

Biogeochemical Budget Models

Understanding material fluxes through the coastal zone is fundamental to LOICZ. The development of budget models for C, N, P across a spread of global sites is a major initiative and can be accessed through the [Biogeochemical Budget site](#), and are also available in database form from the [global typology website](#)

LOICZ- Biogeochemical Modeling Node

Under LOICZ I, the goal was to compile regional carbon/nitrogen/phosphorus data and budget models for numerous coastal areas of the world that can be used to produce global syntheses models of their flux in the coastal zone.

LOICZ II continues to support the approach, to refine the methodology, and to begin to apply it to other coastal management questions. The node is currently housed at the Baltic Nest Institute (<http://nest.su.se/>), a program of the Stockholm Resilience Centre (<http://www.stockholmresilience.org/>).

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BACKGROUND BUDGETARY MODELS IN LOICZ

A model is any simplified description or abstraction of a process.

In science, models are tools that help us conceptualize, integrate, and generalize knowledge. Natural systems such as ecosystems are usually very complex, and models vary greatly in the degree of simplification away from that complexity. "Budget models" are simple mass balance calculations of specific variables (such as water, salt, sediment, CNP, etc.) within defined geographic areas and over defined periods. Usually budget models are built to aggregate the many small individual pieces of a system into smaller sets of pieces which are similar to one another. Thus, all plant species in an ecosystem might be aggregated into "primary producers." Some grouping will occur for almost any model. As one applies a single model across a range of systems, the value of such groupings becomes readily apparent. For some purposes it may be adequate to group all organisms within an ecosystem into the "net biogeochemical reactions" which occur within the system.

One can proceed from these simple, highly aggregated, models to more complicated models which describe specific processes (e.g., primary production as a function of light; sediment transport as a function of river flow, etc.). Many such process models may be further combined into an integrated system model. However, in general, the more complex the model structure, the less statistically robust is the statistical output.

A working group was convened at the Bedford Institute of Oceanography (Halifax, Canada) in September 1995 to draft initial guidelines for modeling within the context of LOICZ. Those guidelines appeared as Gordon et al. (1996): LOICZ Biogeochemical Modeling Guidelines. The interested reader is referred to that document for more detail. Gordon et al. recommended the following activities to initiate modeling within LOICZ:

- Construct many local budget models, following a budgeting procedure which is as internally consistent as possible within the limitations of available data.
- Compare these budget models to seek patterns of similarity or difference in material fluxes.

- Use accepted statistical procedures to extrapolate the flux calculations from budgeted regions of the coastal zone to unbudgeted regions, in order to improve our understanding of material fluxes to and from the coastal zone of the world's oceans.

Subsequent to the preparation of those guidelines, two members of the working group (S. V. Smith, University of Hawaii; F. Wulff, University of Stockholm) were asked to set up a "Biogeochemical Modeling" research node within LOICZ. Preparation of several budgets in addition to the examples reported in the guidelines and ongoing discussion with the LOICZ IPO about how to expedite globalization have led us to develop these web pages. We hope that these pages will provide a ready mechanism to revise and update details of the recommended budgeting procedure, will stimulate the contribution of materials to this effort, and will make the information widely available for use by other scientists. Besides presenting budgets (or literature references to budgets) which closely follow the procedures outlined in the LOICZ Guidelines, we will provide links or references to other budgets which seem both relevant to the present effort and of likely interest to the scientific community. In some cases, several alternative budgets for the same system may be available. Moreover, any budget presented here may be considered "work in progress;" additional information which we find or which readers of these pages provide may allow revisions of the budgets.