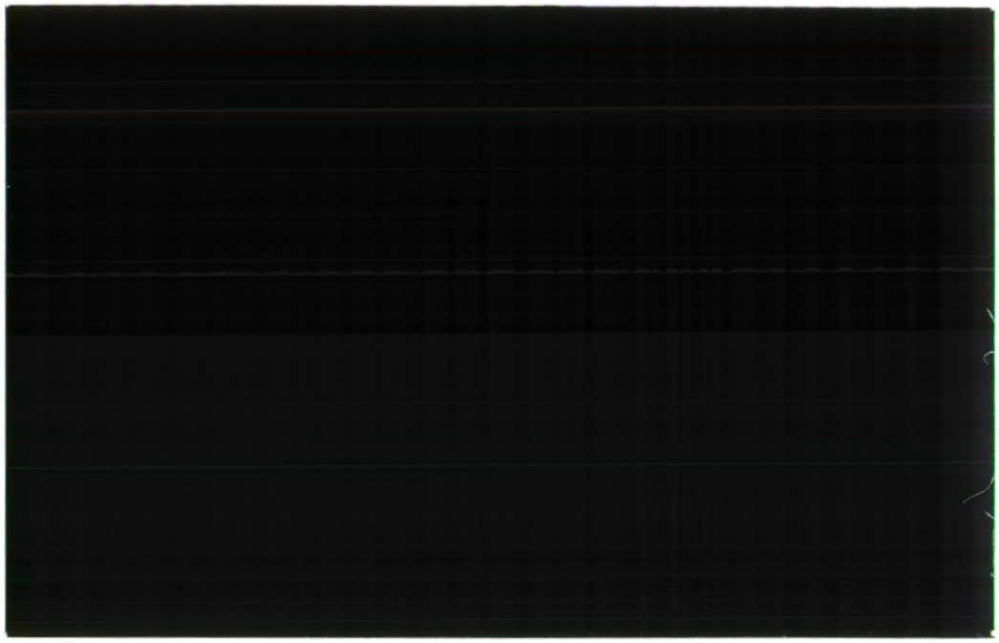
Institute of Hydrology



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Natural Environment Research Council

ODA/JAU Know How Fund
Aral Sea Project

Central Asia HYDATA Project

Visit Report

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Summary

The United Kingdom's Know How Fund has agreed to support the hydrological data processing component of Program 2.1 "Hydrometeorological Services", which is one component of the overall World Bank program of assistance to the Executive Committee of the Interstate Council for the Aral Sea. This report summarises the first phase of this contribution, in which hydrological data processing software, computer equipment and training were provided to hydrologists from all five countries of Central Asia during November - December 1995. Under the current funding arrangements, the second and final phase will be completed in March - April 1996, with follow-up visits to all five countries to provide additional training and software, and to solve any operational problems which may have arisen.

Contents

1. Background

1.1 In an effort to identify and alleviate the problems caused by reduced inflows to the Aral Sea, the World Bank has launched a major program of technical assistance and cooperation to the five countries of Central Asia under the auspices of the Executive Committee of the Interstate Council for the Aral Sea (ICAS). The ICAS/World Bank Aral Sea program is divided into eight sub-programs, which cover areas such as water resources policy and strategy, environmental studies, and water and sanitation. One key component is Program 2.1, which aims to improve the data processing and monitoring facilities available to the Hydrometeorological Services of Central Asia. In February 1995, some fifteen representatives from the Central Asian Hydrometeorological Services participated in a fact-finding visit to the UK and Switzerland. The UK Government, through the Know How Fund, subsequently agreed to support the hydrological data processing, remote sensing and GIS aspects of Program 2.1.

1.2 Initial training in remote sensing and GIS techniques was provided by the UK's Natural Resources Institute (NRI) to representatives from the five Central Asian Hydrometeorological Services during a workshop held at the offices of the Central Asian Hydrometeorological Research Institute (SANIGMI) in Tashkent in October 1995. This workshop, and the computer equipment and software provided to all five countries, is described in reference 1. The systems selected for hydrological and meteorological data processing were the Institute of Hydrology's HYDATA system (for hydrological data) and the World Meteorological Organisation's CLICOM system (for meteorological data). The Institute of Hydrology is the main research centre for hydrology in the UK, and also maintains the UK's national archive of river flow data. The World Meteorological Organisation is a UN agency responsible for providing training, specialist advice and other support to meteorological and hydrological services throughout the world.

1.3 Both HYDATA and CLICOM are personal computer-based database systems with menu-driven input and many facilities for the analysis and output of data. HYDATA is currently used as the national database system for hydrological data in more than twenty countries and CLICOM performs a similar role for meteorological data in more than one hundred countries. The CLICOM installation is being arranged by WMO in collaboration with the Central Asian Hydrometeorological Services. Arrangements for the supply and installation of the HYDATA system were discussed at a planning meeting, between representatives from the Hydrological Departments of each country and a staff member of the Institute of Hydrology, in Tashkent in September 1995. This report describes the outcome from that planning meeting and the subsequent installations of the HYDATA system in each country.

1.4 The main decision at the HYDATA planning meeting was that all five countries had an urgent need for computer facilities for processing hydrological data, and that the HYDATA system could meet most of their requirements. It was decided that the best way to provide the initial installation and training would be through a two-week workshop at SANIGMI in Tashkent, followed immediately by one-week installation visits to each country, with second follow-up visits after a short time (three months, say) to provide more advanced training and to resolve any operating problems which might have arisen. These proposals were subsequently approved by the Know How Fund and preparations for the HYDATA workshop were started in November 1995.

2. The HYDATA Workshop

2.1 The HYDATA workshop was held at SANIGMI in the period 26 November - 7 December 1995. The participants consisted of two representatives from the Hydrological Departments of the Main Administrations of Hydrometeorology in each of the five countries of Central Asia. All logistical arrangements, such as issuing invitations, liaison with the UK, and arranging translation services and accommodation, were performed ably by the International Relations Department of the Main Administration of Hydrometeorology of Uzbekistan. Training was provided by two staff members of the Institute of Hydrology with assistance from two senior scientists from SANIGMI and a professional interpreter. Topics covered included: basic data entry and validation procedures, data transfer techniques, an introduction to hydrological analysis facilities in HYDATA, data backup procedures and the use and care of modern personal computer hardware and peripherals. Special interest lectures were also given on hydrological data collection and processing procedures in the UK, and on flood estimation techniques in the UK. However, most of the training consisted of practical work by the participants using their own data.

2.2 During the workshop, it was decided that, as a course project, a short yearbook would be produced, both as a training exercise and to demonstrate to a wider audience the new capabilities of the Hydrological Departments in the Hydrometeorological Services of Central Asia. In the course of this project, all participants succeeded in entering river level and discharge data for 1993 and/or 1994 for at least three stations in their own countries, and in developing preliminary versions of the rating curves and daily mean flows for those stations. The sites considered included stations on the rivers Amu Darya, Syr Darya, Zeravshan and Naryn. Copies of this yearbook have been provided to all participants and to the Know How Fund and the World Bank.

2.3 Discussions were also held on additional requirements for hydrological data processing in Central Asia. Rivers in Central Asia experience a wide range of climatic conditions ranging from ice cover to extreme heat and, in some cases, from frequent shifts in rating curves resulting from flood flows and mud flows. Also, during the time of the former Soviet Union, some specialised and unique forms of output were adopted throughout Central Asia; for example, summary tables of daily mean levels and the presentation of river levels, flows, discharge measurements, rainfall and river water temperatures on a single plot. To produce these types of output, several utility programs were prepared by Institute of Hydrology staff in advance of the workshop as follows:

GSUMM - Plots river levels, flows, discharge data, rainfall, water and air temperatures (as available) on a single graph for output to printer or screen

STAGE - Computes daily mean river levels from two or more readings per day and outputs values to printer or file

QINTERP - Interpolates between occasional discharge measurements to compute daily mean flows (e.g. for when a river is covered in ice or has near-constant flow)

An additional program, CATRANS, was prepared which will write out all the types of data stored on HYDATA in a standard format. This will facilitate the transfer of hydrological data into and out of HYDATA and other systems (e.g. CLICOM), both within and between the countries of Central Asia. Copies of these programs and user notes were provided to all participants, and all participants succeeded in operating this new software.

2.4 The issue of language was also discussed extensively. To assist these discussions, parts of the HYDATA software were translated into Russian. The general consensus was that HYDATA should remain in English. However, to assist the initial transition to HYDATA, a set of notes was prepared in Russian which included a Russian translation of all the HYDATA menus, guidance notes for using the new hardware, and a set of 18 HYDATA tutorial exercises. Copies of these notes were provided to all the participants.

3. HYDATA installation visits

3.1 For operation of the HYDATA system, each country has been provided with two personal computers, two laserjet printers, a tape backup drive, an uninterruptable power supply, single user licences for several utility software programs (e.g. word processor, spreadsheet) and a supply of consumable items. The total value of equipment provided to each country was about $9200 including shipping. Following the workshop, Institute of Hydrology staff made one-week visits to four of the five countries to ensure that the equipment was installed correctly, and to provide additional training as required. In all countries, the equipment was installed in the Hydrological Departments of the Main Administrations of Hydrometeorology (Glavgidromet in Russian).

3.2 In the case of Almaty, Bishkek and Ashgabat, the training consisted mainly of consolidation of the material covered during the workshop. Some fifteen other staff who were unable to attend the workshop were also given practical training in the use of HYDATA. In each country, advice was provided on how to set up and operate the national database, and river level and discharge data were entered for several gauging stations. Staff were also given additional training in data backup procedures, and in use of the items of utility software provided.

3.3 In the case of Tajikistan, delays in obtaining customs clearance meant that the equipment was not delivered to Dushanbe in time for an installation visit to be made. It is therefore proposed that an extended visit will be made to Dushanbe during the follow-up visits planned for March - April 1996 (see 4.2 below).

3.4 As the main computing and research centre for hydrometeorology in Central Asia, computing and analysis skills are marginally more advanced at SANIGMI than in the other countries of Central Asia. The installation visit in Tashkent was, therefore, used mainly for investigation of technical issues relating to HYDATA and hydrological data processing, such as transfer of data from existing systems and techniques for the analysis of rating curves. SANIGMI staff have also translated some of the HYDATA teaching material into Russian in order to be able to give lectures on the system to their own staff.

4. Main findings and recommendations

4.1 The participants from all five countries showed great enthusiasm for the equipment provided which will help to automate many of the laborious tasks which are being performed manually at present. This will lead to more reliable and credible data, and will permit experienced staff to spend more time on data validation and hydrological analysis work. The availability of a common database system and common data transfer formats will also facilitate hydrological studies of the region and, in particular, of the Aral Sea situation. Good progress was made even in those countries where staff had previously had only limited experience of the use of personal computers.

4.2 All participants and their administrations were keen that the planned follow-up visits should go ahead. It was felt that, after 2-3 months of operating the new software unassisted, it would be easier to identify areas requiring additional training or follow-up work. Also, more advanced subjects which were only discussed briefly during the workshop could be covered in more detail, and any initial operating problems could be resolved. The suggested timing of the visits (Spring 1996) was acceptable to all concerned. It is proposed that one-week visits are made to each country with a slightly longer visit to Tajikistan which, for logistical reasons, did not receive an initial installation visit. These visits will complete the work authorised under the current funding arrangements.

4.3 During the workshop and installation visits, recent records for some twenty stations in Central Asia were processed and no significant problems were found in entering and analysing these records using the HYDATA system. Despite the provisional nature of the rating curves developed (i.e. first attempts), daily mean and annual total flows generally agreed to within a few percent with those already obtained by manual procedures. However, a number of areas were noted where improvements and modifications could facilitate hydrological data processing work in Central Asia; for example, the option to present several hydrographs on a single plot (Turkmenistan) and the option to produce annual statistical information of the type presented in the five-year summary books produced in the former Soviet Union (Kyrgyzstan). Utility programs for these tasks are already available at the Institute of Hydrology and will be provided during the follow-up visits to all five countries.

4.4 A common theme arising from the installation visits was the desire for further collaboration in the form of additional training and support, and of joint research into hydrological problems in the Aral Sea Basin. For example, one particular area of discussion was the procedure used for developing rating curves in HYDATA. The procedure follows standard practices used in many parts of the world, and provides great flexibility in terms of the number of curves fitted and the parameters of those curves; however, it requires the operator to have a reasonable knowledge of the hydrology of the gauging station under consideration and of the theoretical background to rating curves. Recent research at SANIGMI, based on experience in Central Asia and research in the former Soviet Union, has followed a different approach, in which algorithms have been developed to identify shifts in ratings and ice formation, and to fit curves completely automatically ("at the touch of a button"). The relative advantages and accuracy of the two approaches could only be determined by an in-depth comparative study using data from many stations, and this would be

an interesting area for future collaboration between the Institute of Hydrology and SANIGMI if funding could be obtained for such a study. One possibility which was discussed was submission of a proposal to allow two hydrological specialists from SANIGMI to make a short initial visit to the Institute of Hydrology and, perhaps, some other organisations involved in water resources projects. This visit would allow them to examine UK procedures, and compare them with those in Central Asia, and to formulate detailed proposals for future studies.

References

1. ODA/JAU Know How Fund Aral Sea Project. Initiation visit to Uzbekistan 19 September to 29 October 1995.

Appendix A: Circulation list

1. HM Ambassador Barbara Hay, Tashkent, Uzbekistan.
2. HM Ambassador, Almaty, Kazakhstan.
3. HM Ambassador, Ashgabat, Turkmenistan.
4. A R Brenton, Know How Fund, British Embassy, Moscow, Russia.
5. Mr Yuri Bobko, First Deputy Chairman, Executive Committee, Inter State Council on the problems of the Aral Sea basin, Tashkent, Uzbekistan.
6. Dr Victor Chub, Minister for Glavgidromet, Tashkent, Uzbekistan.
7. Mr Geoff Matthews, World Bank, Washington DC, USA.
8. Mr Peter Whitford, World Bank, Washington DC, USA.
9. Mr Werner Roider, World Bank, Tashkent, Uzbekistan.
10. Dr Anatoly Krutov, World Bank, Tashkent, Uzbekistan.
11. Mrs Sybille Velisek, International Affairs, Berne, Switzerland.
12. Dr Manfred Spreafico, Swiss Hydrological and Geological Survey.
13. Dr Stephen Waller, Natural Resources Institute, Chatham, UK.
14. Ms Heidi Hutchings, Dept of the Environment JAU London, UK.
15. Sara Squire, ODA JAU, London, UK.
16. Richard Waters, ODA JAU, London, UK.
17. Mr Werner Schmidt, EU-TACIS, Brussels, Belgium.
18. Mr Christopher Le Breton, EU-TACIS, Brussels, Belgium.
19. Mr Arrigo di Carlo, WARMAP Project, EU-TACIS, Tashkent, Uzbekistan.
20. Prof. John Hilton, Institute for Freshwater Ecology, Wareham, UK.