Environmental Science Research Laboratory

Brief Overview

The Environmental Science Research Laboratory investigates various environmental issues, ranging from those in areas served by individual power companies to those of a global scale, and aims at contributing to their solutions by developing countermeasure technologies.

Achievements by Research Theme

Assessment of atmospheric environment

[Objectives]

To develop a pioneering and rational impact assessment method contributing to the conservation of the atmospheric environment with a view to dealing with diverse environmental issues and contributing to sustained development

[Principal Results]

- Several new models were developed to assist the monitoring of the urban environment and assessment of the atmospheric environment. They are an air quality model, a visible plume model from a cooling tower and a dispersion model for exhaust gas from nuclear power plants.
- The basic performance of the "wind tunnel for turbulent flow modelling", a large facility for basic research, was confirmed. At the same time, efforts were made to develop a new wind tunnel experiment method which takes heat, turbulence and atmospheric stability into consideration.

Assessment of hydrospheric environment

[Objectives]

To develop an assessment technique to solve various problems at reservoirs, rivers and sea areas for the purpose of achieving the efficient management and operation of power plants

[Principal Results]

- To assess the impacts when the sediment discharged by a dam is deposited at coastal marine forests, an experimental formula to predict the lethal probability was developed through an aquarium experiment featuring Lamineria japonica which is a principal kelp species forming marine forests in Japan.
- To verify the applicability of the high resolution oceanic radar developed by the CRIEPI to sea area monitoring, field observation results for the Sea of Ariake and other data were analysed and the impacts of the radio wave, meteorological and oceanographic conditions in the vicinity on the data acquisition rate were clarified.

Biotechnology

[Objectives]

To develop unique as well as competitive environmental conservation and remediation technologies using advanced biotechnology

[Principal Results]

- To economically and effectively remove selenium from the waste water discharged by power stations, a new processing technology (Fig. 1) was developed through a combination of multiple micro-organisms (composite microbe system).
- To develop a soil conditions remediation technology using plants, the demonstration test was continued to breed cadmium absorbing plants and to remove cadmium from contaminated soil using candidate plants.

Assessment of biological environment

[Objectives]

To develop a new ecosystem analysis method which is useful for efficient environmental measures and a technology to control aquatic organisms at power facilities

[Principal Results]

- The scientific and rational ecosystem assessment method developed by the CRIEPI was applied to an actual ecosystem impact assessment and its effectiveness was demonstrated.

・To develop new methods, such a pheromone trap, to control fouling organisms at power stations, a pheromone inducing the settlement of barnacle larvae was identified and purified. The settlement induction effect of this pheromone was verified.

Environmental risk management

[Objectives]

To develop support tools which are required for the management of the environmental risk of mercury and other trace substances

[Principle Results]

・Using the multi- media model developed by the CRIEPI to analyse the transportation of chemicals into the air, soil and water systems, the risk of oral exposure of mercury and other trace chemical substances was evaluated and the health risk exposed by these substances was found to be small (Fig. 2).

・A survey was conducted on the awareness of citizens of their possible inhalation exposure to mercury and other chemical substances with a view to preparing a risk message.

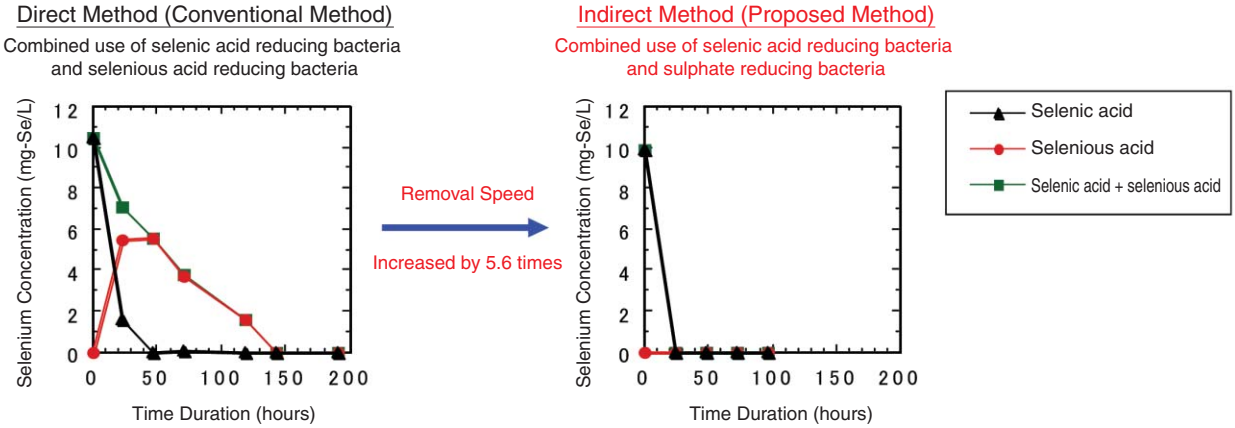

Fig.1 New Method to Remove Selenium from Discharged Water Using a Compound Microbe System
The removal speed of soluble selenium increased by 5.6 times with the combined use of selenic acid reducing bacteria and sulphate reducing bacteria.

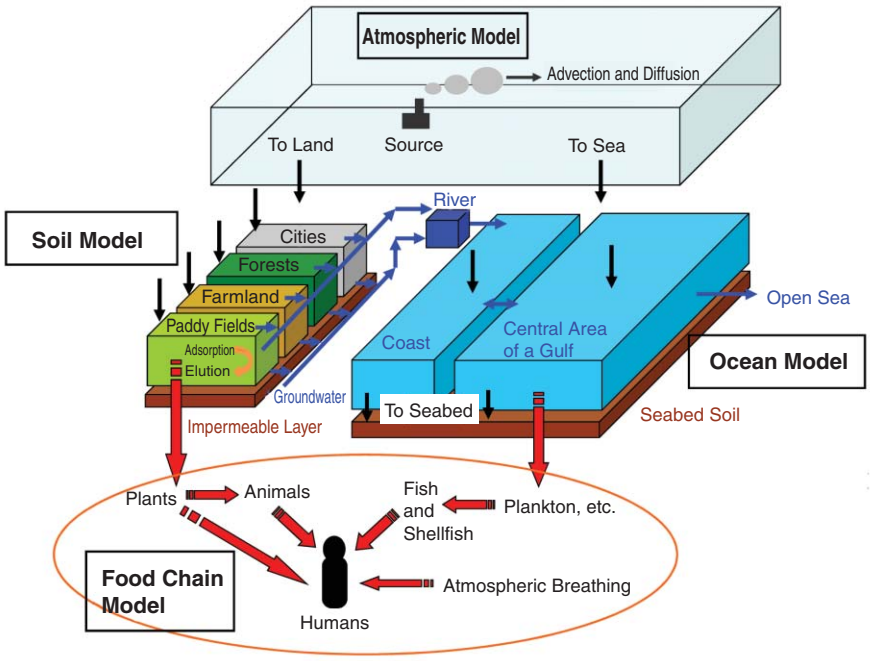

Fig.2 Multi- Media Model to Calculate the Amount of Exposure to Trace Substances
The model consists of sub-models featuring the atmosphere, soil/inland water, ocean and food chain and is capable of calculating the amount of exposure of humans to trace substances discharged by a factory or other sources.