

6.0 Recommendations for the future of carbon studies within PICES

Over the past four years, PICES, through the activities of its Working Group 13, played a major role in fostering international cooperation among member nations towards the integration and synthesis of the WOCE/JGOFS global CO₂ survey data in the North Pacific. *Appendix A* summarizes the specific activities of the Working Group from 1998 through the end of 2001. The Working Group 13:

- supported CO₂ inter-comparison studies for carbon species;
- developed strategies for exchanging data at the international level;
- promoted collaborative interactions towards the analysis and synthesis of the global CO₂ survey data;
- sponsored several meetings and symposia on CO₂ system dynamics in the North Pacific.

These activities were essential for resolving data synthesis issues and developing strong collaborations for the integration of the large CO₂ data set in the North Pacific Ocean. As we strive to increase our understanding of how the carbon system in the North Pacific will respond to global warming and large-scale climate shifts in the future, there is an increasing need for PICES to continue its focus on carbon system dynamics. Below are several recommendations for future activities that PICES could support to greatly improve our knowledge of the carbon system in the North Pacific.

1. The next phase of carbon research in the North Pacific will involve repeat measurements of carbon system and biological parameters, tracers and hydrography at time-series stations and along repeat sections of the WOCE/JGOFS Global CO₂ survey. These studies are designed to determine the physical, chemical and biological changes controlling the carbon system in the North Pacific, and how these changes affect the ocean's response to climate variability and global warming. PICES should continue to provide a venue for data exchange and program coordination at the

international level to ensure optimal use of resources to obtain appropriate temporal and spatial coverage as well as maximum comparability with historical data. This could be done as part of a joint effort with the Climate Variability and Predictability Program (CLIVAR) and Global Carbon Project (GCP).

2. Little is known about the exchange of anthropogenic CO₂ from the marginal seas to the open North Pacific. In some cases, particularly in the northwest Pacific including the Sea of Okhotsk and Bering Sea, water mass formation in the marginal seas plays a significant role in the formation of Intermediate Water. How anthropogenic CO₂ is ventilated and transported from the marginal seas to intermediate depths in the North Pacific Ocean is the subject of much research by member countries of PICES. PICES should support synthesis activities for carbon system parameters from these regional studies and foster integrated studies between the marginal seas and the open North Pacific.
3. In association with existing Data Centers, PICES should take the lead in developing a North Pacific database for ocean CO₂ and related parameters, and provide advice to Data Centers on which of the available historical data sets should be assigned a high priority for acquisition and conversion to an electronically readable form.
4. PICES should support the preparation of a written *Guide of best practices for oceanic CO₂ measurements and data reporting*, and carry out, as needed, inter-laboratory method comparisons to assure future measurement quality and encourage the availability of suitable reference materials.
5. PICES should continue to sponsor symposiums and/or annual meeting sessions on the impacts of climate change on the carbon cycle in the North Pacific Ocean.