No.01

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Правительство Кыргызской
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Государственная Комиссия по Архитектуре и
Строительству

Японское Агенство
Международного
Сотрудничества

THE STUDY ON

INTEGRATED DEVELOPMENT PLAN

OF ISSYK-KUL ZONE

IN THE KYRGYZ REPUBLIC

FINAL REPORT

(TOPOGRAPHIC MAPPING)

February 2006

KRI International Corporation
Nippon Koei Co., Ltd.
Aero Asahi Corporation

SD
JR
06-020

Preface

In response to the request from the Government of Kyrgyz Republic, the Government of Japan decided to conduct "The Study on Integrated Development Plan of Issyk-kul Zone in the Kyrgyz Republic" and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA dispatched a study team to the Kyrgyz Republic over the period from November 2003 to February 2006. The Study team consists of lKRI International Cooperation, Nippon Koei Co., Ltd., and Aero Asahi Corporation.

In Addition JICA set up an advisory committee headed by Mr. Shuji Koiso, Professor of Kushiro Public University between November of 2003 to November of 2004, which examined the study from specialist and technical point of view.

The study team held a series of discussions with the concerned officials in the Government of the Kyrgyz Republic and international partners, conducted related field surveys and trainings. After returning to Japan, the study team conducted further studies and compiled the final results in this report.

I hope that this report will contribute to Development of Issyk-kul Zone and to enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the concerned officials in the Government of Kyrgyz Republic for their close cooperation extended to the study team.

February 2006

Kazuhisa Matsuoka
Vice - President
Japan International Cooperation Agency

February 2006

Mr. Kazuhisa Matsuoka
Vice President
Japan International Cooperation Agency (JICA)

Dear Mr. Matsuoka

Letter of Transmittal

It is with great pleasure that we submit the Final Report of the "Study on Integrated Development Plan of Issyk-Kul Zone in the Kyrgyz Republic" which has been completed by joint efforts of the experts assigned by the State Commission on Architecture and Construction and the State Service of Geodesy and Cartography of the Kyrgyz Republic and the JICA Study Team from October 2003 to February 2006.

The Study has worked out strategies and programs to attain balanced development of the Issyk-Kul region which is endowed with a superb landscape of the Issyk-Kul Lake surrounded by the ever-snowed Tyan Shan mountain ranges. Digital topographic maps (1/25,000 and 1/100,000) have been newly prepared, and a master plan for integrated regional development has been formulated on the basis of assessments of resources available in the region. A participatory approach has been taken for the plan formulation, as well as for the pilot project operations.

Various actions are required to make the Issyk-Kul region more attractive to the people living in the region and visitors, and to make it more dynamic in economic and social activities. Our Study Team hopes that the Final Report would serve for implementation of the proposed programs by the initiative of stakeholders at the regional level as well as by the central agencies concerned.

Our Study Team wishes to take this opportunity to express our sincere appreciation for the kind assistance and cooperation extended by the people in Issyk-Kul, working group members, and all other parties concerned in the Kyrgyz Republic. This Final Report is a fruit of excellent collaboration of all participants in this Study.

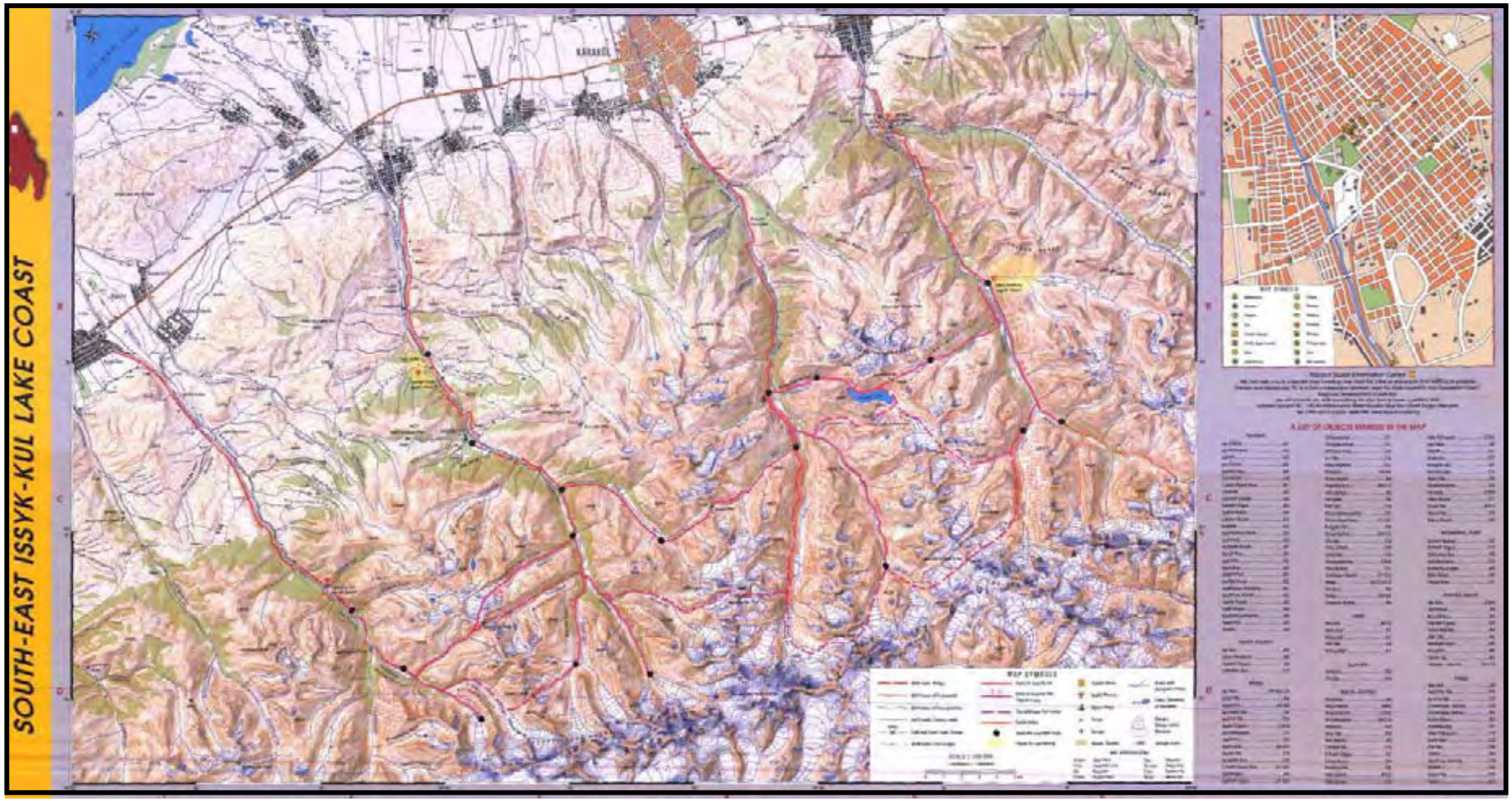
Very Truly Yours,

Hajime KOIZUMI
Study Team Leader

Issyk-Kul beach, Vicinity of Karakol City

Issyk-Kul Lake with TienSian Mountain

Trekking Map-face, produced by SSGC



Trekking Map-back, produced by SSGC

GPS Observation Work at the top of Tien Sian Mountain
(Altitude is 4,082m) Project area in August

Pricking point f GCP_GPS
(Photographed by GPS camera)

Evaluation of Aerial Photographs

Discussion of Trekking Map

2nd Technology Transfer Seminar (Topographic Mapping and GIS basic data)

Handover of Trekking Map to the Vice-Governor of Issyk-Kul Oblast

PRODUCTS OF THE STUDY

Work Items		Work Volume
1.	Acquisition of Satellite Imagery	
	SPOT 5 (2.5m)	15 scenes
2.	Aerial Photography	
	Photograph Scale	1:30,000
	Photographed area	14,000 km^2
	Negatives Film	1 set
	Contact prints	1 set or project area, 1 set for 1:25,000 mapping area
	2 times enlarged photographs	1 set
3.	GPS observation	
	GCP_GPS	Existing: 8 points, Pricking: 29 points
4.	Geometric correction	
	Orthogonal satellite images	1:25,000: 30 imageries
		1:100,000: 54 imageries
5.	Production of map manuscript	
	Map manuscript	1:25,000: 30 sheets
		1:100,000: 54 sheets
6.	Digital topographic mapping	
	Map scale	1:25,000, 1:100,000
	Mapping area	1:25,000: 2,300km^2, 1:100,000: 14,000km^2
	Number of sheets	1:25,000: 30 sheets, 1:100,000: 19 sheets
	Contour interval	1:25,000: 10m, 1:100,000: 40m
	Digital Plotting	1:25,000: 2,300km^2, 1:100,000: 14,000km^2
	Digital Compilation	1:25,000: 2,300km^2, 1:100,000: 14,000km^2
	Field completion	1:25,000: 2,300km^2, 1:100,000: 14,000km^2
7.	Data creation	
	Topographic mapping data	1:25,000: 30 sheets, 1:100,000: 19 sheets
	Basic data for GIS	1 set
8.	Production of CD_ROM	
9.	Topographic mapping data	2 sets
	DEM Data File	2 sets
	Digital mapping work manual	English 30 sets, Russian 20 sets
	Printed map	503 sets of each map sheet
	Printing Plates	1:25,000: 30 sets, 1:100,000: 19 sets
	Topographic maps	1:25,000: 30 sheets x 503 sets 1:100,000: 19 sheets x 503 sets
	Trekking map	1 set
10.	Reports	
	Inception report	English 25 sets, Russian 25 sets
	Progress report	English 25 sets, Russian 25 sets
	Draft final report (Main, summary, manual)	English 25 sets, Russian 25 sets
	Final Report (With CD_ROM)	English 25 sets, Russian 25 sets
		Japanese 15 sets
11.	Seminar	
	2nd Technology transfer seminar	1 set

THE STUDY ON INTEGRATED DEVELOPMENT PLAN OF ISSYK-KUL ZONE IN THE KYRGYZ REPUBLIC

FINAL REPORT

(TOPOGRAPHIC MAPPING)

TABLE OF CONTENTS

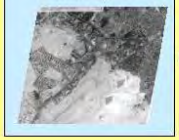
Outline of Topographic Map Production

Satellite Image Acquisition

Second Phase Work

Third Phase Work

Raw Image Data



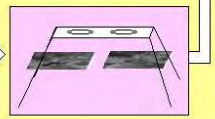
(8)Geometric Correction

Geometrically Corrected Image

(13) Control Point Survey (GPS)

(12) Aerial Photography

Stereoscopic Vision



(10) Preparation of Manuscript for Digitization

With the help of stereoscopy of aerial photograph, features on the satellite image will be interpreted and transcribed on the overlaid polyester base by color pencil.

Overlaid polyester base on the satellite image.

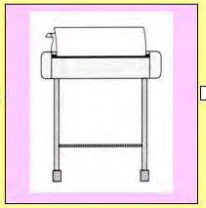
Ortho-Satellite image
Cut out exactly at each map sheet.

Original Map Manuscript
Acquisition of Height Information, Geographical Names and others

Manuscript for Digitization

Scanning of Manuscript

Scanning of printing plate of contour line



(14) Digitization of Topographic Maps
To encode the features on the Manuscript using CAD software.

(7) Vectorization of Existing Map
Height Information
To encode the contour line, spot elevation and so on.
Other Information
Other information as annotations will be acquired from existing map.

(23) Field Completion
Unclear part of compiled data will be checked in the field and amended.

(18) Digital Compilation & Structuralization
Combination of Planimetric Information and Height Information
To combine both planimetric and height information.
Digital Compilation
Combined data will be compiled.

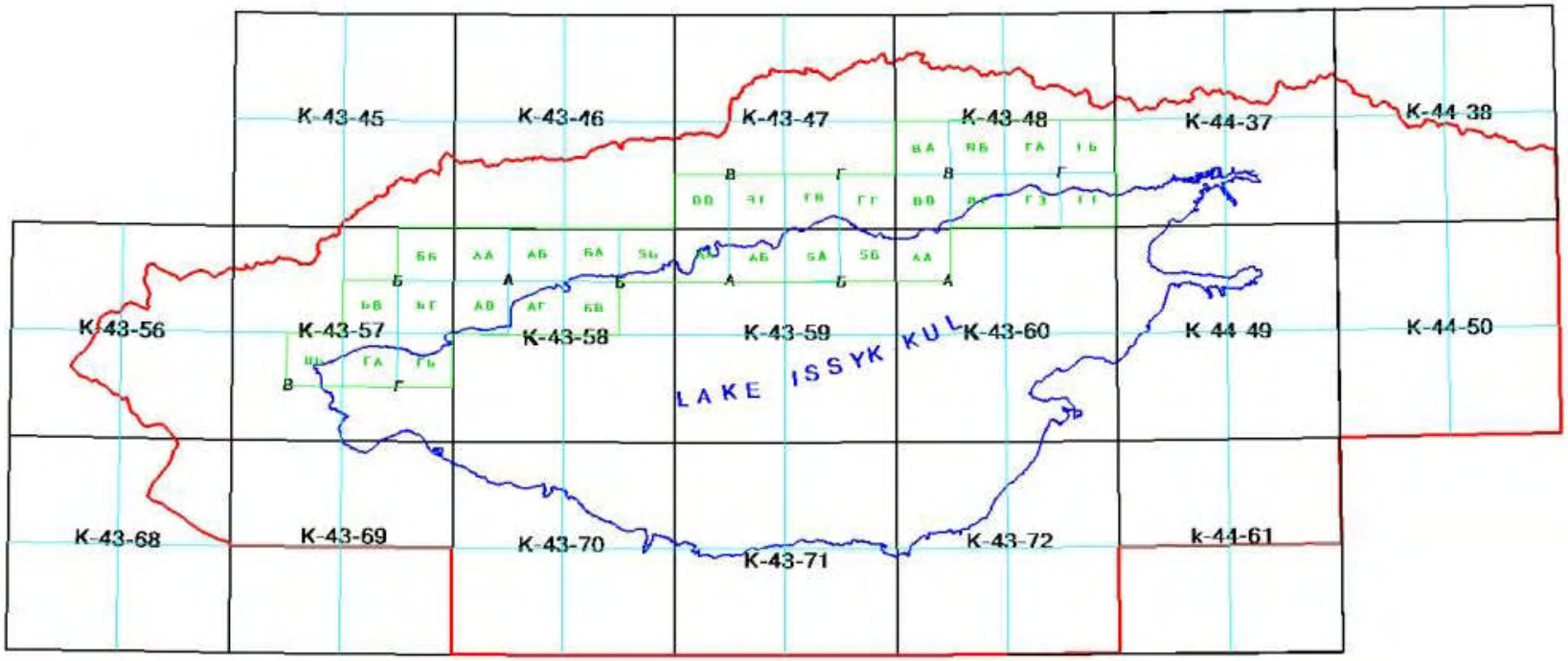
(19) Symbolization
Compiled topographic digital data will be symbolized.

(20) Preparation of Printing Plate
Using the symbolized data, printing plate will be prepared by laser plotter.

Basic Data Structuralization for GIS

(25) Printing of Topographic Maps
500 sets of topographic map will be printed.

INDEX MAP TO THE SCALES OF 1/25,000 & 1/100,000



Mapping Area

1:100,000 Topomap

1:25,000 Topomap

ABBREVIATIONS

AN30	Antonov 30 (Russian Aircraft)
B/W.....	Black and White
CAD.....	Computer Aided Design
CD_ROM	Computer Disk Read Only Memory
CIS	Commonwealth of Independent States
CK42.....	Coordinate System 1942
DEM	Digital Elevation Model
GCP	Ground Control Point
GCP-GPS.....	Ground Control Point observed by Global Positioning System survey
GCP-MAP	Ground Control Point selected on the map
GIS.....	Geographic Information System
GOJ.....	Government of Japan
GOK	Government of Kyrgyz Republic
GPS.....	Global Positioning System
JICA.....	Japan International Cooperation Agency
LSG.....	Local Self Government
NOAA.....	National Oceanic and Atmosphere Administration
OJT	On the Job Training
RMS.....	Root Mean Square
SCAC.....	State Commission on Architecture and Construction
SPOT	Systeme Probatoire d'Observation de la Terre
SSGC	State Service of Geodesy and Cartography
UPS.....	Uninterruptible Power Supply
USSR	Union of Soviet Socialist Republics

CHAPTER 1.

INTRODUCTION

CHAPTER 1. INTRODUCTION

1-1. Background of the Study

The Issyk-Kul Lake is a unique alpine lake attracting many people not only in the Kyrgyz Republic, but also from neighboring countries. Its surrounding area, Issyk-Kul Oblast is an important region for the development of tourism as well as conservation of the natural environment and ecology. Back in the 1970s, Issyk-Kul resort development plan was prepared. However, the plan is no longer practical due to the change in political and economic situation. Thus, the Government of the Kyrgyz Republic (hereinafter referred to as GOK) has been willing to prepare an appropriate integrated development plan for the Issyk-Kul zone for sustainable regional development, preserving the landscape and biodiversity, as a model of regional development plans for the whole country.

GOK requested support of the Government of Japan (hereinafter referred to as GOJ) to conduct a comprehensive study for formulation of an integrated regional development plan. Utilization of the modern methodology of Topographic mapping was specifically highlighted to workout a sound development plan. The Japan International Cooperation Agency (hereinafter referred to as JICA), the official agency responsible for the implementation of the technical cooperation program of GOJ, undertook the Study in close cooperation with the related authorities of the GOK. KRI International Corporation and Nippon Koei Ltd. (Regional Development Study) and Aero Asahi Corporation (Topographic mapping Study) have been retained by JICA to jointly conduct the Study and they formed a Team for this Study (hereinafter referred to as Study Team).

1-2. Counterpart Organization

State Service of Geodesy and Cartography (hereinafter called SSGC), counterpart of this project is the only one government organization authorized to carry out Topographic mapping and other Geodetic Surveying work in the Kyrgyz Republic.
After the independence from USSR, they had a technical assistance from other countries such as Switzerland and Germany. As a result of such assistance, they produced large-scale map (1:2,000) and Ortho-photos for cadastral mapping in vicinity of Bishkek and Osh city. However, necessary basic data, in other words, Topographic map data hasn't been provided sufficiently in spite of the provision and disclosure of fundamental information being necessary for development plan and social infrastructure due to security regulation and no work progress of digitizing. Study Team took into account the actual condition of Topographic map data

provision in Kyrgyz Republic as well as the structure, framework, technology and ability of SSGC, designed Digital Mapping method and Technology Transfer for all work programs of the Study.

(1) Structure of SSGC

Structure of SSGC is shown in following in figure 1-1. There is 300 staff approximately in the first on the list with Director.

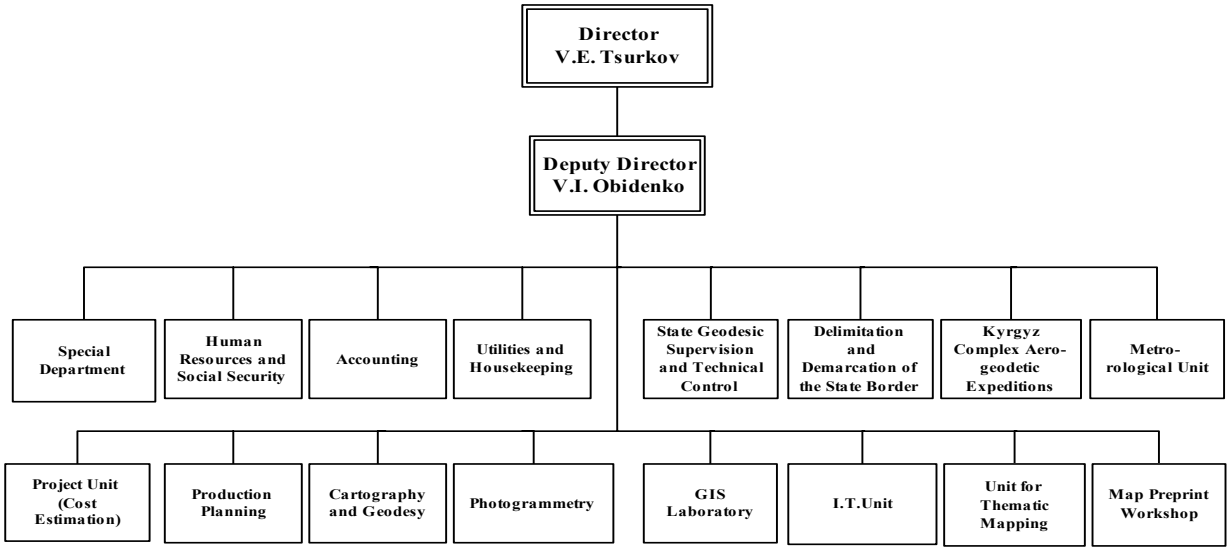


Figure 1-1. Structure of SSGC

(2) Map production facilities and equipment of SSGC

- Map production facilities and equipment of SSGC is shown in table 1-1.

No.	Facilities	Details	Qty	Remarks
1	Digitizing facility And computer	• INTERGRAPH H28MHL ; HP Workstation x 1100	3 sets	Intel Pentium 4 RAM 512Mb
		• SD 2000	3 sets	
		• Socet set	1 set	LEICA
		• HP Vectra VL 420 MT	2 sets	LEICA
2	Software	• MicroStation 95 & SE	3 sets	Bentley
		• MGE	1 set	
		• GeoMedia 5.0	1 set	GIS Environment
		• CorelDraw 10	1 set	

3	Large-sized plotter	• HP DesignJet 800ps • HP DesignJet cc800pc	1 set 1 set	
4	Photogrammetric scanner	• Ultra Scan 5000	1 set	Vexcel
5	Stereo plotter	• STS-1	12 sets	USSR, 1976～85
6	GPS receiver	• SR-300 • SR-530 • SR-520	3 sets 6 sets 11 sets	Dual frequency, Leica
7	GPS analysis Software	• SKI-Pro (Ver.2.5)	2 sets	Leica

Table 1-1. Mapping Facility of SSGC

- Network System of Data processing is shown in figure 1-2.

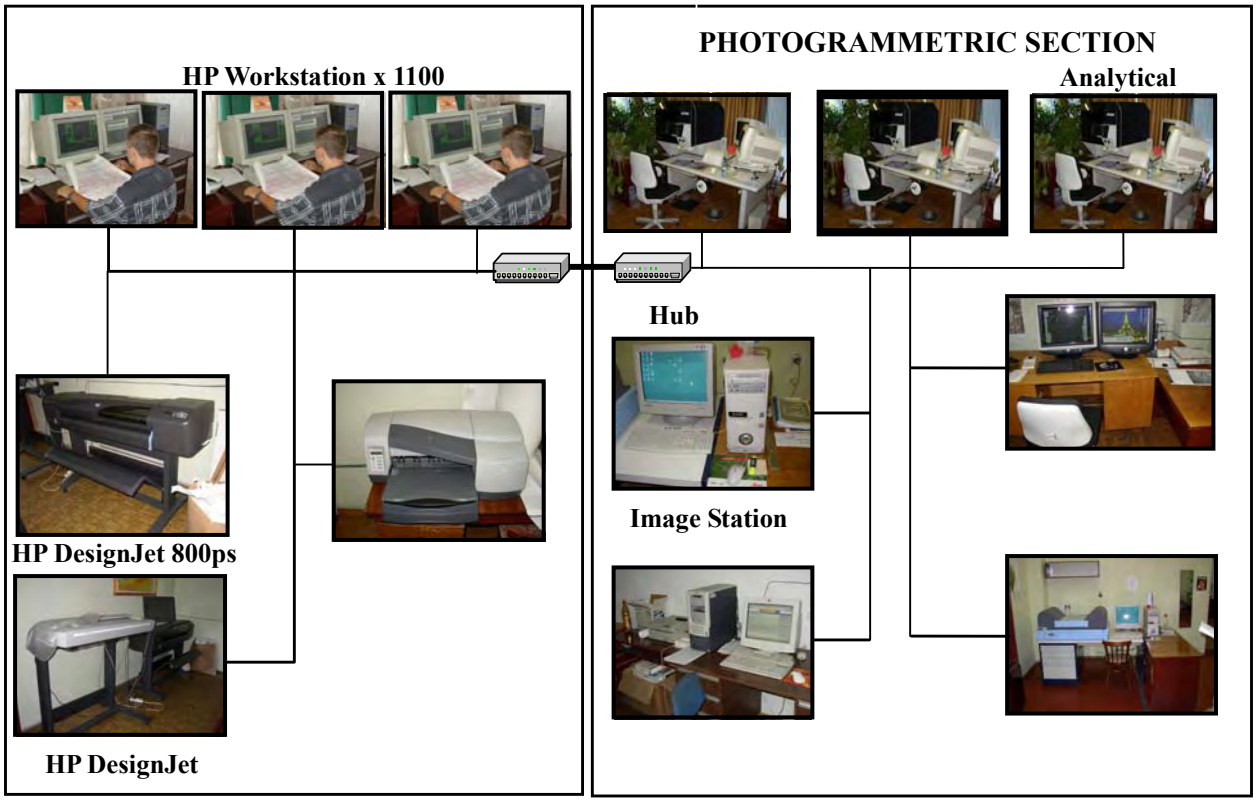


Figure 1-2. Network System of SSGC

- Condition of existing map in Kyrgyz Republic is as following table 1-2.

Map Scale	No. of Sheet	No. of Available original plate	Year of establishment	Digitalization
1:1,000,000	5	100%	1970～80	Not started
1:500,000	10	100%	1970～80 (partly 1990)	Not started
1:200,000	54	100%	1970～80	Not started
1:100,000	174	100%	1970～80 (partly 1990)	Not started
1:50,000	617	100%	1970～80	Not started
1:25,000	2,301	100%	1970～80	Not started

Table 1-2. Existing maps of Kyrgyz Republic

(3) Major work of SSGC

Major works of SSGC are;

- Geodetic Survey
- Various Terrestrial Survey
- Updating of Topographic maps
- International Border determination Survey
- Photogrammetry
- Production of various types of Thematic Maps