Grontmij | Carl Bro A/S
Granskoven 8
2600 Glostrup
Denmark
T +45 4348 6060
F +45 4348 6660
www.grontmij-carlbro.com

CVR No. 48233511

Final Summary Report

Information systems operationalised as a decentralised tool
KK 2008/136/2

25. November 2008
Project: 80.2799.10

To : Environmental Sector Programme
EEAA – Danida
30, Misr Helwan Agricultural Road
Maadi, Cairo, Egypt

From : Arne Hurup Nielsen, Anders Humle

Enclosure : 4 debriefing notes
Pending and completed tasks
Memo on backup Strategies

Copy to :

Main entry to the Environmental Information Portal - EIP

1 BACKGROUND

The current contract KK 2008/136/2 is an element in Output 3 of the Strategic support to EEAA: " Information Systems Operationalised as a Decentralization Tool", being a part of the Environmental Sector Programme.

The immediate objective for the strategic support is:
Improve organisational performance of EEAA with quality assurance procedures and well-functioning information systems in place by 2008

Output No 3 states:
Information Systems Operationalised as a decentralization tool
Milestone: Systems outputs functioning as an important decentralization tool

2 OBJECTIVES

The overall objective of the Consultancy has been to provide a road map for reliable environmental information implemented and disseminated by EEAA on Intra- and Internet.

This overall objective has been further detailed by two sub-objectives:

1. An Egyptian environmental information system established, based on decentralised databases in the Regional Branch Offices as data sources for a central datawarehouse server located in EEAA in Cairo.
2. Selected information disseminated to the public through an Environmental Information Portal. The Environmental Information Portal will use the datawarehouse database as one source of data. Other data sources comprise an online Air quality database and a Coastal zone database. More data sources will be included in the future.

3 OUTPUTS

The contract has been centred around providing consultancy to the EEAA in terms of establishing the decentralised environmental information system – EREMIS, a datawarehouse database and an environmental information portal.

In the table below, the main outcome of the stipulated outputs in the Terms Of Reference are mentioned and briefly discussed. In the debriefing notes from each of the three international inputs more detailed information is found.

Output	Planned Items	Status by end of consultancy. September, 2008
1	EREMIS is installed in the remaining RBOs	EREMIS was by June 26, 2008 installed in the following: Pilot RBOs: Suez, Assiut, Cairo Other RBOs: Alexandria, Tanta, Mansoura, Red Sea, Aswan A version of EREMIS is installed in Inspection Department in EEAA.

2	EREMIS is available for selected EMUs through internet connection, provided that internet connections are properly established	EREMIS is in process of being web-enabled. A local consultant has been employed to gather the requirements for use in EMUs. The consultant came up with a number of requirements, which clearly exceeded the current working areas of EREMIS. It was then decided to web-enable only 32 central screen images, which would allow EMUs to enter EIAs, inspections and complaints. The work on web-enabling these screens should be started in September 2008, i.e. after the end of the consultancy. One or two pilot EMUs should be selected, based on possibilities of good connectivity. EMUs in Assiut and Suez have been mentioned. The 4 pilot EMUs are the New Valley (Wadi El-Gedid), Beni-Sueif, Ismailia, and Portsaid.
3	Datawarehouse server is up-and-running and receives data from RBO EREMIS installations by agreed frequencies	Frequent transfer of data from RBO's to DWH have been implemented.
4	The Environmental Portal is running on the EEAA intranet. Selected data and information relevant to CDBA, air pollution data and noise data are available.	The Environmental Portal is running on the EEAA Intranet. Information on air pollution, noise, coastal waters, biodiversity, CDBA reports etc. are available.
5	ArcIMS is integrated in the environmental information portal	ArcIMS has been integrated in the Environmental Portal. ArcIMS is installed on a GIS server with fixed IP address. This is a precondition for being able to access it through the network.
6	The environmental information portal is planned to be extended with new data types, e.g. climate, fresh water, biodiversity data, land degradation data etc.	The architecture of the portal will allow for new data areas to be included, e.g. climate, fresh water, hazardous substances etc. Phase 1: Air Quality, Coastal Water and Regional Branches Reports Phase 2: Noise, Biodiversity and Hazardous substances Next Phases: Climate, fresh water, etc.

4 METHODOLOGY AND SCOPE OF WORK

The methodology of the assignment has been to follow up on and continue the development of the previous activities in the IT setup within EEAA departments and between the RBOs and EMUs.

The consultants have facilitated how selected data and information should be published on the EEAA web site as well as functioning as the main source for data for the State of Environment Report and the EEAA Annual Report.

The work has been executed as a cooperation between the international consultants and the Egyptian specialists. The main goals have been laid down in cooperation and the actual implementation has been done by the Egyptian specialists. The status of the different tasks have been documented in the work plan on pending and completed issues and have been discussed at bi-weekly meetings between the working groups, the head of ICC and the CTA. The updated work plan has been sent to the consultants for information and comments. This way of cooperative work has proved to be very efficient.

5 ACTIVITIES

The consultancy consisted of 4 one week missions to Cairo.

The timing of the missions has been:

Mission No.	Timing	Main tasks
1	April 19 – April 24, 2008	Refer to debriefing note No. 1
2	May 31 – June 5, 2008	Refer to debriefing note No. 2
3	July 20 – July 24, 2008	Refer to debriefing note No. 3
4	August 23 – August 29, 2008	Refer to debriefing note No. 4

During the missions the status of the different working tasks has been assessed and work plans for the following period have been elaborated and discussed with the local counterparts and consultants.

Between the missions home office support has been given to ESP especially in connection with the IT-Committee meetings but also as follow-up on the ongoing activities.

6 TERMS OF REFERENCE (TOR)

In the table below, the planned activities are listed. These constitute the TOR for the consultancy.

Main activities	Planned activities	Status by end of consultancy. September, 2008
1	Follow up on the implementation of EREMIS in the remaining RBOs	EREMIS implemented in 8 RBOs. Two of the pilot RBOs Suez and Assiut were visited during the August mission.
2	Follow up on the implementation of EREMIS in the EMUs	It has been decided which parts of EREMIS to be web-enabled, namely the parts which most clearly contain the

		collaboration with the RBOs and EMUs: EIA, inspections and complaints.
3	Anchor the environmental information system in EEAA	The DWH and the Environmental Portal is now an integrated part of the work in EEAA (Intranet)
4	Follow up on establishing the Environmental Portal in EEAA	The Environmental Portal has been extended to cover a row of data items: air pollution, noise, coastal waters, biodiversity data, CDBA reports etc.

The overall objectives of the consultancy were fully met.

Due to a very cooperative effort from the management of EEAA and a very dedicated staff it has been possible to establish a data flow from the EREMIS databases in the RBOs to the datawarehouse database and further on to a well-functioning Environmental Portal in EEAA.

7 THE ORGANISATION

During the previous development phase three major working groups were formed. These groups continued their work during the present phase. The groups covered:

1. The Datawarehouse/EREMIS, taken care of by the Oracle team, which consists of:
    - Eng. Manar
    - Eng. Mohammed abd del Wahab (left his position in EEAA during the phase)
    - Eng. Ahmed Bshlawy
    - Eng. Mohammed Bahaa
    - Eng. Wafaa Sayed (left her position during the phase)
    - Eng. Medhat (local consultant)

2. The Environmental Portal, taken care of by the Web Team, which consists of:
    - Eng. Hend
    - Eng. Zeinab
    - Eng. Khaled, Air Pollution Office (left his position during the phase)
3. The GIS part, taken care of by the GIS Team:
    - Ms. Hoda
    - Mr. Mohamed Essam
    - Eng. Ahmed Mostafa

Eng. Moheeb has been the overall coordinator of the development. System engineer Mr. Khalid has supported the teams in network questions.

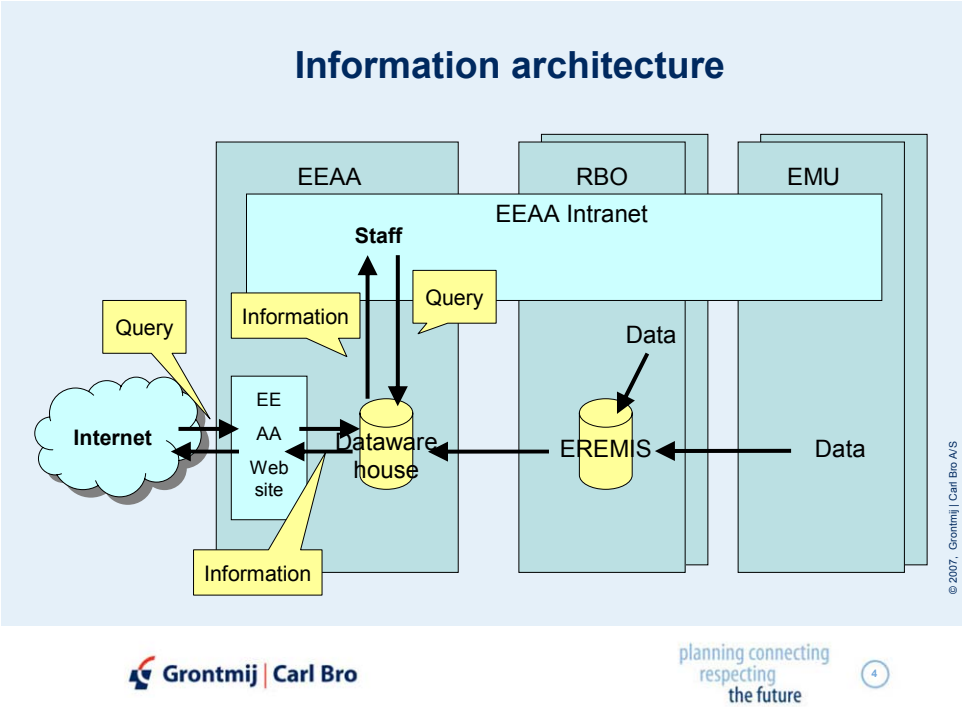
Mr. Anders Humle and Mr. Arne Hurup Nielsen were international consultants on the development activities.

Work plan schemes on pending and completed tasks have been maintained during the phase. The status has been discussed on bi-weekly meetings facilitated by the CTA and the results have been reported to the international consultants regularly to allow for follow-up during the missions.

8 BRIEF STATUS ON THE ENVIRONMENTAL PORTAL

The development of the Environmental Portal has been progressing very well during the phase. It has been supplemented with new data types and more are planned to be included. The work on the Noise part of the portal follows the same structure as for Air pollution. The Noise part is already being used internally in EEAA for reporting Noise information, as no tools existed prior to this. Coastal data have been included in the portal.

The information architecture of the portal is shown below.



The portal basically serves 3 levels, EEAA, RBOs and EMUs. Eventually, it will serve both as an intranet portal (more data and information available. It will be login-prorected) and an internet portal (lesss information, aimed at the public).

The portal was presented at a meeting with SMAP in August 2008. SMAP is a short name for “Short and Medium-term priority environmental Action Programme”. It is a EU-financed framework programme for protection of the Mediterranean environment.

SMAP works in five major priority areas:

- Integrated water resource planning
- Integrated waste planning
- Hot spots

- Integrated coastal zone management
- Combating desertification

Among other things SMAP contains a so-called “clearing house”, which can be seen as an index on meta data, i.e. where to find information.

The presentation of the Environmental Portal revealed, that the portal is quite unique and is in fact to be considered at state-of-art in its area in the region. This was emphasized by the delegation, headed by Italian representatives.

The next steps for the Environmental Portal will be to implement hazardous substances and biodiversity.

Since spring 2008 attempts have been made to have a presentation of the Portal for HE the Minister to obtain an approval to disseminate selected environmental information to the public. However, by the end of the Consultancy it had still not been arranged. Thus, the Environmental Portal is only available on the EEAA Intranet – and only for selected staff.

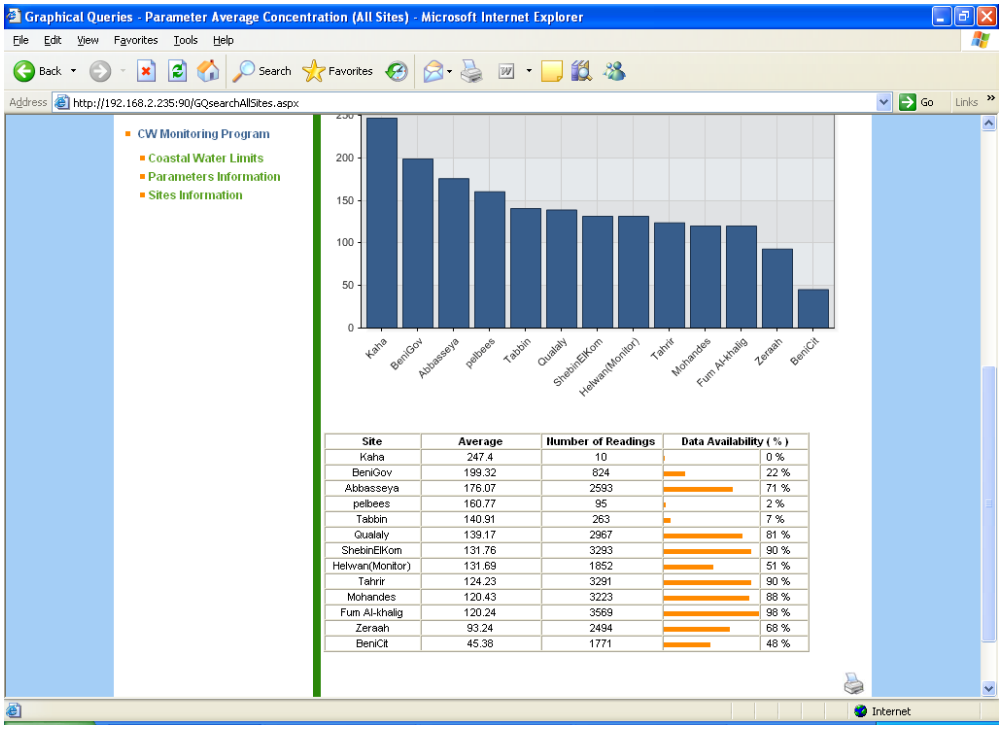
9 FUTURE VISION FOR DATA EXCHANGE

It can be foreseen that the requirements for exchanging data will increase dramatically in the years to come – not only within EEAA but also within the Egyptian administration in general. Environmental data will play an increasing role in many decisions, not only because they describe the state of the environment , but also because any goal of improving the environmental quality and thereby the quality of life has big implications on the economy of the country. This means that updated and reliable data and information should be available as basis for decisions in many other sectors.

The internet/intranet technology provides all required instruments which are needed to allow for data access and data exchange. The Environmental Portal is designed to be the entrance to Egyptian environmental information. Access to the information should be protected by user-ID and password, except for information which is aimed at the public in general.

The portal should be further developed to serve as an “information product provider”, meaning that data/information, which is to be retrieved on regular basis should be made available by use of standard queries. Such queries should result in reports, which combine data, calculations, graphs and maps, as required by the users.

Below is shown an example from the Air Pollution Monitoring part of the Environmental Portal. The data covers particular matters (PM10) on different stations.



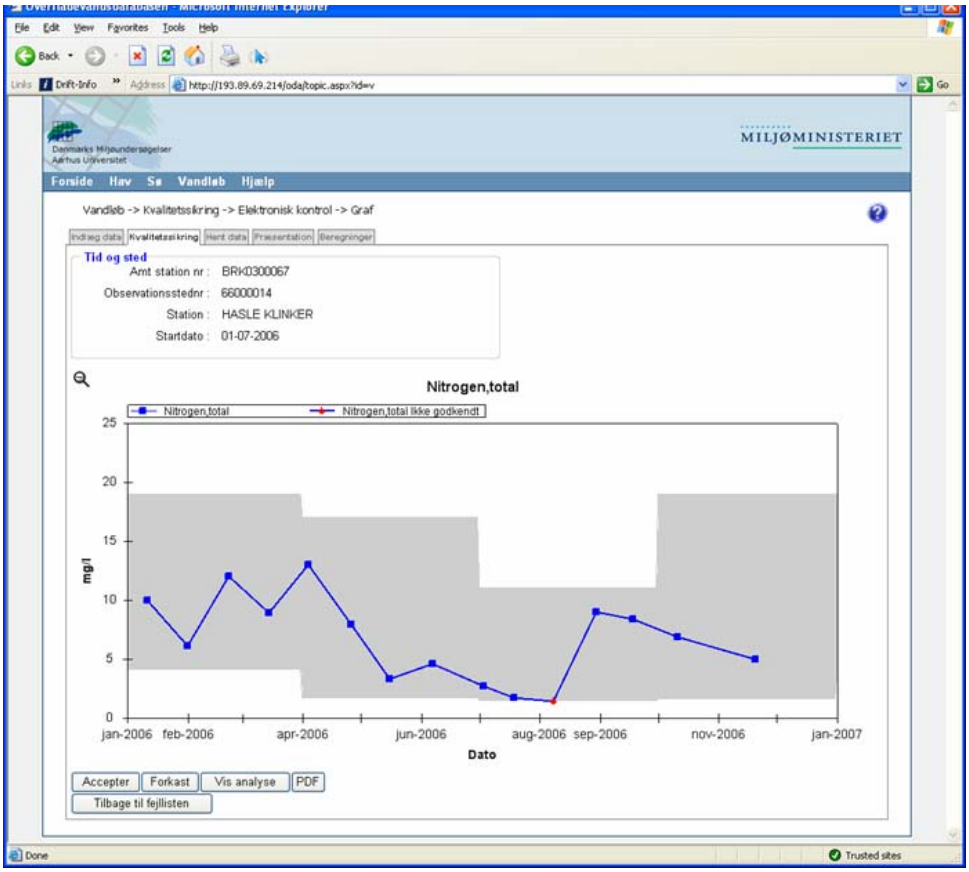
An example from the Air Pollution Monitoring programme, showing the average level of PM10 for a given period. The data availability is shown to give a measure of the basis for the calcukated average.

In the short run, it should be possible to extract data in different formats e.g. Excel and MS Access and download them to one's own system. Only data which is quality approved should be accessible outside EEAA to avoid decisions taken on doubtful data.

In the longer run, systems in EEAA should be equipped with web services, which allow for system-to-system communication. By using such techniques, a seamless communication could be built up within EEAA and between systems in different agencies throughout the Egyptian administration - even across the country.
The web services will use XML (eXtensible Markup Language) as the means of data transfer. The XML can be built up as standardised schemas, which will ensure a "transparent" data exchange, i.e. sender and receiver interpret data in the same way. There are many examples of standardised XML now. In Denmark, a secretariat called "OIO-sekretariatet" (OIO is a Danish abbreviation for "Public Information Online") was formed in 2003. OIO is the Danish standardisation body for "Digital Governance" and digital architecture and covers XML schemas among many other subjects. The portal can be accessed via this link: http://en.itst.dk/architecture-and-standards

Data transfer via web services can be done “batch-wise” or “on demand”, as required. Batch transfer will put less requirements on the connections as it can take place in periods with little traffic on the net. Online transfer will give the possibilities of updating information, as soon as new data exist. The frequency of data transfer should be governed by the need for data update. We believe that data transfer during the night would be sufficient in most cases. Even online monitoring data from e.g. air pollution monitoring programmes would need quality control before it is transferred or published. Online sensors can fail or need calibration which can only be revealed by a person who has professional knowledge of such data.

Below is shown an example from quality control procedures in Danish freshwater and coastal water monitoring. Each new data series is compared to all previous data measured for the same parameter on the same station. An upper and a lower limit (5% and 95% percentiles) are calculated for each quarter and shown as a gray “band”.

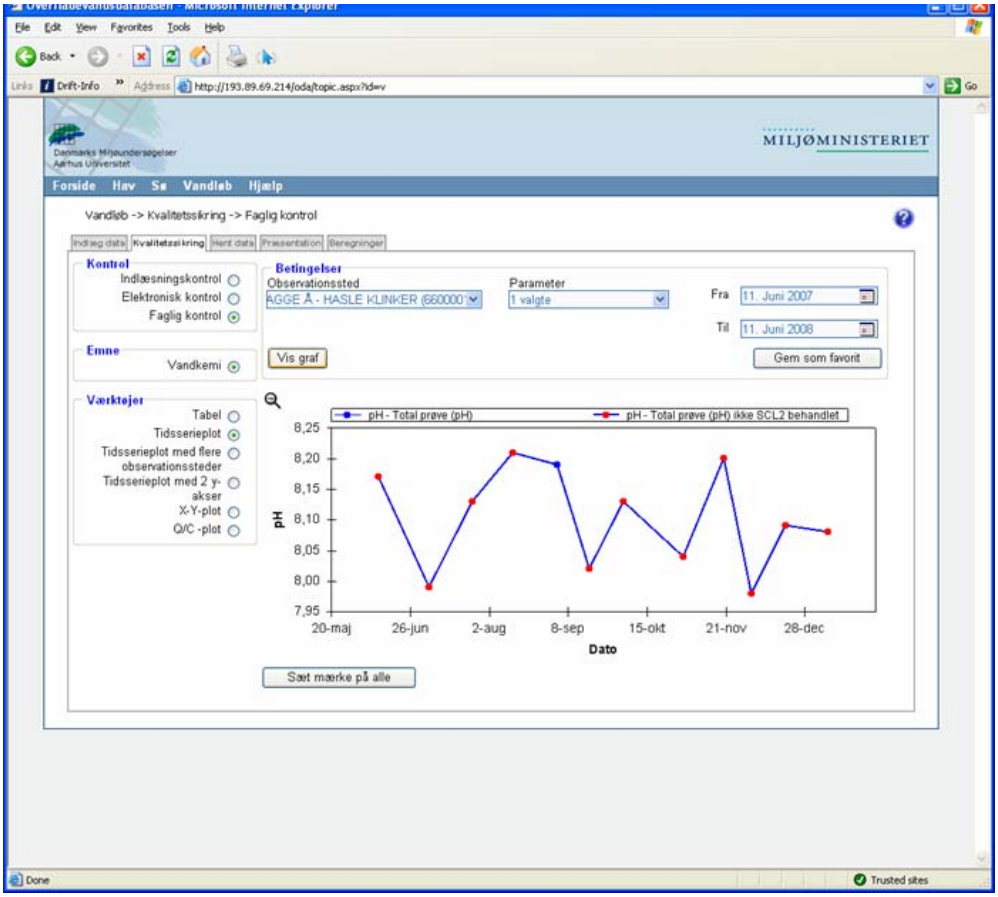


Any data falling outside this “band” will be subject to further investigation.

The Danish quality system works with a number of layers of control:

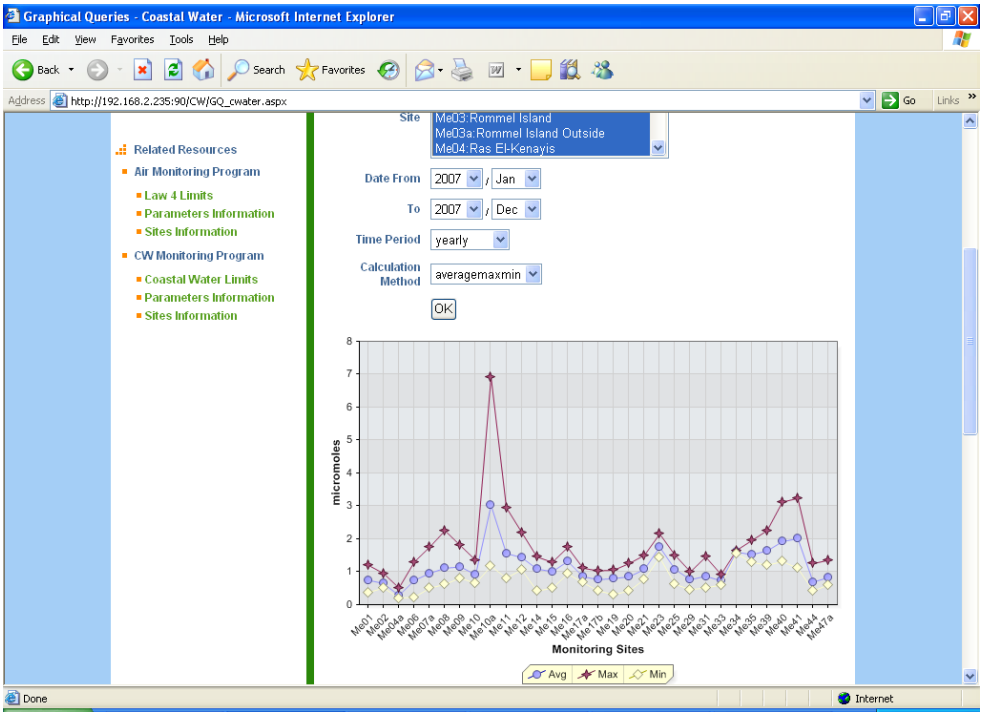
- Hard constraints, which are format errors, missing parameters etc. which prevents the data from being put into the database at all
- Soft constraints, level 1, which are data errors falling outside fixed boundaries, e.g. as shown above – or instances where the sum of e.g. P-derivates is bigger than the measured Total-P value.

- Soft constraints, level 2 is a manual control done by a person who knows the specif data very well. This can be done visually by making graphs. An example is shown below. Data can be accepted or rejected by the expert simply by clicking on the value in the graph.



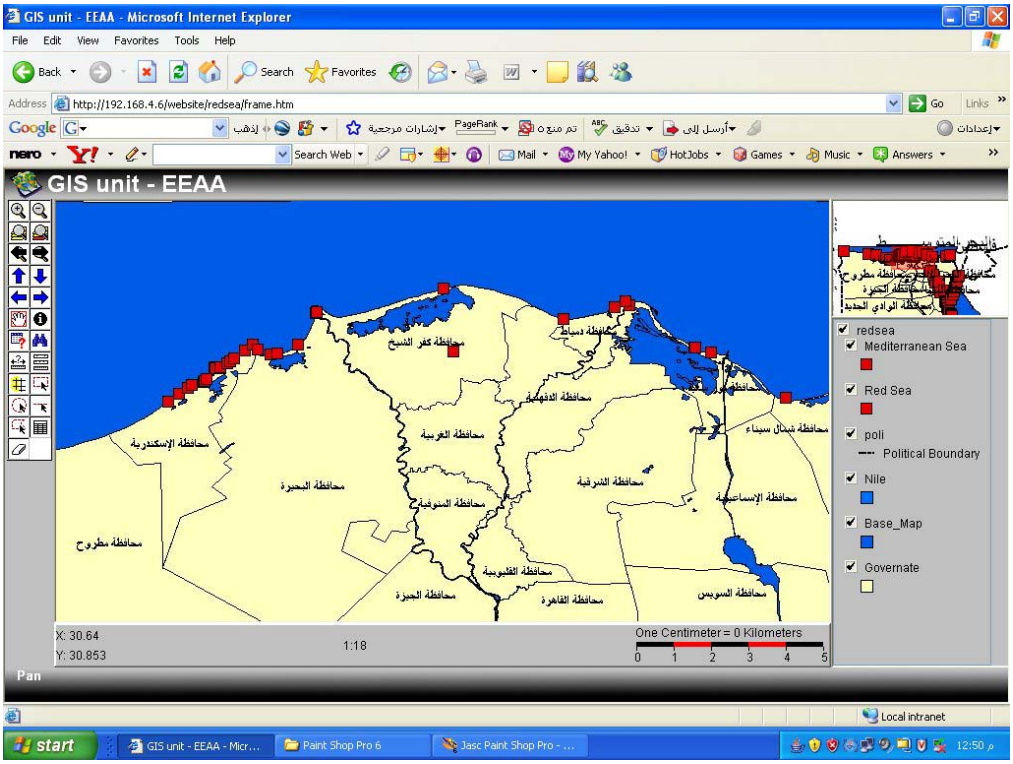
This type of graph allows the user to accept or reject data directly via the graph. Simply by clicking at a value it can be omitted from any future dataprocessing, but it remains in the database. The red dots mark values which are still not checked. The blue one is a value which has been checked and approved.

Similar checks have been made on data via the Environmental Portal. Simple graphs of data often reveal “strange” values. Below is shown an example from the Environmental Portal. Maximum, minimum and mean value for a certain parameter is calculated per station and shown in a graph.



This reveals that one of the stations has a maximum value that exeeds the others with more than a factor 2. It may be correct, but it needs further investigation.

Using GIS as a tool for getting access to data will be very convenient for both professional users and the public in general, since environmental data by nature are spatially distributed. The commercial GIS system ArcIMS, which is widely used, has been implemented and integrated in the Environmental Portal. The screen image below shows monitoring stations in the Mediterranean Sea. The GIS offers full functionality, i.e. zoom in/out, pan, info button etc,



Implementation of ArcIMS from ESRI in the Environmental Portal

9.1 Exchange data with other departments

Environmental data contains important information and needs to be available as basis for decisions in many different contexts. Within EEAA we suggest that the datawarehouse database over time is supplied with new data types and thus forms the “total picture” of available environmental information. It should be the place, where users seek data and information to be used in the daily work. It should be possible to do calculations, aggregations, presentations etc. The data should be quality marked by the “data owners” to allow users to assess the basis on which they take decisions. In that way, data exchange can take place whenever the user need information.
It should be fixed when “data providers” are obliged to update data under their responsibility. This could be done via the IT-Committee.

9.2 Connecting other government agencies

There is no doubt, that exchange of data with other agencies will play an increasing role in the future, as mentioned above. However, when data/information may be used in contexts not known to EEAA, not only the physical exchange formats are important. Perhaps, the most important issue is to have a “coordination protocol” which states the agreement for use of data.

In cases where frequent exchange of data with another agency is agreed, an "information product" could be defined. The "product" could describe a certain type of data, a certain type of aggregation, a certain type of presentation etc. In this way the receiver of information will know what to expect and how to interpret the data/information. The sender will be more confident of its use and interpretation when handing over data for external use.

Data can be exchanged by use of data files e.g., in XML format, but other formats can be used as well. Or it can be published via web services. If EEAA provides an UDDI (Universal Description Discovery and Integration). An UDDI is a platform-independent way of publishing web services on the internet. The UDDI describes the services available and the data (contents and format) that each service demands and/or delivers. In case EEAA developed a number of web services, which could be of interest to e.g other ministeries to be included in their systems, they could be "published" in a UDDI online "catalogue". The catalogue can be accessed from outside and will provide information on what the service can do (e.g. calculate the AQI for a specific station for a given period), how it is called, what input is needed and what output is delivered. The UDDI is interrogated by a SOAP (Simple Object Access Protocol) call and provide access to a WSDL (Web Services Description Language) document describing the message formats required to interact with the service. This is a way to ensure, that the developer can always access the UDDI for a certain service and get the updated information on how to use it.
Please refer to the internet to get more information on e.g. UDDI. One possibility is:
http://en.wikipedia.org/wiki/Universal_Description_Discovery_and_Integration

10 CONSIDERATIONS ON HARDWARE SETUP AND CONNECTIVITY

10.1 Hardware

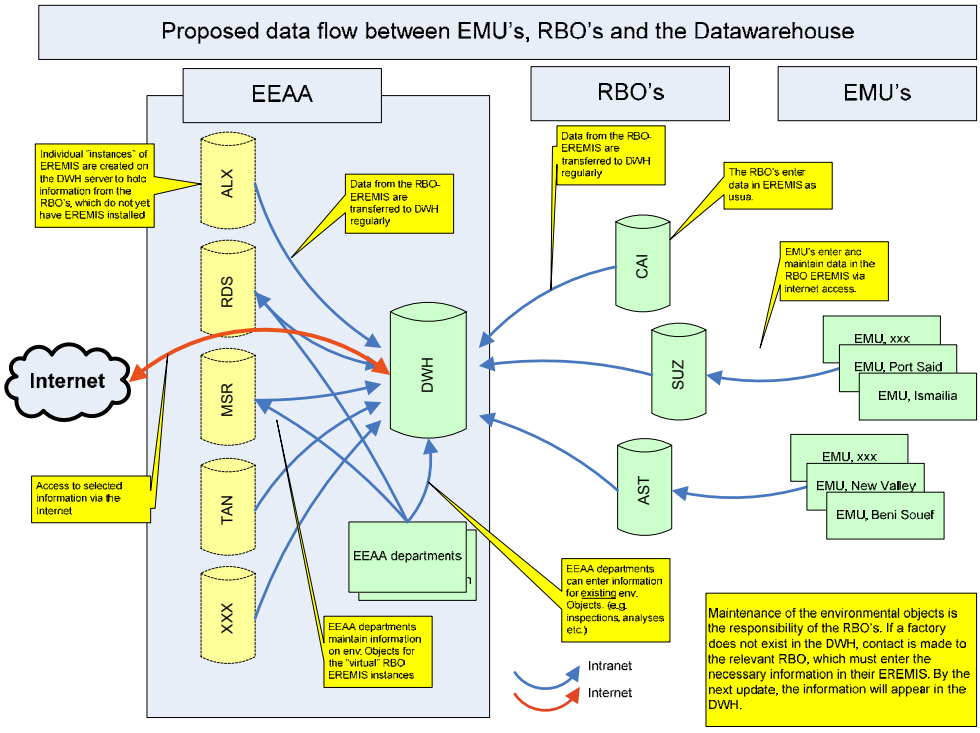
The hardware and the network setup within the EEAA is equivalent to what is found in almost any organisation today. The setup is governed by the fact, that it has been built up gradually over a longer period and that individual parts are being replaced when necessary.
The hardware consists of a number of pc's of different capacity and age and of a number of servers, equally distributed. The servers in EEAA headquarter under the ICC governance are gathered in servers room. A number of project-specific servers (e.g. for air pollution database, biodiversity database, and Noise database) are placed in the relevant offices and maintained there.
The overall problem with setups, where users have individual pc's with local hard disks is the potential lack of backup in case the user stores data on his own hard disk instead of using the network servers. If the network capacity is sufficient for working directly on the servers, the users should be obliged to store any data or information created in connection with the work on the servers.
To make the maintenance of the servers easier for ICC it should be considered to gradually change them to be of more unified types (if practical).

A choice of fewer rack-based servers and a virtualised environment would be easier to maintain and would offer a much higher and more flexible capacity.

A virtualised environment means that a physical server is divided into a number of “virtual servers” each of which can run its own operating system, applications etc. as if is was actually a physical server. The virtual environment makes it easy to re-prioritize resources among the virtual servers. In this way, it is possible to grant more resources to a system which is currently much used without moving it to a more powerful server. Also, it can be used for setting up test environments for software which is still not ready for publishing.

10.2 Connections between EEAA, RBOs and EMUs

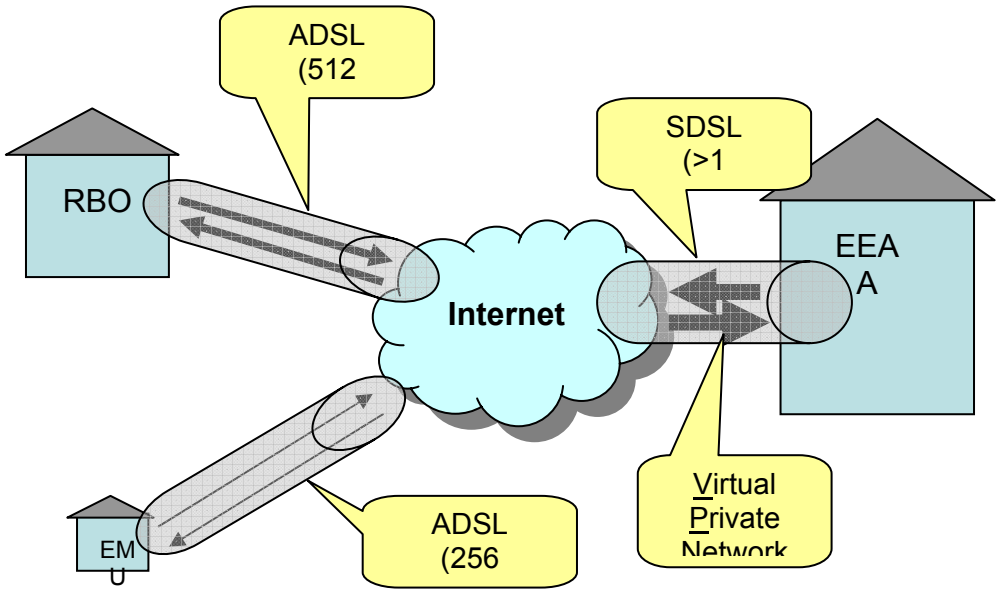
The proposed flow of data between the different stakeholders of the environmental structure is shown below:



The connectivity between EEAA, the RBOs and the EMUs has been subject for discussion during the entire project – from the start of the Environmental Portal and the datawarehouse. In order to make this work in reality, internet access with some capacity is needed.
By the end of the project it seems as if the connections between EEAA and the RBOs have reached a level where they can be used in the daily work. Based on the most recent information, all RBOs have now ADSL lines to the internet. Since internet connections are subject to constant changes, it is assumed that the speed is >1-2 Mbit/sec. This is sufficient for “normal use”, i.e. data transfer, browsing etc. It has earlier been discussed if the connections should allow for video meetings, IP-telephones etc. The current status is not known but such services would call for an increased bandwidth to be able to serve the purposes.

The architecture sketched to include the EMU level assumes that the EMU is linked to the internet and thereby to its RBO EREMIS database. This architecture was chosen since the cost of establishing an IT centre in each EMU with hardware, software and staff would most probably not be viable. It was assumed that the needs for data storage and data processing in the EMUs regarding environmental matters would be limited. Therefore, it was decided to allow remote access via the internet to the RBO EREMIS (Complaints, EIA, and Inspections). This could be done in different ways. As EREMIS is built on an Oracle platform in a Client/Server architecture remote access could be established by installing the client at pc's in EMUs and use the database remotely. Tests from EEAA to the database in Suez proved, that this strategy gave a poor performance. In addition, it would be difficult to keep the client pc's updated with the latest version, if changes were made to the client software. Therefore, this alternative was given up.
Another way of giving the EMUs access to EREMIS is by using the internet as described above. This requires web-enabling of parts of the EREMIS user interface. But it would give a much better user experience. Therefore, it was decided to follow this path.
Unfortunately, by now many of the EMUs have limited or no connections to the internet. This is however subject to change. It was decided to select a few "pilot-EMUs", preferably in Suez and Assiut RBOs, since these RBOs have the most profound experience with EREMIS. In Suez, Ismailia and Portsaid has been mentioned and in Assiut Beni Suef and Wadi El-Gedid.

The connections between the different parts of the system could follow the outline shown below:



The internet speeds (256 Mbit/s, 512 Mbit/s and >1 Mbit/s) are only stipulated minimum values. The possibilities changes rapidly. The “tubes” around the connection arrows symbolise use of Virtual Private Network technology (VPN). VPN is a way of separating your internet traffic from others, thus making a “tunnel” for private communication. Most environmental information may not need this kind of protection.

10.3 Portable technology

Portable technology has not been addressed individually in this project. However, it might prove useful to implement it at a later stage.
Especially when data capture is done in the field, it might be cost effective to use e.g. tablet pc’s or PDA’s (Personal Digital Assistant) to register data on location. Both tablet pc’s and PDA’s provide the possibility of working away from the office and do not require keyboards, since they have touchscreens. If you have the possibility of having wireless internet access, you can actually update the central database “on the fly” – provided you have the necessary access rights. Or – in case you work offline – you can enter data on the device and transfer them to the database, when returning to the office. When inspections are done at factories it would be time saving to enter data directly into a local database – or in the long run – directly into e.g. EREMIS via a link to the internet. Also, it would be a means of improving the data quality, since many errors occur when being transferred from paper to data system.

In Denmark, portable technology is used in many sectors. It is now quite usual in e.g. restaurants that the waiter issues the bill and processes the payment via credit card from a wireless portable terminal at the table. It saves man resources for the restaurant that the waiter can do billing and payment directly, and the customer can feel more safe since the credit card stays in sight all the time.

In Grontmij | Carl Bro we have been working with portable technology for some years, especially when doing building assessments. When the assessor goes to examine a building, he has access to all of the information which is stored in public systems. The tablet pc contains a database and an application, which leads him through the work flow. When digital pictures are taken to document a deficit, it is automatically stored in the database and linked to the building in question. Is the same way, measurements of humidity, distances etc. are stored in the database, when measured.
When returning to his office, data is transferred to a common database and a report can be issued and sent to the client and to the authorities.
The tablet pc’s are still somewhat expensive compared to desktop pc’s and even to laptops. Therefore, it might take some time before this technology can be available for e.g. environmental inspectors. But it is important to include such elements in the future planning.

11 RECOMMENDATIONS

The project has demonstrated that it is possible to establish an environmental reporting system, which reaches from local monitoring, data capture and reporting to the central “instrument”, which can receive data from many sub systems, make it available for professionals for further analyses and for publication to a broader audience via a portal.

The most important knowledge obtained is the fact that the work has been done mostly by the staff in EEAA and the RBOs. The international consultants have had the role of generating ideas, giving advice, helping in planning and in follow up on the activities.

Therefore, EEAA in particular and the Egyptian environmental administration in general now has the basis for further development of a unique tool for turning environmental data into information and further on into knowledge to be presented to the public.

Maintain the staff and qualifications

To keep momentum, responsibility for the future development must be taken by the management in EEAA. It is important to be able to maintain the staff and their skills. Each time new staff is to be included into the teams, it will set back the development. It is therefore recommended to offer the IT staff incentives to continue working in the public administration. This means sufficient salary but also possibilities of further education.

The work plan

During the project, a work plan has been maintained. It has been discussed on bi-weekly IT-meetings in the development teams. It is highly recommended that these meetings continue, also after the end of the ESP project. It is a very good way to discuss and exchange information and to plan the work in a co-operative way.

Roles and responsibilities

A proposal for an IT Decree has been elaborated (May 13, 2008) by Mr. Anders Bjornshave, CTA/ESP. The draft lays out principles for roles and responsibilities for the daily use and maintenance and the future development of the total system, i.e. EREMIS in the RBOs, the datawarehouse and the environmental portal. It is recommended, that the roles and responsibilities are agreed and put into action.

IT Group and IT Committee

The proposal for the IT Decree also contains a suggestion for establishing an IT Group and an IT Committee. The aim of the IT Group is to be a forum for technical discussions and should consist of IT-staff form EEAA, from RBOs and from EMUs. It is to be chaired by the General Manager of IT in EEAA. The role of the IT Committee is to formulate policies and strategies, make recommendations for the top management of EEAA and to endorse annual progress reports in the IT field.
It is highly recommended to establish the two fora, since they will be means of securing stable and coordinated initiatives re. IT.

Stabilise EREMIS

It is highly recommended to stop further development of the EREMIS system for a period to allow for a stabilisation of the daily operation and maintenance. The IT Committee should lay out principles for implementation of the future development needs to avoid uncoordinated initiatives. Just rolling out new versions of EREMIS will be a time consuming process and must thus be well planned.

Unification of EREMIS data models
It is highly recommended that the data models of the different EREMIS implementations are kept unified. No changes should be allowed unless approved by the IT Group/IT Committee. When changes are to be implemented, a roll-out plan should be agreed in advance.

Transfer of data from local RBO's to EEAA
It is recommended that a unified frequency of transferring data from the different RBO EREMIS to EEAA Datawarehouse should be agreed and maintained. Upon reception in EEAA the Datawarehouse database should be updated immediately and some of the CDBA reports should be run, e.g. the report on "missing data". This will give an overview of the status of the data work in the RBOs.

The future maintenance of EREMIS
To allow for a secure operation of EREMIS after the end of the ESP project, it is highly recommended that a maintenance contract is made with Eng. Medhat Moustafa, who has designed, developed and implemented the system. The contract should be a framework contract and should run for a 6 months period from the end of the project. The reasons for this recommendation are twofold:

- EREMIS has become a vital tool in the daily work in the RBOs. Therefore, it is very important to be able to react quickly on user problems and queries
- ICC has currently problems with lack of IT staff. Therefore, any help to support ICC in its daily operation is highly needed. Furthermore, a number of IT-professionals in the RBOs have left their positions, which enhances the pressure on the ICC IT staff members.

Finalise the web-enabling of 32 screen images
A part of the decentralization process is to extend EREMIS to be used in the EMUs. To allow for this a number of screen images have been selected for web-enabling. It is highly recommended to start the web-enabling as soon as possible.

The Environmental Portal
It is highly recommended that the work on extending the Portal with new data types and new forms of presentation is continued. The Portal is to be considered as a "exhibition window" not only to EEAA departments and management but also to the public. It will constitute a tool which can be a vital element in enhancing public awareness on environmental issues.

Integrating GIS
The work of integrating GIS in the Environmental Portal has taken more time than originally anticipated. By the end of the project it seems to be working. Since GIS is a vital element in all presentation of environmental data and information, this should be given priority. For users, it is much easier to understand information or get access to data, if it is provided through a geographic interface. In e.g. the air pollution part of the Environmental Portal we have used a quite simple map tool, since – at that time – ArcIMS was not ready. This simple method can be used in other contexts where full GIS functionality is not needed.

Connectivity
One of the bigger obstacles in the current project has been the limited internet connections between EEAA and the RBOs and especially to the EMUs. It is recommended that the connections are being given high priority since this is supposed to form the backbone of the entire system.

Presenting the system to H.E. the Minister
As mentioned above the Egyptian environmental administration now has a unique basis for following data from capture in the local EREMIS databases and other sources such as air pollution monitoring, noise monitoring etc. to a level of information generation, knowledge retrieval and presentation via the Environmental Portal. Until approval has been obtained from the political level data cannot be published to a broader audience. Therefore, it is recommended that the entire system is presented to H.E. the Minister as soon as possible.

11.1 Strengths and weaknesses

The project has proved that there is a lot of very skilled IT people in both EEAA centrally and in the pilot RBOs who have been very enthusiastic in building up a national environmental information system to be used not only by the professionals but also to be able to issue meaningful information to the public. There really is a strong basis for keeping the developed systems running also after the end of the ESP.

The most important weakness seems to be the pressure on the IT management of EEAA to be able to maintain the staff necessary to maintain and further develop the systems. The private companies can offer much higher salaries than EEAA. Therefore, there is an imminent risk of losing key staff, unless they are offered incentives to stay. Incentives can be salary, but also higher employment security, further education, established career paths etc. will be reasons for people to stay.

11.2 Lessons learned

The primary lessons learned seen from the side of the international consultants heave been:

- The way of working, where the majority of the work has been done by the local staff and where the consultants have had short missions to follow up and to define new tasks has been very successful.
- The forming of the teams: Oracle team, Web team and GIS team has proved to be very good.
- The bi-weekly IT meetings have very positively contributed to the progress of the many pending tasks and the exchange of information within the group. The minutes of the meetings have allowed the consultants to closely follow and comment on the work from abroad.
- There has been good response from different parts of EEAA when results have been presented or when they have been asked for inputs of comments to the developed functions.

- Two of the three pilot RBOs have successfully implemented EREMIS and use it as a primary tool in their daily work. It has been very positive to follow this.
- There has been some confusion on the organisation of the local IT staff in the RBOs now when ESP is about to close. It would have been better, if the future employment status had been addressed at an earlier stage. The confusion has most probably lead some of the IT people to leave for jobs in private enterprises.
- The web-enabling of EREMIS for use in EMUs should have been started much earlier. The Terms of Reference for the local consultant could perhaps have been clearer and narrowed since the result of his survey included requirements which are not addressed by the current version of EREMIS. The idea was not to include new areas but merely to reveal what parts of the existing EREMIS was of interest to EMUs.
- The connectivity between EEAA and the RBOs and the EMUs have been a matter for discussion throughout the project and needs to be decided.

12 CLOSING REMARKS FROM THE CONSULTANTS

The current project concludes a series of initiatives starting from the decision on developing and implementing the decentralised tool EREMIS over preparation of central tools for gathering data in a datawarehouse to presenting data and information on a web based portal.

Looking at IT-development projects in general there are at least two major challenges to reach a successful implementation:

- When developing a system, it must be designed, developed and implemented to serve the requirements of the users. This is a matter of good architecture and good “craftmanship”. This is what IT-people are good at. However, it is important for the IT-people always to have in mind that the success of any system lies in the way it handles the user’s requirements in the daily work
- The introduction of a new IT-system in any organisation will have impact on the user’s way of working. It is seldom a good idea just to “digitise” an existing work flow. The opportunity to review and assess the work processes as part of the specification and design phases should be taken. The big advantages re. efficiency are experienced only when you also look at the way the work is done. However, there is always a risk of resistance from the users, since they have often grown acustomed to how to do the work. Changing this attitude can be a challenge. This is a management taks.

In the current project, one of the recent and very good examples stems from the work with noise data. Here, the Environmental Portal became a tool for data interpretation which did not exist in advance. So simply by trying to make a tool for presentation, this also added value to the daily work of the staff working with noise data.

For IT-people, it takes some time to get used to see problems not only as "bits and bytes". It is often difficult to "speak the same language" as the users. However, if the IT-solutions are to be sustainable, this dialogue must be strengthened. The many discussions between the users and the IT development teams during this project have been very important elements in this and have moved the IT staff in EEAA from being providers of IT-systems to being "IT and workflow architects" with major influence on the way work is to be done in the future.

The chosen way of conducting the project with relatively short inputs from the consultants and longer working periods for the teams has proven to be very sustainable. We are sure that this is the best way to secure an ongoing development – also after the end of the ESP.

The project has benefited from having very dedicated teams on board and a management level which has been very determined to assure a successful outcome by securing resources for the project.

APPENDICES

Debriefing note No. 1, April19-24, 2008
Debriefing note No. 2, May 31- June 5, 2008
Debriefing note No. 3, July 20 – July 24, 2008
Debriefing note No. 4, August 23-29, 2008

Work plan 2007-08, pending tasks (status as of 28/08/2008)
Work plan 2007-08, completed tasks (status as of 02/06/2008)

Memo on backup strategies