

Postscript for the English Edition

During the last eight years since I wrote this book, the world situation has changed greatly, and people have begun looking even more earnestly to increase the sustainability of society. Along with this, DOW (Deep Ocean Water) has been given more attention. This can be clearly seen in the great increase in the last five years in the number of participants attending the annual meetings of the International OTEC/DOWA (Ocean Thermal Energy Conversion/DOW Association), which changed its name from the IOA (International OTEC Association) in 1995. Also, the Japan DOW Association was established in 1996 to exchange ideas and information, and has quickly expanded in size.

In 1997, the Cyanotech Co. in Hawaii, a producer of health foods and β -carotene from algae, was listed by the US magazine *Business Week* as no. 67 among America's most rapidly expanding companies over the three years 1995 to 1997.

The National Energy Laboratory of Hawaii (NELH) and the Hawaii Ocean Science and Technology (HOST) Park amalgamated to form the NELH Authority (NELHA) in 1990. They have the capability to pump up about 170 kilotons of DOW per day through two major pipelines, 45 and 100 cm in inside diameter and 1.884 and 1.916 km long, respectively, from depths of 619 and 675 meters, and they are planning to install a 140 cm diameter, 3.124 km long pipeline reaching a depth of 915 meters in 2001. There were already 26 private enterprises and research institutes in operation at the site in 1998. Their contribution to the local economy was estimated to have been at least \$30 million per year in 1998.

In Japan, too, two more pipelines have been installed. One, the same size as an earlier one at the Kochi Deep Sea Water Research Laboratory, was installed in 1994, and the other, 25 cm in inside diameter, 2.63 km long and reaching to a depth of 321 meters was installed in 1995. It has a pumping capacity of 3600 tons per day and was installed in 1998 at the Toyama Experimental Fisheries Station in Namerikawa City, Toyama Prefecture. A variety of products including cosmetics, soy sauce, *sake*, *miso* paste, sports drinks, fresh water, bread, noodles, bean curd, and salt have been developed using DOW and successfully marketed. The economy of Kochi Prefecture is estimated to have benefited by as much as \$100 million.

A floating type of DOW pumping station has also been developed by the Okinawa DOW Corporation, and two facilities are now in operation, one pumping water from 600 meters and 1,400 meters at 1,800 meters bottom depth using 5 cm inside diameter polyethylene tube, and the other from 800 meters and 2,000 meters at 2,100 meters depth.

Three more land-based pipelines will be installed by the end of March 2000 with the joint support of the federal and prefectural governments: two of 28 cm and 2.527 km on Kumejima Island, Okinawa, to pump up 13,000 tons per day from 600 meters down, and one of 27 cm and 2,970 km at Muroto City in Kochi Prefecture to pump up 4,000 tons per day from 300 meters down. Both systems will share their DOW resources commercially. All these pipelines are made of polyethylene coated with two extra layers of steel wiring and a plastic covering, the same as the first type installed in Kochi, and will last at least 10 years with minimum maintenance.

Three more pipelines have been scheduled for the early years of the new millennium: two in Suruga Bay, Shizuoka Prefecture in 2002 and one at Nyuzen, Toyama Prefecture. There are more than 10 locations throughout Japan planning to have land-based pipeline systems.

The Japanese Ministry of International Trade and Industry (MITI) has started a five-year project of research and development focusing on the use of DOW as cooling water for such places as electric power plants, which would require as much as one million tons of DOW per day for a 300,000 kilowatt power plant.

The US international project "Blue Revolution 2000" mentioned in this book has been revised and improved. Its idea now is to focus on creating a new fishing area in subtropical open ocean; its name has been changed to "Upwelling Mariculture 21."

Since publishing the Japanese edition of this book, I have been enthusiastically encouraged by Dr. Tom Daniel, the scientific/technical director of NELHA, and several others abroad to translate it into English. Both Dr. Kazuhiro Kitazawa and Mr. Paul Snowden kindly did the work of translation. Mr. Keiji Oshida of the Terra Scientific Publishing Co. has spared no effort to publish the book by getting financial support from the Ministry of Education, Science, Culture and Sport, Japan. Those whom I mentioned in the postscript for the Japanese edition have also kindly permitted me to use their materials in this English edition again. I heartily thank them all.

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On the research vessel, *Hakuho-Maru*
in the Japan Sea