

## Budget Tools

---



Nutrient budgets are fundamental constructs in the study of all ecosystems. They improve our ecological understanding by relating biological processes to material fluxes – the essence of biogeochemistry.

### **Biogeochemical budgeting in LOICZ I**

Biogeochemical budgeting of coastal ecosystems was proposed early in LOICZ I and initially formalized as the "LOICZ budgeting methodology" in Gordon et al. (1996).

Nutrient budgets were assembled for coastal ecosystems around the world over the first decade of LOICZ, under the leadership of Fredrik Wulff of Stockholm University, and Stephen V. Smith, then at the University of Hawaii.

The primary goal of LOICZ I budgeting activities was to estimate ecosystem metabolism (net ecosystem production and N fixation - denitrification) for individual systems, and to scale this up with the goal of improving regional and global estimates of these processes to assess their significance to global C, N and P cycles.

The LOICZ typology tools and environmental database provided a useful approach for attempting these scaling.

### **Biogeochemical budgeting in LOICZ II**

Under LOICZ II, budgets provide one approach for linking coastal response ( Priority Topic 1 ) via material fluxes ( Priority Topic 2 ) to human activities ( Priority Topic 3 ).

Budget methodology is hierarchical, leading from water balances, to salt balances, to nutrient balances, generating new information at each step. While the assumption of steady state is often invoked, the procedure does not require it, and given sufficient data can examine changes in space and time as well as steady state conditions. Budgets provide an integrative framework for understanding coastal ecosystem processes, and specifically for integrating data to address questions of coastal science and management including, but not limited to, those asked in LOICZ I.