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Ocean energy potential of the West African region

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PREFACE

Ten years ago the United Nations Conference on the Human Environment (Stockholm, 5-16 June 1972) adopted the Action Plan for the Human Environment, including the General Principles for Assessment and Control of Marine Pollution. In the light of the results of the Stockholm Conference, the United Nations General Assembly decided to establish the United Nations Environment Programme (UNEP) to "serve as a focal point for environmental action and co-ordination within the United Nations system" (General Assembly resolution (XXVII) of 15 December 1972). The organizations of the United Nations system were invited "to adopt the measures that may be required to undertake concerted and co-ordinated programmes with regard to international environmental problems", and the "intergovernmental and non-governmental organizations that have an interest in the field of the environment" were also invited "to lend their full support and collaboration to the United Nations with a view to achieving the largest possible degree of co-operation and co-ordination". Subsequently, the Governing Council of UNEP chose "Oceans" as one of the priority areas in which it would focus efforts to fulfil its catalytic and co-ordinating role.

The Regional Seas Programme was initiated by UNEP in 1974. Since then the Governing Council of UNEP has repeatedly endorsed a regional approach to the control of marine pollution and the management of marine and coastal resources and has requested the development of regional action plans.

The Regional Seas Programme at present includes ten regions^{1/} and has over 120 coastal States participating in it. It is conceived as an action-oriented programme having concern not only for the consequences but also for the causes of environmental degradation and encompassing a comprehensive approach to combating environmental problems through the management of marine and coastal areas. Each regional action plan is formulated according to the needs of the region as perceived by the Governments concerned. It is designed to link assessment of the quality of the marine environment and the causes of its deterioration with activities for the management and development of the marine and coastal environment. The action plans promote the parallel development of regional legal agreements and of action-oriented programme activities^{2/}.

At the third session of UNEP's Governing Council (1975), a number of West and Central African States requested UNEP to study the problems of marine and coastal pollution of their region. As a result of that request, UNEP's exploratory mission visited fourteen States of the region during 1976. The mission's report identified the major environmental problems of the region and recommended the development of a regional action plan for the protection and development of the marine environment and coastal areas of the region.

^{1/} Mediterranean, Kuwait Action Plan Region, West and Central Africa, Wider Caribbean, East Asian Seas, South-East Pacific, South Pacific, Red Sea and Gulf of Aden, East Africa and South-West Atlantic.

^{2/} UNEP: Achievements and planned development of UNEP's Regional Seas Programme and comparable programmes sponsored by other bodies. UNEP Regional Seas Reports and Studies No. 1. UNEP, 1982.

(ii)

After considering the report of the mission, the fifth session of the Governing Council (1977) decided that "steps should be undertaken for the development of an action plan and a regional agreement to prevent and abate pollution" in the West and Central African region.

The preparatory work on the development of the action plan and the regional agreement included several expert group meetings, missions and surveys^{3/} leading to the Conference of Plenipotentiaries on Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region (UNEP/IG.22/7) convened by UNEP in Abidjan, 16 - 23 March 1981 as the final stage of the preparatory work leading to the adoption of the (a) Action Plan for the protection and development of the marine environment and coastal areas of the West and Central African Region, (b) Convention for the Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region, (c) Protocol concerning co-operation in combating pollution in cases of emergency, and (d) a set of conference resolutions.

This document is one of the surveys prepared as a contribution to the development of the Action Plan.

3/ For details see:

- Report of the Executive Director on preparatory activities for an action plan for the protection and development of the marine and coastal environment in the West African Region. UNEP/IG.22/4. UNEP, 1981.
- UNIDO/UNEP: Survey of marine pollutants from industrial sources in the West and Central African Region. UNEP Regional Seas Reports and Studies No. 2. UNEP, 1982.
- UNESCO/UNEP: River inputs to the West and Central African marine environment. UNEP Regional Seas Reports and Studies No. 3. UNEP, 1982.
- IMCO/UNEP: The status of oil pollution and oil pollution control in the West and Central African Region. UNEP Regional Seas Reports and Studies No. 4. UNEP, 1982.
- UNDIESA/UNEP: Onshore impact of offshore oil and natural gas development in the West African Region. UNEP Regional Seas Reports and Studies No. 33. UNEP, 1983.
- UNDIESA/UNEP: Environmental management problems in resource utilization and survey of resources in the West African Region. UNEP Regional Seas Reports and Studies No. 37. UNEP, 1983.

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CHAPTER I: INTRODUCTION

Even though the major current utilization of the ocean area as an energy source in the West African region is in the production of oil and gas from the continental shelf, ocean energy from renewable sources, particularly from favorable areas, could be of major local importance. The present profile of commercial energy production and consumption in the region is dominated by oil and gas. During the period 1971-75, the average annual production of oil and gas in the region accounted for almost ninety-nine percent of commercial energy production. Hydropower and coal accounted for the remaining one percent. The distribution of energy production in the region is also very uneven. Though the general prospects for oil and gas on the continental shelf of the region are quite good, at the present time, production is from only eight of the countries with an overwhelming proportion of it originating from Nigeria. Of the eight producing countries, three are net exporters of primary energy while the remainder are net oil importers.

The fourfold increase in OPEC oil prices in 1973-74 was, therefore, a serious blow to most of the oil importing countries in the region. The oil price rises, world economic recession, and lack of deflationary policies in several of these countries have led to large increases in their current account deficits since 1973. Since imported energy requirements at present consist almost entirely of oil, a reduction in imported oil can be achieved in the short

term only at the expense of a reduction in energy supply and, in consequence, lower economic growth, because non-productive uses of oil (private transport and residential and commercial cooling) are minimal. For the oil importing countries of the region, the new level of petroleum prices has two principal long term implications:

- The development of domestic sources of petroleum that were regarded as uneconomic at pre-1973 prices now prompt endeavors to expand known oil and gas reserves; and
- the development of energy from alternative sources will lead to the substitution of petroleum-based energy supplies.

Within this context, the need for both national and regional ocean based energy development strategies is unavoidable. The main consideration in setting these strategies is a knowledge of the ocean based energy resource endowments. The countries of the region possess ocean based energy resources that are both renewable and non-renewable in character. These energy resources, however, are often either not proven or not fully developed, but these potential energy resources, if developed, could reduce or eliminate the dependence on imported energy.

It is a prime requirement of energy planning to identify these potential resources and plan for their evaluation as a viable energy source. It is in this connection that this study is undertaken, specifically in regard to renewable ocean energy sources. Though it is not expected that renewable ocean energy will replace

fossil energy, the options it offers in the long-term, include the potential of extending the life of nonrenewable fossil and nuclear fuel resources as the power generated from renewable ocean sources may locally substitute for conventionally generated power.

This paper undertakes a general review of ocean energy sources of the region, the state-of-the-art in the development of technology to harness these resources and the potential benefits of ocean energy utilization. The second chapter summarizes the current status of commercial energy production and consumption in the region. Chapters III and IV provide an overview of the region's ocean energy sources and the state-of-the-art in the technology to develop these sources. The final two chapters present proposals for regional action in ocean energy resource appraisal and development.

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