

RED SOIL POLLUTION ON OKINAWA ISLAND, JAPAN, AND THE EVALUATION OF MITIGATION MEASURES -- A CASE STUDY By Angela Dikou¹, and Takeaki Toma²: ¹Marine Science Department, University of the Ryukyus, Senbaru 1, Nishihara, Okinawa 903-01, JAPAN, ²Information Engineering Department, University of the Ryukyus, Senbaru 1, Nishihara, Okinawa 903-01, JAPAN:—Since the late 1960's an unprecedented increase in sedimentation outflow (namely red-soil pollution) has occurred on Okinawa Island, Japan. This paper aims at: 1) Presenting the agents causing the red-soil pollution, the impacts and results of monitoring the pollution; and 2) Presenting and evaluating the administrative and technical measures taken against red-soil pollution. The main agents of red-soil pollution on Okinawa can be divided into natural and anthropogenic ones. Natural factors are affected by the nature of: i) the soil, *i.e.* low permeability and mainly composed of fine particles; ii) the terrestrial area, *i.e.*, proximity of mountains to the shore, and comparatively small rivers facilitating quick discharge of red soil to the sea; and iii) the geomorphology of the sea, *i.e.*, the closed sea around Okinawa island inhibits dilution of red-soil and facilitates its settlement near the shore. On the other hand, the main anthropogenic factors include: i) extension of the agricultural zone, ii) increase in construction activities, *e.g.* dams, roads, tourist facilities, and iii) military activities. Red-soil pollution has had adverse effects on fringing coral reef ecosystems around Okinawa, fisheries, aquaculture, the tourism industry, and underground water resources. The Okinawa Prefectural Institute of Health and Environment has adopted an innovative monitoring method for the content of red soil in benthic samples. It measures the weight of suspended particles in kilograms (kg) contained in one cubic meter (m³) of sea sediment, to obtain an index of red soil pollution. From 1983 to 1991, 560 sites all over Okinawa were repeatedly sampled annually to obtain a status of red-soil pollution along the coasts. The reports indicate that the red-soil content in benthic samples has dramatically decreased, mainly due to the application of mitigation measures and improved environmental politics. The main mitigation measures applied to prevent red-soil outflow include the use of sand-catch ponds, mulching, and contour farming. However, these measures have proven to be inadequate, and cost-ineffective in many cases, *e.g.* sand-catch ponds were helpful in preventing accumulation of coarse particles but not the outflow of fine ones, and mulching is too expensive for individual farmers, necessitating governmental funding of cooperatives. Administrative measures against red-soil erosion from farmland development utilize preventive standards originally set for mainland Japan. However, the standards were inappropriate because of differences in climate, topography, and soil characteristics between Okinawa and mainland Japan. In addition, environmental impact assessments (EIAs) of potential development projects are still in preliminary stages and have not yet yielded satisfactory results. Although the Okinawa Prefecture recently implemented a red-soil prevention ordinance for construction projects, this ordinance acts more as a guide for construction projects than as a law, since neither penalties nor rewards are mentioned. Prefectural research on the status of red-soil pollution and impacts on ecosystems is in the data accumulation stage, and collaboration between various, pertinent sectors is essential. A coastal zone management plan which would integrate the pertinent prefectural offices, researchers, users and an environmentally-aware Okinawan community is needed in order for the problem of red-soil pollution in Okinawa to be managed sustainably.