Eutrophication assessment in the context of the European water policies

Gheorghe Constantin
Director
Ministry of Environment, Water and Forests

ECRAN Multi-beneficiary Workshop, Sarajevo, 16-18 May 2016

European policy on eutrophication

- Identified eutrophication as a priority issue for water protection
- There is a need for coordination to achieve a harmonized result for different policy areas
- Use the Common Implementation Strategy of the Water Framework Directive and the European Marine Strategy to provide guidance
- Guidance document on eutrophication assessment has been developed in order to have a common understanding at the EU level

EU coordination on eutrophication

- Harmonization of assessment methodologies and criteria for agreed eutrophication elements/parameters/ indicators for rivers, lakes, transitional, coastal and marine waters;
- Use of water type-specific objectives for biological and general physico-chemical elements;
- Co-ordination of monitoring and reporting;
- Harmonization of models for assessing or predicting anthropogenic or natural nutrient loading into inland and marine waters based on nutrient sources information or nutrient sources scenarios (e.g. EUROHARP models);
- Systematic identification of sources of nutrients and possible restoration measures for water bodies.

OVERALL CONCEPTUAL FRAMEWORK FOR THE ASSESSMENT OF EUTROPHICATION

- The need, requirements and principles of a common conceptual framework

  -capture the commonalities in the process and manifestations of eutrophication in different water categories, and should also provide the means of linking the "process" of eutrophication (i.e. a rate process) to the requirements of the WFD for assessing ecological status of all surface water bodies

  -provide a suitable means for developing category-specific checklists as a basis for the classification assessment and for specifying monitoring requirements

- Description of the conceptual eutrophication framework

  -define models which link the cause (i.e. nutrients) and effect (e.g. excessive algal growth) of the eutrophication process

  -provide the understanding of the complexity of the eutrophication process, not only for the assessment of ecological status of a water body, but also for planning appropriate mitigation measures

Commonalities under the conceptual framework

- Aspects of the process that may be common to all aquatic environments include:
  - -Nutrient enrichment;
  - -Enhanced primary production/biomass;
  - -Algal blooms;
  - -Changes to taxonomic composition of algae/ plants;
  - -Effects on light climate and hence on biota;
  - -Increased fixation of carbon;
  - -Decreased/increased oxygen levels, possible anoxia and consequent effects on biota;
  - -Reduced diversity of benthic fauna

Assessment methodologies and criteria used for lakes water quality status classification

- Most commonly used assessment parameters are chlorophyll a, total phosphorus (TP) and Secchi depth
- For the indirect effect criterion it is used oxygen saturation
- Impacts were measured based on nutrient concentrations (phosphorus and nitrogen) with occasional examples of the use of direct effects (chlorophyll a) to supplement them
- Assessments are based on phytoplankton and macrophyte responses to nutrients

Assessment methodologies and criteria used for river water quality status classification

- Assessment of the degree of eutrophication in rivers to date has been primarily determined through the application of nutrient (phosphorus and nitrogen) concentration criteria with the occasional supplementary use of metrics indicative of direct effects (chlorophyll a and changes to phytobenthos and macrophyte communities
- For indirect effects is used dissolved oxygen concentration and changes to benthic invertebrate communities criteria
- Impact criteria are based on nutrient concentrations (phosphorus and nitrogen). The most commonly used impact criteria were TP and orthophosphate
- For rivers, the eutrophication assessment is based on biological quality elements are mainly phytobenthos, macrophytes and, where appropriate, phytoplankton and macrozoobenthos.

Assessment methodologies and criteria used for transitional water quality status classification

- The measure of state comprises metrics for physico-chemical (dissolved oxygen) and direct biological response determinants. These includes chlorophyll a, oxygen saturation, total nitrogen and total phosphorus
- The impact criteria is based mainly on nutrient concentrations and chlorophyll a (direct effect) and occasionally on dissolved oxygen, macrovegetation
- The assessment method use phytoplankton, macroalgae and angiosperm biological quality elements in relation to nutrient pressure and that macroinvertebrates and fish (in transitional waters only) are used in relation to oxygen depletion.

Assessment methodologies and criteria used for coastal water quality status classification

- The measure of the state include nutrient enrichment, some measurement of direct effects of nutrient enrichment (phytoplankton chlorophyll a, macrophyte vegetation, and other biological elements) and indirect effects of nutrient enrichment (dissolved oxygen, algal toxins, macrozoobenthos)
- The impact criteria were based mainly on nutrient concentrations and chlorophyll a(direct effect) and occasionally on dissolved oxygen, macrovegetation, etc (indirect effects).
- The eutrophication assessment is related to biological metrics (benthic invertebrate fauna quality element) metrics and boundaries representing the phytoplankton quality element (chlorophyll a), metrics representing the macroalgae and angiosperms quality elements

Existing assessment methodologies and criteria used for marine water quality status classification

- Eutrophication is determined according to criteria including nutrient concentration together with direct effects (chlorophyll and other biological parameters) and indirect effects (dissolved oxygen, organic matter, algal toxins, etc.)
- The Marine Strategy Framework Directive 2008/56/EC33 is in force since 15 July 2008 and is require monitoring and assessment tools in relation to the eutrophication-related components of “good environmental status”

Harmonization of classification criteria

- Use of nutrient standards and best practice in deriving them
- Combining information from different quality elements in the assessment of ecological status
- The river basin perspective: linking results of inland waters with transitional and coastal waters
- WFD and marine conventions: coherence of current eutrophication assessment schemes

Monitoring – Guidance and integration of requirements stemming from various obligations

- Specify further which aspects in the existing Guidance on Monitoring are relevant for eutrophication assessment
- Provide guidance on how to harmonize the monitoring in a way to satisfy the requirements in the different directives and regional conventions dealing with eutrophication

Links of eutrophication assessment with pressure and impact analysis and programme of measures

- Use of the D(driving force)P(pressure)S(state)I(impact)R(response) DPSIR framework
- Steps in the development of measures for a water body (or part of marine area) that is eutrophic or may become eutrophic in the near future
  - assess all the sources
  - consider combination of reduction measures
  -consider other measures in the affected body which influence eutrophication
  -decide combination of measures at source or in the water body
- Identification of gaps that need to be addressed