

11. Tasks and Perspective

It is said that the twenty-first century is the Century of Water; the total securing of safe and healthy water resources, beginning with drinking water, is an important task. However, in developing countries in Asia and the Pacific area, water pollution has been accelerating progressively with the increasing human and industrial activities; and it has now reached a critical state. Particularly in recent years, in lakes and marshes, there has been the growing presence of toxic water-blooms that produce microcystins, a designated poisonous substance in the WHO's (World Health Organization) guidelines on the qualities of drinking water. Thus, the problem of securing safe water resources has become an issue of extreme concern. This microcystin is more poisonous than potassium cyanide and has killed a large number of livestock all over the world. In Brazil, it has been confirmed that microcystins have killed human beings. Therefore, worldwide investigation on the actual state of affairs caused by this substance is urgently required. Furthermore, if toxic water-blooms proliferate abnormally, taking in nutritive salts such as nitrogen and phosphorous, they absorb the inorganic nitrogen in lakes and transform it into organic nitrogen, which is found in the cells of algae. That is, they are produced internally, and consequently they become the organisms that are responsible for the COD increase. For this reason, the toxic water-blooms have been indicated internationally as a toxic-substance producing algae as well as the organisms responsible for the COD increase in lakes. In such circumstances, it has also been pointed out, as a technological response to the remediation of water environments and as a measure for treating residential wastewater that occupies 50% to 80% of the overall pollutant loads to a water area, it is essential to implement an energy- and cost-saving, low maintenance-cost, dispersive-type purification system that is not targeted at only one point or purpose. This system also has to be capable of returning onsite, highly-treated water for nourishment, removing nitrogen, phosphorous and so forth, and meeting the conditions of each country.

Therefore, an important positioning is given to the development of bioecoengineering, a hybrid engineering that combines bioengineering as bioremediation engineering and ecoengineering as the engineering of ecology, and to the building of responsive technology that is based on the conditions of each country and the particularities of each area, and that can be widely used and diffused. In other words, effective measures for solving the international water-related problems of the twenty-first century are: to investigate the actual situation relating to the generation of toxic water-blooms in lakes and marshes across the world under different climatic conditions, ranging from the temperate and tropical to subtropical and sub-frigid zones; to develop technology to utilize remediation microorganisms such as microanimals that eat toxic water-blooms; to grasp the properties of discharged wastewater at pollution sources of dispersive, residential wastewater in a basin that is principally responsible for eutrophication; to develop technology for advanced, simple wastewater treatment that includes, among other things, dispersive wastewater treatment septic tanks and soil purification systems as a measure against pollution sources; to develop bioengineering technology to utilize aquaculture, artificial wetlands and large-size water plants such as reeds and cattails; and through all such technology, to create bioecoengineering aimed at energy- and cost-saving, recycle-oriented, easy-to-maintain-and-control water environment remediation technology that is compatible with the reality of each country in Asia and the Pacific area, and to build healthy water environments.

In other words, water environment remediation measures in developing countries of Asia and the Pacific area are the problems and tasks of scientific and technological policies that are based on the national and social needs of each country; and such problems and tasks are common to every country now that it has rivers, lakes and marshes in the areas surrounding cities heavily polluted by untreated residential and industrial wastewater. Thus, for the remediation of such water environment pollution, the introduction of water treatment technology is indispensable. Although some aspects relating to water environment remediation measures and water treatment technology are not common between developed and developing countries, it is essential that for solving these water pollution-related environmental problems, the internationalization of water environment remediation measures be more thoroughly promoted through joint international study for the development and diffusion of measures suitable for each country. In promoting such internationalization of water environment remediation measures, the tasks will be: (1) the cultivation of experts in water environment remediation technology, (2) the cultivation of talented staff in developing countries, (3) the building of a tripartite system among industry, government and academia, (4) the building of an international network and (5) financial aid through ODA, JICA and so forth. The philosophy behind the Basic Environment Law is, "Promotion of global environmental conservation through international cooperation." Thus, internationalization is gaining an increasingly important position; reinforcing and promoting international joint study will further advance the development of technology aimed at energy- and cost-saving, and low maintenance-cost systems suitable for developing countries, and will make it possible to build a sustainable, recycle-based and coexistent system that has less load on the environment. It will also be very important in the future to positively provide international technological assistance and cooperative study to developing countries suffering from worsening water environment pollution, and endeavor to promote water environment remediation measures from a global, borderless environmental perspective.