

OSPAR CEMP Guidelines

Common Indicator: Changes to non-indigenous species communities (NIS3)

(OSPAR Agreement 2018-04)¹

This OSPAR biodiversity indicator is still in the early stages of implementation and as a result of iteration and learning, it is anticipated that there will be evolution of the methods and approaches documented in the CEMP guidelines. Version updates will be clearly indicated and be managed in a phased approach via ICG-COBAM through its expert groups and with the oversight and steer of BDC.

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¹ This document exists in English only

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1 Introduction

Non-Indigenous Species (NIS) are organisms that have been introduced outside of their natural range as a result of human mediated activities (e.g. shipping, aquaculture, recreational boating). NIS can threaten the balance of a local or regional ecosystem, and can displace indigenous species through competition for food, space and resources, by predation or the introduction of disease. At global scale, human-mediated introductions are responsible of biotic homogenization. Invasive NIS are a subset of established NIS which have spread, are spreading or have demonstrated their potential to spread elsewhere, and have an adverse effect on biological diversity, ecosystem functioning, socio-economic values and/or human health in invaded regions. Globally, invasive NIS are considered one of the most important threats to biodiversity after habitat loss. In recognition of this NIS are one of the pressures on the marine environment being addressed under the Marine Strategy Framework Directive (MSFD), where descriptor 2 states that ‘NIS introduced as a result of human activities are at levels that do not adversely alter the ecosystem’.

Preventing the introduction of NIS is currently considered the only feasible management option in the marine environment. This is a result of limited practical and cost-effective means of eradicating or controlling NIS in the marine environment. Efforts under the MSFD are therefore focused on limiting environmental pressure of NIS by reducing the rate of their introduction and spread by managing pathways through which NIS move. A similar approach is also the main driver behind the alien species regulations (EC regulations 1143/2014).

The MSFD aims to link a programme of measures to reduce human pressures on the marine environment, in this case the introduction and spread of NIS, and a monitoring programme implemented with the view of determining the effectiveness of the programme of measures. The indicator presented within this document takes a pragmatic approach to assessing changes to the community of NIS within the OSPAR marine region. The indicator examines 3 parameters (P1-3):

1. **The “New Introductions” parameter**, P1, quantifies new NIS records in the assessment area during the assessment period. Simply, it is a measure of the number of NIS identified and reported for the first time in the assessment area (i.e. not previously present) during the assessment period. Relative change in this parameter seen over subsequent assessment periods facilitates assessment of this pressure on the marine environment and may be used to evaluate the effectiveness of measures aimed at preventing or reducing the introduction of NIS and their spread across areas.
2. **The “Community abundance” parameter**, P2, quantifies the relative change in the total number of NIS (not the number of individuals) present in the assessment area between assessment periods. This parameter provides insight into the persistence and stability of NIS populations in the assessment area. In addition, it facilitates the evaluation of eradication measures, undertaken where appropriate.
3. **The “Dispersal” parameter**, P3, quantifies the relative change in the number of discrete locations a species is found within the assessment area between assessment periods. Comparison of P3 scores between assessment periods can facilitate assessment of speed of spread and potential effectiveness of eradication. Calculation of a mean P3 score, in addition to assessment of P3 scores for individual species, provides an overall indication of how species distributions are changing.

These 3 parameters provide a means of determining the effectiveness of a programme of measures aimed at reducing the number of NIS being introduced, becoming established and spreading. This indicator

provides a framework for the assessment of Good Environmental Status (GES) under the MSFD with respect to NIS. While it incorporates three discrete parameters, assessment of GES, at least initially, will be based on P1, New Introductions. With the further development of monitoring programmes and the gathering of more robust data, assessments using the other parameters will be made feasible. Where possible flexibility has been built into how the indicator is applied. Flexibility in implementation accounts for the fact that Contracting Parties may be at very different stages with respect to NIS monitoring and data collection. In addition, a minimum requirement for information with regard to new NIS introductions only, may relieve pressure on Contracting Parties who have limited financial resource, while still enabling effective and comparable GES assessment across the OSPAR region.

Assessing the effects of introduced species is covered by criterion 2.2 (2010/477/EU). However, this requires intimate knowledge of their interactions with the local ecosystems, which often is unavailable or very difficult to demonstrate without significant investment. In addition, the likelihood of reducing the impact of established NIS through a programme of measures is considered low. Therefore, the environmental impact of NIS is not addressed in this indicator.

While currently there is limited monitoring for NIS in the marine environment, this is increasing, allowing for more robust and in-depth assessments to be conducted. Furthermore, with increased regional co-ordination of monitoring and data management, assessments will become more standardised with less need for interpretation of results.

2 Monitoring

2.1 Purpose

The indicator presented in this document relates to the MSFD criterion 2.1.1 (2010/477/EU):

‘Trends in abundance, temporal occurrence and spatial distribution in the wild of non-indigenous species, particularly invasive non-indigenous species, notably in risk areas, in relation to the main vectors and pathways of spreading of such species.’

The assessment is conducted from a baseline of those NIS currently present within the assessment area. In order to implement this indicator, two minimum requirements need to be met:

1. NIS baseline
2. Monitoring programmes able to detect established and introduced NIS

In order to implement this indicator, a list of NIS already present within the marine waters of Contracting Parties needs to be drawn. Published and grey literature, historical database entries and data from baseline monitoring for NIS, prior to the first assessment period, will contribute to this list. With each new assessment period, introductions from the previous assessment period will be added in order to create a ‘live’ baseline.

Monitoring capable of detecting newly introduced NIS, as well as those already present, is required to quantify the number of new NIS introductions, assess NIS community abundance and determine spread. The indicator does not specify methods to be used for monitoring. However, it is worth noting that monitoring in high risk locations such as ports and marinas will enhance detection of new NIS introductions and therefore may provide more accurate data on which to base assessment of GES. The minimum requirement for monitoring is the identification, recording and collation of data on new NIS introductions (date, location, species).

Quantification of monitoring effort is valuable for the interpretation of indicator assessment outcomes. For example, a relative increase in new NIS introductions, may be an artifact of increased total monitoring effort or increased monitoring effort in high-risk locations, rather than an increase in NIS introductions. Synergy and transparency between Contracting Parties with respect to monitoring effort, collection of data and reporting of data is recommended to aid quantification of effort and interpretation of indicator assessments.

Though, not an explicit requirement of the indicator, the use of species priority list may aid monitoring for new NIS introductions. A priority species list would comprise high-risk species and include species associated with key introduction pathways i.e. shipping, recreational boating, aquaculture. It should also include species already reported in neighboring regions, seas or states but not yet in the targeted area. Rather than attempting to identify and report on all NIS, focusing on a specific set of species may facilitate acquisition of more accurate data on those species. Therefore, a species list may provide a balanced approach to NIS monitoring in a climate with limited resources.

2.2 Quantitative Objectives

Specific targets are required to determine whether, based on the outcome of the indicator assessment, GES is met or not. The target proposed for the NIS indicator developed here is demonstration of a 'reduction in the rate of introduction and spread of NIS', which should be standardized by the monitoring effort as pointed in the previous section. Targets have yet to be developed for the other parameters, but will likewise be qualitative in nature, and be of a similar nature, i.e. a reduction in the rate of spread or increase in NIS community, being relative to a baseline point. For some MSFD descriptors and associated indicators explicit quantitative thresholds can be easily set. However, in the absence of detailed information regarding the current status of NIS, and while NIS monitoring in a number of locations is in its infancy, determination of a quantitative target for achievement of GES in relation to NIS is problematic. Though flexibility within the indicator means that Contracting Parties can adopt their own quantitative threshold, such a threshold is not defined within the indicator.

The indicator depends on a baseline survey of NIS in the assessment area which aims to detect the presence of NIS. By comparing the change in numbers of new NIS introductions recorded over the assessment period a rate of introduction can be calculated. In addition to assessing the rate of introduction, the total NIS composition is determined to assess monitoring, control and eradication effectiveness. This will provide a more detailed assessment of the data highlighting possible pathways of concern or monitoring anomalies. Also, by comparing several monitoring stations within the assessment area, information about the secondary spread of NIS will be collected.

2.3 Monitoring Strategy

A baseline assessment of the extent of NIS within the assessment area will provide a reference point against which the success of a programme of measures can be estimated. Data from a range of sources e.g. research and development projects, implementation of the Ballast Water Management Convention Risk Assessments, other risk assessment processes and from dedicated monitoring should be used to develop a distribution list of NIS for use as a baseline. From this baseline, any further introductions, changes in community and spread of NIS will be considered.

It is impossible at this point in time to specify exact monitoring requirements for this indicator, but rather this indicator provides a framework of common ground on which to build more detailed requirements, while recognising and accommodating the range of monitoring efforts that are likely to be applied by Contracting Parties. There are several methods that can therefore be adopted and be applicable to this

indicator, such as, a dedicated NIS monitoring programme, a risk based approach (focusing on high risk locations only), or the use of existing monitoring programmes that have been modified to facilitate detection of NIS. It is however, imperative that locations at high risk from the introduction of NIS, particularly invasive NIS, are monitored.

Certain elements of the indicator are deliberately open to interpretation to allow Contracting Parties to adapt them to their needs and current situation (e.g. monitoring methods and species to be monitored). The indicator provides a framework to ensure that there is a common basis for a regional approach to assessing descriptor 2 of the MSFD, ensuring a degree of comparability between contracting parties and regions.

2.4 Sampling Strategy

As with the monitoring strategy it is not possible to specify the sampling strategy for this indicator at this point in time. Currently all sampling strategies suitable for the detection of marine NIS should be utilised. Ideally monitoring should focus on the main introduction vectors and points at high risk of introduction (i.e. in harbours, marinas and aquaculture sites). Focusing monitoring at these locations will optimise the potential for timely detection of new introductions allowing for a rapid response to their introduction. Moving forwards we should attempt to standardise the monitoring methods used across the region.

2.5 Quality assurance/Quality control

Currently there is no specific QA/QC process, although data sources from Contracting Parties is subject to internal processes.

2.6 Data reporting, handling and management

Reporting will be conducted every 6 years, but assessments can be conducted between years at any point during this period. Reports will be submitted to OSPAR by Contracting Parties every reporting period. Data handling and management will need to be agreed as the indicator is developed further. Data management and handling will be further developed over time. Several databases exist at an EU level which may be of use, but this needs to be examined further. A process whereby base-lines for the region and/or Contracting Party are maintained and up-dated need to be agreed.

3 Assessment

3.1 Data acquisition

Currently data is being provided on request from each Contracting Party and supplied to the indicator leads. The data flow process within each Contracting Party will need to be organised internally. Data handling and reporting at an OSPAR level will be agreed upon and formalised, preferably this should be aligned with similar processes being established on an EU level.

3.2 Preparation of data

Data requirements for this indicator are very simple- date, geo-reference and species detected. There should be very little requirement for data preparation if data has been recorded and reported

appropriately. At year zero, NIS presence and their distribution will be recorded on the baseline list. This baseline list will be established by a range of available data, including existing statutory monitoring, information from research projects, data from neighbouring countries and other sources. Assessments using the parameters can be made from the baseline list during and at the end of each reporting period. Baseline lists will be up-dated at the end of each reporting period so that new introductions are not reported in more than one reporting period. The baseline list should be up-dated based on information provided by P1 and P2. From the Table 1, below, summarises the parameters and their calculation.

Table 1. Parameter summary, where t refers to the assessment period, M refers to total monitoring locations and M_s refers to species positive monitoring locations.

Parameter	Description	Formula
1. New Introductions	Number of new introductions within assessment area and assessment period	$\sum \text{new NIS introductions}$
2. Community Abundance	Relative change in total number of NIS between assessment periods	$\sum NIS_{t-1} - \sum NIS_t$
3. Dispersal	Relative change in the proportion of monitoring locations within which the species is found	$\left(\frac{M_s}{M}\right)_{t-1} - \left(\frac{M_s}{M}\right)_t$

For each parameter trends within reporting periods can be examined by a simple comparison between years. While a T-test should be used to examine differences between reporting periods, with multiple reporting periods multivariate analysis (ANOVA) will be used. Further details of how to examine data from multiple reporting periods will be provided with further development of the indicator.

3.3 Assessment criteria

The new introductions parameter (P1) identifies how many new NIS are introduced into the assessment area during and between assessment periods. By quantifying the number of NIS species present in the monitoring location throughout the indicator assessment period this parameter can be used to measure the effectiveness of measures aimed at stopping or reducing the introduction of NIS, both in the short term (i.e. 1 year) and over longer periods of time (i.e. over multiple reporting periods). For example, use of the species parameter to show a reduced trend in the annual numbers of introductions after the implementation of ballast water management measures would enable us to conclude that the ballast water management is an effective management option. This is the only parameter that has been used in recent assessments such as IA2017.

The community abundance parameter (P2) quantifies whether the NIS species composition changes over time and focuses on changes in the total number of NIS. This is important to assess whether recently introduced species persist over a longer period or vanish after, for example, the following winter. The Inventory-Parameter therefore concentrates on the community of NIS and changes therein. The inventory is negative if the number of disappearing NIS is higher than the number of newly introduced NIS. Should there be measures to eradicate unwanted species or NIS in general (e.g. cleaning pontoons in marinas); the Inventory Parameter can monitor their effectiveness. This can provide additional information on management effectiveness at the regional and/or local level e.g. individual marinas or OSPAR region level.

The dispersal parameter (P3) quantifies if an established NIS is expanding or decreasing in range within a specific geographical area. A positive dispersal parameter value indicates that the species is increasing in range coverage within the assessment area and a negative dispersal parameter value indicates that the species is decreasing in range. NIS range may vary over time with natural fluctuation of the species distribution, but also as the species spreads, or in response to management measures.

3.4 Spatial Analysis and / or trend analysis

The scale at which the analysis can take place is dependent on the level of resolution recorded. In theory, if the data is accurately geo-referenced, the analysis can be conducted at the highest resolution of scale used for OSPAR assessments. However, the IA2017 was conducted at the regional level (i.e. Greater North Sea) as the finest scale usable given the data available.

3.5 Presentation of assessment results

The presentation of the results is best kept as simple as possible. Self-explanatory graphs and maps are most effective, but the exact methods are still to be agreed upon.

Specifically, the assessment will include a plot of the number of introductions per year and assessment period for each OSPAR region. In addition, the assessment will include a plot of the cumulative number of introductions per year and assessment period for each OSPAR region. Tables should also provide data on inter-assessment period statistical analysis.

4 Change Management

Responsibility for delivery and follow up of this assessment is through the ICG-COBAM expert group on mammals, which provides input to ICG-COBAM under the Biodiversity Committee, the work is undertaken by the NIS expert group which provides input into ICG-COBAM.