

ILWIS 2.1 for Windows

The Integrated Land and Water Information System

User's Guide

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ITC

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Preface

ILWIS is an acronym for the Integrated Land and Water Information System. It is a Geographic Information System (GIS) with image processing capabilities. ILWIS has been developed by the International Institute for Aerospace Survey and Earth Sciences (ITC), Enschede, The Netherlands. For more than a decade, since 1985, the software has undergone major improvements. The last of which includes the change from DOS to the Windows environment. The release of ILWIS for Windows marks a new era in the development of the software.

As a GIS package, ILWIS allows you to input, manage, analyze and present geographical data. From the data you can generate information on the spatial and temporal patterns and processes on the earth surface.

The ILWIS media

The ILWIS User's Guide is part of the documentation for ILWIS 2.1. The full documentation includes:

- ILWIS Installation Guide. Instructions for setting up ILWIS and guidelines for setting up hardware, such as digitizers and printers;
- ILWIS Beginner's Guide. A first look at ILWIS, introducing the basic concepts, some essential ILWIS techniques and the main operations included in ILWIS;
- ILWIS User's Guide. Training in the skills you need to work with ILWIS. It provides numerous exercises to practice GIS techniques and Image Processing operations;
- ILWIS Applications Guide. Advanced procedures to work with ILWIS, providing 25 case studies for various research disciplines;
- ILWIS Reference Guide. Detailed description of the functionality of ILWIS including its window types, the objects, the operations, etc., illustrated with tips and examples.

Besides these Guides, extensive on-line and context-sensitive Help is available in the program.

The ILWIS User's Guide: Main objectives

The ILWIS User's Guide is intended for those who want to know how ILWIS 2.1 is used in basic GIS and Image Processing operations. It can be used both by persons that want to learn how to work with ILWIS by themselves, or in a course environment.

If you have been using an earlier DOS version of ILWIS, we strongly recommend that you go through the first two chapters of the *ILWIS User's Guide*, since there have been many conceptual changes with respect to earlier versions.

The *ILWIS User's Guide* is basically an exercise book. Therefore we have kept the amount of theoretical explanations to a minimum. For a thorough introduction to GIS and Image Processing, we recommend the following textbooks on GIS and on Remote Sensing:

- Aronoff, S. (1989). *Geographic Information Systems: a management perspective*. WDL Publications, 294 pp.
- Bonham-Carter, G. F. (1996). *Geographic Information Systems for Geosciences. Modeling with GIS. Computer methods in the Geosciences*. Pergamon Press, 398 pp.
- Sabins, F.F. Jr. (1987). *Remote Sensing, Principles and Interpretation*. W.H. Freeman and Co., 449 pp.
- Lillesand, T.M. and R.W. Kiefer (1987). *Remote Sensing and Image Interpretation*. John Wiley & Sons, New York, 612 pp.

Structure of the ILWIS User's Guide

The *ILWIS User's Guide* consists of 13 chapters.

- Chapter one, *Introduction to ILWIS for Windows*, is intended to get you started with ILWIS, and to show you the basics of the user interface.
- Chapter two, *Main concepts of ILWIS*, presents key concepts of ILWIS for Windows. We recommend users familiar to previous ILWIS DOS versions to go through this chapter, in order to get an idea of the new concepts in the Windows version.
- Chapter three, *Spatial data input*, allows you to practice digitizing maps and importing maps and images from other software packages.
- Chapter four, *Spatial data management*, explains all ILWIS activities used to arrange your spatial data in such a way that it can be used for analysis.
- Chapter five, *Attribute data handling*, deals with the use of tables: how to create or import tables, and how to calculate with data in tables.
- Chapter six, *Image processing*, explains various operations that can be applied to visualize, enhance, georectify and classify remote sensing images.
- Chapters seven, eight, and nine all deal with *spatial data analysis*. Various analysis techniques, such as retrieval, classification, measurement, overlay, neighbourhood and connectivity operations are demonstrated.
- Chapter ten explains how to generate *Digital Elevation Models* with ILWIS, and shows procedures to create derivatives, such as slope steepness and slope direction maps.

- Chapter eleven deals with the use of **geostatistical tools** for the analysis of point data.
- Chapter twelve is intended to show other functionalities of ILWIS for more advanced data analysis, including the use of the **command line, functions and script language**.
- Finally, chapter thirteen is dedicated to the production of output maps, the way to create annotations, how to treat colors, printing, exporting data and creating demos.

The exercises in the **ILWIS User's Guide** are intended not only to demonstrate to you how certain ILWIS operations are used, but also give you a basic idea of when they can be used in real applications. Therefore we used as much as possible examples from a single region, surrounding the city of Cochabamba, in Bolivia. Only when the Cochabamba data was not suitable for explaining certain operations, we selected some other examples.

The data set

All data files required for the exercises in the **ILWIS User's Guide** are included on the CD-ROM, which also contains the software, the data for the **Beginner's Guide** and the data for the case studies of the **Applications Guide**. The files of the Cochabamba area can be found in the directory `d:\usrguide` (where d is the drive letter of the CD-ROM drive) .

For each chapter there is a separate subdirectory, in which the data required for the exercises of that chapter are stored (e.g. `d:\usrguide\chap01` for chapter 1).

During the installation of ILWIS you can install the data files on your hard-disk, normally in the directory `c:\ilwis21\data\usrguide` and the subdirectories for the 13 chapters.

! If you did not install the data files during the installation of ILWIS, you should do so, before continuing. See the **ILWIS Installation Guide** on how to install data files. You can also use the **Windows File Manager** to copy the data files from the CD-ROM to your hard-disk.

The subdirectories of `c:\ilwis21\data\usrguide` will be the working directories for the exercises of each chapter. For example, when you start with the exercises for the first chapter, you should go to the directory `c:\ilwis21\data\usrguide\chap01`. When you have finished the exercises for a certain chapter, and you want to continue with the next one, you should change directory.

- ! When you want to repeat the exercises for a chapter, we recommend that you copy the original data files from the CD-ROM, or use the ILWIS Installation program, so that you always start with the original files, and not with files which may have been altered.
-

The ILWIS User's Guide has been structured in a way that you can start with any chapter. It is advisable, however, to follow the order of the book, since it reflects the data flow of working with a GIS.

Conventions used in the ILWIS User's Guide

This manual is formatted in such a way that the specific actions dealing with the software are separated from the accompanying text.



- This is an *exercise box*. You can follow the instructions step by step.
- Words in *Times New Roman 10 Italics* are keywords.
- Formulas that you should be entered are shown in *Courier New 10*.
For example: `Mapc = Mapa + Mapb`
- All information that should be supplied by the user is also shown in *Courier New 10*, as well as all the names of objects (maps, tables, columns etc.)
For example: *Geology*.
- The names of, operations, dialog boxes and the options in dialog boxes are shown in *Arial 10*.
For example: *Display Options - Raster Map*.

- ! This is a *tip-box*. It is used to give tips.
-

We assume that after a certain procedure is explained a few times, such as opening or closing maps and other objects, you will be familiar with it, and therefore basic things are not repeated too often.

The ILWIS User's Guide was made on computers with SVGA display (with a resolution of 1068 by 768 pixels, and 256 colors). If you are working on a screen with a lower resolution, some of the pictures in the book may look slightly different from the ones displayed on the screen. This is even more so when you work in

VGA mode (640 by 480 pixels, and 16 colors); the display of some of the maps and images may be confusing. We therefore recommend you to have at least a resolution that allows you to display 256 colors.

The *ILWIS User's Guide* was prepared with ILWIS running under Microsoft Windows 3.1, with the Windows default color scheme, so all ILWIS windows shown in this book are in the Windows 3.1 fashion.

Using the *ILWIS User's Guide* in courses

The *ILWIS User's Guide* is intended to be used both on an individual basis, for learning how to work with ILWIS, as well as in GIS and Image Processing courses.

Since the *ILWIS User's Guide* covers most of the functionality of ILWIS it is too large to treat it in a single course. In the following scheme the recommended exercises are shown for courses with different duration:

Introductory GIS courses

Intended for persons without prior knowledge of GIS.

- 1 day course: We recommend you to use the *ILWIS Beginner's Guide*.
- 5 days course: Chapter 1, 2, and parts of chapters 5 (5.1 to 5.3), chapter 7 (7.1 to 7.3), and chapter 8 (8.1, 8.2 and 8.4)
- 2 weeks course: Chapter 1, 2, 3, 4 (4.1, 4.3, 4.4 and 4.5), 5, 7, 8, 13 (13.3 to 13.5).
- 1 month course: Chapter 1, 2, 3, 4 (4.1, 4.3, 4.4 and 4.5), 5, 7, 8, 9 (9.1, 9.3), 10, and 13.

Advanced GIS courses

Intended for students already familiar with the basics of ILWIS.

- 1 week course: Chapter 4 (4.1 to 4.3, 4.6), 9.
- 2 weeks course: Chapter 4 (4.1 to 4.3, 4.6), 9, 10
- 1 month course: Chapter 4 (4.1 to 4.3, 4.6), 9 , 10, 11, 12, 13 (13.7).

For advanced courses with a longer duration, it is recommended to also practice with some of the case studies of the *ILWIS Applications Guide*, depending on the professional background and interest of the participants.

Image Processing courses

Intended for students without prior knowledge of image processing.

- 1 week course: Chapter 1, 6 (6.1 to 6.4)
- 2 weeks course: Chapter 1, 6 (6.1 to 6.5)
- 1 month course: Chapter 1, 6.

The schedule can also be followed when learning ILWIS on an individual basis. However, in the schedule of the courses about one third of the time will be spend on lectures. Users that are already familiar with GIS and Image Processing will need a much shorter time.

