanced approaches include semi-quantitative assessments and quantitative assessments using models or tools for assessing changes in the pressures and state.

Information sources

⇨ Information on the effectiveness of measures for various pressures on the marine environment:

Results of an on-going EC project BLUE2 on assessment of effect of measures (e.g. quantitative assessment approach for assessing the effect, data on effectiveness of measures).

ARCADIS (2012) *Economic assessment of policy measures for the implementation of the MSFD*. Final report and Excel database of a study for the EC DG ENV (Project Nᵒ 11601). Available at http://ec.europa.eu/environment/enveco/water/pdf/report.pdf

⇨ Information concerning measures for specific pressures, examples for marine litter:

ARCADIS (2012) *Pilot project '4 Seas' – plastic recycling cycle and marine environmental impact. Case studies on the plastic cycle and its loopholes in the four European regional seas areas*. Results of a project for the EC (Project No BE011102328).

BiPRO (2013) *Study of the largest loopholes within the flow of packaging material. Annex 6 to the Final Report: Possible Measures and Feasibility Analysis.* For the EC (reference: ENV.D.2/ETU/2011/0043).

Risk & Policy Analysts Ltd. (2013) *Feasibility study of introducing instruments to prevent littering.* Final Report, prepared for DG Environment. Available at http://rpaltd.co.uk/uploads/report_files/j767-1.pdf

4.3   Assessment of changes in the pressures and state and the gap between BAU and good status

Tools and methods are needed for assessing changes in the pressures and state in the BAU due to changes in marine uses and implementation of existing policy frameworks, and for assessing the gap to good status. More detailed information for each element of the assessment is provided below.

Approaches for assessing changes in the pressures and state may differ for various descriptors of good status, for instance, eutrophication and alien species. The results should as a minimum include a qualitative assessment of the expected trends in the pressures and the state, i.e. whether the changes in uses and pressures lead to deterioration, improvement or no change for each good status descriptor. The need for more quantitative assessment could be discussed in the future, for instance, to serve as input where the size of the gap between the BAU and good status should be estimated to set appropriate additional measures for achieving the good status.

For the assessment of the gap between BAU and good status, a regional assessment approach needs to be developed. As a minimum, a qualitative judgement of whether there is a gap between BAU and good status, accounting for changes in the BAU, should be provided. The needs and a possible approach for quantitative gap assessment should be investigated in the future.

Text Box 4.3.1. Assessment of changes in the pressures and state and the gap between the BAU and GES

Tasks

⇨ Investigate the need for quantitative assessments of the changes in the pressures, state and the gap to good status. Develop methods and tools for the quantitative assessments where relevant. Quantitative assessment is relevant for pressures and descriptors of good status where accurate estimates on compliance to the good status and size of the gap are needed for planning of future measures.

⇨ Prepare regional assessment of the changes in the pressures and state in the BAU using qualitative or quantitative approaches. The approach may differ across pressures and descriptors of good status, depending on the availability of environmental information and quantitative assessment tools.

  o The qualitative approach should, as a minimum, provide assessment of expected future trends in the pressures and state (accounting the changes in activities and effect of the BAU policies).

  o The quantitative approach should rely, as much as possible, on existing models and tools.

  o All approaches must address uncertainties in the assessments (e.g. by elaborating alternative scenarios, assessing confidence level).

⇨ Develop a regional approach for assessing the gap between BAU and good status, accounting the BAU as the baseline, and prepare such assessment (according to MSFD GES descriptors and HELCOM CORE indicators) to assess the need for additional measures.

Information sources

⇨ Input information for assessing the changes come from the previous steps of the BAU development (e.g. assessments of the future changes in the activities, effect of the policies included in the BAU).

⇨ Existing Baltic Sea regional models and tools for assessing pressures and state. For example: The Baltic Sea Impact Index (BSII) and Pressure Index (BSPI), available at: https://portal.helcom.fi/meetings/BalticBOOST%20Theme%203%20WS%201-2016-362/Related%20Information/BSEP125%20extract.pdf

⇨ Qualitative assessment approaches for assessing the gap to good status, for example:

The approach assesses the risk of failing GES according to the MSFD descriptors, as well as the confidence of the risk assessment. It uses specified assessment categories and expert judgement. Developed for the MSFD PoM in Latvia (available at http://www.lhei.lv/attachments/article/133/Projekti-Prieksizpete_JSD_PP_Nosleguma%20atskaite_20141222_gala.pdf), adapting the approach developed by the EU research project ODEMM (Options for Delivering Ecosystem Based Marine Management) (www.liv.ac.uk/odemm); Breen P. et al. (2012) An environmental assessment of risk in achieving good environmental status to support regional prioritisation of management in Europe. Marine Policy. Vol.36: 1033-1043.

4.4   Timeframe of the regional BAU

The time period covered in the BAU should extend to at least the target year of achieving good status (2020 for the MSFD and 2021 for the HELCOM BSAP). However, the BAU can also extend beyond this year, for instance, to allow the potential impacts of existing policies accounted for in the BAU to be fully reflected. The BAU time period should, in either case, be consistent in the whole marine region (WG ESA 2010).

For the on-going national assessments (the updated MSFD Initial Assessment) and regional assessment (HELCOM HOLAS II), 2014-2016 are used as base years. The number of years until the target year (5-6 years) is a rather short time period for significant changes in human activities. Thus, analysing the future changes for that given time period could have limited usefulness. It is also possible that impacts of measures of existing policy frameworks with on-going or planned implementation are only visible after a longer time period. Thus, using an additional longer time period, e.g. 2030, for the BAU assessment is useful. The year 2030 is aligned with the end year of the next MSFD planning cycle (2027) and renewed HELCOM BSAP, and thus could be an appropriate additional timeframe.

Text Box 4.4.1. Timeframe of the regional BAU

> ⇨   Two time periods are recommended for the assessment of (changes in) the pressures and state and gap to GES – to the year 2020 and 2030.

5   A proposal for the regional BAU work for the revision of Baltic Sea Action Plan

This report has shown, that the BAU is needed for the proper assessment of reaching good status by a target year. The experience on developing and using BAU scenarios in national assessments varies. The need for BAU has been made more apparent by the EU MSFD process. This imposes a challenge on how to develop a regional BAU that can be used to assess our achievement towards Baltic Sea Action Plan targets. The challenge is very acute, as the first BSAP (2007-2021) is approaching its target year and the new revised BSAP will be developed during the last years prior to the end of the current action plan. The new BSAP II timeframe is yet to be decided, but in case it follows the existing pattern, it would aim for the improvement during the next 15 years (2021-2035).

The main steps towards regional BAU are summarised as follows:

1) Identification of national BAU experiences and results (initially qualitative) for the HOALS II report (data call). A possibility to identify national BAU results is collecting national information via a data call from the countries regarding the updated Initial Assessment. The data call to complement the socio-economic analysis in HOLAS II report focuses on the following data: 1) on the use of marine waters; 2) cost of degradation for the EU MSFD Initial Assessment in 2018, and 3) on the business-as-usual (BAU) scenario in the national assessments.

The BAU related questions focus on the future changes of human activities assessed at the national initial assessments prepared for MSFD. The list of human activities is provided and the questions are:
- Are future changes in the activity assessed?
- What are the expected future changes (trend)?
- Which assessment approach has been used? (Please specify for "Other")
- What time period is used for the assessment?
- What types of information sources are used for the assessment?

The data call will not cover the projected impacts of existing policy frameworks on human activities and the pressures and state of the marine environment. Such an overview could be carried out during the BSAP revision and preparatory process, and could be in line with MSFD Programme of Measures development process.

Additional information about the BAU is requested under the cost of degradation section of the data call. Contracting parties are asked to specify whether the BAU is used as current state or BAU scenario. In addition, what assessment approach for CoD has been used (qualitative, quantitative and non-monetary, monetary, various, other).

2) Consultation with the sea region ESA and GES experts on a proposed methodology for the regional BAU

The consultations will aim to discuss and further refine the regional BAU development methodology. This report (Deliverable 3.3), along with developments related to step 1 can serve as a base for consultations. The documents can be sent out to the ESA experts of HELCOM network, as well as the natural scientists working on the processes at the national level. Feedback can be collected during a future HELCOM workshop. Participation by both social scientists (namely economists) as well as natural scientists is key due to the integrated nature of BAU, as a large part of its development lies in the natural sciences (the assessment of changes in pressures and state). Joint workshops will also further promote integrated regional scale work.

3) Plan for a regional fit-for-purpose cost of degradation analysis and results for HOLAS III report. Conducting such studies for selected significant activities and pressures and/or good status descriptors for the use of the BAU in the regional cost of degradation analysis and future MSFD Programme of Measures and/or BSAP II.

In SPICE (2.2.3), an illustration for D2, the introduction of alien species and D2, was provided. However, further refining the proposed methodology and highlighted relevant issues to move towards the regional BAU development is needed. The selection of the topics for the regional studies shall be discussed during the preparatory process for BSAP II and based on the updated results from the HOLAS II report.

4) Plan for developing a regional quantitative BAU scenario for a selected significant human activity in HOLAS III report. Developing a regional "work plan"/ roadmap for future work in the period 2018-2021 or longer to prepare a sufficient information base (e.g. input assessments, assessment methods and tools) for the regional BAU development.

A work plan can, for instance, follow a basic management cycle model, similar to which has been applied to the MSFD. Here, HELCOM HOLAS can be seen as the equivalent of the MSFD Initial Assessment and the HELCOM Baltic Sea Action Plan can be seen as the counterpart to the MSFD Programme of Measures.

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Annex 1: Comparative analysis of the BAU in the previous round of national Initial Assessments and Programme of Measures

Table 1 An overview of BAU elements based on national level Initial Assessments (IA) and Programme of Measures (PoM). Note: CoD refers to Cost of Degradation. (Source: Based on Pakalniete and Murasko, 2012 and expert knowledge of SPICE project partners)

Characteristics of the assessments	Sweden	Finland	Estonia	Latvia
1) The sectors and their future changes which are assessed	Only marine-based sectors. Significance of sectors is assessed based on their impact on ecosystems.	Sectors benefitting from the use of the sea and having an impact on sea.	Sectors benefitting from the use of the sea and having an impact on sea quality (land and marine)	Relevant land and marine based sectors creating pressures on the national marine waters.
2) How the existing policies are considered in the BAU development	Fully: significant policies regarding activities impacting the sea identified and assessed for effectiveness.	Partially: existing policies partly considered (for eutrophication BAU)	Fully: existing policies for some activities considered in assessing future trends in IA. Effect/impact of these policies assessed during PoM.	Fully: existing policy frameworks, requirements and measures for improving the state by 2020 reviewed and their effect on changes in pressures and state assessed. The effect/impact assessed qualitatively for PoM based on expert knowledge.
3) For which pressures the changes in the BAU are assessed	Physical damage, loss, disturbance Contaminants Oil spills Nutrient and organic matters enrichment Biological disturbance	Nutrient pollution	Not analysed in IA, but later in PoM for all pressures by expert judgement.	For selected pressures as part of IA (e.g. extraction of fish species, nutrients pollution, risks of oil spills) and for all pressures as part of PoM.
4) For which GES descriptors the changes in the state in the BAU are assessed	(D1) Biological diversity (D5) Eutrophication (D8) Concentration of contaminants (D10) Marine litter	(D5) Eutrophication	Assessed for all descriptors during PoM	For D3, D5 and D8 as part of IA; for D2, D3, D5, D6, D8, D9, D10 as part of PoM.
5) Whether and how the BAU results are used for CoD	CoD interpreted as a gap between the BAU and GES in all countries.			
6) How the gap to GES (accounting the BAU results) is assessed for developing PoM and what is used as a baseline	Qualitative expert assessment to assess the need for measures. BAU has been used as the baseline for the gap assessment.	Evaluation was conducted in working groups preparing the PoMs. The current state has been used as the baseline.	Suggested list of new measures during PoM developed by experts, consultations with policy officers and public hearings.BAU has been used as the baseline.	Assessed applying specified methodology, with specified assessment categories (high, moderate, low risk of failing GES and confidence of the risk assessment), using expert opinion. Assessment by descriptors (for D2, D3, D5, D6, D8, D9, D10). BAU has been used as the baseline.
7) The timeframe of the BAU	2020	2020/2021	2020	2020