

The SANCOR Programme on Coastal Processes

APRIL 1982 – MARCH 1988

Programme developed under the aegis of the South African
National Committee for Oceanographic Research

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PREFACE

The South African National Committee for Oceanographic Research (SANCOR) programme is one of a number of cooperative research programmes developed by the scientific community in South Africa and managed on their behalf by the Cooperative Scientific Programmes (CSP) of the Council for Scientific and Industrial Research (CSIR). These programmes depend upon cooperation between disciplines for the solution of many and diverse questions. They have also contributed to the increasing awareness by the scientific community of the value of such cooperation.

The objective of the SANCOR programme is to gain knowledge of the basic structures, processes and relationships in the marine environment around southern Africa in order to provide a fundamental scientific understanding and to facilitate:

- the efficient exploration, exploitation and conservation of living and non-living marine resources;
- the judicious management of the coastal zone;
- the fuller understanding of climate;
- improved utilization of environmental information in maritime activities.

The terms of reference of SANCOR are to provide policy and scientific guidance for oceanographic research in South Africa, by designating priorities. Specifically it:

- takes cognizance of actions and developments affecting marine science and technology in southern Africa and promotes communication within the oceanographic community;
- reviews the objectives, priorities and progress of its constituent programmes;
- guides effort by deciding on the funding of its constituent programmes, keeping in mind also the need for balance both geographical and disciplinary;
- ensures that its research findings reach decision makers;
- keeps informed on international developments in marine science, inter alia by acting as the South African National Committee for SCOR and related international bodies.

Within the SANCOR programme the following constituent programmes currently exist:

- Benguela Ecology Programme
- Programme on Coastal Processes
- Marine Linefish Programme
- Marine Pollution Programme
- Estuaries Programme

In addition a programme of research in the open ocean is still under consideration. The coastal zone, within which the Programme on Coastal Processes is concentrated overlaps at least three areas in which other SANCOR research programmes operate, namely estuaries, the open ocean and Benguela ecology. In addition, there are direct links to the research undertaken in the Marine Linefish Programme, the Marine Pollution Programme and to the work on dune fields being undertaken in the National Programme for Environmental Sciences (NPES) Programme on Nature Conservation, as well as possibly also to the Fynbos Biome Project. Furthermore, the National Research Institute for Oceanology (NRIO) is initiating a multi-disciplinary research project on the Agulhas Bank, which, although it is at present not a part of the SANCOR programme, has many similar objectives. It can therefore be seen that the Programme on Coastal Processes is but one component of the national oceanographic research effort of South Africa. Appendix I contains a short summary of the contents and objectives of the above-mentioned programmes.

This publication contains a summary of what the Programme on Coastal Processes stands for, the motivation for the programme, the definition and objectives of the programme, an overview of the research covered by the programme, and sets out those items which are considered specific priority areas for research during the six year period April 1982 to March 1988. However, any research organization is free to submit to SANCOR proposals for any research which it considers relevant to the Programme on Coastal Processes.

Although it was attempted to make this booklet as definitive and precise as is possible with the present available knowledge, it is neither the final word on the subject nor is it static. It is expected that as further research results become available the emphasis and direction of the Programme on Coastal Processes may change.

The progress in the research programme is reviewed annually by the Programme Committee on Coastal Processes. The structure and terms of reference of this committee are given in Appendix II, whereas Appendix III gives guidelines for the submission of project proposals and for the reporting on completed research. The first draft of this document was prepared at a workshop in Kleinmond in September 1981, the names of the participants being given in Appendix IV, and was subsequently developed in consultation with them and other interested marine scientists. Titles of other publications in the series are given in the back of this booklet.

ABSTRACT

This publication outlines the Programme for Coastal Processes as it will exist within SANCOR for the next six years. The programme was drawn up by active researchers in the field and by executives responsible for management in the coastal zone, where the coastal zone is defined as that area within which the processes taking place have a direct bearing on coastal systems. An integrated systems approach is recommended within which physical, chemical and biological aspects and their interactions are to be studied. Processes are identified in terms of input/output to and from the coastal zone, external driving forces (including human interference), basic features (including habitat features) and the responses and interactions within the zone. Priorities for research are recommended. In defining these priorities, emphasis is given to the study of those factors which are most needed for the understanding of the coastal zone as a whole with particular reference to those factors which will aid the understanding of the effect on the environment of human interference.

OPSOMMING

Hierdie publikasie gee 'n uiteensetting van die Kusprosesseprogram soos dit binne SANKON sal bestaan vir die volgende ses jaar. Die program is opgestel deur aktiewe navorsers in die veld en deur persone verantwoordelik vir die bestuur van die kusgebied, waar die kusgebied gedefinieer word as daardie gebied waarbinne die prosesse nog 'n direkte invloed op kussisteme kan hê. 'n Geïntegreerde sisteembenadering word voorgestel, waarbinne fisiese, chemiese en biologiese aspekte en hulle interaksies bestudeer sal word. Prosesse word geïdentifiseer in terme van invoer/uitvoer na en van die kusgebied, eksterne dryfkragte (insluitende menslike invloed), basiese eienskappe (soos habitat-eienskappe) en die effekte en interaksies binne die gebied. Prioriteite vir navorsing word voorgestel, met klem op die studie van daardie faktore wat die dringendste nodig is vir 'n begrip van kusprosesse in hul geheel met spesifieke verwysing na die faktore wat die begrip van die invloed op die omgewing van menslike ingrepe sal verbeter.

LIST OF ACRONYMS

CSIR	Council for Scientific and Industrial Research
CSP	Cooperative Scientific Programmes
DEA	Department of Environment Affairs
GS	Geological Survey
IMT	Institute for Maritime Technology
JLBSII	JLB Smith Institute for Ichthyology
NIWR	National Institute for Water Research
NPB	Natal Parks Board
NPES	National Programme for Environmental Sciences
NRIO	National Research Institute for Oceanology
ORI	Oceanographic Research Institute
PEM	Port Elizabeth Museum
SAM	South African Museum
SANCOR	South African National Committee for Oceanographic Research
SCOR	Scientific Committee on Oceanic Research
SFRI	Sea Fisheries Research Institute
UCT	University of Cape Town
UN	University of Natal
UPE	University of Port Elizabeth
US	University of Stellenbosch

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INTRODUCTION

GENERAL

South Africa has a coastline of about 3 100 km of which about one-third is still undeveloped. The coast is a strong focal point for recreation and will become more so as the population and the standard of living increase. Major industrial development on the coast is concentrated at a few focal points, namely Saldanha Bay, Cape Town, Mossel Bay, Port Elizabeth, East London, Durban and Richards Bay.

The Good Hope Plan for southern Africa, scheduled for implementation in April 1982, sets out a regional development strategy and industrial growth plan for southern Africa. Many of the identified growth points, metropolitan areas and deconcentration areas are situated on the coast.

There are already many signs that our marine resources are being affected by, for example the exploitation and disturbance of the coastal environment. It is therefore, essential to do research on a wide front to facilitate a proper understanding of the coastal zone and the multiple interactions present therein, thereby allowing the establishment of effective management measures. Appendix V gives a summary of present legislation which affects the coastal zone.

MOTIVATION

The coastal zone is a priority area:

- as a result of its intensive utilization by man;
- because it is a dynamic, environmentally sensitive area;
- because research results are urgently needed to allow proper management policies to be drawn up; and
- since it is of scientific interest as the land/sea interface.

DEFINITION OF STUDY AREA

It is not desirable to define strictly a coastal zone. The programme is limited to the study of those **parameters which have a direct bearing on coastal systems**. As such, this loose definition implies:

- a system with open boundaries which may include estuaries, onshore areas and offshore areas whenever they form an integral part of the system under investigation; and
- that the zone could vary in width and could extend from the coastal dunes out across the continental shelf.

OBJECTIVES

The objectives of the programme are:

- to identify the key processes which operate in the coastal zone and to define the factors and understand the mechanisms that control them (in the context of the definition above); and
- to contribute information required for the judicious development, management and conservation of the coastal zone and its resources.

OVERVIEW OF FIELD OF RESEARCH

GENERAL

Coastal processes are, as a matter of convenience, classified into three categories, namely physical (including geological), chemical and biological, which logically leads to three fields of expertise.

Since the processes in each of these three main categories have a direct or indirect bearing on those in the others, this publication recommends an integrated systems approach which encourages combined research projects. In cases where for logistical reasons this is not possible, it asks of researchers to take due cognizance of the research needs of their colleagues in the other disciplines. At the 6th SANCOR symposium it is the intention of the Programme Committee on Coastal Processes to synthesize and evaluate progress with the integrated systems approach to the study of coastal processes as contained in this framework.

The terminology in each of the three categories is different which makes it difficult to combine the discussion of these topics in a uniform way in one document. Nevertheless, the attempt is made. The functioning of the coastal system normally depends in one way or another on one or more of the following factors:

- basic features, for example topography, basement geology, nature of sediment, physical and chemical properties of water masses and the atmosphere and community structure;
- external driving forces, for example astronomical, meteorological, geodynamic, human interference, atmospheric chemical input and radiation intensity;
- input, such as soluble and suspended matter, sediment influx and immigration of animals, mainly via estuaries and the open ocean boundary but also from the atmosphere;
- responses, for example tides, waves, currents, nutrient fluxes, chemical gradients and biological responses such as community functioning and internal controls (physiology/behaviour);
- interactions, for example water/sediment and nutrient/primary producer/animal; and
- output, mainly becoming important when losses occur, such as sediment and nutrient losses and emigration of animals, into estuaries and to the atmosphere or through the open ocean boundary.

The interrelationship between these factors is shown schematically in Figure 1 with examples for each of the main categories (physical, chemical and biological). This figure should be used as background when reading the discussion of the processes below. It indicates the difficulty of defining uniform terminology, for example waves, currents and tides are considered responses in the physical sense but as habitat

features in the biological sense. This subtle change of emphasis should always be kept in mind when using this document.

It is accepted that the essential requirement is to predict changes to the environment. Two approaches are possible, namely:

- the empirical which bases predictions on what has been measured in the past; and
- the deterministic which bases predictions on the theoretical understanding of processes, responses and interactions.

Normally predictions are possible sooner through the empirical approach but then tend to be less reliable.

Research into the physical processes can be undertaken at various levels from a macro-scale (for example external driving forces) through to a micro-scale (for example water/sediment interaction or physiological adaptation).

In addressing the question of priorities in the Programme on Coastal Processes it was recognized that to achieve the objectives of the programme, work would be required at various levels - theory, field, laboratory - and ideally in all three categories into which the programme has been structured. However, it is unrealistic to expect all facets of the research to proceed simultaneously and it is also accepted that in some areas existing information and expertise are more advanced than in others. It is in the light of these considerations that the priorities given below were agreed upon.

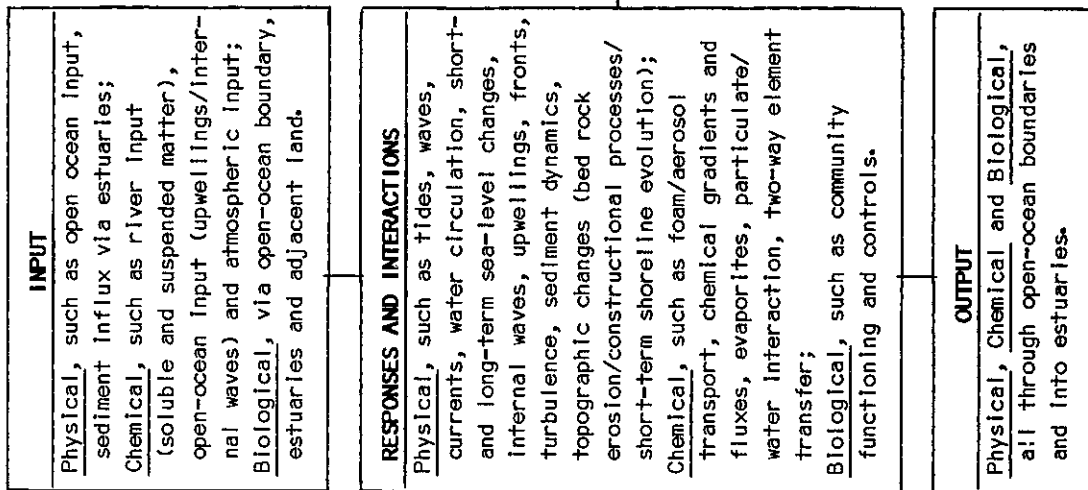


FIGURE 1: GENERAL COASTAL PROCESSES DIAGRAM

PHYSICAL PROCESSES

Air, water and sediment serve as carriers for chemicals and as carriers and habitats for biota. This is but an example why a knowledge of physical processes is basic to the understanding of biological and chemical processes.

In order to be able to predict detailed coastal processes at a particular site extended time series data on basic features, the external driving forces and responses for the particular site will be needed. The interpretation of such information will be aided by the availability of an accurate theoretical framework for the prediction of tide, wave and current motion as well as input to and output from the area concerned. In addition, detailed measurements and theory development are required to understand physical interactions and to allow the extrapolation to future situations of the results obtained.

Basic features, such as topography, geology and water column structure influence the nature of the responses to the external driving forces.

In the physical sense external driving forces can be separated according to the responses they elicit:

- geodynamic forces result in long-term changes (on the scale of years to decades and longer) in, for example *sea level* ;
- astronomical forces cause predictable periodic variations of all *tidal motions* with periods ranging from hours to years; and
- meteorological forces, generate currents and wind, which vary seasonally in a reasonably predictable fashion but also rapidly on a scale of days. Since the wind generates the *waves* which impinge on the coast, the wave motion also contains a predictable seasonal shift of dominant wave direction with superimposed on it, a short-term variation of wave direction and incident wave energy (for example the effect of the regular succession of north-easterly- and south-easterly wave patterns on the Natal Coast). In addition, changes in weather patterns also lead to rain which carries chemicals from the air into the sea and to strongly varying river runoff, which serves as a major input of material via the estuaries to the coastal environment.

The responses printed in italics above are secondary driving forces in the physical sense. The wind, the waves, the tides, the currents and the turbulence generated by them in turn cause the flow of sediment, be it sand or mud, with the biota or chemical substances they contain in the water body and sometimes also in the air. The sediment motion in the sea is primarily confined to an active transport zone which extends from the shore to a water depth of about 15 to 20 m, although wave-driven sediment transport has been observed in water depths up to 80 m and current-driven sediment transport in the Agulhas Current may be substantial in even greater water depths.

Variations in sediment transport cause bottom changes which inherently influence the behaviour - or fate - of biota and chemical substances in and near the sea bed. In turn these bottom changes affect the tides, waves, currents and turbulence.

The impact of man on the environment plays a central role throughout the complex chain interaction of processes, responses and interactions sketched above.

Priorities

Bearing in mind those factors which would have a most direct and immediate influence on the coastal system and with specific reference to the objectives of the programme, priority is given to the understanding of driving forces and responses, with slightly more emphasis on the latter due to the more direct bearing that responses have on the coastal system.

The following items thus need the most urgent attention:

- | | |
|-----------------------|--|
| <u>responses</u> | <ul style="list-style-type: none"> - wave-related nearshore phenomena; - present-day sediment sources/transport/deposition (of interest to biological and chemical processes as well); and - to a lesser extent, tides. |
| <u>driving forces</u> | <ul style="list-style-type: none"> - wave climate; - coastal wind field/fronts/currents; and - geological controls. |

In and around estuary mouths coastal and estuarine processes are closely interlinked. Wave-driven sediment transport in the sea tends to block the estuary mouth whereas the tidal and riverine flow through the estuary mouth tends to flush it. Seeing that the state of the estuary mouth will eventually determine the fate of the estuary and has a bearing on biota in the sea, emphasis should also be given to the study of estuary mouth dynamics. Due to the close interaction between marine and estuarine processes such research could resort either under the Estuaries Programme or under the Programme on Coastal Processes, depending on the emphasis of the particular project.

CHEMICAL PROCESSES

The chemistry of the coastal zone may primarily be seen as an **input** into, **processes** within and an **output** from the zone. This should be seen against the background of Figure 1.

Input: Chemical elements and compounds enter the coastal zone by various routes. Through an aqueous route this may, for example, be via suspended and soluble matter, including nutrients, entering from rivers and estuaries, or from adjacent marine regions.

Particularly during floods, the catastrophic addition of material over a few days may exceed that added by "normal" river flows over several decades or more.

Decaying of detrital matter advected into the system, and diagenetic release of chemical elements and compounds from the underlying sediments into the water, are important inputs into the water column.

Atmospheric input, for example, gas exchange, wet and dry fall-out, followed by mixing into the bulk water is also important in many areas.

Processes within the zone: Many complex chemical processes occur in the coastal zone, for example, at the air/sea interface where poorly understood chemical processes are thought to be important in controlling fluxes in both directions. Aerosol and foam formation are also important.

Uptake of nutrients during photosynthesis occurs in the euphotic zone, and many complex organic molecules are synthesized and later released to the water or retained in biological structures. Bacterial action in the water column releases elements and compounds and converts compounds from one form to another.

Settlement of decaying organic material creates conditions within the sediments which are often anoxic and may lead to large changes in the chemistry of the system, for example, dissolution of previously insoluble material. These processes are further influenced by physical re-suspension and by burrowing organisms. A large chemical flux in both directions occurs across the sediment/water interface. Deeper burial in sediments often is the final repository of chemical compounds on any but geological time scales.

A significant amount of chemical material (organic matter, nutrients and trace elements), entering sediments, undergoes extensive changes in the micro-environments within the sediment. This may then re-enter the overlying aqueous system. Such cycling may drastically alter the chemistry of the coastal waters.

Output: Losses occur via advection of soluble and suspended matter to adjacent marine zones, via aerosol and foam formation to the atmosphere and via permanent burial in the deeper layers of sediments. In arid areas, evaporite formation may remove some material.

Priorities

Priority should be given to three areas of research:

- the characterization of the organic groups present in soluble or suspended matter to gain information on their positive or, in the case of toxins, negative, role in food webs;
- the identification of the forms in which inorganic constituents are present, since reactivity is markedly affected by chemical speciation;

- carefully designed simulations studying specific aspects of coastal chemical processes, such as the mixing of river and sea water in estuarine or coastal environments.

BIOLOGICAL PROCESSES

In the broader sense of the study of coastal processes the structure and functioning of biological communities can be regarded as a response to their abiotic environment. Their understanding thus depends critically on a sound knowledge of the physical and chemical processes involved. Biological processes can be investigated in terms of responses, habitat features and interactions. Against the above background habitat features are mostly physical and chemical in nature, whereas interactions and responses have biotic and abiotic components. There are three mutually complementary approaches to the analysis of the response of biological communities to their marine environment. Within each, it is possible to identify many fields of study in need of research some of which are highlighted below.

The descriptive approach : There are not sufficient data available to adequately describe the structural communities around our coast in terms of aspects like species, species diversity, biomass and food chains. Subtidal communities are particularly poorly understood. A firm taxonomic basis is a necessary start for such work and the following groups of organisms are in need of taxonomic revision, namely: macroalgae, diatoms, ascidians, bryozoa, sponges, nematoda and herpacticoid copepods. Taxonomic research on these groups will be sponsored where the results are needed for the description of a specific community and where such research falls within the broader objectives of the Programme on Coastal Processes.

The dynamic approach : To understand the functioning of a system there is a need to quantify the flow of energy through the various trophic levels of a community and the nutrient cycles present. This should involve more than simply giving numbers to the individual boxes in an energy flow chart and should therefore also focus on individual processes, controlling factors and the nature and rates of transfer between boxes. Specific aspects which should not be overlooked are primary production, micro-organisms and detrital decomposition.

Experimental approach : Emphasis is placed here on hypothesis generation and subsequent testing, so that by attempting to understand why things happen, we may ultimately be able to predict the outcome of given actions and conditions.

Within the framework of these three approaches the following all need attention.

- **Biological interactions** : The interactions between plants and animals, predators and prey and competitive and symbiotic interactions should be studied.

- **Physiological processes** : Both evolutionary and short-term physiological adaptations change the way in which organisms respond to physical and other factors. Amongst other processes, research is needed on photosynthesis, the physiology of feeding, respiration, growth and reproduction. Emphasis should be placed on relating physiological research to the ecology of animals and the plants, rather than on accumulating further isolated observations.
- **Behaviour** : Animals have important behavioural adaptations to cope with their environment. In many cases physiological and behavioural studies should be carried out simultaneously.
- **Life cycle studies** : This will involve descriptive studies on animal and plant groups that have been neglected so far. For instance experimental work on substratum selection, recolonization and succession (especially seasonal effects), quantification of recruitment and survival is required.

In the latter two approaches and in some cases also in the first, the response of the biological components to abiotic factors can only be understood if information is available on habitat features, interaction and input/output to the system.

Habitat features

- The level of nutrients, their nature, transformation, speciation and rates of turnover.
 - Waves, currents, tides and tidal water movement with reference to amounts of movement in selected habitats and transport of materials. There is a need for long-term data and for maxima and minima to be determined in given localities rather than spot readings.
 - **Substratum** : the nature of soft substrata and their transport and stability.
 - **Light** : long-term data are needed on the quantity and quality of light, at different depths, and how it influences plant and animal life.
 - **Oxygen** : Continuous data at different depth intervals are required. Spot measurement usually have little value except under extreme conditions.
 - **Temperature** : Continuous data to determine range, rate of change, seasonal patterns and depth distribution.
- Salinity** : Expected salinity changes are not such that it is normally regarded as an item of high priority.

The relative priority of the various factors mentioned will differ according to the specific system studied. While biologists routinely record some of these factors, specific contributions from physical

oceanographers, coastal engineers, geologists and chemists are needed with respect to nutrients, waves and currents and soft substrata.

Interactions

- Interaction between nutrients, micro-organisms and detritus : What are the rates and nature of nutrient turnover and transformation? It is stressed that an interdisciplinary approach is needed to tackle this problem and that, in particular, microbiologists and chemists need to be involved.
- Animal/sediment interactions : What influence does a substratum have on organisms and how do organisms modify the substratum?
- Oxygen : What influence do current system, decaying material, respiration and photosynthesis have on oxygen availability, and under what conditions does oxygen become a limiting factor for plants and animals?
- Waves and currents : The effects on plant and animal growth of waves and currents.
- Light : The influence of the distribution of light on plants and animals.

Input/Output

- The coastal system has relatively open boundaries and major contributions into the coastal zone as well as losses out of the zone can occur via rivers, the open ocean boundary, the air as well as adjacent land.

Priorities : The research priority of a specific project will depend on the nature and aim of the investigation and it is therefore not advisable to single out specific projects for study at this stage. It should be pointed out though, that studies that emphasize the biological processes that occur in the coastal zone, with specific reference to the interactions between biological, chemical and physical processes, have not received sufficient attention and are therefore encouraged.

PRESENT RESEARCH EFFORT

Research, aimed both at a better understanding of the processes which are operative in the coastal zone and at improving the data base on driving forces and their effect on the coastal environment, is at present being undertaken in the field, in the laboratory and on a theoretical basis. The table below gives an indication of the present research effort. It is clear that such a multiple research input needs to be coordinated to obtain optimum results.

TABLE 1: PRESENT RESEARCH INVOLVEMENT

ORGANIZATION	RESEARCH ON		
	Physical Processes	Chemical Processes	Biological Processes
Geological Survey	A*		
IMT Simonstown	B*		
JLB Smith Institute of Ichthyology			A
NIWR	B	A	A
Natal Parks Board	B	B	A
NRIO	A	A	A
ORI			A
PE Museum			A
SA Museum			A
SFRI	B	B	A
UCT - Analytical Sciences		A	
- Botany			B
- FitzPatrick Institute			A
- Geology	A		
- Physical Oceanography	A		
- Surveying	B		
- Zoology	B	B	A
UN - Botany			A
- Zoology			B
UPE - Botany			B
- Zoology	B	A	A
US - Ocean Engineering	A		

*Level of involvement in the Programme on Coastal Processes:

A - major effort

B - as an adjunct to major effort.

INTEGRATED APPROACH

The need for an integrated approach to the study of coastal processes was accepted as the research premise for the Programme on Coastal Processes at the Kleinmond workshop in 1981. It is elaborated on early in this document, after which the three categories of research, ie physical, chemical and biological, are discussed separately. In conclusion, the integrated approach is again stressed. The central theme in this integrated approach is an understanding of the processes in the coastal zone and the interactions between them with reference also to the effects of human interference on the environment.

Since research in the coastal environment with its frequently hostile breaker zone is costly and the available resources are limited, it is desirable that research be concentrated at a few regional sites. This does not, however, mean that those researchers who, for practical (geographical) reasons, cannot participate in research at the regional sites will be excluded from participation in the Programme on Coastal Processes. Any work, irrespective of where in the country it is performed, which can make a valid contribution to the Programme on Coastal Processes, will be accommodated in the programme, provided sufficient funds are available.

APPENDIX I

Objectives of Programmes with which the SANCOR Programme on Coastal Processes has the most direct links:

SANCOR Estuaries Programme

The objective of the Estuaries Programme is to provide a scientific understanding of estuaries - in particular of the interactive physical, chemical and biological processes within them, of their interactions with their fringe areas and with their adjacent marine and terrestrial environments and finally of human impact upon them - thereby contributing information required for their wise management.

SANCOR Marine Pollution Programme

The Marine Pollution Programme has as its general aim the study of the effects and influences of man's actions in the marine environment, particularly the discharge of effluents, as well as dredging and dumping activities.

SANCOR Marine Linefish Programme

The Marine Linefish Programme aims specifically to provide scientific information about this valuable component of the marine foodweb to aid the development of effective management strategies.

SANCOR Benguela Ecology Programme

The objective of the Benguela Ecology Programme is to provide scientific information on the structure and functioning of constituent ecosystems, to complement the scientific knowledge which is required for the management of the renewable natural resources of the Benguela System.

NPES Inland Water Ecosystem Programme

The Inland Water Ecosystem section of the National Programme for Environmental Sciences (NPES) has as its aims to develop the understanding necessary to predict the effects of natural events and planned development and management actions on inland water ecosystems, to improve the scientific base necessary for the wise use of the systems and to seek for solutions to particular environmental and management problems related to inland water ecosystems.

NPES Nature Conservation Research Programme

The Nature Conservation Research section of the National Programme for Environmental Sciences has as its objective to stimulate and coordinate research needed for the development of ecological principles and practices necessary for the conservation of indigenous species and communities, together with their habitats and life support processes for the long-term benefit of mankind.

NPES Fynbos Biome Programme

The aim of the Fynbos Biome project is to investigate ecosystem functioning, especially in relation to plant nutrient deficiencies and water relations, and to study the effects of fire and invasive plants and problems such as threatened species and the nature, extent and causes of past vegetation changes.

NPES Programme for Human Needs, Resources and the Environment

The principal objective of this programme is to develop the capacity to assist in the understanding, measurement and prediction of relative effects of factors involved in the achievement of balanced socio-economic development and the satisfaction of human needs. The main objectives of the programme are to determine the most relevant and important socio-political, economic and ecological relationships involved in the satisfaction of human needs, to develop the capacity to measure and predict both the interrelationships and the outcome of planning policies aimed at balanced development and satisfaction of human needs and to monitor and evaluate developments.

NRIO Coastal Engineering and Hydraulics Division

The objective of the Coastal Engineering and Hydraulics Division of NRIO include undertaking basic and applied research required for coastal works, including beach and estuary improvement and marine disposal studies and to work in close collaboration with other disciplines to avoid duplication of effort and ensuring an environmentally acceptable solution, and at the same time, endeavour to point out deficiencies in coastal planning and management to the relevant authorities.

NRIO Agulhas Bank Studies

The Programme represents a long-term, interdisciplinary programme of measurement and analysis on the Agulhas Bank. It is the first major research programme of this type to be carried out by NRIO, and will eventually incorporate all the divisions, that is marine biology, marine chemistry, marine geoscience, physical oceanography and coastal engineering and hydraulics.

Initial investigations have concentrated on the physical aspects, namely ocean dynamics on the shelf and at the inshore front of the Agulhas current, while the Sediment Dynamics Programme has started with the aim of identifying sources, transport routes and sinks of suspended sediment and bedload material. Weather stations have been erected, while limited biological sampling has started: it is anticipated that the biological and chemical components will grow, while the major interdisciplinary work will probably take place in the near-shore regime.

The major aim of the ABS is an understanding of the processes operating on the Agulhas Bank. Coastal sites will be selected for detailed study: it is then hoped to be able to transpose the knowledge gained to other sites with a minimum of additional measurements while building up an overall picture of conditions on the bank.

NRIO Estuarine and Coastal Research Unit

The Estuarine and Coastal Research Unit (ECRU) was established by NRIO in 1979. Its aims are to contribute information relevant to the development of a cohesive management policy for the South African coastline, to compile syntheses of all available knowledge on the 167 estuaries of the Cape between the Kei and Orange rivers, to identify gaps in information and to carry out or stimulate research at universities, museums and other institutions to fill these, and to contribute to ad hoc investigations carried out by NRIO on the impact of proposed developments in the coastal environment, and especially in estuaries. The unit was established at the request of the Government, and the Department of Environment Affairs contributes substantially to the running costs.

APPENDIX II**STRUCTURE AND TERMS OF REFERENCE OF SANCOR COMMITTEE ON THE PROGRAMME ON COASTAL PROCESSES**

The Committee consists of scientists active and involved in the Programme, independent assessors and representatives of the principal authorities concerned. The Chairman serves on SANCOR and is appointed on the advice of the Committee for a three year period.

The primary responsibility of the Committee is to manage the SANCOR Programme on Coastal Processes on behalf of SANCOR by:

- monitoring the balanced development of the programme in relation to its objectives;
- annually reviewing the relevance of the programme to changing needs;
- remaining informed on national and international developments relevant to the programme;
- stimulating interest in the programme and its results among scientists and decision makers in related fields;
- drawing attention to aspects of the programme not receiving adequate attention and initiating projects thus required;
- ensuring close collaboration with other SANCOR programmes, that is Marine Pollution, Estuaries, Benguela, Linefish;
- reviewing the progress of the work being done within the programme;
- evaluating project proposals for participation in the programme;
- recommending on funding priorities particularly if SANCOR funds are involved;
- annually providing a long-term (3 to 5 years) projection of financial requirements;
- dealing with specific matters relevant to the programme referred to it by any SANCOR Committee.

APPENDIX III

GUIDELINES ON PROJECT PROPOSALS AND REPORTING

Project Proposals

Within the guidelines contained in these pages prospective participants are invited to submit project proposals on special forms which are available for the purpose. These forms (NP10) are available from CSP/CSIR and also from University Registrars' offices.

Guidelines for completing project proposals are also available (CSP2, 1980). In summary, prospective participants are expected to be as specific as possible with their proposals by indicating clearly how they correspond with the objectives of and fit into the programme, providing a realistic list of key questions to be answered and preparing a well defined work plan according to which the project will be undertaken in a specified time (typically one, two or three years). Participants are expected to consider what they expect the final product of the project to be and to indicate this clearly.

In particular, first proposals should be accompanied by an appropriate summary of existing knowledge/literature survey. Where new or untried fields of activity are being proposed, proponents are advised to consider short (that is one year) feasibility studies to establish more definitive research programmes.

In completing the financial sections of applications, guidelines for salary scales are available from CSP, University Registrars and institute secretaries.

It is recognized that it may be necessary to import expert manpower for certain projects where the necessary expertise or capacity does not exist in the country. This is acceptable provided the normal CSIR/CSP policy regarding such matters is adhered to (for example, in the simplest case, this provides for part (maximum 20%) of the allocation for a specific salary to be spent on assistance for travel and the transport of personal effects).

Reporting

The following are guidelines on the format for annual progress reports and final project reports to SANCOR :

Annual Progress Reports

- (a) Identification : Title of project, names and addresses of project leaders and project researchers, date, period of report, maximum five keywords of contents for indexing purposes.
- (b) Objectives

(c) Background : Concise history of project to allow (b) and (d) to be read in context.

(d) Scientific progress : Scientific progress made since submission of last report, with emphasis on scientific findings and achievements during the year, as measured against the objectives and target dates provided in the project proposal.

(e) Publications : Full references to publications emanating from the project and which have appeared since submission of last report (including published, accepted for publication and unrestricted internal reports).

(f) Activities report : An activities report as an addendum to the main report, if it is felt that, for some reason, activities and not scientific progress have to be reported.

As a guideline, the length of the body of the report ((a) above) should be about three A4 pages (typed single spacing), although it has to be accepted that this varies from project to project.

Progress reports are required from all those supported in the programme by 30 June. Those not supported but who are engaged on projects which complement the work supported from the programme are encouraged to submit reports on their work in the same format.

These progress reports, in addition to serving as the basis for the evaluation of progress with a view to continued support, are also compiled into a single volume entitled, "Progress Reports to SANCOR 19 " and distributed to all participants in the SANCOR Programme and its committees in an inexpensively reproduced form.

Final Reports

Participants are encouraged to publish their findings as soon as possible in reputable scientific journals of their choice. However, no project will be regarded as complete until a final report has also been submitted to SANCOR and all the data collected in the project have been lodged in the South African Data Centre for Oceanography as applicable. The final report, submitted at the end of the last year of the project, should cover:

- (a) Background : Identification (as in annual reports), introduction, background and objectives of the project (refer to the relevant NP10 proposal).
- (b) Methods : Description of procedures, methods, study areas and other aspects of relevance to the project or summary with reference to published descriptions.
- (c) Findings : A synthesis of the findings of the project, with special reference to the realization of the objectives set.

- (d) Conclusions and recommendations : Conclusions and recommendations on the work as a whole, including comments on future work to be undertaken or avoided, and any practical decision making implications.
- (e) Publications : List of scientific publications and other documents arising from the work including a list of any data available and stored in the institute concerned.
- (f) Project staff : List of participants and collaborators in the project.
- (g) Acknowledgements : Including sources of funds and assistance.

Final reports are bound in with the volume "Progress Reports to SANCOR" of the year concerned, but also serve to inform decision makers of the findings of the research done within the programme, some of which they may have supported.

APPENDIX IV

SANCOR Workshop held at Kleinmond on 10 and 11 September 1981 to formulate the programme framework for the Programme on Coastal Processes.

LIST OF PARTICIPANTS

Prof B R Allanson (Chairman)	Rhodes University
Mr F P Anderson	NRIO, CSIR
Dr G Birch	Geological Survey
Prof G M Branch	University of Cape Town
Prof J H Day	University of Cape Town
Dr A J de Freitas	Oceanographic Research Institute
Mr G de Villiers	Sea Fisheries Institute
Mr A du Plessis	Geological Survey
Prof T Erasmus	University of Port Elizabeth
Prof J Heeg	University of Natal
Dr A E F Heydorn	NRIO, CSIR
Dr R J Kleywegt	Geological Survey
Mr A K Martin	NRIO, CSIR
Dr M J Orren	University of Cape Town
Dr E Schumann	NRIO, CSIR
Prof E S W Simpson	University of Cape Town
Dr D H Swart	NRIO, CSIR
Mr O A van der Westhuysen	CSP, CSIR
Mr G A Visser	Department of Environment Affairs
Dr J H Wallace	Port Elizabeth Museum
<u>In attendance</u>	
Miss A Schnetler	CSP, CSIR

APPENDIX V

LEGISLATION RELEVANT TO THE MANAGEMENT AND CONTROL OF COASTAL AREAS

AREA/ASPECTS	CONTROLLING BODY	LEGISLATION
Proclaimed national parks	Board of Trustees for National Parks (National Parks Board)	National Parks Act (No. 57 of 1976)
Proclaimed lake areas	Lake Areas Development Board	Lake Areas Development Act (No. 39 of 1975)
Nature conservation areas	Cape of Good Hope Provincial Administration (Department of Nature & Environmental Conservation)	Ordinance (No. 19 of 1974)
	Natal Provincial Administration (Natal Parks Board)	Ordinance (No. 15 of 1974)
Marine reserves	Sea Fisheries Research Institute, Department of Environment Affairs	Sea Fisheries Act (No. 58 of 1973)
	National Parks Board	National Parks Act (No. 57 of 1976)
	Cape Provincial Administration	Ordinance (No. 19 of 1974)
	Natal Provincial Administration	Ordinance (No. 15 of 1974)
Islands	Sea Fisheries Research Institute, Department of Environment Affairs	Protection of Seabirds and Seals Act (No. 46 of 1973)
	Cape Provincial Administration	Ordinance (No. 19 of 1974)
Estuaries	Land Affairs Branch, Department of Community Development	Seashore Act (No. 21 of 1935)
	Cape Provincial Administration & Natal Provincial Administration	Ordinances
	National Parks Board	National Parks Act (No. 57 of 1976)

AREA/ASPECTS	CONTROLLING BODY	LEGISLATION
Estuaries (continued)	Water Affairs Directorate, Department of Environment Affairs	Water Act (No. 54 of 1956)
	Department of Transport	Prevention & Combating of Pollution of the Sea by Oil Act (No.67 of 1971)
Seashore & seabed	Land Affairs Branch, Department of Community Development	Seashore Act (No. 21 of 1935)
	Department of Mineral & Energy Affairs	Mines & Works Act (No. 27 of 1956)
		Mining Rights Act (No. 20 of 1967)
		Precious Stones Act (No. 73 of 1964)
Natural forests & shrubbery areas	Directorate of Forestry, Department of Environment Affairs	Forest Act (No. 72 of 1968)
		Mountain Catchment Areas Act (No. 63 of 1970)
	National Parks Board	National Parks Act (No. 57 of 1976)
	Cape Provincial Administra- tion & Natal Provincial Administration	Ordinance (No. 19 of 1974)
		Ordinance (No. 15 of 1974)
Marine pollution	Sea Fisheries Research Institute, Department of Environment Affairs	Sea Fisheries Act (No. 58 of 1973)
	Directorate of Water Affairs, Department of Environment Affairs	Water Act (No. 54 of 1956)
		Dumping at Sea Control Act (No. 73 of 1980)

AREA/ASPECTS	CONTROLLING BODY	LEGISLATION
Marine pollution (continued)	Department of Health & Welfare	Health Act (No. 63 of 1977)
		Hazardous Substances Act (No. 15 of 1973)
	Department of Transport	Prevention & Combating of Pollution of the Sea by Oil Act (No. 67 of 1971)
		Merchant Shipping Act (No. 57 of 1951)
Nature areas	Office of the Prime Minister (Physical Planning Branch)	Physical Planning Act (No. 88 of 1967)
	Department of Environment Affairs	Environmental Conservation Act (1982)
		Physical Planning Act (No. 88 of 1967) Delegated authority in terms of proclamation (No. 223 of 1981)
Soil conservation	Department of Agriculture	Soil Conservation Act (No. 76 of 1969)
Territorial waters	Sea Fisheries Research Institute, Department of Environment Affairs	Territorial Water Act (No. 87 of 1963)
Recreational use on the seashore and in the sea	Local authorities	Regulations promulgated in terms of the Seashores Act
Defence Force areas	Department of Defence	Defence Act (No. 44 of 1957)

AREA/ASPECTS	CONTROLLING BODY	LEGISLATION
Prevention & combating of pollution in proclaimed commercial harbours	South African Transport Services, Department of Transport	Railways & Harbours Control and Management (Consolidation) Act No. 70 of 1957)
Fish harbours	Sea Fisheries Research Institute, Department of Environment Affairs	Sea Fisheries Act (No. 58 of 1973)
	Fisheries Development Corporation	Fish Industry Development Act (No. 68 of 1978)
Pollution resulting from radioactive radiation	Atomic Energy Board	Atomic Energy Act (No. 90 of 1967)
		Nuclear Installations (Licensing & Security Act (No. 43 of 1963)
Public resorts	Provincial and Local Authorities	Ordinance on Public Resorts
Roads	Department of Transport (National Transport Commission)	National Roads Act (No. 54 of 1971)
	Cape Provincial Administration (Roads Department)	Road ordinance
	Natal Provincial Administration (Roads Department)	Road ordinance

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