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GIS and the Coastal Zone: An Annotated Bibliography (93-9)

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**GIS and the Coastal Zone:
An Annotated Bibliography**

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National Center for Geographic Information and Analysis
Report 93-9

Table of Contents

Preface and Acknowledgments

Executive Summary

Section I: Introduction: GIS and the Coastal Zone

Section II: Annotated Bibliography

Preface and Acknowledgments

To all who sent me references, and especially to those who sent me off-prints of their work, and copies of published reports referenced in the listings, I owe a particular debt of gratitude. I would particularly like to acknowledge the enthusiastic support of Professor Norbert Psuty, Chair of the IGU Commission on Coastal Systems; and Drs David Mark (NCGIA and State University of New York at Buffalo) and Mike Goodchild (NCGIA and University of California at Santa Barbara), which has led to the publication of the Bibliography in its present form. Publication of this report is supported in part by a grant to NCGIA from the National Science Foundation (SES-88-10917); support by NSF is gratefully acknowledged.

EXECUTIVE SUMMARY

Following a brief introduction to the role of GIS and related technologies in the coastal zone, this report consist of an annotated bibliography containing over 150 entries. All entries include keywords, and notes are provided on more than 60 of the items.

SECTION I: INTRODUCTION

GIS AND THE COASTAL ZONE

Successful application of Geographical Information Systems (GIS) tools and concepts to the coastal zone is one of the great challenges still facing developers and users of the technology.

The coast is of paramount importance to human society. Already over 40% of the human race live on or near the coast, a proportion that is increasing allometrically (Carter, 1988). Throughout the ages, mankind's relationship with the shore has traditionally been based on some form of *management*. Carter (1988) subdivides coastal management into three broad areas of policy, planning and practice. Most coastal management issues, he suggests, "raise conflict between various coastal user and interest groups". These conflicts may include disputes between jurisdictions over access to key resources; conflicts between sectors of society over the allocation of these resources; conflicts between human use of the coast and the ecological requirements of other components of the coastal system; and conflicts arising through misunderstanding or underestimating the operational requirements of natural coastal processes such as sediment movement, shoreline erosion, etc.

Nowadays, in recognition of the many problems that have arisen in the past through inappropriate use and management of the coast, a new, more "environmentally-oriented" ethos of coastal management is emerging, based on more holistic, trans-disciplinary and integrative principles, and aiming at sustainable management of coastal resources. This new philosophy depends, however, on a thorough understanding the entities and relationships at work in the coastal system, and this in turn demands a solid base of data and information to be harnessed in support of decision-making. Thus, for these and many other reasons, coastal scientists and administrators are increasingly looking to developments in information technology for tools and methodologies that might assist them in their work.

Three areas of information technology which have already proven their worth in coastal studies have been the use of computers for simulation modelling of coastal processes such as sediment transport or ocean wave behaviour; the use of satellite imagery and remote sensing techniques; and the application of Computer-Aided Design (CAD) packages for designing civil engineering structures for the coastal zone. Against this, however, and somewhat paradoxically, geographical information systems (GIS) have not yet enjoyed the success at the coast that they have undoubtedly had within more terrestrial spheres of investigation.

In 1989, the International Geographical Union's Commission on the Coastal Environment approved the establishment of a Commission Project aimed at investigating and promoting the utility and application of GIS for coastal management purposes. The Commission on the Coastal Environment formally came to an end in August 1992, but a new Commission on Coastal Systems was authorised, and will continue to August 1996. Sponsorship of the Project on Coastal GIS was transferred to the new Commission, and work on this research initiative continues.

A number of facets to the Project have already been put in motion, including participation in international conferences on the theme, and establishment of an electronic discussion group (COASTGIS), based on a Listserv node on the Internet computer network¹, to facilitate exchange of information. Further activities are also planned, including a possible compendium volume of papers on the theme of GIS and the Coast.

One particularly important problem, identified early in the work of the Commission Project, is that the literature base relating to coastal applications of GIS is very small, and such references as do exist tend to be scattered across a very great number of journals, proceedings volumes and other source. Thus, gaining access to the existing literature is a somewhat daunting task, which may itself be an impediment to progress in the field.

In an effort to improve knowledge of, and access to, relevant information about coastal GIS, it was decided early on in the Project to compile an annotated bibliography of literature on the subject. To date, some 150 references have been identified. While it is intended to maintain the bibliography into the foreseeable future, through periodic updates and inclusion of new references, it now seemed an appropriate juncture at which to publish the first "hard copy" results of the search (provisional "pre-release" versions have been circulated to Project supporters for amendment / comment from time to time over the past two years).

¹ Internet address: COASTGIS@IRLEARN.UCD.IE. To subscribe, send a one-line email message to LISTSERV@IRLEARN.UCD.IE, with the text of your message as follows:

SUBSCRIBE COASTGIS <yourfull name>

Acknowledgement of successful inclusion in the COASTGIS mailing list, and details about the Listserv facilities available should be returned to you within a short space of time.

In compiling the listing, a flexible approach to defining "GIS" was maintained and, in addition, a number of other references were encountered which, although not about GIS per se, were considered to have some particular reference or utility to those researching this field. These have also been included: they include descriptions of simulation modelling of coastal processes; satellite and air photo remote sensing techniques; and conventional mapping of the coastal zone.

Sources of bibliographic information included in the listing

Membership of the IGU Commission on Coastal Systems is free to all, but participants are expected to contribute actively in the Commission's work. In the case of the Coastal GIS project, this condition has been fulfilled admirably. A very great number of people, on all continents and in both the academic and commercial spheres, have kindly contributed to the present Bibliography.

For many of the references listed in the Bibliography, off-prints or loan copies were obtained (often kindly supplied by the authors themselves), which enabled details to be extracted first-hand; in a small handful of cases I have drawn on references and descriptions supplied by COASTGIS subscribers, or by the authors of the material themselves; most of the remainder are citations encountered in the bibliographies of other documents.

The information contained in this compendium has been brought together in the hope of providing a useful research service for the scientific community. While every effort has been made to ensure that entries are accurate and complete, no liability can be entered into, by either the compiler or the publishers, with respect to any errors and omissions that may have crept in to the completed work. However, readers are earnestly requested to make any such errors or omissions known to the compiler, so that subsequent editions of the bibliography might be amended accordingly.

Reference:

Carter, R.W.G. (1988) Coastal Environments. Academic Press: London, 617 pp.

SECTION II: ANNOTATED BIBLIOGRAPHY

Adner, R.R. (1982)

The role of the USFWS Geographic Information System in Coastal Decisionmaking.

Auto Carto V Proceedings. 1 - 11.

KEYWORDS: GIS, Coastal management, MOSS, WAMS.

Alper, S. (1990)

Second Generation Automated Nautical Charting System at the National Ocean Service.

FDC Newsletter. 11,

KEYWORDS: GIS, Coastal applications, Charting, US Federal Agency.

Anderson, R.R. (1972)

Applications of High-altitude remote sensing to coastal zone ecological studies. Operational Remote Sensing Seminar, American Society of Photogrammetry. 191-95.

KEYWORDS: GIS, Remote sensing, Coasts, Environment.

Apinan, V. (1986)

Remote sensing application to coastal resource management and planning in Thailand.

The Application of Remote Sensing Techniques to Coastal Zone Management and Environmental Monitoring, Seminar Proceedings, Ohaka, Bangladesh, Nov 18 - 26, 1986. 249 - 252.

KEYWORDS: GIS, Coasts, Remote Sensing, Thailand.

NOTES:

Author's address / affiliation: Thailand Nat. Environment Board, 60/1 Soi Prachasumpun 5, Roma VI Rd., Bangkok 10400, Thailand.

Argento, M.S.F. (1989)

The Geographical Information System of the Brazilian Coastal Management Program.

Proceedings, Sixth Symposium on Coastal and Ocean Management (Coastal Zone '89), Charleston, South Carolina.

KEYWORDS: GIS, Coasts, Brazil.

NOTES:

Describes the GIS (GEOSYS) developed as part of the Brazilian National Coastal Zone Management Plan (PNGC). (The organisational aspects of the project are described in Frischeisen et al, 1989).

Argento, M.S.F. (1985)

O Sistema de Infonnacoes do Gerenciamento Costiero. Proc. Simp. Bras. Gerenciamento Costiero.

KEYWORDS: GIS, Coasts, Brazil.

NOTES:

Describes Brazilian work on developing a coastal GIS. See also Argento, 1989; and Frischeisen, 1989 for English-language literature on the project.

Ashmore, S. and Johnson, N. (1986)

Looking for Alaska's Coastal/Marine Boundary - the story of the Alaska Federal/State Boundary Project. 1986 ASPRS-ACSM Fall Convention. ACSM Technical Papers. 324 - 331. KEYWORDS: GIS, Coasts, Surveying, Boundaries, Alaska.

August, P., S. Hale, E. Bishop, and E. Sheffer. (1990)

GIS and Environmental Disaster Management: World Prodigy Oil Spill.

Paper presented at Oil Spills Management and Legislative Implications Conference. Newport, RI. May 15-18, 1990. Published by the A.S.C.E.

KEYWORDS: GIS, Coastal management, Oil Spill.

NOTES:

GIS was used during the oil spill disaster to store spill position data, convert spatial data to formats that could be used by spill trajectory models, give quick cartographic representations of spill location, and integrate all spill data into one database. After the spill the GIS was used to show areas of oil exposure and calculate statistical summaries of these regions. The authors also make several suggestions to make oil spill management using GIS technology more useful: they suggest the maintenance of data layers

that would locate a variety of fragile and important coastal zones whose safety might take precedence over other areas; the expansion of environmental information in general; and the maintenance of linkages between organizations that might be involved in another spill.

Bartlett, D.J. (1988).

GIS Applications for Regional Studies: The Antrim Coast Erosion Survey.

Merlewood Research Papers, Institute of Terrestrial Ecology (UK Natural Environment Research Council), Merlewood, Cumbria, England.

KEYWORDS: GIS, Coastal GIS.

NOTES:

A short paper which describes how computer mapping using GIMMS was combined with an Oracle database to handle the data associated with an investigation of coastal erosion in Northern Ireland.

Bartlett, D.J. (1988)

The Use of GIMMS in the Antrim Coast Erosion Survey.

Proceedings, Third Annual GIMMS Users Conference and Workshop, Oxford Polytechnic, 20-21 April 1988.

KEYWORDS: GIS, Coastal GIS, GIMMS.

Bartlett, D.J. (1990)

Spatial data structures and coastal information systems.

Proceedings EGIS '90 - First European Conference on Geographical Information Systems (J. Harts, H.F.L. Ottens, H.J. Schotlen and D.A. Ondaatje eds). 30-39.

KEYWORDS: GIS, Coasts, Data structures.

NOTES:

The coast is an inherently difficult landscape to store digitally because of its varying spatial resolution and the temporal dimension to many of its attributes (such as shoreline). However, a number of potential benefits of applying GIS to the coast can be identified: they include facilities for modelling the impacts of proposed changes to the shore; greater integration of data from a wide number of sources; and easier distribution of conclusions to concerned parties. The two main models for representing spatial data within GIS, the vector and tesseral respectively, are compared and evaluated with regard to their utility for coastal applications. The conclusion drawn is that neither is currently suited to such work, although it is acknowledged that in the absence of more optimal solutions many attempts have been made to adapt these models to shoreline data.

Bartlett, D.J. (1993)

Time, Space, Chaos and Coastal GIS

Proceedings of the 16th International Cartographic Conference, Cologne, Germany, 3 - 9 May 1993.

KEYWORDS: GIS, Coasts, temporal databases, chaos theory, fractals, GIS data structures.

NOTES:

Discusses the nature and geometry of the coastal zone, and suggests most applications of GIS to coastal problems have achieved their success despite rather than because of their data-handling characteristics. The coast is presented as a four-dimensional fractal, and attention is drawn to chaotic aspects of shoreline behaviour.

Bhuiyan, H.H. (1986)

An integrated approach to the application of remote sensing in resource surveys and thematic mapping as a key to effective coastal area management.

The Application of Remote Sensing Techniques to Coastal Zone management and Environmental Monitoring, Seminar, Proceedings, Ohaka, Bangladesh, Nov 18 - 26, 1986. 286 - 293.

KEYWORDS: GIS, Coasts, Remote sensing, Bangladesh.

NOTES:

Author's address / affiliation: Bangladesh Bureau of Statistics, 477 Nayatola, Baramagh Bazaar, Dhaka-17, Bangladesh.

Birdwell, K.R. and Daniels, R.C. (1991)

A Global Geographic Information System Data Base of Storm Occurrences and Other Climatic Phenomena Affecting Coastal Zones.

Environmental Sciences Division Publication No. 3656, Oak Ridge National Laboratory,

Tennessee (ORNL/CDIAC-40; NDP-035).139 + apps..

KEYWORDS: GIS, Coasts, Databases, Climatic phenomena, Storms.

NOTES:

A report describing a comprehensive data base of climatic data relating to the coasts of

the world. The data are available in ARC/INFO and other formats, and may be obtained on floppy disk from the authors/compiler.

Boedecker, D and Schauser, U-H. (1990)

A GIS for the Coast. Experiences from Schleswig-Holstein (West Germany).
Comptes rendus du 1er symposium international de l'Association europeenne -
EUROCOAST. LIT70RAL 1990 Marseille, France. 588-595.

KEYWORDS: Coastal management, Environmental management, ARC/INFO, Germany.

Boedecker, D. (1988)

Nutzungskonflikte und deren Auswirkungen auf die Uferlandschaft der Eckernförder Bucht.
Hamburger Geographische Studien. 44, 145-160.

KEYWORDS: Coastal management, Germany, North Sea, ARC/INFO, Human impacts.

Bokuniewicz, H., Goldsmith, V and Clarke, K. (1989)

I-Geographic Information System: Section 728-PL 99-662, Monitoring and Modeling the New York Bight; and II-GIS for Zone of Siting Feasibility in support of a U.S. Army Corps, of Engineers Dredged Material Disposal (Mud Dump Site) replacement. Final Report, N.Y. District U.S. Army Corps of Engineers.

Film & slides.

KEYWORDS: GIS, Coastal Management, USA, Dredging, Resource management.

Bourgeois, P., J. Barras, B. Blackmon, and D. Clark. (1989) Geographic Information Systems Applications for Marsh Management Plans. Biological Report--U.S. Fish and Wildlife Service. 89(22), 330-343.

KEYWORDS: GIS, Coastal management, Wetlands.

Brandt, J., Brandt, R., Frederiksen, P., Frederiksen, P., Munier, B and Holmes, E. (1990)

Geografisk Informations System til Faellesnordisk Monitorings program.

Rapport vedrorende programmets bilag 2. 64pp.

KEYWORDS: GIS, Coastal applications, Baltic Sea, International projects.

Caixing, Y. (1986)

The application of remote sensing in the investigation of the resources and environment in the coastal zone of China.

The Application of Remote Sensing Techniques to Coastal Zone Management and Environmental Monitoring, Seminar Proceedings, Ohaka, Bangladesh, Nov. 18-26, 1986. 185-197.

KEYWORDS: Coasts, GIS, Remote sensing, China.

NOTES:

Author's address / affiliation: Inst. of Estuarine and Coastal Research, East China Normal University, Box 20062, Shanghai, China.

Carter, V. (1976)

Computer Mapping of Coastal Wetlands.

USGS Professional Paper 929.

KEYWORDS: GIS, Coastal management, Computer mapping.

Christensen, E.J., Jensen, J.R., Ramsey, E.W. and Mackey, H.E. Jr. (1986)

Wetlands vegetation change detection using high resolution aircraft MSS data. 1986 ASPRS-ACSM Fall Convention ASPRS Technical Papers. 148 - 162.

KEYWORDS: Remote sensing, Wetlands, Change detection, Monitoring.

Christidis, Z.D. (1990)

A Parallel Processing Technique for Oceanic Pollution Problems.

Computer Techniques in Environmental Studies III., Edited P. Zannetti. 285-298.

KEYWORDS: Parallel Processing, Computer modelling, GIS, Coastal studies, Marine studies.

Claasen, D.B.V.R. and Jupp, D.L.B. (1986)

Mapping shallow waters: the application of remote sensing techniques in coastal zone management in the Great Barrier region, Australia.

The Application of Remote Sensing Techniques to Coastal Zone Management and Environmental Monitoring, Seminar, Proceedings, Ohaka, Bangladesh, Nov. 18 - 26, 1986. 145 - 153.

KEYWORDS: GIS, Coasts, Remote Sensing, Australia.

NOTES:

Authors' address / affiliation: Great Barrier Reef Marine Park Authority, P.O. Box 1379, Townsville, Queensland 4810, Australia.

Clark, M.J., Gurnell, A.M. and Edwards, P.J. (1990)

A GFIS Approach to Management Decision Making for the Coastal Environment.

Proceedings EGIS '90 - First European Conference on Geographical Information Systems (J. Harts, H.F.L. Ottens, H.J. Schotlen and D.A. Ondaatje eds). 1, 189-198.

KEYWORDS: GIS, Coasts, GFIS, Coastal management, Case study, South-east England.

NOTES:

The paper opens by discussing the context for a coastal GIS, and the design criteria that should be adopted in creating a coastal GIS solution. The authors are of the opinion that "...although [the coastal] zone shares many of the problems and solutions common to the broad fields of land, landscape and environmental management, it reflects some unique characteristics which render it particularly well-suited to representation within a geographic information system".

Attention is drawn to the fact that the engineering profession has a long tradition of using CAD tools - particularly AutoCAD - for coastal structure design and management. However, these CAD-based techniques are poorly suited to handle topological relationships.

It is suggested that "where the focus has been on rigorous logical design for data structure from the outset, the preferred approach has been to concentrate on the assembly of a georeferenced relational database". The authors cite the Anglian Sea Defence Management Study, carried out by Sir William Halcrow and partners (see Townend, 1990) for Anglian Water, as "perhaps the most advanced example [of such an approach] in the UK".

Clark, W.F. (Principal Investigator). (1990)

North Carolina's Estuaries: A Pilot Study for Managing Multiple Use in the State's Public Trust Waters.

Abermarle-Pamlico Study Report 90-10.

KEYWORDS: GIS, Coastal applications, Coastal management, ARC/INFO.

Clayton, I. (1991)

Gulf of Maine GIS database aids oceanographers. *Sea Technology*. 32(11), 29-33.

KEYWORDS: GIS, Coasts.

NOTES:

"News" article, describing use of the FMG InfoATLAS environmental information and mapping system, for research and management of the Bay of Fundy / Gulf of Maine / Georges' Bank coastal area. the article is written by an executive of GeoAXSES, a consultant on the FNG project.

Clow, J. C. (1987)

Marine safety, the marine environment, and MSIS.

Coastal Zone '87 (Proceedings of the Fifth Symposium on Coastal and Ocean Management, Seattle, Washington, USA, May 26-29, 1987). 285-299.

KEYWORDS: GIS, Coasts, Oceans, Environment.

Cole, G.M. (1988)

Use of hydrology for determining Ordinary High Water in non-tidal waters. Technical Papers, 1988 ACSM-ASPRS Annual Convention. Vol 1, 34 - 43.

KEYWORDS: GIS, Coasts, Surveying, Base level measurement, Hydrology.

NOTES:

In the case of tidal waters in most states of the United States, the boundary between private and publicly owned lands is defined by the position of ordinary high water. However, in the case of non-tidal waters, more ambiguous indicators have tended to be used. This paper describes the legal setting, and proposes a possible hydrological approach to defining boundaries in non-tidal lands. The method uses the mean of the peaks of short-term water level fluctuations, averaged over long time periods, to provide an equivalent to mean high water in tidal waters.

Coleman, D., Law, M. and Stewart, C. (1991)

A Great Lakes Geographical Information System and Coastal Zone Database.

The Operational Geographer. 7(4), 5-8.

KEYWORDS: GIS, Coastal Applications, SPANS, Great Lakes, Littoral cells, Modelling.

Coleman, D.E., Law, M.N. and van Wyngaarten, R. (1991)

A GIS case study of Point Pelee, Canada.

Proceedings, Flood Plain Management Conference, Toronto, Canada, March 12-14th 1991.

KEYWORDS: GIS, Coastal Applications, SPANS, Canada.

Courboules, J., Maniere, R. and Bouchon, C. (1988)

Systemes d'Informations Geocodes et Teledetection a Haute resolution.

Exemple d'application aux Cotes Jordaniennes (Geocoded information system and high-resolution remote sensing. Application to the Jordanian Coast).

Oceanologia Acta. 11(4), 337-351.

KEYWORDS: GIS, Coastal management, Jordan.

Cowen, D.J. (1978)

Coastal Plains regional resource information system study: recent geographic information systems.

Third International Symposium on Computer Assisted Cartography.

KEYWORDS: GIS, Coasts.

Cracknell, A.P., Hayes, L.W.B. and Keltie, G.F. (1987)

Remote Sensing of the Tay Estuary using visible and near-infrared data: Mapping of the intertidal zone.

Proceedings, Royal Society of Edinburgh. 92B, 223 - 236.

KEYWORDS: GIS, Coasts, Remote sensing, Coastal mapping.

Crandal, D.A. (1986)

U.S. Recreation Information System.

Tourism Management. 7(3), 205-207.

KEYWORDS: GIS, Coasts, Recreation, Dunes.

Dahl, T. (1987)

Wetlands Mapping in the coastal zone - Progress towards creating a national digital data base.

Coastal Zone '87 Proceedings. 465 - 477.

KEYWORDS: GIS, Coasts, Wetlands, Data bases.

Davis, B.E. and Davis, P.E. (1988)

Marine GIS: Concepts and Considerations.

GIS/LIS 1988 Proceedings. San Antonio ACSM/ASPRS. 159-168.

KEYWORDS: GIS, Coasts.

Debusschere, K., Penland, S., Westphal, K.A., Reimer, P.D. and McBride, R.A. (1992)

Aerial videotape mapping of coastal geomorphic changes.

Proceedings of the Seventh Symposium on Coastal and Ocean Management (Coastal Zone '91), Long Beach Ca., July 8-12, 1992. 370-390.

KEYWORDS: GIS, Coasts, Videotape, coastal mapping, geomorphology.

NOTES:

Describes the use of low-altitude (helicopter-home), high-resolution aerial videotape surveys to describe and quantify the longshore and cross-shore geomorphic, sedimentologic, and vegetative character of Louisiana's shoreline systems. The video survey was used in conjunction with a coastal geomorphic classification system, based upon 10 years of shoreline monitoring, analysis of aerial photography for 1940 - 1989 and numerous field surveys. The resulting morphological units were mapped parallel to the regional shoreline, from the videotape imagery, onto base maps at 1:24,000. This enabled the production of diagrammatic representations of the shoreline which could be analysed and used for time-series analysis. The authors suggest that the linear nature of the mapping technique "increase its analytical potential". The mapping itself was conducted on an Intergraph system.

Demirpolat, S., Tanner, W.F., Orhan, H., Hodge, S.A. and Knoblauch, M.A. (1989)

High-Precision Study of Florida Shoreline Change.

Proceedings, 6th Symposium on Coastal and Ocean Management (Coastal Zone '89), Charleston, South Carolina, July 11 -14, 1987. 1, 683-697.

KEYWORDS: GIS, Coasts, Intergraph GIS, Data capture, DTM.

Devoy, R.J. and Bartlett, D.J. (1991)

Assessing the potential impacts of sea level rise on the Atlantic margins of Europe: problem definition and methodological discussion. International conference on the Protection of the Coastal Zone, Nantes, France, October 17 -20, 1991

KEYWORDS: GIS, Coasts, Sea level rise, EPOC, Modelling, Coastal management.

NOTES:

Statement of the conceptual and methodological problems to be addressed in a European Communities-funded project to investigate the climatic and other impacts of sea-level rise on the Atlantic margins of Europe. These include problems of data availability; data modelling and representational issues; etc.

Dickson, S.M. (1987)

Coastal Hazards Mapping of Maine's Beaches.

1986: The year in review (Activities of the Maine Geological Survey Department of Conservation).

KEYWORDS: GIS, Coastal applications, USA, State of Maine, Government agency.

Dickson, S.M. (1988)

Coastal Hazard Mapping in Maine.

GIS: Integrating Technology and Geoscience Applications. National Academy of Sciences, Sept 26-30, 1988, Conference Abstracts, Denver, Co.

KEYWORDS: GIS, Coastal Applications, USA, State of Maine, Government agency.

Dickson, S.M. and Kelley, J.T. (1987)

Coastal Hazards and Geological Mapping of Maine's Beaches and Barrier Islands. Geological Society of America Bulletin. 19(1), 11.

KEYWORDS: GIS, Coastal Applications, USA, State of Maine, Government Agency.

Dickson, S.M., Kelley, J.T. and Witherill, D.T. (1988)

The threat of sea-level rise and new codes for coastal sand dune development in Maine. Geological Society of America Bulletin. 20,

KEYWORDS: GIS, Coastal applications, Dune management, USA, State of Maine, Government agency.

Ditton, R.B., and Miller, M.L. (1986)

Coastal Recreation: An Emerging Area of Managerial Concern and Research Opportunity. Leisure Sciences. 8(3), 223-239.

KEYWORDS: GIS, Coasts, Recreation.

Dorland, D and Luikkonen, B. (1989)

North Shore Environmental Management. Proceedings, 6th Symposium on Coastal and Ocean Management (Coastal Zone '89), Charleston, South Carolina, July 11 -14, 1987. 5, 4116-4124.

KEYWORDS: GIS, Coasts, Great Lakes, ARC/INFO, Waste management.

Eberhart, R.C. (1980)

Pressures on the edge of Chesapeake Bay: 1973-1979. Environmental Programs Report CPE-7905. Maryland, USA: John Hopkins University.

KEYWORDS: GIS, Coastal Applications, RAMS database.

Eberhart, R.C. and Dolan, T.J. (1980)

Chesapeake Bay Development Pressures: RAMS data base analysis. Coastal Zone '80.

KEYWORDS: GIS, Coastal Applications, RAMS database.

Ellis, M.Y. (ed.). (1978)

Coastal Mapping Handbook.

United States Government Printing Office: Washington.

KEYWORDS: GIS, Coasts, Mapping.

NOTES:

A description is given of coastal mapping programs that were used in various states throughout the United States (US) (eg. California, Delaware, Florida, New Jersey, and Texas). A technical background is provided on datums (numeric or geometric quantities serving as a reference); map projections (eg. transforming spherical coordinates to Mercator); grid systems (representing a small portion of the Earth's surface using a local rectangular grid); remote sensing; photogrammetry; and aerotriangulation.

This book was written before computers were in widespread use, and they are discussed as an aid to preparing and extracting map data. Digital map data may be points, lines or polygons (i.e. vector data). The United States Geological Survey (USGS) still represents maps as vector data.

The appendices provide a list of US agencies working in the coastal region, and outline a coastal zone management act and amendments, and relevant mapping accuracy standards.

Ellis, R.H. (1972)

Coastal Zone Management System: a combination of tools. In Marine Technology Society (eds): Tools for Coastal Zone Management. Washington D.C.: Marine Technology Society.

KEYWORDS: GIS, Coastal applications.

Erwin, D.G., Picton, B.E., Connor, D.W., Howson, C.M., Gilleece, P. and Bogues, M.J. (1986)

The Northern Ireland Sub-Littoral Survey. Ulster Museum, Belfast, Northern Ireland.

KEYWORDS: GIS, Coasts, Sub-littoral ecology, diving surveys.

NOTES:

The final report of a diving survey undertaken around the coast of Northern Ireland. The investigation looked at fauna and flora of the sea bed and the overlying water column. Results were recorded on home-developed software on PC machines running under CP/M. This was not a full GIS implementation, but output from the database could be plotted as point symbols on basic outline maps stored in vector format.

ESL Incorporated. (1975)

The Application of Remote Sensing and Computer Systems to Coastal Zone Management.

Document No. 5, ESL Inc., Sunnyvale, CA.

KEYWORDS: GIS, Coastal management, Remote sensing.

Everitt, J.H., Escobar, D.E. and F.W. Judd. (1991)

Evaluation of Airborne Video Imagery for Distinguishing Black Mangrove (*Avicennia germinans*) on the Lower Texas Gulf Coast. Journal of Coastal Research. 7(4), 1169-1173.

KEYWORDS: Coasts, remote sensing, Computer image analysis, Colour infra-red, GIS, Airborne video.

NOTES:

Critical assessment of the potential of airborne colour infra-red (CIR) video imagery as a data source for mapping black mangrove [*Avicennia germinans* (L.)L.]. The paper includes technical descriptions of the hardware and software employed. Results quoted suggest that CIR imagery is suitable for distinguishing between mangrove and other vegetation, soil and water. The conclusion drawn is that airborne CIR imagery provides a useful near-real-time tool, and could be useful "for rapid assessment of damage to populations following catastrophic weather events such as freezes and tropical storms". Airborne video surveys are also less costly than conventional photographic ones.

Fairfield, F. M. (1987)

Marina planning with Geographic Information Systems. Coastal Zone '87 Proceedings. 1023 - 1030.

KEYWORDS: GIS, Coasts, Marinas, Coastal management, Planning.

Field, D. (1988)

National Coastal Wetlands Data Base.

FDC Newsletter. 7,

KEYWORDS: GIS, Coastal applications, Raster GIS, USA, US Federal Agency.

Fleming, C.A. and Townend, I.H. (1989)

A Coastal management Database for East Anglia.

Proceedings, 6th Symposium on Coastal and Ocean Management (Coastal Zone '89), Charleston, South Carolina, July 11 - 14, 1987. 5, 4092-4107.

KEYWORDS: GIS, Coasts, England, Coastal processes, Database design.

NOTES:

Describes work conducted by Halcrows (a large U.K. civil engineering firm) to develop a GIS for coastal management on the East Anglian coast of England. The region concerned consists of extensive low-lying wetlands and agricultural lands, highly prone to flooding particularly during periods of storm surges and high tides. The shoreline itself consists of soft, recent, barely-consolidated sediments and is thus highly vulnerable to erosion. An integrated programme of coastal management and defense is therefore required, and GIS is seen as a prime tool for aiding decision-making and planning. The system being developed is based on Intergraph hardware and software, and considers the East Anglian coast as a linear, essentially one-dimensional entity.

Foley, M. (1991)

The creation of a morphological map using field techniques and computer-based analysis: An application at Long Strand sand dune complex, Co. Cork.

Paper presented at the 3rd Congress of the European Union for Dune Conservation and Coastal Management, Galway, Ireland, June 17th-24th, 1991 (to be published).

KEYWORDS: GIS, Coasts, Dunes, Morphology, IDRISI.

NOTES:

Describes how a morphological map of the Long Strand sand dunes complex (County Cork, Ireland) was created by field survey of topographic data using an electronic distance meter, and subsequent input of these data to IDRISI. The mapping was conducted as part of a wider investigation into vegetational history and management considerations for this important dune field.

Frederiksen, P., Frederiksen, Pia, and Muenier, B. (1991)

Nordic Council Marine GIS - a conceptual framework.

Third Scandinavian Research Conference on Geographical Information Systems. Proceedings.

KEYWORDS: GIS, Coasts, Baltic Sea.

NOTES:

This paper presents a conceptual framework for monitoring pollution in Nordic coastal waters. It emphasises the need to consider GIS as part of a larger information system including databases, hardware, software, applications, and data management issues. The discussion is set in the context of a proposal by the Nordic Council to establish a marine monitoring scheme covering Nordic waters from the Bay of Bothnia to Skagerrak, and possibly up along the Norwegian coast. As part of the study, 89 commercial GIS products were evaluated. From this list, three products (ARC/INFO, Spans and Genamap/Genacell) were shortlisted for further evaluation. The strengths and weaknesses of each products are compared, and an implementation strategy is proposed.

French, D.P. (1991)

Quantitative mapping of coastal habitats and natural resource distributions: application to Narragansett Bay, Rhode Island.

Coastal Zone '91 Proceedings. 1, 407-415.

KEYWORDS: GIS, Coasts, Coastal mapping, Coastal habitats, ARC/INFO.

NOTES:

The author suggests that effective management of the coastal zone depends on the availability of "accurate information on the distributions of natural resources in both time and space". She suggests that field collection of appropriate data "requires considerable effort" before GIS can be employed for analysis and display. The paper describes how data relating to natural habitats (wetlands vegetation types, bathymetry, etc.) in and around Narragansett Bay, Rhode Island were obtained through field mapping and other techniques. The data were collected for mapping both in atlas and digital format, the latter using ARC/INFO. The study was funded by the Narragansett Bay Project, part of the (US) National Estuary Program.

Fricke, A. and Forbes, D.L. (1988)

A system for coastal description and classification. Coastal Management 16, 111-137

KEYWORDS: GIS, Coasts, Canada, Government agency, segmentation.

Frischeisen, E.R., Argento, M.S.F., Herz, R and Carneiro, R.P. (1989)

The Coastal Management program in Brazil.

In Coastlines of Brazil, Edited by Claudio Neves (Series editor Orville T. Magoon). American Society of Civil Engineers. 1 - 9.

KEYWORDS: GIS, Coasts, Brazil, Coastal Management, Government Agencies.

NOTES:

In 1988, the Brazilian government established a National Coastal Zone Management Plan (PNGC). The SECIRM (Secretaria da Comissao Interministerial para os Recursos do Mar) is responsible for conducting coastal management.

The paper stresses the view of the coastal zone as a transition environment, possessing characteristics of terrestrial, atmospheric and oceanic environments, in different balance according to the "functional categories of each space". For this reason, and also because the PNGC has a decentralised character, coastal decision-making is devolved to the state level. Nevertheless, an integrated view of coastal management is promoted. The programme include systematic gathering of existing data, and

normalisation of these data to common standards suitable for inclusion in a database. For this, the data were transformed onto thematic maps at scales of 1: 100,000, 1:50,000 or 1:25000 depending on coverage and level of detail available. Twelve basic themes have been established: topography and bathymetry; geology/faciology (sic); agricultural vocation; aquatic and terrestrial ecosystems; oceanographic parameters; climatic information; socio-economic information; soil cover; land use; geomorphology; declivity; water quality; and planned and current zoning.

The cadastral survey is restricted to sectors measuring 30' by 30' longitude / latitude, and is coded in matrix format for input to a "Geographical System of Information of the Coastal Management" (GEOSYS). Satellite imagery is also used as a means of inputting data to the system as and where appropriate.

Gardels, Kenneth D., Scott T. McCreary, and Susan Huse. (1990).

"Land Use Policy Analysis with GIS: San Francisco Bay Estuary".

GIS/LIS 90 proceedings of the ACSM/ASPRS annual convention.

KEYWORDS: GIS, Coastal management, Environmental modelling.

NOTES:

GIS is used to model impacts of landuse on water quality. Two modelling techniques are used: growth senario map production and environmental/ water quality analysis. Modelling is done using standard tools in GRASS. So far just the growth modelling as been done although with several different senarios (combinations of development incentives and limitations). The second part will examine the possible effects of development on estuary environment, etc.

Giardina, M., Trerranova, C and Piscedda, S. (1991)

A GIS application for the management of night Thermal infrared data: monitoring of the coastal environment. (Poster paper abstract).

Proceedings, Second European Conference on GIS (EGIS '91). 2, 1318.

KEYWORDS: GIS, Coasts, remote sensing, Environmental monitoring, applications.

Gornitz, V. and Kanciruk, P. (1989)

Assessment of Global Coastal Hazards from Sea Level Rise.

Proceedings, 6th Symposium on Coastal and Ocean Management (Coastal Zone '89), Charleston, South Carolina, July 11 -14, 1987. 2, 1345-1359.

KEYWORDS: GIS, Coasts, Coastal Hazards, Sea level change, ARC/INFO, Coastal Data modelling.

NOTES:

Describes work on developing a global coastal hazards database, intended to predict the coastal segments at greatest risk to a rise in sea level caused by future climate warming.

Gornitz, V., White, T.W., Cushman, R.M. (1991)

Vulnerability of the U.S. to future sea level rise.

Coastal Zone '91 Proceedings. 2354-2368.

KEYWORDS: GIS, Coasts, Vulnerability assessment, Hazard mapping, Sea level rise.

NOTES:

Describes how a coastal hazards database is used in conjunction with a GIS to assess the vulnerability of the coastline of the conterminous U.S. to floods and other hazards. The approach adopted is based on application of a Coastal Vulnerability Index (CVI). Data sources for the DTM and database are also discussed.

Grelot, J-P. (1982)

An inventory of the French Littoral.

Auto Carto V Proceedings. 367 -373.

KEYWORDS: GIS, Coasts, Coastal mapping, France.

NOTES:

The Institut Geographique National (IGN) in France produced a database inventory of the French littoral, showing land use and legal status of different sectors of the coastal zone. The data are stored in digital from the programme will be repeated every five years, and it is anticipated that "it will be possible to up-date the files and automatically compile evolution maps".

The data are limited to a coastal strip about 5km wide. Land use was captured from 147 large-format sheets at 1:25,000 obtained by medium-scale photo- interpretation, and legal status of the land was obtained from 23 sheets at 1:100,000 as obtained from town planning documents, etc. Basic products that may be obtained from the data consist of maps and summary statistics. However there is only very limited flexibility of format and design in these maps and statistics.

Guss, P. (1972)

Tidelands mapping for the Coastal Plains region. Coastal Mapping Symposium, American Society of Photogrammetry. 243-62.

KEYWORDS: GIS, Coasts, Coastal mapping, Tidelands.

Guth, J.E. (1972)

The National Ocean Survey Coastal Boundary Mapping.

Tools for Coastal Zone management - Proceedings of the Conference. February 14-15, 1972, Washington D.C. marine Technology Society, Washington D.C. 67-69.

KEYWORDS: Coasts, Coastal zone management, Coastal mapping, GIS.

NOTES:

Reviews the importance of, and chief criteria for, delineation of coastal boundaries. "Part of the problem of mapping coastal boundaries is that it hasn't been clear what to map or how to map it". He argues that the private sector is too narrowly focussed, and the international community "has been talking about the problem for a long time without any specific action", and that therefore "federal and state authorities must share the responsibility for solving the problem"

Haddad, K. D. and B. A. Harris. (1986)

A Florida GIS for Estuarine Management.

Technical Papers of the 1986 ACSM/ASPRS. 3, 2-11.

KEYWORDS: GIS, Coastal management, Remote sensing, ELAS.

NOTES:

A report on the development of their Marine Resource Geobased Information System for research and management. Aerial photos and TM data are used to analyse estuarine off shore seagrass. The system uses ELAS for habitat and historical analysis (old at --photos that are digitised, etc.). The data overlay approach "differs from standard GL, overlays only in the types of parameters being entered." (p. 9).

Haddad, K.D. and Hoffman, B.A. (1987)

The role of Geographic Information Systems in managing Florida's coastal wetland resource.

Proceedings, Coastal Zone '87. 5182-5195.

KEYWORDS: GIS, Coasts, Wetlands, Coastal management.

Haddad, K.D. and McGarry, G.A. (1989)

Basin-wide management: A remote sensing / GIS approach. Coastal Zone '89 Proceedings. 2, 1822 - 1836.

KEYWORDS: GIS, Coastal GIS, Remote sensing, Watershed management, LANDSAT TM.

NOTES:

Data are being housed and analysed on the Florida Department of Natural Resources Marine Resource GIS (MRGIS). The MRGIS applications software includes ERDAS image processing / raster GIS software, and ARC/INFO. Also uses NASA's non-proprietary ELAS (raster-based image processing and manipulation software). MRGIS was developed in the early 1980s to map and monitor marine fisheries habitat and has evolved into an integrated GIS.

Hansen, W., Cheng, Z., Goldsmith, V, Clarke, K. and Bokuniewicz, H. (1990)

Implementation of a marine GIS in New York Bight for the Evaluation of proposed dredged sediment disposal sites.

GIS/LIS '90 Proceedings. 2, 820-829.

KEYWORDS: GIS, Coastal Applications.

Hazelhoff, L and van Hees, J. (1991)

The development of a GIS for mapping polluted sediments in an estuary.

Proceedings, Second European Conference on GIS (EGIS '91).

KEYWORDS: GIS, Coasts, Estuaries, Pollution monitoring, Environmental management.

Heinecke, A.M. (1990)

Experiences with PC databases in Maritime Environmental Protection.

Computer Techniques in Environmental Studies III, Edited by P. Zannetti. 311-321.

KEYWORDS: GIS, dBASE, Relational databases, Coastal applications, Environmental Pollution.

Hiland, M.W., R.A. McBride, D.W. Davis, D. Brand Jr., H.R. Streiffer,

F.W. Jones, A.J. Lewis and S.J. Williams. (1991)

Louisiana coastal GIS network: graphical user interface for access to spatial data.

Proceedings GIS/LIS '91 American Congress on Surveying and Mapping/ American Society of Photogrammetry and Remote Sensing: Atlanta, Georgia. 2, 845 - 856.

KEYWORDS: GIS, Coasts, USA, Apple Macintosh.

NOTES:

The Louisiana Coastal Geographic Information Systems Network (LCGISN) was created to provide an index to spatially referenced data (eg.shoreline change maps, aerial photography).Its primary objective was to provide access to Louisiana coastal zone data. The goals of the project were: to improve communication (between scientists, planners, managers etc.), simplify integration of data (i.e. translate between computer platforms and data formats), reduce duplication of effort (i.e. informing organisations of previous work), identify common data sets (deemed important by coastal representatives), promote networking and data exchange, develop guidelines for cataloguing, develop a friendly user interface, publish a newsletter and assist other organisations. A prototype interface was constructed using HyperCard on an Apple Macintosh. The menus were a trade-off between many aspects including user-friendliness vs. systems capabilities; non-technical verbage vs. precise technical language; simplicity vs. high level of detail; etc. Other points raised included the Freedom of Information Act (i.e. how the general public could access computer data); LCGISN's liability for incorrect information; standardising bibliographic entries with MARC (a national/ international machine readable library catalogue format); and the storage space required for the accumulated information.

Hill, G.J.E. and Kelly, G.D. (1987)

A Comparison of existing map products and LANDSAT for land cover mapping.
Cartography. 16(1), 51-57.

KEYWORDS: GIS, Coasts, Remote sensing, LANDSAT, Coastal mapping, Australia.

NOTES:

Authors' address / affiliation: Univ. of Queensland, Dept. of Geography, St. Lucia,
Brisbane, Queensland 4067, Australia.

Hill, J. M., D. L. Evans, and J. Blackmon. (1985)

Development of a Permit Geographic Information system for Coastal Zone Management.
Technical Papers, 5 1 st Annual Meeting, American Society of Photogrammetry, vol. 1,
Theodolite to Satellite. Washington, DC, March 10-15, 1985.

KEYWORDS: GIS, Coastal management, Development control.

NOTES:

A GIS was developed to aid assessment of environmental impacts in permit areas of the coastal/estuary regions of Louisiana. The GIS which incorporates a wide variety of data layers from many sources has proved valuable to map, compare, calculate areas, etc.

Howey, T and Blackmon, J.B. (1987)

Use of a Geographic Information System as a tool for making land use management
decisions for coastal wetlands in a State Regulatory Program.

Coastal Zone '87 Proceedings. 399-414.

KEYWORDS: GIS, Coasts, Wetlands, Decision Support Systems, USA.

Hubertz, Jon M., Driver, D.B. and Reinhard, R.D. (1991)

Wind waves on the Great Lakes: A 32 Year Hindcast. Journal of Coastal Research. 7(4), 945-968.

KEYWORDS: Coasts, Waves, Hindcasting, GIS.

NOTES: Describes how shortcomings in the available database relating to wave climate in the North American Great Lakes was overcome by backwards projection ("hindcasting") from existing limited data.

Humphreys, R. G. (1989)

Marine Information Systems. Hydrographic Journal. 54, 19-21.

KEYWORDS: GIS, Coastal management.

Ibrahim, A.M. (1989)

Integrated Monitoring Approaches in Coastal Resources Management in Malaysia.

Global Natural Resource Monitoring and Assessments: Preparing for the 21st Century, Workshop Proceedings, Venice, Italy, Sept 24 - 30, 1989. 769 - 777.

KEYWORDS: GIS, Coasts, Remote sensing, Malaysia.

NOTES:

Author's address / affiliation: Research and Consultancy Unit, Univ. Teknologi
Malaysia, Kuala Lumpur, Malaysia.

Jeffries-Harris, T and Selwood, J. (1991)

Management of marine sand and gravel - a seabed information system.

Land and Mineral Surveying (L&MS).9(2), 6- 8.

KEYWORDS: GIS, ARC/INFO, Coastal resources, Marine resources, Mineral extraction.

Jensen, J. R., et al. (1990)

Environmental Sensitivity Index (ESI) Mapping for Oil Spills Using Remote Sensing and Geographic Information System Technology.

International Journal of Geographical Information Systems. 4(2), 181-201.

KEYWORDS: GIS, Coastal management, Oil Spills.

NOTES:

Considers the use of GIS to organize several layers of information that would be relevant to oil spill or other emergency responses as well as useful for non-emergency management. Layers in the database include information on shoreline sensitivity, oil sensitive wildlife, and access and protection features.

Jones, D.K. et al. (1975)

A Coastal Area Information System for the New Jersey Department of Environmental Protection : A Feasibility Study.

Bureau of Regional Planning, Division of State and Regional Planning , N.J. Department of Community Affairs, 329 West State Street, Trenton, N.J. 08625,.

KEYWORDS: GIS, Coasts.

Jungerius, P.D., Loedeman, J.H., van der Meulen, F and Stuiver, J. (1991)

A geometrical approach to monitoring deflation features from aerial photographs in a GIS environment.

Paper presented at the 3rd Congress, European Union for Dune Conservation and Coastal Management, Galway, Ireland, June 17th - 24th 1991 (to be published).

KEYWORDS: GIS, Coasts, Dunes, Monitoring, Air photography.

Kam Suan Pheng. (1989)

The Use of GIS for Coastal Resources Study: Some Case Examples.

Tropical Coastal Area Management. 6-7.

KEYWORDS: GIS, Coastal management, SPANS, Malaysia.

NOTES:

The Malaysian Coastal Resources Management Project is using the Spatial Analysis System (SPANS) for preliminary analysis of socioeconomic data in South Shore.

Kapetsky, J.M., McGregor, L. and Nanne, H.E. (1987)

A Geographical Information System to Assess Opportunities for Aquaculture Development: A FAO-UNEP/GRID Study in Costa Rica.

GIS '87 Proceedings - Second Annual International Conference, Exhibits and Workshops on Geographic Information Systems, San Francisco, October 26-30, 1987. 2, 519 -535.

KEYWORDS: GIS, Coasts, Aquaculture, GIS Applications, Third World.

NOTES:

Using ELAS to look at several parameters that might determine the location of possible aquaculture sites. Variables include: salinity, bathymetry, shelter (wave calculations from wind and depth data), land uses (for drainage etc. from landsat data), infrastructure, soils, proximities, etc. The study recommends the use of GIS in fisheries management and planning.

Kappraff, J. (1986)

The geometry of coastlines: a study in Fractals.

Computers and Mathematics with Applications. 12B (3/4), 655-671.

KEYWORDS: GIS, Coasts, Fractal geometry.

NOTES:

Builds on empirical work by Lewis Richardson, and concepts pioneered by Benoit Mandelbrot. Various mathematical models of coastlines are presented, displaying different aspects of self similarity. Operational definitions are given to the basic concepts of self-similarity, length of a curve, dimension, geometrical fractals and random fractals.

Kendziorek, M. (1989)

Using GIS in a Global Scale Disaster: the T/V Exxon Valdez Oil Spill.

Geographic Information Systems Seminar: Beyond the Pilot Project - the Next Generation. Toronto, Canada, November 27-28, 1989. 132-173.

KEYWORDS: GIS, Coastal Applications, Environmental management, Oil spills, GeoSQL.

Komar, P.D. (1983)

Computer models of Shoreline Changes.

In Komar, P.D. (Editor) CRC Handbook of Coastal Processes and Erosion. CRC Press Inc., Boca Raton, Fa.

KEYWORDS: GIS, Coastal processes, Simulation modelling.

Langran, Gail. (1990)

Tracing Temporal Information in an Automated Nautical Charting System.

Cartography and Geographic Information Systems. 17(4), 291-299.

KEYWORDS: GIS, Coastal management, Temporal GIS.

NOTES:

The author considers methods of spatiotemporal representation within traditional geographic information systems data structures. A distinction is drawn between information-oriented and production-oriented temporality, and fundamental elements of temporal metadata are examined. She suggests that a truly temporal GIS "should include automated procedures to detect trends, compare events, compute rates, and explore the nature of the spatio- temporality described by the data base."

Law, M.N. (1991)

Utility of GIS in the development and implementation of shoreline management plans.

Proceedings, Flood Plain Management Conference, Toronto, Canada, 12-14th March 1991.

KEYWORDS: GIS, Coasts, Canada, Great Lakes.

NOTES:

Describes the rationale behind selection and use of a GIS to develop and implement shoreline management plans for the Great Lakes shores of Ontario, Canada. The paper outlines briefly the process for developing Shoreline Management Plans, the limitations of conventional mapping, the potential of GIS and the current provincial perspective in Canada towards using GIS in shoreline management.

The traditional spatial unit used in map-based shoreline management in Ontario was the littoral cell, defined as "a self-contained sediment system that has no movement of sediment across its boundaries". Each littoral cell is divided up into shoreline reaches ("segments of shoreline that have a similar physiography, geologic composition, average annual recession rate and orientation to waves").

The GIS selection was based on hardware restrictions which required implementation on an AT (286) PC-compatible machine; a perceived need for twin-screen operation ("because of the need to interact with the public and the need to maintain privacy of certain information"); a need for user interface with other existing GIS, image processing systems and databases; and finally, "the system should be capable of producing a minimum of twelve map layers of information to be overlaid simultaneously in boolean operations".

Law, M.N. (1990)

Applications of GIS to local shoreland management issues.

GIS for the 1990s (Proceedings of the Canadian National Conference of GIS, March 5-8, Ottawa, Ontario). 1333-1345.

KEYWORDS: GIS, Coasts, Coastal management, Applications, Great Lakes, Canada.

NOTES:

Examines the use of GIS for management of Ontario's Great Lakes shoreline.

Law, M.N., Saunders, K.E., Coleman, ME, Fisher, J.D., van

Wyngaarden, R., Boyd, G.L. and Stewart, C.j. (1991)

Using GIS to monitor and predict long-term Great Lakes shoreline erosion.

GIS 1991 Conference Proceedings. National Conference on GIS, March 18-22, 1991, Ottawa, Ontario, Canada.

KEYWORDS: GIS, Coastal Management, Great Lakes, ARC/INFO, SPANS, Environmental monitoring.

Leatherman, S.P. (1983)

Shoreline mapping: a comparison of techniques.

Shore and Beach. 51(3), 28-33.

KEYWORDS: Coastal management, GIS, Coastal survey, Cartography.

Lissauer, I.M. and Gaines, R. (1989)

Ports and Waterways Management Information System.

Proceedings, 6th Symposium on Coastal and Ocean Management (Coastal Zone '89), Charleston, South Carolina, July 11 - 14, 1989. 5, 4065-4074.

KEYWORDS: Coastal management, Coastal GIS, U.S. Coastguard, Dynamic modelling, Process modelling, Hawaii.

Loubersac, L and Populus, J. (1986)

The applications of high resolution satellite data for coastal management and planning in a Pacific coral island.

Geocarto Int. 1(2), 17-31.

KEYWORDS: GIS, Coasts, Remote sensing, Pacific Ocean.

NOTES:

In Portuguese with English abstract.

Address/affiliation of authors: Dept. de Pesquisas e Aplicacoes, Inst. de Pesquitas Espaciais, C.P. 515, 12201, Sao Jose dos Campos, SP, Brasil.

Loubersac, L., Grotte, A. and Viollier, M. (1986)

Utilisation des images SPOT pour l'amenagement littoral et l'inventaire des sites aquacoles en Nouvelle calédonie (Project ALIAS). Resultats Preliminaires.

Unpublished report (Obtainable from Inst. Francais de Recherche Pour L'exploitafion de la Mer, 29273 Brest, France.). 7 pages.

KEYWORDS: GIS, Coasts, Remote sensing, SPOT, Aquaculture, New Caledonia.

NOTES: Cited in RESORS database. No further details, known.

Maher, R.V. (1987)

Applications of GIS to the Ocean Environment.

Proceedings: The Ocean, an International Workplace (Marine Technology Society). 10651067.

KEYWORDS: GIS, Coastal management, Marine studies, Environmental management.

Maness, Lindsey V. J., Paul Mausel, and Stephen J. Stadles. (1978)

Landsat/Land Use Planning in the Coastal Zone.

Coastal Zone 78 Proceedings. American Society of Civil Engineers.

KEYWORDS: GIS, Coastal management, Remote sensing.

NOTES:

Considers landsat-derived data and argues that these data must be integrated into larger GIS to be useful in coastal zone management. CZ is described as a "unique region", in that the landscape changes rapidly, common law doesn't apply, and it is difficult to survey. Change detection is particularly relevant to the rapidly changing coastal zone. Changes are due to both natural and human related processes. The paper further describes how COMARC Design Systems will be used to develop Landsat/GIS CZ system in Washington.

Marine Technology Society (editors). (1972)

Tools for Coastal Zone Management. Proceedings of the Conference, February 14-15th 1972., Washington D.C.

KEYWORDS: Coastal management, GIS, Methodologies.

Matusek, S. (1990)

Nutzungskonflikte auf der Insel Sylt. Darstellung, Bewertung und Wege zur Problemlösung unter Verwendung eines GIS.

Dipl. Arb. Keil. 100 pp.

KEYWORDS: GIS, Coastal management, Germany, ARC/INFO.

Mauriello, M.N. (1991)

The Use of Computer Mapping to establish historical erosion rates and coastal construction setbacks in New Jersey.

Coastal Zone '91 proceedings. 1, 357-369.

KEYWORDS: GIS, Coasts, Coastal mapping, Coastal erosion, US East Coast.

NOTES:

Describes work in progress in New Jersey to update and revise earlier Erosion Hazard Areas policy, and to establish areas of concern. The work is a joint project involving the New Jersey Division of Coastal Resources, the University of Maryland's Coastal Mapping Group, and New Jersey's Stockton State College.

A metric mapping analysis was undertaken of historical shoreline data for New Jersey's oceanfront and portions of Delaware Bay, which enabled compilation of historical shoreline change maps. A PC-compatible computer program called p-MAP was created, which allows compilation and plotting of shoreline data at various resolutions and scales.

McBride, R. (1989)

Accurate computer mapping of Coastal Change: Bayou Lafourche Shoreline, Louisiana, USA.

Proceedings, 6th Symposium on Coastal and Ocean Management (Coastal Zone '89), Charleston, South Carolina, July 11 -14, 1987. 1, 707 - 719.

KEYWORDS: GIS, Coasts, Intergraph, Coastal erosion, USA, Government agency.

McGarry, Gail A. and Kenneth D. Haddad. (1990)

Applications of GIS Soil Data Layers in Resource Research and Management in a Florida Estuarine Watershed.

Technical Papers, 1990 ACSM-ASPRS Annual Convention. 3, 202-213.

KEYWORDS: GIS, Coastal management, Estuaries, USA, Florida.

NOTES:

GIS tools are being used to analyze watersheds and estuaries. In particular, attempts are being made to integrate Soil Conservation Service data into a watershed GIS to assess the impacts of different land use scenarios. All data are stored and analyzed within the framework of the Marine Resources Geographic Information System, an integrated facility based on ERDAS, ARC/INFO, and NASA's ELAS software packages. ----

McGrath, Timothy S. (1990)

Geographic Information Systems Applications for Recreation Management: A case study in the Oregon Dunes National Recreation Area.

Unpubl. Masters Thesis, University of Oregon, Eugene, Oregon.

KEYWORDS: GIS, Coasts, Dunes, Recreation.

Meaille, R., Wald, L and Boudouresque, C-F. (1988)

Cartes des peuplements benthiques en Mediterranee: constitution d'une banque de donnees geocodeset synthese cartographique. Oceanologica Acta. 11 (2), 201-211.

KEYWORDS: Coastal management, GIS, Mediterranean.

Mealle, G. and L. Wald. (1990)

A Geographical Information System for some Mediterranean Benthic Communities.

International Journal of Geographical Information Systems. 4(1), 79-86.

KEYWORDS: GIS, Coastal management, Mediterranean.

NOTES:

Describes the use of GIS to integrate a large amount of data on a single theme (benthic communities). The data were previously only available from a variety of agencies, whose methods of collection and representation varied. A GIS was used to pull together the data, identify gaps, and eliminate redundancies.

Michener, W.K., D.J. Cowen and W.L. Shirley. (1989)

Geographic Information Systems for Coastal Research.

Coastal Zone '89- Proceedings of the Sixth Symposium on Coastal and Ocean Management (O.T. Magoon, H. Converse, D. Miner, L.T. Tobin and D. Clark eds.). 5, 4791 - 4805.

KEYWORDS: GIS, Coasts, Remote sensing, Concepts.

NOTES:

Critical review of the potential of remote sensing, Geographic Information Systems (GIS) and other analytical methods as tools for coastal management and research. Specifically, the paper focuses on the trade-off between raster and vector approaches to data storage and analysis. Also discussed are available data needs, the need for and availability of new analytical tools, and a suggested research agenda. The authors conclude that GIS has great application in coastal resource management (natural and man-made). Although problems remain, including: inability to represent certain types of coastal information in maps (e.g. time dependence); data loss when converting between raster and vector; and the inability to apply traditional statistical techniques to spatial data. However, in spite of its flaws, GIS has gained wider acceptance as a management system because of decreasing software and hardware costs.

Moreno, D.D. (1989)

Application of Geographic Information Systems in Marine Resource Assessment -Georges Bank Case Study.

Coastal Zone '89 Proceedings. 1844 - 1859.

KEYWORDS: Coastal management, Coastal GIS, Boundary disputes, Resource management, GIMS.

Neilsen, P. (1988)

Three simple models of wave sediment transport.

Coastal Engineering. 12, 43-62.

KEYWORDS: GIS, Coasts, Simulation modelling, Sediment transport.

Nicolaisen, N. (1989)

OCSEAP data and information management.

Proceedings, 6th Symposium on Coastal and Ocean Management (Coastal Zone '89), Charleston, South Carolina, USA, July 11 - 14, 1989. 5, 4061-4064.

KEYWORDS: Coastal management, GIS, Data management, NOAA, USA.

Page, S. H. (1986)

Remote sensing techniques to monitor kelp beds in California.

1986 ASPRS-ACSM Fall Convention, ASPRS Technical Papers. 163 - 171.

KEYWORDS: GIS, Coasts, Remote Sensing, Kelp, Monitoring.

Pitchel, W., Weakes, M., Sapper, J., Tadepalli, K., Jandhyala, A., and Ketineni, S. (1991)

Satellite mapped imagery for Coastwatch.

Coastal Zone '91 (7th Coastal and Ocean Management Symposium) Proceedings, Long Beach, Ca., July 8-12, 1991. 2531-2545.

KEYWORDS: GIS, Coasts, Remote sensing, Coastal change monitoring, USA.

Pleasants, J.B.

The marine Environment and Resources Research and Management System MERRMS.

<Mimeograph: original source unknown>.

KEYWORDS: GIS, Coasts, Virginia, USA., data retrieval systems, Bibliographic databases.

NOTES:

MERRMS provided "researchers, advisors, students and managers a point Source of data on Virginia's coastal zone and its inhabitants, phenomena, and uses". The aim was to "present these data in such a way that their interactions become clearer, and the effect of proposed changes can be predicted better". However, it was not a GIS as the term is now generally understood: MERRMS consisted of a number of "distinct but related sectors", namely (a) The Wetlands, Shallows and Shorelines inventory, which consisted of a basic description of the coastal zone, georeferenced by latitude and longitude or by alpha-numerical index; (b) the Chesapeake Bay Bibliography, a "compilation of all references concerning the Chesapeake Bay or its inhabitants"; (c) a number of databanks of "hard" data amassed by the Virginia Institute of Marine Science and other institutes, entered on punched cards, which could be retrieved and sorted on the basis of geographical coordinates; (d) the MERRMS Library, which was conceived as a totally microfiche library of document- based information; and (e) the "Visual Display" (sic), which was based on the use of 35mm slides and multiple projectors aimed at a single screen, to display map, air photo and related imagery.

Porter, D.E. and Eiser, W.C. (1991)

Using GIS Technology in Assessing the Impact of the SC Beachfront Management Act following Hurricane Hugo.

Coastal Zone'91 (Proceedings of the Seventh Symposium on Coastal and Ocean Management), Long Beach, California, edited by O.T. Magoon et al. 2, 1213-1219.

KEYWORDS: GIS, Coasts, Storms, Hurricanes, US East Coast.

Pramanik, M.A.H., Ali, A., Quadir, D.A., Rahman, A., Shahid, M.A. and Hossain, M.D. (1987)

Regional seminar on the Application of Remote Sensing Techniques to Coastal Zone Management and Environmental Monitoring, Dhaka, Bangladesh, 18 - 26 November 1986.

International Journal of Remote Sensing. 8 (4), 659 - 673.

KEYWORDS: GIS, Coasts, remote Sensing.

Queleennec, R-E. (1989)

The CORINE "Coastal Erosion Project": Identification of coastal erosion problems and data base on the littoral environment of eleven European countries.

Proceedings, 6th Symposium on Coastal and Ocean Management (Coastal Zone '89), Charleston, South Carolina, July 11 - 14, 1987. 5, 4594 - 4601.

KEYWORDS: CORINE, European Community, EUROCOAST, Coastal monitoring.

NOTES:

The European Communities CORINE database brings together data about a wide range of environmental processes and phenomena. The objective is to develop a comprehensive decision- support and research facility for the European Community. CORINE has been developed as a large ARC/INFO application. Within the CORINE project are subsumed various sub-projects, one of which was concerned with identifying and recording coastal erosion problems around the European coasts.

Data were collected by national representatives in each participant country. The coast was sectioned and classified according to specified criteria, and the resulting data were standardised and digitised.

Rahman, A., Rahman, N., Hossain, D and Hossain, T.I.M.T. (1986)

The application of remote sensing data in the study and mapping of coastal land accretion and mangrove plantations in the coastal belt of Bangladesh.

The Application of Remote Sensing Techniques to Coastal Zone Management and Environmental Monitoring, Sem., Proc., Ohaka, Bangladesh, Nov. 18 - 26, 1986. 3 10 -319.

KEYWORDS: GIS, Coasts, Remote sensing, Mangroves, Bangladesh.

Ranganath, B.K., Dutt, C.B.S. and Manikiarn, B. (1989)

Digital mapping of Mangroves in Middle Andamans of India.

Coastal Zone '89 Proceedings. 1, 741 - 750.

KEYWORDS: GIS, Coastal GIS, Remote sensing, LANDSAT TM, Mangroves, Indian Ocean.

Reithmuller, R., Lissen, A., van Bernern, K.-H., Krasernann, H.L., Muller, A and Patzig, S. (n.d.)

WATIS - An information System for Wadden Sea Research and Management.

<publication details not available>.

KEYWORDS: GIS, Coastal management, ARC/INFO, Germany, Wadden Sea, Environmental management.

Ricketts, P.J., McIver, A.R and Butler, M.J.A. (1989)

Integrated Information Systems, the key to coastal zone management. The Fundy/ Gulf of Maine/Georges Bank (FMG) Project, a Canadian case study.

Proceedings, 6th Symposium on Coastal and Ocean Management (Coastal Zone '89), Charleston, South Carolina, July 11 - 14, 1987. 5, 4138 - 4150.

KEYWORDS: GIS, Coasts, Canada, Case study, Data management, CARIS.

Roberts, S.I. (1989)

Problems of developing a GIS database for the FMG.

Proceedings, 6th Symposium on Coastal and Ocean Management (Coastal Zone '89), Charleston, South Carolina, July 11 - 14, 1987. 5, 4129 - 4137.

KEYWORDS: GIS, Coasts, Maritime boundaries, North America, Data management.

Robinson, G.J. (1991)

Projet d'Atlas Marin Numérique du Royaume-Uni: Approche progressive vers un système d'informations marines.

Revue Hydrographique Internationale Monaco. 68(1), 41-54.

KEYWORDS: GIS, Coasts, Oceanography, Marine Atlases, Electronic Atlases, UK.

NOTES:

Describes the British Digital Marine Atlas Project. Suggests that GIS technology will only have limited scope for marine atlases, and that new techniques will have to be developed to take into full account the special nature of marine information.

Robinson, G.J. (1991)

The UK Digital Marine Atlas Project: an evolutionary approach towards a marine information system.

International Hydrographic Review, Monaco. 68 (1), 39 - 51.

KEYWORDS: GIS, Coasts, Oceanography, Marine Atlases, Electronic Atlases, UK.

NOTES:

This paper was published simultaneously in English and French versions (see separate citation for details of the French-language version). The paper describes the UK Digital Marine Atlas Project, undertaken by a consortium headed by the United Kingdom Natural Environment Research Council (NERC). The first part of the paper outlines the project history, and discusses aspects of the Atlas design and development. The Atlas project was conceived out of a recognised need to collate and standardise a range of marine and related information, pertaining to British coastal waters in particular, in order to support a range of functions undertaken by the NERC and other interested organisations, including administration, policy making and scientific bodies.

The resulting Atlas is seen as the first stage in development of a full Marine Information System (MIS), with full analytical as well as data retrieval and storage facilities. The operational system is based on Laser-Scan software running on a DEC VAXstation, but a read-only version of the Atlas is also available for PC compatible machines.

Current work, described in the conclusion of the paper, entails introduction of GIS technology to the cataloguing element represented by the Atlas. This is based around pc-ARC/INFO, but the author suggests that "in common with most commercial GIS this system cannot cope very well with information possessing a depth of time dimension, such as salinity and temperature.

The effective handling and portrayal of such data sets must therefore await the development of suitable new data structures and tools".

Rogers, Golden and Halpern, Inc. (1990)

Profile of the Barnegat Bay.

(Report prepared for the Barnegat Bay Study Group by Rogers, Golden and Halpern, Inc., in association with Expert Information Systems, Inc.).

KEYWORDS: GIS, Coastal management, ARC/INFO, New Jersey GIS, USA, Government agency.

Scalise, A. and Bartlett, D.J. (1992).

A review of some operational problems for implementing a GIS-based environmental assessment for coastal areas.

Paper presented at Environmental Modelling and GIS conference, 7 July 1992, University of Reading, UK.

KEYWORDS: GIS, coasts, conceptual framework, coastal management, environmental impact assessment.

Schauser, U-H. (1991)

Überlegungen zur Nutzung von GIS-WEST für raumplanung und Küstenmanagement am Beispiel Busems.

Poster Presentation, Symp. Ökosystemforsch., Busum, FRG., 3 -4 March 1991 (in press).

KEYWORDS: GIS, Coastal management, Germany, Environmental management, ARC/INFO.

Schauser, U.-H. and Sterr, H. (1989)

Inhaltliche und methodische Konzeption landschaftsökologischer Untersuchungen im Litoral der Schleswig-holsteinischen Ost- und Nordseeküste.

Essener Geographische Arbeiten. 17, 1 - 9.

KEYWORDS: GIS, Coastal management, ARC/INFO, Wadden Sea, Environmental management, Landscape ecology.

Schauser, U.-H., Boedeker, D., Matusek, S and Klug, H. (1990)

The use of a Geographic Information System for Wadden Sea conservation.

Poster presentation, 7 Int. Waddensea Symp., Ameland, FRG. 22 - 26th October 1990 (in press).

KEYWORDS: GIS, Coastal management, Germany, Wadden Sea, ARC/INFO, Environmental management.

Sharp, G., Pringle, J. and Duggan, R. (1989)

Assessing Fishing effort by remote sensing in the Scotia Fundy region of Fisheries and Oceans Canada.

Int. Geoscience and Remote Sensing Symposium - IGARSS '89/ 12th Canadian Symposium on Remote Sensing, Proceedings., Vancouver, B.C., July 10 - 14, 1989.

2056-2060.

KEYWORDS: GIS, Coasts, Remote Sensing, Fisheries, Canada.

Simpson, J.A. (1986)

Coastal Boundary Hiatus: Tidal Datum vs Ordinary High Water Mark.

1986 ASPRS-ACSM Fall Convention. ACSM Technical Papers. 361 - 364.

KEYWORDS: GIS, Coasts, Surveying, Boundaries.

Smith, A.W.S. and Piggott, T.L. (1987)

In search of a coastal management database

Shore and Beach 55(2), 13 - 20

KEYWORDS: GIS, coasts, databases, data quality, data availability, Australia.

Somers, R., Jones, B and Snyder, S. (1989)

Managing and disseminating data necessary for coastal wetland management in South Carolina.

Proceedings, 6th Symposium on Coastal and Ocean Management (Coastal Zone '89), Charleston, South Carolina, July 11 -14, 1987. 5, 4125-4128.

KEYWORDS: GIS, Coasts, Wetlands management, USA, pc ARC/INFO, Data management.

Specter, C. and D. Gayle. (1990)

Managing Technology Transfer for Coastal Zone Development: Caribbean Experts Identify Major Issues.

International Journal of Remote Sensing. 11(10), 1729-1740.

KEYWORDS: GIS, Coastal management, Caribbean.

NOTES:

Report on the deliberations of a Delphi Panel survey. The Experts suggest that most applications of remote sensing have been oriented towards agricultural and geologic areas. Marine remote sensing is behind but progressing rapidly with new satellites etc. The Report discusses research to propose "recommendations that may be useful to policymakers and managers concerned with improving the flow of remote sensing technology to and through the Caribbean"

Specter, C. and Gayle, D. (1988)

Technology Transfer for Development of Coastal Zone Resources: Caribbean Experts examine critical issues. Int. Geoscience and Remote Sensing Symp. - IGARSS'88, Proc., Edinburgh, Sept 13 -16, 1988. 1449 - 1452.

KEYWORDS: GIS, Coasts, Remote Sensing, Caribbean, Technology Transfer.

Sterr, H and Boedeker, D. (1987)

Anthropogene Modifizierung der Küstenlandschaft und litoralen Morphodynamik im Bereich der Eckernförder Bucht. Ostsee.

Berliner Geographische Studien. 25, 219 - 245.

KEYWORDS: GIS, Coastal dynamics, Coastal zone planning, ARC/INFO, Environmental impacts, Wadden Sea.

Sterr, H. and Boedeker, D. (1989)

Quantitative modelling of the coastal environment along Keil Bay, Southwestern Baltic Sea, with respect to tourism and recreation. Proceedings, 6th Symposium on Coastal and Ocean Management (Coastal Zone '89), Charleston, South Carolina, July 11 -14, 1987. 4, 4862 - 4876.

KEYWORDS: GIS, Coasts, Tourism and recreation, Baltic Sea, ARC/INFO.

Thompson, D.E. (1972)

Airborne remote sensing of Georgia tidal marshes.

Operational Remote Sensing Seminar, American Society of Photogrammetry. 126-140.

KEYWORDS: Coasts, Remote sensing, GIS, Tidelands.

Thornton, L. (1991)

GIS Supports Environmental Assessment and Settlement of Exxon Oil Spill.

New Jersey GIS Update.

KEYWORDS: GIS, ARC/INFO, Coastal GIS, Environmental Assessment, Environmental management, US Government Agency.

Townend, I.H. (1991)

The Application of GIS to Coastal Zone Management.

Proceedings, Flood Plain Management Conference, Toronto, Canada, 12-14th March, 1991.

KEYWORDS: GIS, Coastal Management, East Anglia (UK), Intergraph.

Townend, I.H. (1990)

The application of GIS to coastal zone management.

Proceedings EGIS'90 - First European Conference on Geographical Information Systems

(J. Harts, H.F.L. Ottens, H.J. Schotlen and D.A. Ondaatje eds.). 2, 1096 - 1107.

KEYWORDS: GIS, Coasts, UK, Intergraph.

NOTES:

Townend discusses the development of a coastal geographic information system (GIS) which has been applied to 750 km of coast in East Anglia, England. A GIS was chosen to map relevant variables affecting the coast, graphically present variables on maps, assess inter-relationships between variables and their effect on the coastal erosion, and provide maps to support formulation of coastal management policy. The ability to work at both regional (synoptic) and site-specific scales was an important part of the analysis. To this end, the coastal zone was represented as a single line running from Flamborough Head to the Thames. While not following conventional practices of referencing items in their exact geographical position, it does enable relationships between coastal morphology and processes to be formulated. Extending the GIS as a management tool would require retrieving information about a specific site, providing summary data for planning, preparing graphical output for educational and public relations exercises, classifying the coast into zones, testing classification systems, and predictive modelling (e.g. economic consequences of a sea level rise). The coast's dynamic nature also requires adequate system maintenance facilities, such as editing features and attributes. The ability to represent time would greatly increase the potential of GIS for environmental applications. The success of such a system is dependent on management issues as well as analysis.

TRRU (Tourism and Recreation Research Unit). (1977)

Remote Sensing of Scottish Coastal Habitats. TRRU Research report No 34, Tourism and Recreation Research Unit, University of Edinburgh, Scotland. 95pp.

KEYWORDS: GIS, Remote sensing, Coasts, Environmental management, Coastal planning.

NOTES:

One of the first documented studies of the use of computers for handling coastal information, and in many ways a report which anticipates questions of methodology and implementation which continue to the present day. Two of the greatest merits of this study lie in the comprehensive recording of metadata as the database was developed; as well as the discussion of the role of metadata in a project of this kind.

The report describes how "the Tourism and Recreation Research Unit has been developing and operating for the Countryside Commission for Scotland and the Scottish Tourist Board ... a computer- based information system, TRIP (Tourism and Recreation Information Package)." The success of TRIP was such that the TRRU was commissioned by the Nature Conservancy Council to prepare "an inventory of selected features of the Scottish coast in a form suitable for entry into the TRIP data bank".

The report describes the methodology employed in this study, and outlines the criteria used to ensure consistency in the data. The data were captured mainly from groundtruthed vertical colour aerial photographs, analysed through stereoscopes.

The survey was restricted to 1 km squares of the (U.K.) National Grid which either contained the high and/or low water marks of ordinary spring tides; and/or included recognisable coastal habitats to the landward side of the high water mark. Information thus extracted were recorded on purpose- designed coding forms and punch cards, for storage in the TRIP system. Output was in the form of listings, statistical tables, and line-printer generated maps. Criteria recorded in the database included hotel capacity along the coast; variety of coastal habitats (number of habitats within 1 km); distribution of wind-blown sand deposits; etc.

van der Meulen, F. et al. (1991)

Dune landscape development and changing groundwater regime: Quantitative landscape succession and modelling with the help of GIS.

Paper presented at 3rd Congress, European Union for Dune Conservation and Coastal Management, Galway, Ireland, June 17th - 24th 1991 (to be published).

KEYWORDS: GIS, Coasts, Dunes, Landscape ecology, Modelling, Environmental management.

van der Muelen, F., Witter, J.V. and Arens, B. (1990)

Assessing impacts of sealevel rise on natural dune functions along the Dutch Coast: 1990 -2090. (A landscape ecological study of the foredunes with help of a geographic information system).

[Cited in van der Meulen et al, 1991

KEYWORDS: GIS, Coastal management, Coastal dunes, Sealevel rise, Netherlands, Landscape ecology.

Vedovello, R. and De Mattos, J.T. (1990)

Verificacao de parametros e propriedades morfoambientais, en imagens de satelite, para estudos do planejamento de areas litoraneas. Simposio Brasileiro de Sensoriamento Remoto, 6th, Manaus, Brazil, June 24 - 29, 1990. 671 -675.

KEYWORDS: GIS, Coasts, Remote Sensing.

NOTES:

In Portuguese with English abstract. Address/affiliation of authors: Dept. de Pesquisas e Aplicacoes, Inst. de Pesquisas Espaciais, C.P. 515, 12201, Sao Jose dos Campos, SP, Brasil.

Versozza, C.G. (1986)

A review of the applications of remote sensing to the coastal zone resources of the Philippines.

The Application of Remote Sensing Techniques to Coastal Zone Management and Environmental Monitoring, Seminar, Proc., Ohaka, Bangladesh, Nov 18-26, 1986. 103- 107.

KEYWORDS: GIS, Coasts, Remote sensing, Philippines.

Weismiller, R. A., S. J. Kristof, D.K. Scholz, P.F. Anuta and S.A.

Momin. (1977)

Change Detection in Coastal Zone Environments.

Photogrametric Engineering and Remote Sensing. 43(12), 1533-1539.

KEYWORDS: GIS, Coasts, LANDSAT, Remote sensing, Temporal GIS, Matagorta Bay, Texas.

NOTES:

The paper describes how techniques were developed and employed to analyse Landsat MSS temporal data for change detection on the coast of Texas. These techniques were (a) Post-classification change detection, based on comparison of independently produced spectral classifications; (b) delta data change detection, based upon

classification of a multispectral difference data set; (c) spectral/temporal change classification, based on standard pattern- recognition techniques applied to Landsat data for different time periods; and (d) layered spectral/temporal classification.

Welch, R., M. Mandden Remillard, and R. B. Slack. (1988)

Remote Sensing and Geographic Information System Techniques for Aquatic Resource Evaluation.

Photogrammetric Engineering and Remote Sensing. 54(2), 177-185.

KEYWORDS: GIS, Coastal management, Remote sensing.

Weyl, P.K. (1982)

Simple Information Systems for Coastal Zone Management.

Coastal Zone Management Journal. 9(2), 155-182.

KEYWORDS: GIS, Coasts, Data models, Vector data models, CZIS requirements.

NOTES:

One of the earliest publications to address questions of coastal data modelling. Weyl argues that the coastal zone may adequately and conveniently be represented in a database as a simple one-dimensional line.

Weyl, P.K. (1986)

Interactive tidal model of contaminant transport through the Port of New York.

Rapp. P.-v. Reun. Cons. int Explor. Mer., 186, 104-114.

KEYWORDS: GIS, Coasts, New York, Simulation modelling, Tidal modelling, Spreadsheet models.

White, K.L., Schornick, L and Hoskins, E. (1988)

HAZMAP - A Computerised Storm Surge Model: A Galveston Bay Area Test.

Proceedings, GIS/LIS '88, San Antonio, Tx., USA. 2, 571 -580.

KEYWORDS: GIS, Coasts, Hazards, Simulation, Storm Surges.

Wilkening, H. A. (1987)

Landsat Data Processing and GIS for Regional Water Resources Management in North East Florida.

GIS/LIS 1987. Proceedings of the ASPRS/ACSM annual convention, Baltimore, M.D. 5, 110-119.

KEYWORDS: GIS, Coastal management, Remote Sensing.

NOTES:

Reports on the development of RS/GIS system for regional water resources management in Florida. System is used in river basin planning studies. Software utilizes NASA's ELAS and ARC/INFO.

Williams, A.T. and C.D. Lavalley. (1990)

Coastal landscape evaluation and photography.

Journal of Coastal Research. 6(4), 1011 - 1020.

KEYWORDS: GIS, Coasts, photography, landscape analysis.

NOTES:

This article moves away from the computing field per se and focuses on the values that are deemed important in evaluating the landscape. Techniques considered for evaluating a coastal landscape are either field based (i.e."expert" observers judge a site), or component-based which includes arithmetic and statistical components. It is suggested that photographs can be used to increase the number of observers assessing a site, because it may be difficult or unfeasible to move a large number of "observers" to a particular location. Tests were undertaken to determine the suitability of "experts" as representatives for a population. For this purpose three groups were chosen, skilled, semi-skilled and layman. All groups were shown slides of the landscape and required to score a preference. Analysis of the results obtained showed that preferences among the three groups were similar. Implications for reliability of "expert" opinion to represent likely public opinion is discussed. This is relevant to aspects of Geographical Information Systems (GIS) where the so- called "expert" may be required to make a planning decision regarding changes to the landscape.

Williams, D.R., Balogh, M.E. and Foresman, T.W. (1986)

Wetlands: a perspective for mapping, monitoring and modeling.

1986 ASPRS-ACSM Fall Convention. ASPRS Technical Papers. 379 - 381.

KEYWORDS: GIS, Coasts, Wetlands, Monitoring.

Wohlwill, J.F. (1982)

The visual impact of development in the coastal zone areas.
Coastal Zone Management Journal. 9,

KEYWORDS: GIS, Coasts.

Wolf, D. and Augenstienj. (1988)

A demonstration GIS project to assist the Chesapeake Bay "clean up" in the Elizabeth River
drainage basin.

FDC Newsletter.

KEYWORDS: GIS, Coastal management, Chesapeake Bay, Estuary.