

NAME of model ASSETS	reporter/institute (a): Ana Sequeira, João Gomes Ferreira / IMAR
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Short DESCRIPTION of model:

ASSETS is a screening model that can be used as an integrated approach for eutrophication assessment. This model provides an overall classification of the eutrophication status of the system into five classes: High (best), Good, Moderate, Poor and Bad (worst).

Main state variables:

Nutrient load, chlorophyll *a*, macroalgae, dissolved oxygen, submerged aquatic vegetation, harmful algal blooms.

Scale to which applicable: This screening model is applicable to the ecosystem scale, corresponding in a CSTT scale to zones B and C - Water body and Regional scale.

General description:

ASSETS is an integrated approach for eutrophication assessment. It provides an overall classification of the system by aggregating the results of three diagnostic indices [Bricker et al. 2003]:

1- Overall Human Influence (OHI), an index of pressure using simple mass balance model based on land nutrient loading and system susceptibility;

2- Overall Eutrophication Conditions (OEC), a symptom based evaluation of state calculated by aggregating primary and secondary eutrophication symptoms (using a combination matrix). The symptoms are evaluated using a logical decision process [Bricker et al. 2003] applied to the variables chlorophyll *a* and macroalgae for the Primary Symptoms Method (PSM) and dissolved oxygen, submerged aquatic vegetation (SAV) loss and nuisance and toxic algal blooms for the Secondary Symptom Method (SSM).

3 – Definition of Future Outlook (DFO) an indicator of how conditions in the system will change in the future (eg prediction of conditions) based on expected changes in management and land use within the watershed combined with an assessment of the susceptibility of the system and is graded to five classes (from best to worst): Improve High, Improve Low, No evolution, Worsen Low and Worsen High. A component to evaluate what the management response should be based on present condition and susceptibility is in development.

(<http://www.eutro.org/documents/Slides%20ASLO2005%20SS72%20Response.pdf>)

Forcing data needed: Values needed for field data (or results from research models) on chlorophyll *a*, macroalgae, dissolved oxygen, SAV spatial coverage and nuisance/toxic algal blooms.

Possibly relevant INDICATORS (f)

Chlorophyll *a*, macroalgae, dissolved oxygen, SAV, HABs.

STATUS of model (g)

Origin(ator):

The development of the ASSETS screening model had as starting point the National Estuarine Eutrophication Assessment - NEEA [Bricker et al. 1999].

Present development state (has been tested, under development, etc):

Ria Formosa model: The outputs of a detailed dynamic model that was developed for the Ria Formosa system were used to drive the screening model ASSETS. The application of the

ASSETS model to Ria Formosa (an ECASA system) resulted in a classification for the eutrophication status of Good.

Present use:

ASSETS screening model has been applied to 5 Northern Ireland sea loughs, 5 systems in Portugal, 2 in Germany, 1 in Italy, 138 estuaries in the continental United States and 4 systems in China (www.eutro.org).

Claimed robustness and scientific basis of this:

[Bricker et al. 2003; Nobre et al. 2005; Ferreira et al. 2003] papers can be consulted and serve as scientific basis of the ASSETS robustness.

IMPLEMENTATION OF MODEL

State of implementation (h)

Together with its predecessor this model has been applied to a wide range of estuarine and coastal systems both in the US, EU and China (www.eutro.org).

State of documentation

Mainly web-based (<http://www.eutro.org>) together with journal papers [Nobre et al. 2005; Bricker et al. 1999; Bricker et al. 2003] and reports [Ferreira et al. 2003]

Intellectual property concerns (i)

Model can be accessed online at no charge.

TESTING

Summary of conditions and measurements needed - including critical forcing data (j)

Measurements of nutrient loads, river flows (if applicable) for pressure; chlorophyll a, macroalgae, dissolved oxygen, SAV and harmful algal blooms (HABs) for state. Response is commonly evaluated heuristically.

Criteria for model rejection

Insufficient data.

OTHER models

Used with this model (k)

EcoWin2000 model (see model description template) as a source of detailed results and for scenario analysis.

Similar models (l)

OSPAR COMPP, CSTT, FjordEnv

References

1. Bricker, S. B, Clement, C. G., Pirhalla, D. E, Orlando, S. P., and Farrow, D. R. G. National Estuarine Eutrophication Assessment. Effects of nutrient enrichment in the nation's estuaries. 1999. NOAA - *NOS Special Projects Office*.
Ref Type: Report
2. Bricker,S.B., J.G.Ferreira, and T.Simas, 2003. An integrated methodology for assessment of estuarine trophic status. *Ecological Modelling* **169**: 39-60.
3. Ferreira,J.G., T.Simas, A.Nobre, M.C.Silva, K.Schifferegger, and J.& Lencart-Silva, 2003. Identification of Sensitive Areas and Vulnerable Zones In Transitional and Coastal Portuguese Systems. Application of the United States National Estuarine Eutrophication Assessment to the Minho, Lima, Douro, Ria de Aveiro, Mondego, Tagus, Sado, Mira, Ria Formosa and Guadiana systems., INAG/IMAR.
4. Nobre,A.M., J.G.Ferreira, A.Newton, T.Simas, J.D.Icely, and R.Neves, 2005. Management of coastal eutrophication: Integration of field data, ecosystem-scale simulations and screening models. *Journal of Marine Systems* **56**: 375-390.