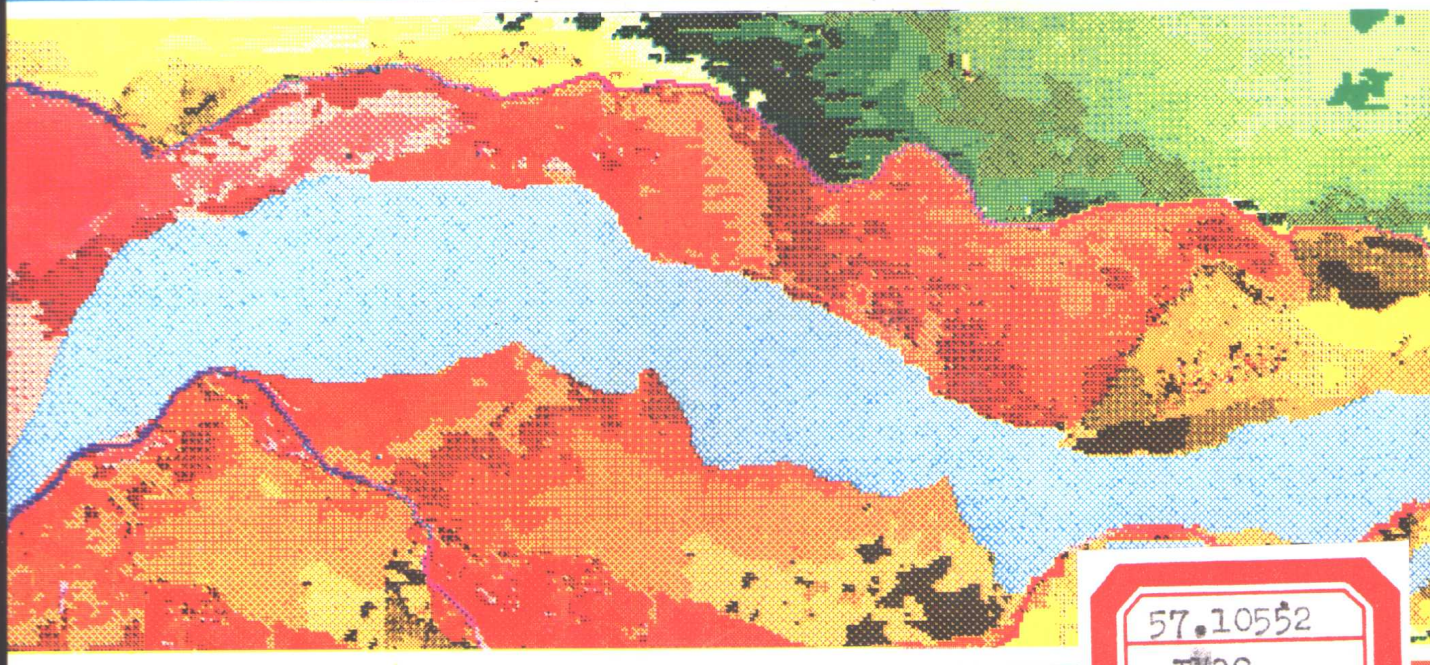
中国地理信息系统

检索地图集

第一卷

黄河下游洪水险情预警与灾情对策信息系统



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中国科学院资源与环境信息系统国家重点实验室 编制

国际文化科学中心世界实验室 赞助

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INDEX ATLAS OF GEOGRAPHIC INFORMATION SYSTEM OF CHINA

Vol. 1

Flood Risk Forecasting and Disaster Countermeasures Information System in the Lower Yellow River

Produced by

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INDEX ATLAS OF GIS OF CHINA

Flood Risk Forecasting and Disaster Countermeasures Information System in the Lower Yellow River

中国地理信息系统检索地图集

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励惠国　何建邦　张　晋

姚岁寒　黄　绚　傅肃性

黄河下游洪水险情预警与灾情对策信息系统

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Foreword

It has been decided by the Laboratory of Resources and Environment Information System (LREIS) of the Chinese Academy of Sciences to publish a series of GIS index atlases. This move serves a double purpose—on the one hand, these atlases will show the research achievements of LREIS; on the other, they will promote the application of GIS by providing the users with concrete examples of application model and software for data capture, storage, updating and analysis. The reason why the functions of GIS such as indexing and graph-display are shown in the form of a hard copy like the map is primarily that about 70% of environmental information is collected by the human eye, and, compared with the screen of a computer monitor, the map is something that people in China are accustomed to, and is widely accepted for its easy use which calls for no special equipment. In view of the fact that GIS is now still a high technology a little ahead of the time in this country, the map may well be regarded as an effective means at the transition stage to spread and deepen the knowledge of the storage and applications of GIS so as to encourage users of the system to conduct overall analyses, simulation experiments and forecasting in relation to environmental protection and resource exploitation.

The publication of the index atlases also represents a breakthrough in the technology of atlas editing and printing—a triumph which will match the achievement of laser photo type-setting technology. This is because the graphs and images produced as a result of the processing by GIS of all the data and images collected from socioeconomic statistics, ground observation networks and aeronautical and space observation systems possess an entirely new conception and content; in other words, they provide multi-dimensional information based on high generalization, summerization, induction and deduction. Undoubtedly, this new technology will go a long way towards enhancing automation and intellectualization in atlas design and compilation. As confirmed by experiments, amono-chromatic scanning and four-colour process printing can take the place of electronic colour scanning, and reduce to the minimum the large amounts of labour usually needed in atlas editing and printing.

What is gratifying is that the index atlases will offer the possibility for the users to obtain a key to the treasure trove and to share the database and software system created by LREIS. In fact, LREIS as a national laboratory has all along made it its duty and task to join efforts with the users to make use of its

information resources for the development of regional economy and the construction of engineering projects, and to promote information exchanges and database building.

LREIS plans to publish regulary, as part of its systematic effort to open to society, index atlases which will focus respectively on the urban system, coastal ecology, lake dynamics, water and soil conservation, forestry economic benefit, environmental evaluation, etc. It is hoped that by so doing, LREIS will have an opportunity to seek advice and opinions from experts both at home and abroad and to report the results of research work it has done to project sponsors and academic committee members inside and out side China, and also that this course of action will epitomize the state's open and reform policy, facilitate social supervision, improve LREIS work and bring LREIS systems to greater perfection.

LREIS is looking forward to responses from units and departments possessing information resources to the call for ensuring a free flow of information in China, so as to accerate material and energy flows among the country's different regions and enable its economic construction to keep pace with the age of information. An age when man-imposed blockade and technological monopoly will eventually be eliminated. With its progress made in the use of survey satellites, communication network and computer technique, China has managed to stand in the front ranks of the world, and is playing an active part in international cooperation programs, and in the building of world database network. Now that the time characterized by big-power domination is gone, China should and can stand on its own feet among the nations, and make its contribution to mankind.

Chen Shupeng

1989. 11

序

中国科学院资源与环境信息系统国家重点实验室计划陆续出版一系列地理信息系统检索地图集，旨在方便用户，反映该室研究成果，提供有关数据采集、存储与更新以及分析应用模型和软件的实例　地理信息系统原有的检索和图形显示功能之所以采用这种硬拷贝形式，主要是考虑人类采集的环境信息量的70%是靠视觉采集　同计算机屏幕相比，地图早已为人们喜闻乐见，无需专门设备，流行广泛　目前在我国地理信息系统尚属于超前阶段的“高技术”，借助地图来宣传与推广，说明其科学储备和应用功能，加深用户的理解，也许不失为有效的过渡方式，以期引导更多的用户来应用地理信息系统，举一反三，对资源开发、环境保护过程中进行多方面的综合分析，模拟实验与预测预报

这种检索图集的出版，对于地图集的编辑、印刷工艺过程的改革，也发出了闪光的信号，与文字编辑的激光照排相映成辉　来自社会经济统计、地面观测台站网络以及航空、航天对地观测系统的各种数据和图像，通过地理信息系统的深加工以及智能化信息处理之后，所输出的图像和图形已经具有崭新的概念和内容，即经高度概括、归纳、分析、演绎所产生的多维信息　这种流程对于提高地图集编制自动化和智能化，无疑是有益的探索和尝试　试验表明，利用单色扫描输出，四色套印合成，可以取代电子分色，简化地图集制印工艺，使清绘、分版、注记、校对、修版等大量手工劳动减少到最低限度

令人欣慰的是，用户通过检索地图集这个窗口，可以得到打开知识宝库的钥匙，分享资源与环境信息系统国家重点实验室已建成的一些数据库及软件系统，共同开发利用这些信息资源为地区经济开发和工程建设服务，并为促进信息交流和更新这些数据库而努力不懈　这是作为国家重点实验室的光荣使命和应尽职责　我们是乐于提供这方面服务的

我们希望把出版这种检索地图集作为开放实验室的一项制度坚持下去　分别将城镇体系、海岸生态、湖泊动态、水土保持、森林效益、环境评价等方面的实验系统，公诸国内外同行专家，征求意见，欢迎批评指教；同时作为向国内外学术委员及资助单位的汇报材料，体现国家开放实验室的改革、开放方针，接受社会的监督，以利改进工作，提高水平，使系统更臻完善

我们更希望得到更多的拥有信息资源的单位和部门的响应，使我国的信息流日益畅通，保障地区之间的物质流与能量流的加速运行，使整个国家的经济建设适应信息时代的步伐。人为的封锁和技术垄断将为历史所淘汰。我国应用卫星、通讯业务网络、计算机技术的进步已跻身国际先进行列，开展更广泛的国际合作，参与许多全球性数据库与信息网络建设工作。列强越俎代庖的时代已成过去，中国人民应该自立于世界民族之林，为人类作出应有的贡献

1989年11日于杭州

Preface

For thousands of years, the Yellow River has frequently migrated from south to north and from north to south, and as a result of the silting-up that has taken place on the river bed, the flood-control dyke has been constantly raised. All this has subjected the lower reaches of the river to flood risks which are of a long standing and too deep-rooted for easy removal. However, as the Lower Yellow River basin is one of the important economic centers of China, a satisfactory solution of the flood problem is of great significance. To achieve this, it is necessary to carry out experiments on the information system for flood-risk forecasting and disaster countering in the Lower Yellow River, on the basis of GIS which features both regionalism and comprehensivencess. The aim of such experiments is to provide a modern technological means, which will play a auxiliary role in the decision-making process concerning flood prevention, disaster relief and regional development, and to explore the potentials of GIS application and evaluate its effectiveness.

The system design, based on the operating system and aimed at meeting users' needs at different levels, consists of a database subsystem and a model base subsystem. In the database are stored, in the form of graph, image or digits, various kinds of information such as land use, digital elevation models, linear thematic elements, hydrological data, population and other socio-economic figures related to the Lower Yellow River and the flood areas of Beijindi and Dongping Lake; in the model base, which is of an open structure, capable of being easily revised, added to or reorganized, are contained models developed not only for flood prevention and control in the Lower Yellow River, but also for use in other areas. The whole system is user-friendly.

This atlas shows the composition, structure and function of the information system of the Lower Yellow River. As the compilation of the atlas is wholly done on the computer, this has saved both time and money, and at the same time, it provides graphs which could not have been made available if the traditional method had been adopted.

The purpose for publishing this atlas is, as a Chinese saying goes, to cast a brick to attract jade. It is hoped that readers will come up with valuable suggestions and criticisms, which will no doubt be helpful in the efforts to further widen the scope of application of GIS and enhance its intelligent level and its ability to solve practical problems.

前　言

几千年来，黄河南迁北徙，主河道游荡不定，河床不断淤积，防洪大堤日趋加高　黄河洪水险情，由来已久；黄河隐患，根深蒂固　而黄河下游区域又是我国重要的经济腹地之一，解决黄河洪水问题，关系重大　发挥地理信息系统区域性和综合性的特点，开展黄河下游洪水险情预报与灾情对策信息系统的实验研究，旨在为防洪救灾和区域开发治理的辅助决策提供现代化技术手段，同时探索地理信息系统的应用潜力，评价其应用效果

系统的设计以运行系统的要求为基础，以满足多层次的用户需求为目标　系统由数据库系统和模型库系统组成　数据库以图形、图像、数字的方式存贮了黄河下游河道滩地以及北金堤和东平湖滞洪区土地利用、数字高程模型、线性专题要素、水文数据、人口以及其它社会经济统计数据　应用分析模型的研制以黄河下游防洪决策为背景，同时充分考虑其应用的广泛性　模型库采用开放式结构，易于修改、增加和重新构造　系统具有友好的用户界面，方便、易用为其特色　该系统在1988黄河下游防汛遥感试验的初步应用中发挥了独特作用，受到国家科委和应用部门的肯定

这本图集反映了黄河下游信息系统的组成、结构和功能　图集采用了全计算机化的制作和输出方式，不仅制作周期短、节省大量的费用，而且实现计算机自动分版，获得常规方法难以制作的图件　我们将这本检索图集作为引玉之砖，以期得到批评指正，并为进一步拓宽地理信息系统的应用领域，提高其解决实际问题的能力和智能水平，继续探索

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Introduction to the Lower Yellow River

The Yellow River is the second largest one in China. The lower reaches begins from Taohuayu near Zhengzhou, 768 km long and 22 thousand km^2 large. The Lower Yellow River, surrounded by two Great Dykes, like huge dragon, runs over North China Plain. From a long time ago, the wide floodplain were cultivated. The farmland reaches 3.6 million mu, and about 2.9 million people live in the zone.

Historically, the Yellow River changed its courses and shifted many a time, involving a total area of 250 000 km^2 from Tianjin in the north to Changjiang and Huaihe River in the south. Dyke breach and flood overflow occurred more frequently. A large amount of sediments were depositted in river course, resulting the Lower Yellow River became a suspended river. The Yellow River's flood has been threatening Huang-Huai-Hai plain.

At present, flood protection in the Lower Yellow River relies on the embankments, like dykes, controlling and guiding engineerings and detention basins. When heavy flood happens, the Great Dyke is in danger and flood protection become extremely hard and difficult. So it is urgent to explore modern information technology in flood protection and flood hazard management.

Water resources shortage has limited the regional economic development of North China Plain. The Yellow River is one of its main water sources. A large amount of water and sediment resources are carried down as flood comes. So, we should do our best to retain floodwater, which also increases the much difficuty to flood protection.

Flood protection and full use of resources is a key problem in harnessing and developing the Lower Yellow River.

黄河下游流域概况

黄河下游自桃花峪起，长768公里，流域面积2.2万平方公里。两条千里大堤挟持着黄河，奔腾在黄淮海平原上，流注渤海。宽阔的河道洪水漫滩地上，居住着290多万人，耕地面积近360万亩。

历史上，黄河河道几经沧桑。河道迁徙无常，北到津沽，南至长江、淮河，整个黄淮海平原上到处留下它的足迹，荡及范围达25万平方公里。大堤溃决、洪水漫溢频频发生。大量的泥沙淤积，河床不断抬高，形成一条多沙的地上悬河。

黄河洪水灾害史不绝书，举世闻名。目前，下游防洪主要依靠各类防洪工程与河道治理工程。但这难以确保下游安全。利用先进的地理信息系统技术，建立洪水实时监测系统和险情预报与灾情对策信息系统，已成为洪水灾害预报以及灾害管理的一个重要途经。

水资源的短缺大大地限制了黄河下游的区域开发与经济发展。洪水造成危害，但也带来大量的淡水资源和泥沙资源。防洪与兴利成为黄河下游治理与开发的一个关键性的问题。地理信息系统技术将有助于解决这些问题。