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RIKZ

Azov Sea DSS:
Evaluation and Application

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delft hydraulics
Azov Sea DSS: 
Evaluation and Application

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I Introduction

The project on Evaluation and Application of the Azov Sea Decision Support System (DSS) is formulated as a follow up of the Dutch involvement in the management of the Azov Sea. It specifically focuses on the Azov Sea DSS, which was developed in the framework for the Black Sea Environmental Protection Programme and which was delivered to the Ukrainian and Russian counterparts in April of 1996.

The Azov Sea project
The Azov Sea project served as a simplified test case for the more complex Black Sea issues. The Azov Sea is a clear example of a semi-enclosed sea which suffers from the economic use of the rivers in its drainage basin. It is a shallow inland sea on the north-east corner of the Black Sea, shared by Russia and Ukraine. Non-retrievable water use from the rivers Don and Kuban have led to an increased salinity and deposits of toxic and untreated organic waste have had serious impacts on the water quality. This drastically affected the main economic uses of the Azov Sea like fishery and tourism. Annual fish catches have decreased more the 60-fold. The increased occurrence of public health problems forces closure of beaches.

Management is of the Azov Sea, though less complex than that of the Black Sea, is still constrained by the large number of institutions involved and the shared responsibilities of Russia and Ukraine. The Delft Hydraulics project recognised that for the improvement of the management of the Azov Sea it is essential that the responsible authorities have consensus on the interaction between management actions, components of the water system and the needs of water users.

The project assisted with the screening of data on hydrodynamics, water quality, and water biology. A decision support system (DSS) was developed to integrate management considerations and scientific disciplines. Initial analyses with the DSS indicated that management actions should focus on the decrease of the nutrient load and the increase of both the average quantity and the seasonal dynamics of the freshwater flow into the sea. The analysis also indicated that only combined actions to improve both water quantity and water quality management will have a significant improvement on the ecology of the Azov Sea.

During the project period of 1993-1996 both the Russian Federation and Ukraine have been occupied in a difficult transition of both the economic and the institutional structure. It was recognised that adoption and implementation of the recommendations of the Azov Sea project would take more than the three years available for the project.

Furthermore, other Dutch projects for the Don, the Seversky Donetz and the international commission would not be finalised for at least another 3 years. Only a combination of all projects would lead to the objective of the Dutch programme: the integrated water management of the Don-Azov drainage basin.

Evaluation and Application of the Azov Sea DSS
Formulation of a follow-up project of another 3 years was considered necessary to further promote the approach and methods for the integrated management of the Azov Sea, but only if the results of the Azov Sea project itself were considered successful by both the Russian and Ukrainian partners and the Dutch counterparts. This assessment was to be carried out in the project on: Evaluation and Application of the Azov Sea DSS.

Objectives of this short term project were:
1. to assist the Russian and Ukrainian experts in the presentation to local authorities of the approach and methods used in the Azov Sea project
2. to evaluate the first experiences of the application of the Azov DSS
3. if the evaluation results were positive, to formulate a long term follow up.
4. to develop a demonstration version of the Azov Sea DSS for promotion within and beyond the context of the Azov Sea.
The results of this project are presented in this report. Chapter II describes the activities to present the Dutch approach at the ministerial level in Moscow. The results of local presentations by the Russian and Ukrainian partners are presented in chapter III. The joint evaluation and planning of future activities is presented in chapter IV. Chapter V briefly describes the production of the demonstration CD.
2 Mission to Moscow

During the Azov Sea project, institutional instability in Russia and Ukraine forced the project management to rely more heavily on the local participants and less on the national authorities. This was especially the case in Russia, where the continuing struggle between the Ministry for Environmental Protection and the State Committee for Water Management threatened to affect the execution of the project.

For the present project on - *Evaluation and Application* - it was acknowledged that special attention would have to be paid to the Russian national authorities to enlarge acceptance of the methods and results. With the assistance of the Netherlands Embassy in Moscow, workshops were planned for the State Committee for Water Management, the Ministry for Environmental Protection and the Centre for Project Planning and Implementation of the Worldbank.

In September 1996, a revision at ministerial level was announced in Moscow. The Ministry for Environmental Protection was downgraded to the level of State Committee. The State Committee for Water Management was merged with the State Committee for Geological resources into a new Ministry for Natural Resources.

Governmental representatives advised to delay the workshop until the situation had settled. This process proved to last longer that the period allowed under the present project. After consultation with mr. Wulffraat it was decided to cancel the Moscow workshops and to invite a key representative from the (new) Russian Ministry for Natural Resources for the period of one week to the Netherlands, paid for by the project budget. The representative is Dr. Yelena S. Lebedeva, head of the Marine Department of the Ministry for Natural Resources.

Dr. Lebedeva actively participated in the evaluation workshop at Delft Hydraulics and had intensive contacts with representatives from the Dutch Ministry of Transport, Public Works and Water Management. Results are reported in the section on the Evaluation workshop and on the Special Meeting.
3 Local demonstration workshops

Three demonstration workshops were organised by the Ukrainian Scientific Centre for Protection of Waters (USCPW) in Kharkov, with financial support from the project. The workshops are reported upon in detail in section 4 of the report provided by the USCPW (see Annex I).

1. One workshop was specially devoted to the personnel of the USCPW (September 1996).

2. One workshop was entered into the seminar programme on the UN Dnieper programme (September 11-12, 1996).

3. One workshop was specially organised for the regional and local environmental and water management authorities around the Azov Sea.

Results were positively commentional upon. The approach and methods used for the Azov Sea project drew much attention with the international organisation, and local authorities. The Azov Sea DSS is considered the example of an approach that could be applied for other water system.
4 Evaluation workshop

From November 25 to November 27, a workshop was organised at Delft Hydraulics to evaluate the Azov Sea Decision Support System.
Participants of the Azov Sea DSS workshop were:

Yelena S. Lebedeva, head of the Marine Department of the Russian Ministry for Natural Resources in Moscow.
Anatoli V. Gritsenko, director of the Ukrainian Scientific Centre for Protection of Waters in Kharkov of the Ukrainian Ministry for Environmental Protection and Nuclear Safety, Kiev.
Georgy A. Sukhorukov, deputy director of the Ukrainian Scientific Centre for Protection of Waters, Kharkov.
Hans Balfoort, Delft Hydraulics, Delft.

Technical services related to the Azov Sea DSS were provided by personnel from Delft Hydraulics, under the lead of:
Poul Grashoff, Delft Hydraulics, Delft.

During the meeting, interpretation services were provided by:
Vladimir Kouznetov, head of the International Relations Departments of the Ukrainian Scientific Centre for Protection of Waters, Kharkov.

Summary

4.1 Technical aspects

The Azov Sea DSS proved to be technically sound and could be installed independently from CD-ROM. Small technical details (see Annex I) will need further attention.

For practical applications, the DSS needs to run on a PC equipped with a fast microprocessor (100 Mhz Pentium or faster). Only when calculations have already been made, slower PC’s can be used for analysis and comparison. Future technical developments should aim at a more efficient calculation method. As an intermediate action, additional testcases could be run on a fast PC and later transferred to slower PC’s.

4.2 Test applications

Only one test application was defined and calculated independently. Even though it proved to be technically feasible, the long calculation time (7 - 12 hours) was a deterrent for further applications. Also, it was quickly realised that results from the DSS would only be acceptable if the calculations are executed simultaneously by Russian and Ukrainian experts.

4.3 Suitability in the Russian and Ukrainian institutional structure

The Azov Sea DSS proves to be technically sufficiently simple to be applied outside the structure of scientific research institutes. The Oblast Environmental Committees, the River Basin Authorities, the Azov Sea Inspection and even some City Administrations around the Azov Sea would be able to use the DSS for analysing the potential effects of their decisions. It would however be very difficult to
keep track of all the versions and data inputs at the various locations. Moreover, due to the transboundary status of the Azov Sea, results can only be accepted and implemented if the DSS is applied in an international context.

The formation of an international working group is therefore proposed as the most practical organisation to promote cooperation on the management of the Azov Sea and to apply the Azov Sea DSS as a tool for the analysis of management alternatives.

The formation of such a working group should be approved at a national level and should have strong links with the major research institutes in Russia and Ukraine.

Practical support for local authorities would be helped if the main rivers Don and Kuban were introduced more detailed into the system. It is hoped that this may be possible by establishing links with the Dutch trust funds / Worldbank projects for the Don and Seversky Donetz.

As an example of integration of DSS systems, the participants were shown a demonstration of the DSS for water resources management, developed for the river Dniester.

4.4 Proposals for future cooperation

The approach used for the development of the Azov Sea DSS has proven to be very appealing. Proposals have been made to copy the approach for application for the Dnieper, the Sversky Donetz or the Black Sea. Even though this is technically feasible, from a practical point of view this is only possible within the framework of internationally financed projects.

A stepwise approach towards future cooperation was agreed upon:
1. the establishment of an international working group, for a minimum period of three years, in which the Netherlands participates as neutral party and for technical support. In this three year period, tasks of the working group are proposed to be:
   - review of present available datasets and addition of missing data on waste load emissions and water quality for the Azov Sea;
   - preparation of a harmonisation plan for the monitoring activities in the Azov Sea;
   - preparation of recommendations for national environmental policies concerning the Azov Sea;
   - initiate further technical development of the DSS;
   - provide support for regional and local authorities on management issues affected by the status of the Azov Sea (development of seaside tourism) or issues affecting the status Azov Sea (industrial development or rehabilitation of waste water treatment);
   - maintain links with other environmental programmes or projects in the Azov Sea drainage basin such as the Black Sea Environmental Programme, the Lower Don project or the Seversky Donetz project;
   - provide advice or technical support for initiatives in other transboundary water systems of Russia and Ukraine;

2. the definition of special projects within the framework of:
   - the Black Sea Environmental Programme on monitoring or DSS development
   - the North-West Caucasus programme of the Worldbank, for the Don and Seversky Donetz
   - the UN Dnieper programme
   - the GEF transboundary waters programme

3. the development of a Don Azov Sea Action Plan

4. the transition into an International Commission for the Don Azov Sea drainage basin.

It was agreed that first proposals would be drafted by Kees Wulfraat and Hans Balfoort. Relations to other Dutch initiatives in water management were discussed in a special meeting, reported in Annex II.
5 Azov Sea DSS demonstration CD

Delft Hydraulics has developed a generic approach for the integration of datasets, modelling and geographical information systems into a single framework and apply this for the support of environmental decision makers. The Azov Sea project is an example such a Decision Support System has been developed specifically for one water system.

A Russian-English language demonstration version has been developed on CD in cooperation with RIKZ to be used as an example of the application of Decision Support Systems for the management of water systems.

The first batch of the CDs have been distributed to the participants of the Azov Sea workshop, to the representative of the Ukrainian State Committee for Water Management and to RIKZ. After some slight modifications, a second batch will be delivered to RIKZ.

The development and production of the CD is presented in Annex III (Dutch).
ANNEX I
MINISTRY OF ENVIRONMENTAL PROTECTION AND NUCLEAR SAFETY OF UKRAINE

INTEGRATED WATER RESOURCES MANAGEMENT
AZOV SEA

THE AZOV SEA DSS INSTALLATION,
TEST APPLICATIONS AND USERS TRAINING IN UKRAINE

Progress Report

UKRAINIAN SCIENTIFIC CENTER FOR PROTECTION OF WATERS

November 1996
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1. **Introduction**

The Azov Sea project is executed as a part of the Netherlands collateral contribution of 1.5 million US$ to the Black Sea Environmental Programme of the GEF. The project was supervised at a national level by the Ministry for Environmental Protection and Natural resources (Minpriroda) and the State Committee for Water Management (Roskomvod) in Russia, the Ministry for Environmental Protection and Nuclear Safety and the State Committee for Water Management in Ukraine, and the National Institute for Coastal and Marine Management (RIKZ) in the Netherlands.

In April 1996 the project workshop has been held in Rostov-on-Don, and at this workshop the Ukrainian and Russian specialists received from the Dutch side the CD copy of the DSS. It was agreed that the Ukrainian and Russian specialists will prepare the progress reports on the DSS installation, implementation and users training and submit them to the Dutch side in November, during the final project workshop to be held in Delft, the Netherlands.

The present report reflects the results of the DSS installation and implementation, analysis of its efficiency, and summarizes the outcome of the seminar held at USCPW on the DSS presentation and users training.

The present report is prepared by the USCPW team:

1. Georgy Sukhorukov - Ukrainian Project Coordinator
2. Maxim Bychkov - computer engineer, system analysis, installation of the DSS, review of the DSS operation and implementation
3. Irina Chernysheva - interpreter
2. Organizational aspects

The project started in the summer of 1993 with exploratory discussions between the governments of Russia, Ukraine and the Netherlands. An inception workshop was organised in Delft, the Netherlands, in March 1994 on the Azov Sea problem and related water management issues with national and regional participation from Russia and Ukraine.

A network was setup of more than 20 research institutes and management authorities on a national and regional level. The network was supervised at a national level and the scientific activities were coordinated at a regional level.

A workshop was organized in Odessa in September 1994 where representatives from all participating institutes and authorities discussed the approach, the available data and the distribution of tasks. Key experts from research and management institutes were invited during the project to the Netherlands to be trained and to assist in the development and application of models.

In April 1996 in Rostov-on-Don there has been organized a seminar during which the Ukrainian and Russian specialists have been provided by the Dutch specialists with basic training to apply the DSS Azov.

In the period of April through November 1996 the USCPW specialists have performed the installation and implementation of the DSS and have purchased the required equipment for this purpose. The results of the DSS installation and implementation are reflected in the present report, together with analytical results, conclusions and recommendations of the Ukrainian specialists concerning further practical application of the DSS.
3. DSS installation and test running. DSS operation analysis

3.1. DSS installation

A. At the project seminar in Rostov-on-Don the Ukrainian team has received a copy of the Azov Sea DSS with the package of the related documents and manuals. Actually, there were 2 copies of the DSS delivered to the Ukrainian team: one on CD and another - on floppy discs, and it's very wise, taking into account that only some few computers here in Ukraine are equipped with a CD-ROM drive. The package of documents and manuals consists of the following books:

- Delft Decision Support System User's Guide
- Delft Decision Support System User Manual (2 volumes)
- Habitat Evaluation Software (Documentation of DELGEM)
- Integrare Water Resources Management Azov Sea
- SCEN_MAN User Manual
- CASEDEF User Manual
- SHOWPICT User Manual
- CONCEPT (Evaluation of Ecological Quality of the Azov Sea)
- Azov Sea Environmental Study (Technical Report V1b)

In general this package of documents fully describes the DSS applications, but some parts of the documents have become already outdated, or are related to those applications and tools which are not supplied with the Azov Sea DSS. At the same time technical manuals for some DSS tools and accessories were not found in the package, and this causes essential problems in the DSS operation and practical implementation.

B. Taking into account the fact that the Azov Sea DSS is a resource-consuming system, which requires powerful hardware, the USCWP Directorate has decided to purchase a new computer specially for the DSS installation and operation. In compliance with the recommendations of computer specialists there has been chosen a computer with the following technical characteristics:

- Mother board - Endeavor Pentium 75/90/100/120 MHz; chip set by Intel's Triton 82430 PCISet, 2nd level cache - 256 KB; memory chip type EDO DRAM. The mother board supports automatic recognition of IDE drives, Windows 95 Plug and Play, upgraded power consumption management (to prevent computer failures).

- Processor - Pentium-75. Taking into account a high frequency bus (66 MHz), this processor is the best one in terms of its efficiency and price.

- Main memory - 16 MB EDO DRAM, access time - < 60 ns.

- Disc drive - shape factor 3.5 in.

- Hard disc - 1.28 GB Western Digital, access time - < 9 ms, reading/recording speed is 2175.8 KB/sec. We've chosen a HS disc to support better DSS operation.

- Videoadapter - SVGA S3* Trio64* PCI video controller.

- Colour monitor - 14 in., KFS LR/NI

- CD-ROM drive - 4-speed, ATAPI IDE CD-ROM DRIVE Model FX-Series, 16-bit interface.

- Operational system - Microsoft Windows 95 (Russian version) and Microsoft Office 95 (Russian version), including:

- Microsoft Word
Microsoft Excel
Microsoft Power Point.

The Azov Sea DSS was installed under Microsoft Windows from CD, using routine setup.exe procedure. The installation procedure is quite simple and does not require high computer skill, running practically independantly. The only task of a user is to specify a correct route to Microsoft Excel tool. It is very nice to have such a program as uninstal.exe, which, if necessary, can undo installation, what makes life easier for a user.

Installation of the DSS on a new computer took up about a quarter of hour, and placed on a working table was a file entitled "DSS Azov Sea" with 2 labels:

- DSS Azov Sea - the system itself
- Uninstall Azov Sea DSS - DSS de-installation.

Disc space used by the DSS is about 100 Mb. So far, the DSS installation on a powerful computer is not time-consuming, does not require high computer skill and runs smoothly, without system conflicts.

3.2. Analysis of the DSS operation

The Azov Sea DSS is a complex program product, which consists of many programs. These programs are written in different programming languages. Data input and presentation blocks are written in Microsoft Visual Basic 3.0 with the use of many additional VBX components. Data processing, water quality and local effects simulation blocks are written in FORTRAN. Biological data computing and presentation blocks are made in Word Basic, like macros in Microsoft Excel. This complex program product is quite difficult and requires certain efforts to learn how to apply it. There are some strict hardware and software requirements which should be satisfied in order to support the operation of such a complex system:

Operational system MS-DOS 5.0 or higher version;
Operational environment MS Windows 3.1 or higher version;
Accessory MS Excel 5.0 or higher version;
Computer processor 80486DX or Pentium, with operating frequency of not less than 50 MHz;
8 MB operational memory;
Minimum 150 MB free space on a hard disc;
CD-ROM drive for installation (though installation from floppies is also possible).

Such strict requirements (in particular to availability of free space on a hard disc) are set because in the process of the system operation the continuous data exchange is going on between the program modules through temporary files, which are created on a hard disc. Input and output data are also disc space-consuming, as well as maps.

3.2.1 Manager program WL_SHELL

The DSS running starts with a main window appearing on the screen. This is a manager program WL_SHELL. Its main purpose is to run the program modules to execute specific tasks. WL_SHELL program has a menu consisting of 5 main items:

About
Development tools
Utils
Help
Water Quality Input Data

Menu item <About> serves to demonstrate brief info about the system:
About the project - brief description of the Azov Sea DSS project, main tasks and objectives of the DSS;  
About the institutional network - information about the participants to the project;  
About the methods and instruments - information about the methods and tools used for the DSS development;  
Introduction to Delft DSS - information about the decision-making and decision support process and about those steps of this process which have been implemented in the DSS;  
Introduction to Delft DSS tools - description of tools used in the DSS;  
Introduction to DSS Azov - information about the environmental problems existing in the Azov Sea basin and the methods used to solve them;  
Exit DSS Azov - end of the DSS session.

Menu item <Development tools> enables a user to individually upgrade and modify the DSS (to add new modules, to delete the old ones):

Design Case Management Tool Application feature enables to create individual computing scenarios, using as a basis the existing set of scenarios, by adding the user specific modules and by deleting not needed for a user modules;

Edit Azov Sea Map Setting feature loads Mapper program, and a user can edit maps demonstrated on the screen, to add and to delete different map layers, to zoom in, to add and to delete different map symbols.

<Utils> menu item contains all utilities created for WL_SHELL program adjusting:

Edit Shell Setup feature enables to adjust WL_SHELL visual presentation. By using this feature a user can change the title of a main window, background picture, a logo and its output window, screen size, as well as description and command lines of icons set in the right part of the screen and used most often. One can also adjust a WL_SHELL menu by adding, deleting or editing menu items and command lines, according to personal requirements;

Edit Shell Language File enables to make editing of the program reports and to translate reports. It is a very convenient feature.

Reset Shell reads new user parameters set up in the latter 2 items and activates them;

English Language feature - all reports and menus will be displayed in English;

Second Language - all reports and menus will be displayed according to user setting made in .ini and .lng files;

Help is a very important feature to assist a user in his work with the DSS:

Introduction to Delft DSS - brief description of the DSS;

Using WL_SHELL - notes on how to adjust and run WL_SHELL program;

Using Winhelp and Using Windows - runs standard hlp files of the operational system. It is useful for a user to get acquainted with Windows operating procedures in order to make correct adjusting of the operational system and to secure more efficient operation of the Delft DSS;

About SHELL - displays copyright and licensing information. Also displays information about the system resources available. User window is automatically closed in 10-15 seconds after it has been loaded.

<Water Quality Input Data> menu item is used in the process of input data preparation for simulation of different scenarios of water protection and water management. There are the following submenu items:
Edit DELWAQ Coefficient Scenario item runs <Scenario manager v2.01>, which enables to delete, to edit and to copy the existing scenarios. In order to test this program we copied SCENARIO.DEF into test scenario file SCENARIO.EX. In this scenario there can be adjusted different constant coefficients, which are necessary for water quality assessment: decomposition, velocity, nitrification and mineralization, and different temperature coefficients - 57 coefficients in total.

Edit DELWAQ parameter scenario item runs <Scenario manager v2.01>, which enables to delete, edit and copy different parameter settings used in water quality calculation process. To test this program we copied SCENARIO.DEF into test SCENARIO.EX. Parameter settings in the SCENARIO.EX were edited. In the process of editing one can change 74 parameters used in water quality simulation process.

Edit waste load schematization. This menu item enables to delete, edit and copy the available schematized maps of waste loads on the Azov Sea basin, and to perform further schematization of waste loads for water quality computation. We performed a test run of this program by copying SCHEMAT.NAT into SCHEMAT.EX, and edited a waste load scheme. Editing is started by running <Edit Waste Load Schematization> program, and the following menu and submenu items appear on the screen:

Waste Load Schematization - provides access to the following schematization models:

Production model - describes the pollution sources of all types. There are 4 types of pollution sources in this specific case: point, non-point, coast erosion, atmospheric impacts. It is possible by using this program to transform the standards measuring units (g/sec) into kgs/year, used in water quality calculation program. User can also change data available on each type of pollution.

Treatment model - describes waste water treatment plants and treatment processes. In this specific case we have only natural treatment, but it is not included into the model.

Boundaries - enables to change the list of water quality monitoring stations in the Azov Sea basin.

The following 2 menu items are related to point sources of pollution:

Edit Point Source Load Data runs the Database Editor program for editing POINTSRC.DBF file. POINTSRC.DBF file contains information on the quality of water discharged from point sources of pollution. The following substances have been included into the simulation model:

- BOD5_q
- Cl_q
- Cu_q
- MOi1_q
- NH4_Nq
- NO2_Nq
- NO3_Nq
- O2
- O_PO4q

Edit Point Source Load Coefficient runs MS Windows 95 Notebook routine program. This program enables to edit a pointsrc.cft file, which contains coefficients of transformation of standard measuring units (g/sec) into kgs/year for 14 water quality parameters.

The following 3 menu items are related to the rivers as pollution sources:

Edit river discharge data - runs the Database Editor to edit a Q_RIVER.DBF file, which contains river flow data on 14 rivers flowing into the Azov Sea:

- Berda
- Don 1
Don 2
Don 3
Don 4
Don 5
Don 6
Kalmius
Kuban
Lotovatka
Molochnaya
Obitochnaya
Protoka
Eya

Edit river concentration data - runs Database Editor to edit a NONPOINT.DBF file, which contains water quality data for the above 14 rivers. The following water quality parameters have been included into the model:

BOD5
Cl
Cu
MinOil
NH4_N
NO2_N
NO3_N
O2
O.PO4
S
SS
Tot_P
Zn

Edit river load coefficient runs a standard MS Windows 95 Notebook program, which enables to edit a nonpoint.cft file and coefficients of conversion from m3/s*g/m3 = g/s into kg/year for 13 substances.

The following menu items are related to the coastal zones being the source of pollution. There are 2 items:

Edit coastal erosion load data runs a Database Editor to edit a COASTLTH.DBF file, which contains data on the distribution of erosion in the following locations of the Azov Sea basin:
East
North
South
West

Edit coastal erosion load coefficients runs a standard MS Windows 95 Notebook program for further editing a nonpoint.cft file, which contains conversion coefficients for the following 13 substances:

NH4nit
NH4_N
NO3_N
Tot_N
Tot_P
O.PO4
Cu
MinOil
Zn
BOD
Cl
SS
O2

Edit atmospheric deposition data runs a Database Editor to edit SEGAREA.DBF file, which contains data on surface pollution.

Edit atmospheric deposition coefficients runs a standard MS Windows 95 Notebook program, which enables to edit conversion coefficients for the following 14 substances:

NH4_N
NO3_N
NH4nit
Tot_N
O_PO4
Cu
Tot_P
BOD
MinOil
Zn
COD
O2
Cl
SS

Edit natural retention coefficients runs a standard MS Windows 95 Notebook program to edit a natural.cft file, which contains information on waste water treatment, including the following substances:

NH4_N
NO3_N
NH4nit
Tot_P
BOD
COD
Cd
Pb
Hg
Cu
Zn
As
PCB
HCH
Oil
Tcoi
SS
Cl
O2

<Water Quality Input Data> menu contains the following items:

Edit Species Distribution Assumptions runs <Scenario manager v2.01> which enables to introduce changes into the schematization of habitats of various biological species in the Azov Sea basin. We made a test copy of a HABITAT.DEF file in a HABITAT.EX file and made editing in it. With the help of MAPPER program a user can change the colour of grid schematically representing the Azov Sea basin. Marked by
green are areas where the selected biological specie occurs, by blue - areas where it doesn't or occurs seldom. Included into the model are 50 biological species.

Edit Species Habitat Requirements Assumptions runs <Scenario manager v2.01> which enables to change the existing habitat suitability requirements for different biological species. We made a test file PARAM.EX and introduced changes in it. After clicking the <Edit Assumptions> button we can see on the screen a group of buttons with which a user can change scenario assumptions for the selected biological species:

Edit Phyto- and Zooplankton assumptions
Edit Zoobenthos Assumptions
Edit Marine Fish Assumptions
Edit Fresh Water Assumptions
Edit Migratory Fish Assumptions
Edit Human Function Assumptions

By clicking on any above item a user can see other functions specifying life activities of the selected biological species. We selected <Edit human function assumptions> button, and the following items appeared on the screen:

Edit Homo sapiens - RECREATION assumptions
Edit Homo sapiens - ALL_FUNCTION assumptions
Edit Homo sapiens - NATURE assumptions

By clicking one of these items we run a standard MS Windows 95 Notebook program to load a text file. Text file contains assumptions on the suitability of water quality parameters for the selected activities of a given specie. Suitability is expressed either by 1 (suitable) or 0 (not suitable). For example, by clicking <Edit Homo sapiens - NATURE assumptions> we loaded a spec_13.par file, which contains suitability indices for different concentrations of the following substances:

Total Oils
Oxygen concentration
Ammonium
Nitrate
BOD5
Suspended Solids
Copper dissolved
Zinc dissolved

A user can scan the parameter settings and change them if necessary.

<WATER QUALITY INPUT DATA> menu contains the following items:

Edit point source location data runs the Database Editor to edit a POINTSRC.DBF file, which contains data on the local sources of pollution: full name, abridged name, location, etc.

Edit river inflow names runs the Database Editor to edit a NONPOINTER.DBF file, which contains information about the rivers flowing into the Azov Sea: full name, abridged name, etc.

Edit coastal erosion length data runs the Database Editor to edit a LENGTHS.DBF file, which contains information about the coastal zone of the Azov Sea: full coast name, abridged coast name, etc.

Edit atmospheric deposition area data runs the Database Editor to edit a SREBCAREA.DBF file, which contains data on the atmosphere condition in the Azov Sea basin. By default the atmospheric deposition is
set homogenous in the whole basin, and this .dbf file contains a single record. A user can change the setting and specify smaller areas and levels of atmospheric impacts for these areas.

The above mentioned menu items are not meant to be used frequently, because the data in .dbf files should not be changed once and again.

3.2.2. **Case Management Tool**

Most frequently used for user purposes are the other two icons located in the upper right part of WL_SHELL user interface window:

Run AZOV Cases
Analyze AZOV Cases

We thoroughly studied the applications of both these items. <Run Azov Cases> item enables a user to simulate his own options (cases) of water uses in the Azov Sea basin, to set up water quality requirements for different water uses and to make assessment of suitability of actual water quality for a selected water use, to calculate for the point pollution sources the concentrations of pollutants at a distance of 250 m from the outlet end, to calculate the habitat suitability indices for different biological species, using the Azov Sea as either permanent habitat or for migrating purposes. Such calculation can be performed for each cell of the schematic grid covering the Azov Sea basin. By clicking on the <Run Azov Cases> item we run AZOV Sea CMT application program. Main menu of this program includes the following items:

Case
Language

<CASE> item is used as a case analysis tool and has its own submenu:

New - to simulate a new case of water use
Open - to address already existing cases
Open as new - to open an already existing case under a new name
Close - to close a currently active case
Save - to save a currently active case and changes introduced in it
Save as - to save a currently active case and changes introduced in it under a new name
Delete - to delete a currently active case physically on a hard disc
Edit description - enables to edit the description of a currently active case
Define batch - accessible only when there are no cases activated. Enables to select tasks which will be run in a batch, in particular computing tasks (water quality calculations etc.)
Exit - end Azov Sea CMT application session
Language - English/Dutch user interface

After loading the Azov Sea CMT there is a scheme displayed on the screen. It comprises processes and links. An arrow from one process to another means that a user cannot run the latter process until the former one would be completed. Process boxes can have 4 different colours, depending upon a running task progress:

Green - a given process is already completed and can be re-started
Yellow - a given process is still active but can be re-started
Red - a given process can not be completed until the input data would be generated by other processes
Pink - a given process is loaded and currently running

Thus a user is always informed about the running progress and accessibility of each process. If there are no cases activated, all boxes are coloured grey.
We performed a test running of the tool by simulating a new case of water uses. Using a menu item <Open as new> we opened a case <pristine hydrodynamics/no reduction of natural loads> under a new name <control count of pristine hydrodynamics> and runned all processes consequently:

Setup case - this process enables a user to set up initial data needed for case calculation:
1. Hydrodynamic scenario - setting up a fresh water inflow scenario. In this task it is SCENARIO.1: pristine situation (before dam construction).
2. Waste load schematization - schematization of pollution sources. In this task it is SCHEMAT.NAT: schematization for natural background loads (before 1952).
3. System assumptions - constants and parameters calibration. In this task:
   n <SCENARIO.DEF: Calibrated process constants>
   n <SCENARIO.DEF: Calibrated process parameters>
4. Definition of waste load reduction - selection of pollution treatment level. There is a special tool which enables to set up treatment level for the following groups of substances:
   1. N compounds:
      N
      NH4
      NO3
      DETN
   2. P compounds:
      P
      PO4
      AAP
      DETP
   3. Oil substances:
      Oil
      dTR1
   4. Cu compounds:
      Cu
   5. Zn compounds:
      Zn
   6. Other:
      IM1
      Si
      DetSi
      Green
      Diat
      DetC

Treatment level can be further defined for the selected water bodies of the Azov Sea basin. For all the above groups of substances in this task treatment level was zero like in the initially set case. Further we conducted calculations for a given case:

Process waste loads - calculation of loads on the basis of input data. This program performs conversion of input data into the required format and compilation of a file containing system constants and parameters.

Process water quality - water quality assessment on the basis of input data.

Process local outfall effects - evaluation of local effects of pollution on the basis of ambient concentrations generated in the preceding process.

Process full ecology - calculation of the habitat suitability indices and other ecological parameters for the selected biological species.

Consequent running of these above mentioned processes for the selected case produced the following results:
<table>
<thead>
<tr>
<th></th>
<th>Process waste loads</th>
<th>Process water quality</th>
<th>Process local outfall effects</th>
<th>Process full ecology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
<td>915</td>
<td>1215</td>
<td>1316</td>
<td>1320</td>
</tr>
<tr>
<td>End</td>
<td>1200</td>
<td>1315</td>
<td>1317</td>
<td>1635</td>
</tr>
<tr>
<td>Calculation time</td>
<td>245</td>
<td>100</td>
<td>0001</td>
<td>315</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>701</td>
</tr>
</tbody>
</table>

This option <control count of pristine hydrodynamics> is not very complicated, a timestep for water quality calculation is 30 days. But the matter of our concern is that the calculation process is very time-consuming, and this would cause significant difficulties in practical application of the system. On completion of calculations a user is able to scan the output results with the help of the following functions:

Present waste load input - presentation of the results of processing of data on the loads. There are 4 result presentation formats:

Messages (ASCII) - ASCII reports presented.
Total production of waste loads - data processing results of 4 types of pollution sources are presented:
  - POINTSRC
  - NONPOINT
  - EROSION
  - ATMODEPO

for the following 13 parameters:
  - NH4_N
  - NH4nit
  - NO3_N
  - Tot_N
  - O_PO4
  - Tot_P
  - BOD
  - SS
  - Cl
  - Zn
  - Cu
  - MinOil
  - O2

A single set of results is produced without timesteps to describe the actual situation at a definite time - 1 January 1991 (beginning of the calculation period). The output results can be either exported to MS Excel or presented in graphs on-line.

Total treatment of waste loads - data processing results on treatment levels.

Waste loads to Azov Sea - data processing results on loads. These data are used in water quality calculations. There are 13 parameters included for 25 sources of pollution. The timestep of data presentation within a whole calculation period is 30 days:

1 January 1991
31 January 1991
2 March 1991
1 April 1991
1 May 1991
31 May 1991
Present water quality results - presentation of water quality calculation results. The system is capable of producing water quality results of several types:

Time series - results are presented in the form of various selections. A user can select one or more monitoring points out of 23 ones included into the system; one or more parameters out of 60 in total; and one or more time step (maximum 36). The selections can be presented either in graphs on-line, or exported to MS Excel for further analysis.

Thematic map of water quality - with the help of MAPPER the results of analyses are presented on the map of the Azov Sea basin in dynamics, according to the selected set of parameters and timestep. This form of presentation is very convincing and informative.

Present local outfall effects - presentation of local effects in the following formats:

Messages (ASCII) - information is presented in the form of ASCII reports in English. Each of the following 9 local pollution sources
- Berdyansk
- Genichesk
- Kertch
- Mariupol
- AzovStal
- Temryuk
- Primorsko-Akhtarsk
- Yeisk
- Taganrog

is characterized by the following parameters:
- IM1
- BOD5
- NO3
- NH4
- dTR1
- DisCu
- DisZn

The information is presented on the ambient concentrations of the above substances, dilution factors and concentrations of these substances at a distance of 250 m from the discharge outlet end.

Graphs - information is presented in graphs for the above 9 pollution sources, but the list of parameters includes 74 substances, and with 36 calculation timesteps. The selected data can be also exported to MS Excel.

Thematic map of local outfalls - with the help of MAPPER the output information is presented on the map of the Azov Sea basin, where marked by small circles are locations of all sources of pollution. The colour of each circle depends upon the concentration of a selected substance at a distance of 250 m from the discharge outlet end.
Present full ecology - presented are computing results of full ecological evaluation. A user runs MS Excel and loads a macro written in Word Basic. Main user interface contains information about the suitability of different concentrations of various parameters such as salinity, dissolved zinc, dissolved copper, for the selected biological species. There are 2 user buttons:

Species Info - displayed is the full list of parameters included into the suitability indices calculated for all biological species. A user can also select different areas at the Azov Sea basin schematization. This button is used when a user wishes to conduct the selective analysis, either for several specific substances, or for the selected area of the Azov Sea basin, e.g. Taganrog Bay, Kertch Strait, etc.

Species Sp. Parameter Info - displayed is the list of parameters for a specific biological specie.

General Parameter Info - displayed is information about parameters (pollutants): name, measuring unit, etc.

Show Data - MAPPER is loaded, and schematization grid covering the Azov Sea basin is dynamically changing the colours depending upon a value of the habitat suitability index of a selected parameter calculated for a selected biological specie. List of parameters to be included into the habitat suitability index can be changed.

Show Radar - presentation of the habitat suitability indices computing results in graphs.

So far, this system is a multifunctional tool which enables a user to calculate various cases of water management activities and to scan the results. But for practical decision-making purposes the possibility to make comparative assessment of two or more cases is of even greater importance than simple calculation on one case.

3.2.3 Case Analyze Tool (CAT 0.21)

For comparative analysis of two or more cases the WL_SHELL interface has an icon <Analyze Azov Cases> for running a Case Analyze Tool CAT 0.21. To check the identity of the test running results with the initial settings of a case we run this program. A user can select several cases to be compared, as well as the list of parameters on which the comparative analysis will be performed:

- Waste loads presentation
- Delwaq water quality result file (special locations)
- Delwaq water quality result file (all locations)
- Local outfall result file
- Overall ecological results

Waste loads presentation - among the following 13 parameters

NH4_N
NH4nit
NO3_N
Tot_N
O_PO4
Tot_P
BOD
SS
Cl
Zn
Cu
MinOil
O2
a user can select those he needs. Then a user has to define special locations and time steps to be included for each file. The program can produce graphs or tables, and for this purpose there are 2 buttons on a user screen. By pressing either of these buttons the menu is displayed on the screen indicating the typical functions, and a user can select any of these functions to apply to the data:

Available Location functions - sum, average, minimum, maximum, standard deviation
(we mainly used a function of average)

Available Timestep functions - similar statistical functions as in <Available Locations functions>
menu item, and again we used a function of average

Available Parameter functions - we didn't apply any

Available Case functions - there are the following functions available to analyze the results on cases: differences between a current case and a base case, absolute differences between a current case and a base case, relative differences between a current case and a base case, percentage of differences between a current case and a base case, absolute percentage of differences between a current case and a base case.

By pressing a right arrow button the results are presented either in graphs or in tables. Graphs can be either copied into the exchange buffer, or printed out on-line. If the results are presented in tables, then this file can be exported either into MS Excel and presented in graphs, or into MS Word and included into the text files.

<Delwaq water quality result file (special locations)> - water quality computing results are presented for the selected locations. There are 60 parameters and 23 locations included into the system.

<Delwaq water quality result file (all locations)> - water quality computing results are presented for the entire Azov Sea basin. There are 40 parameters and 492 locations (the total quantity of cells in the schematization grid). Timesteps are to be defined by a user (in this case we set a 30 days timestep within a year).

<Local outfall result file> - water quality computing results are presented for 9 locations, indicating industrial plants discharging waste waters into the Azov Sea. There are 74 parameters included, and results are presented with a 30 days timestep.

<Overall ecological results> - results are presented to describe the overall ecological situation in the basin. There are 20 parameters and 41 biological species included, but results are presented without timesteps, for a single date of the computing period commencing.

Comparison of the set-up case with the test calculation case showed that both cases are absolutely identical. So, the main conclusion can be made that the system operates without internal failures and is suitable for practical application.

3.3 Comments, recommendations and conclusions

In the process of the system installation and gaining working experience in its application there have been formulated several comments and recommendations as follows:

3.3.1 The DSS operation

With having a powerful computer available, the time of running a single water management case for a period of 1 year with a 30 days timestep makes up about 7 hours. Such a long period is hardly suitable in practical application of the DSS, especially taking into account that the hardware available at the local
water management authorities is at the best of 486DX2-66/4 Mb RAM type. It would be desirable to speed up the running time of the following 3 processes: Process waste loads, Process water quality, Process Full ecology. The Ukrainian specialists proposal is to use for this purpose all operation memory available. It might be also useful to perform re-compilation of the programs under Windows medium and respectively change the operating procedure. The best though more complicated way consists in re-writing the program in one of the medium-level languages (C, C++, Pascal, etc.), and to use Assembler in writing the computing and memory-oriented programs, what would enable to accelerate working procedure.

Sometimes it becomes necessary to reduce the size of the schematization grid covering the Azov Sea map, but it is impossible due to a lack of the MAPPER manual. It is desirable to organize training of the Ukrainian specialists on adjusting the DSS and on drawing a new schematization grid on the map.

In order to calculate new estimates of local effects it is required to prepare new initial data and to re-calculate a case from the very beginning. This procedure is not convenient, because in practical work a user has to calculate dozens or even hundreds cases of local effects on the basis of the same ambient concentrations. To calculate a hundred cases of local effects of pollution with an existing procedure would take up about 2 months, and this is a very optimistic prediction. It is desirable to upgrade the system in such a way that a user would be able to run <Process local outfall effects> after just having changed the values of local discharges.

3.3.2 Installation of the system

Why the system is stored on the disc in an uncompressed state, in particular taking into account that the disc space consumed by it is very large? It would be more convenient to install the DSS in a compressed state, located in the archive consisting of several fixed-size files. It would enable to install the DSS from a CD or from floppies.

It is also desirable that the installation procedure would enable a user to have a choice - which cases out of the available list should be installed on a hard disc, and which not. And it would be very convenient to have an opportunity to add the needed cases without re-installing the DSS.

It would be very nice to have a simple read.me file available for a user before the installation.

Uninstall program enables to delete the system working directories, without emptying the system directory, into which in the process of installation there should be copied the system libraries of about 8 Mb size. It is not convenient to empty it by hand. Automatic emptying would be preferable.

3.3.3 The DSS documentation

There are some discrepancies in the package of manuals attached. In particular, there is a MAPPIX program description included, but the program itself was not supplied, as well as a QRIUS program, the description of which we have too.

There is some but not much technical information about the data formats to be transferred between various program modules. This information is very important in practical work with the DSS, because it sometimes becomes necessary to check the interim data.

Also there is the few information in a hlp file. It is recommended to include in it information on the input, computation and analysis of the cases.

3.3.4 The system performance

<Water Quality Input Data>
<Edit Waste Load> item
<Edit Point Source Load Coefficients>
All matrix coefficients are zero, but in case of conversion from g/sec into kg/year then the coefficients should be as follows:

-Waste Load Schematization- button
-Production Module- button

The names of values and coefficients for a case are not visible on the screen in full. It is desirable to adjust the size of the menu windows, or to make them scrolling.

-Boundaries- button. Right after loading the program a user has no access to <Available measure station>, until the button <Kersh> has been clicked. It would be better to have this button activated from the very beginning, in order the available measure stations would be accessible after loading.

-Edit river load coefficients- button. The coefficients of conversion from m3/s*g/m3 into kg/year are different, though their dimension is the same.

-Species distribution assumptions- item. <Start copying assumptions> toolbar. The name of this toolbar does not fit in fully. It is desirable to adjust the size of the toolbar.

-Data Base Edit-. When generating the QBE query it is impossible to restore the initial full set of records, and further work can be performed only with the records received on query. In order to restore the initial set of records a user should open a file again. It is desirable to have an opportunity to reject the QBE query and to work with the full set of file records.

-Analyze Azov Case-. It is desirable to have the list of analyzed cases and analyses visible on the screen in full.

-Run Azov Cases...- module. <Definition of waste load reduction> procedure. After re-load of this procedure the earlier data on wastewater treatment disappear. All data should be input from the very beginning. It is recommended to give a possibility to a user to change values of the treatment coefficients and to load them on a multi-time basis.

Combo-box containing the polluting substances and sources of pollution is formed as a list, and a user has no possibility to select any substance or source and to set the needed treatment level for it, though such a possibility would be desirable.

In the process of editing a new directory is created, and all files for a case are moved into it. There is only one file parupd.inp left in an old directory, which is never used further. It is recommended that the file containing new values of the treatment coefficients would be simply written over an old file, without creating a new directory and consuming a hard disc space.

-Process Waste Loads- wlmrun.exe program. When working in Windows 95 medium there is no a message on the screen reflecting the progress of the information preparation in %. Instead of it there are blank lines, which may appear because of the conflict between the monitor drive and a direct display function. There is an impression that the program is suspended (in Windows 3.1 medium everything goes fine).

Running this program for a case <1985-1991 Hydrodynamic/no waste load reduction> takes up a lot of time (about 22 hours on Pentium-75/RAM 16 Mb/HDD - 1.3 Gb).

-Process water quality-. Running water quality calculation program is performed in DOS window, and available memory is only 640 Kb. It is desirable to use all computer memory available to run such a complex and powerful program. The best but more complicated way is to recompile this program in a
medium-level language (C, C++, Pascal, etc.), and to prepare the computing and memory-oriented blocks in Assembler.

<Process full ecology >. Calculation is performed very slowly, because the program is written in WordBasic. It is recommended to recompile this program in a medium-level language, and to transfer the data from MS Excel accessory using DDE or OLE.

<Present full ecology result>. When changing a water quality parameter the displayed figure also changes, but the subscript title stays the same.

When we load this program directly after the calculation, the Excel cannot be loaded and the error message is displayed < >. It happens because *.his and *.cmt files are stored in different directories, so Excel cannot find the required *.his files. A user has to copy *.his files into the main directory and to correct *.cmt files by hands, in order to define a case correctly. After this procedure Excel is easily loaded. It is desirable that the program will be capable of automatically moving the files with the results and *.cmt files into one directory and introducing respective changes into the main *.cmt file, or an Excel macro will be capable to recognise the main *.cmt file and to find *.his files in other directories.

When clicking the <Analyze> button the Excel is suspending for a long time. We cannot understand the reason of such behaviour.

<Analyze AZOV cases>. <Case analysis tools> module. When copying a diagram into the buffer with the help of <Copy> button the copied diagram becomes very small, and symbols and letter are not visible. It is desirable to have a possibility of direct copying a diagram into a file.

Conclusions.

1. The Azov Sea DSS is quite efficient and runs without internal failures and conflicts.
2. The DSS installation and working procedure is simple enough and does not require of extra computer skills. User interface is very convenient and an ordinary-user oriented.
3. The DSS is ready for practical application, but it would be desirable to make changes in it according to the above mentioned recommendations.
4. In order to increase the DSS application efficiency and to widely distribute the system among the potential users it is recommended to organize training of the Ukrainian specialists and to teach them how to re-adjust the DSS so that it would become applicable for other water bodies, in particular the Dnipro-Bug Liman.
4. The DSS presentation and users training

The DSS presentation has been performed in 2 stages in September-October 1996:

1. The DSS presentation for the USCPW specialists, collection and review of recommendations and proposals.
2. The DSS presentation for the participants to the international seminar on transboundary diagnostic analysis under the UN Dnipro Programme. The seminar was held in the period of 11-12 September 1996 at USCPW, with participation of the following specialists: Viktor Romanenko, Institute for Hydrobiology, Ukraine; Nikolai Evtushenko, Institute for Hydrobiology, Ukraine; Anatoly Gritsenko, USCPW, Ukraine; Alexandr Shekhovtsov, International Center of Environmental Projects, Moscow; Viktor Usenko, National Institute for Water Resources, Belarus; Jan Barika, UNDP International consultant, Canada; Alexander Vasenko, USCPW, Ukraine. In respect of the DSS there has been discussed a possibility of the DSS application for the Dnipro river basin.

In October 1996 there has been organized a seminar at USCPW to provide the training on the DSS application for the specialists of the regional and local environmental and water management authorities of Ukraine.

The list of participants to the seminar:

1. Margarita Zadorozhnaya chief specialist, department of water resources, Donetsk regional environmental protection authority
2. Nikolai Karapira chief specialist, Azov Sea state inspection, Mariupol
3. I. Kaplenko chief specialist, department of water resources, Zaporozhie regional environmental protection authority
4. S. Kvashina chief of department, Kharkov regional environmental protection authority
5. I. Golovko chief of department, Kharkov regional environmental protection authority
6. E. Evsyukova state inspector, Kharkov regional environmental protection authority
7. V. Tonchy state inspector, Kharkov regional environmental protection authority
The seminar programme:

1. Opening address (G. Sukhorukov, Deputy Scientific Director of USCPW, Professor)
2. Presentation of the seminar programme and introduction to the Azov Sea DSS
3. Presentation of the Azov Sea DSS and the DESERT DSS for river systems
4. Application of the Azov Sea DSS
   4.1 Installation and start-up
   4.2 Configuration and tasks of WL_SHELL
   4.3 <Calculation> and <Analysis> toolbars
   4.4 <Calculation>: test running and results
   4.5 <Analysis>: test running and results
   4.6 Adjusting features
5. Input data to calculate a case
   5.1 Editing coefficients setup scenario
   5.2 Editing parameters setup scenario
   5.3 Editing pollution schematization
   5.4 Editing biological species habitats
   5.5 Editing habitat suitability requirements
   5.6 Point source data
   5.7 River network data
   5.8 Coastal data
   5.9 Atmospheric data
6. Case calculation
   6.1 Setting up a new case
      6.1.1 Setting up a case
      6.1.2 Setting up pollution reduction
   6.2 Case calculation
      6.2.1 Running a calculation procedure on query
         6.2.1.1 Initial data processing
         6.2.1.2 Water quality calculation
         6.2.1.3 Local outfall effects calculation
         6.2.1.4 Full ecology calculation
      6.2.2 Direct running a calculation procedure
         6.2.2.1 Setting up modules
         6.2.2.2 Selection of cases
         6.2.2.3 Running a calculation procedure
   6.3 Scanning the results
      6.3.1 Data processing results
      6.3.2 Water quality calculation results
      6.3.3 Local outfall effects calculation results
      6.3.4 Full ecology calculation results
7. Analysis and comparison of cases in the DSS
   7.1 Selection of options and results to be compared
   7.2 Selection of parameters, locations and timesteps
   7.3 Selection of data processing functions
   7.4 Results presentation
8. The Azov Sea DSS adjusting features
   8.1 CMT designing
   8.2 Editing MAPPER settings
   8.3 Editing language settings
9. Final presentation (Prof. G. Sukhorukov)
Main conclusions made during the seminar are as follows:

1. The Azov Sea DSS is an up-to-date tool which can be effectively used in practical work of Donetsk and Zaporozhye regional environmental protection and water management authorities and the Azov Sea State inspection for solving the environmental protection problems both in the entire Azov Sea basin and on a local level. Practical implementation of the Azov Sea DSS would be very useful.

2. Installation of the DSS requires certain technical efforts (availability of PC Pentium-100 6 Mb RAM/1 Gb HDD)

3. Recommendations
   - In `<Present waste load>` program the results should be presented not only in kg/year, but in mg/l and mg/s, because these units are usually applied in Ukraine
   - It is necessary to include iron into the list of water quality parameters
   - It is necessary to have a copy of the DSS manual in Russian, with clear description of all water quality parameters included into the DSS, with several examples reflecting various stages of the DSS installation and performance, as well as the data input and the results presentation procedure
   - All graphs should include the measuring units
   - The DSS includes very few point sources. The instruction should be supplied to users on how to add the point sources into the data base and to the map, and how to set links between them
   - Atmospheric and soil erosion effects are defined in the system as zero. It is necessary to specify and to take into account these effects
   - Taking into account that the DSS will be installed at several local inspections, it is necessary to provide the required e-mail communication support
   - In MAPPER demonstration it is recommended to reflect the date instead of the number of the timestep - it is more convenient
   - The list of water quality parameters should be organized in alphabetical order
   - It is desirable that water quality parameters to be displayed in Ukrainian or Russian
5. Conclusion

1. After the seminar in Rostov-on-Don, where the Azov Sea DSS was handed over to the Ukrainian and Russian sides, the Ukrainian specialists have undertaken a number of activities on the DSS implementation:

   - USCPW has purchased the required computer equipment (Pentium-75/16 Mb RAM/1.3 Gb HDD)
   - USCPW specialists have installed the DSS, tested it and gained working experience in the DSS application
   - There has been organized the seminar for the DSS presentation and training of specialists of the regional and local environmental authorities subordinated to the Ministry of Environmental Protection and Nuclear Safety of Ukraine
   - USCPW specialists carried out the detailed analysis of the DSS applications and specified its main benefits and disadvantages

2. In the process of the detailed analysis of the DSS application and its presentations there have been produced the following conclusions:

   - Regional environmental protection authorities of Donetsk, Zaporozhye and Kharkov oblasts have specialists which are capable to master and to apply the DSS in practical work, but they have no suitable equipment for the DSS installation
   - The Azov Sea DSS has a great practical significance, but it needs to be improved and refined (some programs are failing, water quality parameters are not clearly defined, as well as some biological species, some tools and technical manuals are not available, some results are presented in unknown measuring units)
   - It is necessary to have available a copy, even a brief one, of the DSS manual in Russian
   - It is recommended to organize a seminar, either in Ukraine, or in the Netherlands for more comprehensive users training.
Annex II

Draft summary meeting report on:

Dutch involvement in water management issues in the Russian Federation and Ukraine
November 26, 1996 - Delft

From November 25 to November 27, a workshop was organised at Delft Hydraulics to evaluate the Azov Sea Decision Support System. A special meeting was organised on Tuesday November 26 to discuss future joint Russian - Ukrainian - Dutch activities in the Azov Sea and the Black Sea. Furthermore, this meeting was used as an opportunity to exchange information about Dutch involvement in water management issues in both Russia and Ukraine.

Participants from the Azov Sea DSS workshop were:
Yelena S. Lebedeva, head of the Marine Department of the Russian Ministry for Natural Resources in Moscow.
Anatoli V. Gritsenko, director of the Ukrainian Scientific Centre for Protection of Waters in Kharkov of the Ukrainian Ministry for Environmental Protection and Nuclear Safety, Kiev.
Georgy A. Sukhorukov, deputy director of the Ukrainian Scientific Centre for Protection of Waters, Kharkov.
Hans Balfour, Delft Hydraulics, Delft

Additional invitees to the special meeting were:
Alexander V. Desiron, deputy chief of the Department for Water Resources from the State Committee for Water Management of Ukraine, Kiev.
Erik Bouwmeester, Department for International Affairs, Ministry for Transport, Public Works and Water Management, The Hague
Rob Uyterlinde, Department for International Affairs of RIZA from the Ministry for Transport, Public Works and Water Management, Lelystad
Richard Holland, Delft Hydraulics, Delft.

During the meeting, interpretation services were provided by:
Vladimir Koznystov, head of the International Relations Departments of the Ukrainian Scientific Centre for Protection of Waters, Kharkov

Summary

1. Azov Sea

The Russian and Ukrainian participants expressed their satisfaction with the Azov Sea Decision Support System, developed with Russia and Ukraine under the Dutch collateral contribution to the Black Sea Environmental Programme. The system proves to be technically sound and provides both scientists and managers with a useful tool to analyse the interactions between management actions and the ecological status of the water system. It is recommended that, in the present institutional context of Russia and Ukraine, effective integrated management of the Azov Sea water system and application of the DSS should be supported by the formation of an international working group.

This international working group consists of 2 to 3 scientific experts from both Russian and Ukraine and includes a ministerial representative from Moscow and Kiev. The Netherlands should have an important role as neutral party and should contribute expertise on both international cooperation on the management of transboundary water systems and the application of DS systems.

In a three year period, tasks of the working group are proposed to be:
- review of present available datasets and addition of missing data on waste load emissions and water quality for the Azov Sea;
- preparation of a harmonisation plan for the monitoring activities in the Azov Sea;
• preparation of recommendations for national environmental policies concerning the Azov Sea;
• initiate further technical development of the DSS;
• provide support for regional and local authorities on management issues affected by the status of the Azov Sea (development of seaside tourism) or issues affecting the status Azov Sea (industrial development or rehabilitation of waste water treatment);
• maintain links with other environmental programmes or projects in the Azov Sea drainage basin such as the Black Sea Environmental Programme, the Lower Don project or the Seversky Donetz project;
• provide advice or technical support for initiatives in other transboundary water systems of Russia and Ukraine.

To execute these tasks, the working group itself will function as a core team, which can be temporarily strengthened by other experts for specific tasks. The institutes from which the experts will be drawn is still under discussion.

The establishment of the working group is directly in line with the trilateral agreement of Delft, 1994 which was signed by representatives from the governments of Russia, Ukraine and the Netherlands. The working group would provide a valuable link between the Dutch contributions to the region: the Don project, the Seversky Donetz project and the Azov Sea project.

The working group may serve as a precursor for the International Commission for the Don-Azov drainage basin mentioned. Therefor the Russian and Ukrainian participants believe that financial support from the national governments could be expected. Additional funding from international sources would be necessary to make the working group fully operational.

It was agreed that Kees Wulffraat and Hans Balfoor will draft a proposal, together with the Russian and Ukrainian counterparts. Erik Bouwmeester agreed to pursue funding from Dutch resources.

2. Black Sea Environmental Protection Programme

After a long delay, the second phase of the BSEP is now finally approved and it has been decided that the Programme Coordination Unit will be superseded by the International Secretariat in one year.

As a continuation of the Dutch collateral contribution of phase I of the BSEP, proposals have been formulated which relate to main activities of the BSEP such as the strengthening of research institutes and the development of a common environmental strategy. These proposals include (1) the harmonisation of environmental monitoring and (2) the development of a DSS for the Black Sea.

Both proposals have already obtained support from the special monitoring activity centre of the BSEP. Russian and Ukrainian participants in the meeting also expressed that the experience with the Azov Sea DSS showed it to be a vital tool for the management of complex transboundary water systems. It was also concluded that the proposals were related to the international working group for the Azov Sea, but should be treated as separate initiatives. The participants agreed that, information about the new status of the BSEP would be sought from the PCU. Initiatives for finalisation of the proposals will be taken by Kees Wulffraat and Hans Balfoor. Erik Bouwmeester will pursue funding from Dutch resources.

3. Netherlands Worldbank trustfunds for the North-West Caucasus and the Ural region.

In 1994 Dutch trustfunds have been transferred to the Worldbank, allocated for water management projects in the North-West Caucasus (Upper Don, Seversky Donetz and an international commission for the Don drainage basin) and the Ural Region (Ekaterinburg). The trustfund projects for the North-West Caucasus were formulated to complement the Dutch project for the Azov Sea and the Worldbank project for the Lower Don and should lead to the development of a Don-Azov Sea Action Plan. To ensure links between the projects, both RIZA and Delft Hydraulics were entered as nominated subcontractors. Since than, projects have been commenced for the Lower Don and Ekaterinburg which are funded by a Worldbank loan to Russia, but little information was received about the Dutch trustfund projects.
Recently, Erik Bouwmeester contacted the Worldbank about this. Toney Garvey reported that the 1994 ToR for the trustfund projects is now reviewed by the Worldbank and will be discussed with Russian and Ukrainian counterparts. In January 1997, the new ToR would be sent to the Dutch government for further comments. A redistribution of funds may be considered.

Participants expressed their concern about this slow process which is almost outside the influence of the Dutch authorities. This might jeopardise the links between the projects and the ultimate objective: the Don Azov Action Plan.

The Ukrainian delegation commented that the Severky Donetz is the most important contributor of pollution to the drainage basin. Management plans have recently been drawn up for this tributary to the Don, which might have been stronger if helped by simultaneous execution of the Dutch trustfund.

It is believed that Worldbank will pursue execution in Russia through its Center for Project Planning and Implementation (CPPI) in Moscow. So far the CPPI has had no direct links with the (new) Ministry for Natural Resources, which is responsible for the water management in the river basins. The identity of the Ukrainian counterparts of the Worldbank concerning these trustfund projects is unknown.

4. Danube

After intensive Dutch involvement in the Danube programme, there is now no immediate follow-up foreseen. Dr. Sukhorukov, who has been actively participating in the later stages of the programme will attend a large concluding meeting in Vienna immediately after the Azov Sea workshop.

5. Dniester

The government of Ukraine has requested the Worldbank for a loan to complete a Pump Storage Plant at the hydroelectric facility of Novodnestrovsk on the river Dniester. The Worldbank commissioned a study on the riparian rights issues in Ukraine and Moldova, to be executed by Delft Hydraulics and paid by Dutch trustfunds. This Ukrainian - Moldovan - Dutch study started in the spring of 1996 and is concluded with a training on the application of a Dniester river basin management models in Delft in November 1996. Follow up is considered in the form of a study on the unnatural temperature regime, caused by the already established hydroelectric facility, in the spring of 1997. Furthermore, the Worldbank is considering to use the Dniester drainage basin as a pilot for a full basin wide integrated water management project.

6. Ekaterinburg

For a number of years RIZA has established very good links with RosNIIVKH, one of the research establishments of the former Roskomvod, now the Ministry for Natural Resources. As a part of this relation, a workshop on integrated water management has been organised in 1996 in Ekaterinburg, which was attended by a wide range of authorities from Ekaterinburg, the Sverdlovsk oblast and elsewhere. The workshop is considered to be very successful and requests have been made to organise a follow-up.

Both RIZA, RosNIIVKH and Delft Hydraulics participate in the present Worldbank project for the rehabilitation of water resources for Ekaterinburg, which serves to further strengthen the relations.

7. Kharkov

Similar to the relations with RosNIIVKH, RIZA has established links with the Ukrainian Scientific Centre for Protection of Waters (USCPW), now one of the research establishments of Ministry for Environmental Protection and Nuclear Safety. RIZA considers the possibility to extend to these relations in the form of the organisation of exchanges and workshops. The future project for the Seversky Donetz, in which RIZA and Delft Hydraulics are supposed to participate, may serve to strengthen the relations. Delft Hydraulics has strong links with USCPW through projects for the Azov Sea and the Dniester.
8. Integrated Water Management for St.Petersburg

An International Commission to study the adverse effects of the St.Petersburg storm surge barrier recommended in 1990 a move towards integrated water management for the Ladoga-Neva water system. Following this recommendation, an integrated water management study has now been granted to the City Administration of St.Petersburg by the Netherlands government.

This study has started in September 1996 and will finish in 1997. The study will result in a Strategy and Management Action Plan, which should include recommendations for institutional reform or strengthening and specific actions concerning water management. To assist the definition of management actions, a decisions support will be developed, mainly based upon the presently available Russian models.
Annex III

Realisatie demo Sea of Azov

In de afgelopen jaren zijn bij WL een aantal ontwikkelingen van start gegaan betreffende beslissings ondersteunende instrumenten die de gebruiker bij de uitvoering van systeemanalyses kunnen ondersteunen. Deze instrumenten worden meer en meer aangewend bij het opzetten van een generieke en interactieve werkomgeving ten behoeve van een efficiënte uitvoering van projecten. Met name binnen het Azov project werd optimaal gebruik gemaakt van deze nieuwe instrumenten en zijn een groot aantal analyses uitgevoerd. Vanwege de omvang en de complexiteit van het totale DSS instrumentarium, leende dit instrumentarium zich helaas niet voor het eenvoudig presenteren van alle uitgevoerde activiteiten en de hiermee opgedane kennis.

Echter met het recentelijk door WL en RIKZ in andere kaders ontwikkelde presentatie-framework kon invulling worden gegeven aan een herhaaldelijk uitgesproken wens om te kunnen beschikken over een demo, waarmee het Azov project op adequate, consistente, inzichtelijke en aantrekkelijke wijze kon worden gepresenteerd.

Uitgevoerde activiteiten

Voor de ontwikkeling van de demo werden de volgende werkzaamheden onderscheiden:

1. Nadere gezamenlijke specificering van de opzet/inhoud van de demo; Het doel van de Azov demo was: "geïnteresseerden in de Azov studie op inzichtelijke en interactieve wijze een overzicht te geven van de problemstellings, gehanteerde werkwijze, de meest interessante resultaten en de oplossing/evaluatie, optimaal gebruikmakend van de gehanteerde Azov werkomgeving en gangbare commerciële software zoals MSOFFICE". Samen met RIKZ is besproken wat er met het nieuwe framework mogelijk was en wat er zoal diende te worden opgenomen in de demo. Er is gekozen voor CDROM als het presentatie medium.

2. Werkzaamheden t.b.v. de aannvaak van de demo; Hierbij is uitgegaan van een bestaande paper over het Azov project, waarin het resultaat van 16 cases werd besproken. In aanvulling hierop werd verklarende tekst bij een groot aantal in de demo op te nemen onderwerpen gezocht (ca. 75 onderwerpen variërend van de betrokken instituten tot de modellen en gehanteerde methodes). Middels hypertextsoftware werd deze tekst als Windows helpfile op tal van plaatsen in de demo beschikbaar gemaakt, optimaal gebruik makend van de ontwikkelde hotspot editor. Tevens is een Russische samenvatting van het project opgenomen.

3. Opname van verklarende tekst evaluatie en aanpassing van de demo; Alle binnen het project uitgevoerde stappen zijn beschreven middels windows meta files dan wel de windows helpfile. Alle demo-menu's zijn twee-talig gemaakt (engels-russisch). Binnen de Azov demo zijn verder installatie opties ingebouwd om de volgende programma's op de harde schijf te kunnen laden:
   - de Azov demo
   - het Azov DSS met 1 voorbeeldcase
   - het Azov DSS met 16 cases
   - een eenvoudig screenings model (pilot model)
   - BlackSIS: het datainformatiesysteem voor de Zwarte Zee

4. Gebruik van bestaande rekenresultaten en presentaties; Alle 16 beschikbare uitvoerfiles met casespecifieke informatie zijn voor de demo uitgekleed voor wat betreft parameters en tijdstappen, om de demo zo compact mogelijk te houden Zowel het aantal parameters als tijdstappen zijn met een factor drie teruggebracht.

Samenvattend zijn de volgende instrumenten aangewend voor de demo:
Mapper: ruimtelijke en tijdsafhankelijke visualisaties
ODS2XLS: XY plots
CMT: case management tool
CAT: case analysis tool
Showpict: presenteren van figuren
Hot-spot editor: adresseren van het scherm
Hypertext / Windows help files
Windows shell tabbladen programma
Standaard MS office software voor de aanmaak van figuren e.d.

In een eerste breed verspreide oplage zijn een achtal CDROMS aangemaakt, alsmede een set diskettes. Na een korte testfase zullen de kleine foutjes worden hersteld en zal een tweede oplage van 10 exemplaren worden opgeleverd aan RIKZ.