

EARTHWATCH

GLOBAL ENVIRONMENT MONITORING SYSTEM

**GEMS
REPORT SERIES
NO. 21**

**NAIROBI
AUGUST 1993**

**Report on the Second HEM Programme and
Technical Advisory Group (PTAG) Meeting**

Munich, Neuherberg, 16-17 March, 1993



United Nations Environment Programme

**REPORT OF THE SECOND/HEM PROGRAMME AND
TECHNICAL ADVISORY GROUP (PTAG) MEETING**

Munich/Neuherberg 16-17 March, 1993

Man
Mon/104
no.21

UNEP/GEMS (1993). Report on the Second HEM Programme and
Technical Advisory Group (PTAG) Meeting, Munich/Neuherberg,
16-17 March, 1993.
Nairobi: United Nations Environment Programme
Ref. GEMS REPORT SERIES No. 21

1. Introduction and participation

The second HEM PTAG meeting took place at the GSF Research Centre for Environment and Health in Munich, Neuherberg, on March 15 and 16, 1993. The Agenda is shown in Annex I.

It is the purpose of the PTAG to oversee, advise and evaluate HEM's programme (see Report of the First HEM-PTAG Meeting, GEMS Report Series No. 15, Nairobi, September 1992). The members of PTAG and the participants in the second meeting are listed in Annex II.

2. Opening of the Meeting

The meeting was opened by Dr. M. D. Gwynne (Assistant Executive Director for Earthwatch Coordination and Environmental Assessment, UNEP) who welcomed participants on behalf of the new Executive Director of UNEP, Ms. Elizabeth Dowdeswell. Dr. Gwynne commented on major events which had taken place in the last year and which had a bearing on the HEM project.

The big event of 1992 for all organizations concerned with the environment was the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in June. The documents which emerged from UNCED were approved by 150 Governments at the highest level of state. The most important of these were the Agenda 21, supported by the Framework Convention on Climate Change and the Biodiversity Convention. The outcome of this conference gives a mandate for the 21st century. Agenda 21 calls for the development of the capacity for early warnings and stresses the need for reliable, comparable and compatible data, whilst emphasizing the necessity of achieving sustainable development.

There had also been major changes within UNEP which were likely to lead to long-term reorientation of a number of projects and a possible change in emphasis of the UNEP approach. Ms. E. Dowdeswell replaced Dr. M. Tolba as Executive Director of UNEP at

the beginning of 1993. In addition six of the eight members of top management would be retiring by June 1993. Mr J. W. Huismans would be replacing Mr. Gwynne as AED Earthwatch and Director of GEMS in the near future. It was also possible that Governments might start to play a more active role in the determination of projects and allocation of resources. UNEP would continue to have an important role to play, as would HEM as an authority on environmental data and ways to make them dependable.

The HEM project had advanced considerably over the past year and was acquiring an international reputation, this had been reflected at a number of meetings in which Dr. Gwynne had participated recently. The future programme should build on this work, whilst considering how to fit into the new ethos of 'post Rio UNEP'. Dr. Gwynne reminded PTAG that it should not only consider the scientific programme of HEM, but also the financial and staffing implications of recommended activities. Funding of the project remained a problem, and the need to consider new sources of funding and cooperative ventures with other agencies remained paramount. Dr. Gwynne concluded by saying how much he looked forward to the valuable advice offered by the Group.

Professor. J. Klein, the Scientific Director of the GSF, welcomed the PTAG participants. He confirmed the importance of UNCED which had been felt at all levels. Agenda 21 had been a major influence in the rewriting of research priorities of the German Federal Government and this could well create opportunities for HEM. The need for good quality environmental monitoring data, and the important role of harmonization in ensuring this, was being increasingly recognized by the scientific community. This had been very apparent at the CHEMRAWN VII meeting in Baltimore in 1992.

Professor Klein noted and welcomed the substantial progress made by the HEM project. HEM was now in the final year of its first full phase (following the pilot phase), thus this meeting would be crucial for its future development. Professor Klein stressed the need for continuity and dependability of the programme. Harmonization is by definition a long-term process even if funding decisions are medium-term.

3. Election of Chairman and Rapporteur

Dr. I. M. Pacyna was elected Chairman and Professor C. Magadza was elected Rapporteur.

4. Presentation of HEM activities

The Director and staff of HEM gave an account of the general status of HEM and of the progress made in the four current activity areas in the period since the first PTAG meeting (11-12 May 1992).

Details of the four present focus areas in the HEM workplan, and activities associated with them, are given in Annex III. HEM had held 6 workshops, and participated with presentations and displays in a number of important meetings and exhibitions. Active cooperation had been established with more than thirty agencies and organizations. A major new publication on Reference Materials had been produced and a further survey on Environment Statistics (in cooperation with UNSTAT) was underway. The information contained in the existing publications had been updated and collated on a single diskette together with a user friendly retrieval interface software. Called 'HEMDISK', this diskette would be available for distribution in the near future. Environmental thesaurus development is a key element in the development of the HEM meta-database system HEMIS, and was being pursued in close cooperation with ESA/ESRIN and the EEA Task Force. The development of HEMIS would be closely coordinated with other meta-database projects in UNEP and the UN system. The four publications developed from the two workshops on 'Sampler Methodologies in Air Quality Monitoring' were being prepared for publication in the GEMS/AIR Methodology Review Handbook series. The HEM initiative on Vegetation Classification was discussed at a preliminary workshop held under the auspices of HEM, WCMC and GCTE (a core project of ICSU's IGBP programme). The need for an initiative of this sort had been established and it was hoped that funding could be found for a pilot project and a full-scale meeting to be held in 1994.

The meeting was also briefed on the update of office facilities, the reorganization of documentation in the library, the increase in requests for information, the demand for the HEM Newsletter Hemisphere, and the general increase in the routine workload of the office. The financial situation remained difficult. A letter requesting support had been sent by UNEP to Heads of Governments. The results to date indicated that Governments supported HEM activities but were not in a position to offer direct funding (in money or in kind) in addition to the funds allocated directly to UNEP.

Dr. Keune stressed that the most important task for this meeting was to concentrate on the future development of the programme and develop a common understanding of the overall framework to which HEM's future activities should be related.

The meeting noted that:

- HEM had had an active and productive year,
- that it had accomplished the tasks set out in the project document for this period,
- that it had developed a rapport with other agencies and organisations,
- that it had a small but highly motivated staff,
- that there had been an inevitable increase in routine office work (including the updating of databases) without a concomitant increase in support staff, which was likely to encroach on the more productive activities,
- that there was a need to fill key posts to implement planned projects,
- that closer integration of HEM meta-database development with other UNEP activities (as initiated) was important,
- that there was a need to satisfy the expectations of funding Governments,
- that there was a need to ensure the financial basis of the project.

5. Development of a conceptual framework

a. Background paper

Dr. Keune briefly presented the background paper 'Global Harmonization of Environmental Measurement: a new concept, an improved strategy for HEM' which had been distributed to participants (Annex IV).

As a result of the experience gained during the first phases of the project, it had become clear that for activities aimed at harmonization to be really effective it was necessary to have a much better understanding of the complex pattern represented by the term 'environmental information'. Environmental data is generally collected for sectorial or thematic purposes, and often within strict geographic boundaries. Such data is generally not comparable and compatible and cannot be used to develop a single comprehensive reliable picture of the environment. The problem is compounded if harmonization efforts are concentrated on sectorial, compartmental or thematic areas without reference to the wider context of potential data use.

A new approach is needed not only to environmental data collection but also to harmonization. It is necessary to develop a globally applicable conceptual framework

('model of the environment') showing the interrelationships between parameters which lead to integrated environmental information.

Such a framework would have two major functions related to harmonization. First, it would provide a basis for defining a core environmental data set with accepted definitions, data quality criteria, sampling definitions, reporting formats, codata requirements, completeness requirements etc. This in itself would be a major step towards harmonization as data collected according to this scheme would by definition be comparable and compatible. Second, it would provide the necessary information, and thus be the basis, for the development of future harmonization strategies. By relating activities to a conceptual framework (focus activities as 'pieces in a jigsaw puzzle') it would be possible to avoid the pitfall of improving harmonization in selected areas, only to discover that the 'harmonized' data is incompatible with related data collected for a different prime purpose.

b. Technical presentations

Three guest experts gave presentations highlighting the need for a conceptual framework for long-term integrated global environmental monitoring and research, and the need for harmonization at different levels and related to such a framework. Prof. W. Haber described the principles of general ecological environmental monitoring, its development over the years, and the application to global questions. Mr. W. Goerke drew on his experience in administration to give examples of the problems encountered when data is required for comprehensive environmental assessments, but measurement programmes have been designed for limited (geographic or sectoral) purposes. The administration is increasingly recognizing the need for integrated approaches. Harmonization is necessary to ensure that environmental data and information is comparable and compatible at all levels of data integration and aggregation. Mr. H. Kerner described the development and application of integrated methodological concepts in research projects concerned with landscape ecology. Such approaches could provide a good starting point for the development of a global conceptual framework.

c. Discussion

There was a protracted discussion of the future HEM programme based on the background paper and the three presentations. It was emphasized that HEM is not interested in developing environmental monitoring programmes as such. However, since HEM's purpose is to improve harmonization of environmental measurement, a conceptual framework for future harmonization activities would by definition be applicable to

integrated monitoring. Development of an integrated approach to monitoring was the most effective way of ensuring compatibility and comparability of data. The availability of a conceptual framework was likely to have a further benefit. If monitoring programmes could be related to a basic scheme this would help in the recognition of overlap and prevention of duplication, and facilitate the identification of existing relevant data sets for specific assessments. By relating programmes with a specific sectorial or thematic interest to a common framework, they could be designed from the start in such a way that the data gathered could be used subsequently for other purposes. Properly developed, the 'framework' would provide the means for developing a systematic approach to environmental data-gathering and assessment world-wide and systematic data collection protocols for specific topics of global concern (e.g. desertification).

6. Programme Outline for HEM Phase III

The General Programme Outline for HEM Phase III was discussed and revised taking into account the points noted during the course of the meeting. The revised outline is attached as Annex VI. The group also made some general recommendations which are summarized below in the Conclusions section. In particular the group recommended that HEM should prepare an information set on the project (overheads, slides etc.) suitable for general presentation and display. A first set of possible overheads was developed and is included as Annex V. PTAG suggested that the HEM mission statement be revised and made more precise for the next phase. Harmonization is concerned with enabling the use of data from a variety of disciplines in integrated systems approaches. This means providing the basis for ensuring that data sets can be integrated, i.e. are comparable and compatible in time and space, promoting improvements in data transparency (by developing protocols for documentation), and facilitating access to data (by identifying and disseminating information on who has relevant data, providing for linkage through information).

7. Recommendations

The HEM Programme and Technical Advisory Group:

- 7.1 Is pleased at the excellent progress made in the implementation of the approved work programme of HEM since the last PTAG meeting.

- 7.2 Further recognizes and endorses the essential nature of the work of HEM in the promotion of activities that result in increasing the comparability, compatibility, and reliability of environmental data.
- 7.3. Recommends that HEM should continue and extend its work in the current four focus areas, in line with the recommendations made by PTAG-1. PTAG-2 endorses, therefore, the general programme outline and list of activities for HEM Phase 3 as outlined in Annex VI.
- 7.4. Considers that as a basis for this work, HEM should explore approaches for developing an overall conceptual framework for the harmonization of environmental research and monitoring activities. This framework will provide the basis for fulfilling the recommendations for future work activities made by PTAG-1 (See report, §8.1).
- 7.5. Recognizes the high value of the data resources being built within the HEMIS information system. HEM must, therefore, consider a long-term strategy for ensuring the increased resources necessary to maintain HEMIS, including the possibility of cooperation with a host institute to manage the database.
- 7.6. Considers the future funding of HEM to be crucial. Thus PTAG-2 urges UNEP to secure adequate funding for the HEM programme. It calls upon UNEP to ensure that core funding is maintained at the present level, and preferably increased. PTAG-2 similarly urges the Government of Germany to continue financial support for this important project, and calls upon other governments to contribute additional resources.
- 7.7. In line with the above, PTAG-2 considers that UNEP should develop an overall funding strategy for the HEM programme, should identify additional contributors, and should seek supplementary resources, both financial and in kind, to augment the core funding. The funding strategy should be developed by the Director of HEM in association with the senior management of UNEP.

- 7.8. Considers that the present staff level of three professionals is the absolute minimum for ensuring the continuance of the core programme areas of information and meta-database, sectoral measurement, classification, and general programme development and management. At least one more professional position is required if HEM is going to move forward with its approved programme in a meaningful way.
- 7.9. Asks the Director of HEM to define, assess and further elaborate the overall objectives and goals of HEM, and to encapsulate these ideas into an information set and publications suitable for general information and for public awareness display. These products should be used in continuing efforts to promote the ideas and concepts of harmonization and to raise awareness of the work of UNEP-HEM.
- 7.10. Recommends that HEM continue to organize and participate in relevant workshops and expert meetings, as a primary means of fulfilling HEM objectives, and of promoting the HEM programme.
- 7.11. Requests HEM to continue to keep in touch with relevant developments in the UN system resulting from the UNCED process and ensure that ideas of harmonization are included in new activities from the start.

8. Next Meeting

The next meeting should be planned for a full two days to enable thorough discussion of the programme and finalization of the text of the recommendations.

The next meeting was tentatively scheduled for March 1994, date to be determined.

9. Summary

The PTAG reviewed the progress of HEM, addressed and endorsed the proposed programme for the next years (HEM Phase III), and advised on a funding strategy.

ANNEX I

AGENDA

Sunday 14th March 1993

19.00 Get together in Hotel Kurfurst

Monday 15th March 1993

08.30 Transfer to GSF, Meeting Room, MEDIS, 160B

09.00 Opening of the meeting by Dr. Michael D. Gwynne

09.15 Report by the Director of HEM

09.45 General discussion of the report

10.15 Coffee

10.30 Short presentation of the HEM activity areas II - V (each 15-20 mins)

12.00 Discussion of the presentations

13.00 Lunch

14.00 Presentation of the programme outline for HEM phase III

Introduction to the background paper: Global Harmonization of
Environmental Measurement - a new concept, an improved strategy for
HEM

Presentations on the issue by Prof. Haber, Mr. Goerke, Mr. Kerner

15.30 Coffee

16.00 Discussion of the programme for HEM phase III

18.00 End of session

19.00 Dinner

20.00 Discussions in smaller working groups

Tuesday 16th March 1993

08.30 Transfer to GSF

09.00 Continuation of the discussions of the programmes for HEM phase III

10.30 Coffee

11.00 Recommendations for HEM's programme in phase III

13.00 Close of the meeting

ANNEX II

LIST OF PARTICIPANTS

PTAG MEMBERS:

Prof. E. Goldberg
Division of Marine Resources
University of San Diego, La Jolla
California 920923-0220
U.S.A.
Tel: +1 619 534 2407
Fax: +1 619 534 0784

Dr. R. Leemans
RIVM, Global Change Department
P.O. Box 1
NL-3720 BA Bilthoven
The NETHERLANDS
Tel: +31 30 743377
Fax: +31 30 292897

Prof. C. Magadza
University of Zimbabwe
University Lake Kariba Research Station
P.O. Box MP 167
Mount Pleasant
Harare, ZIMBABWE
Tel: +263 4 22312
Fax: +263 4 732828
Fax: +263 61 2707

Dr. B. Mendonca
Climate Monitoring and Diagnostics Laborat
Observatory Operations Division
NOAA
R/E/CG1, 325 Broadway
Boulder, CO 80303
U.S.A.
Tel: +1 303 497 6812
Fax: +1 303 497 6290
e-mail: BMendonca@CMDL.ERL.GOV

Prof. J. Paasivirta
Department of Chemistry
University of Jyväskylä
P.O. Box 35
SF-40351
Jyväskylä
FINLAND
Tel: +358 41 602652
Fax: +358 41 602501
e-mail: IN%"PAASIVIRTA@JYLK.JYU.FI

Dr. J. M. Pacyna
The University of Michigan
School of Public Health
Dept. of Env'tl and Industrial Health
109 Observatory St.
Ann Arbor
Michigan 48109-2029
U.S.A.
Tel: +1 313 936 0706
Fax: +1 313 764 9424

Dr. B. Wyatt
Institute of Terrestrial Ecology
Monks Wood
Abbots Ripton, Huntingdon
Cambridgeshire, PE17 2LS
U.K.
Tel: +44 4873 381
Fax: +44 4873 467

Dr. B. Walker
CSIRO
Division of Wildlife and Ecology
P.O. Box 84
Lyneham, Canberra ACT2602
AUSTRALIA
Tel: +61 6 242 1742
Fax: +61 6 242 1742
(represented by Dr. R. Leemans)

EX OFFICIO MEMBERS:

Dr. M. D. Gwynne
Assistant Executive Director
Earthwatch Co-ordination
UNEP
P.O. Box 30552
Nairobi, KENYA
Tel: +254 2 520600
Fax: +254 2 226491

Prof. Dr. Klein
Wiss. Techn. Geschäftsführer
GSF
Ingolstädter Landstrasse 1
8042 Neuherberg
GERMANY
Tel: +49 89 3187 4410
Fax: +49 893187 3372

Dr. J. Müller
Umweltbundesamt
Pilotstation-Frankfurt
Frankfurterstrasse 135
6050 Offenbach
GERMANY
Tel: +49 69 22 80 2149
Fax: +49 69 800 3873

Dr. K. W. Schramm
Institut für ökologische Chemie
GSF
Ingolstädter Landstrasse 1
8042 Neuherberg
GERMANY
Tel: +49 89 3187 4103
Fax: +49 893187 3371

HEM STAFF:

Dr. H. Keune
Dr. A. B. Murray
Mr. A. Theisen
Ms. L. Tsai-Köster
Ms. M. White

GUESTS:

Mr. W. Goerke
Keltenweg 11
D-5484 Bad Breisig
GERMANY
Tel: +49 2633 9399
Fax:

Prof. W. Haber
Technische Universität München
D-8050 Freising
GERMANY
Tel: +49 8161 713495
Fax: +49 8161 714427

Mr. H. Kerner
Bahnhofstrasse 18
D-8050 Freising
GERMANY
Tel: +8161 530112
Fax: +8161 41384

Dr. R. Winkler
GSF - Projektträgerschaften
PT - Umwelt und Klimaforschung
Kühbachstrasse 11
8000 München 90
GERMANY
Tel: +49 89 65 108840
Fax: +49 89 65 108844

Dr. I. Crain
The Orbis INstitute
P.O. Box 4115, Stn. 'C'
Ottawa, K1Y 4P3
CANADA
Tel: +1 613 744 5653
Fax: +1 613 725 0643
e-mail: crain@Arc.ab.ca

ANNEX III

HEM ACTIVITIES, June 1992 - March 1993

Brief description of HEM activity areas as laid down in the HEM project document, and summary of meetings, publications etc. in the above time period. Copies of most of the publications were distributed as background information for the PTAG meeting.

I - Programme Development:

Draft Report on the Strategy for HEM Phase III (see Annex IV)

II - Sectoral Environmental Measurements:

Will focus on specific groups of variables in a particular sector - air quality is perhaps the most important environment sector needing attention at present - to reach agreement on measurement, analytical and data management procedures and their value to assessment processes.

Activities related to the improvement of sectoral environmental measurements:

- (a) Development of a background paper (concept) on the improvement of air quality measurements (e.g. acidic deposition forming substances, respirable suspended particulate matter, selected radiative trace gases) by external experts working in close co-operation with WMO, WHO, ECE, EEC, ISO and others as appropriate. This background paper will take into account the existing/ongoing activities concerning harmonization of air quality measurements.
- (b) Discussion of the background paper (concept) by experts to give advice and develop recommendations on the choice of sector and sector variables for improved harmonization studies through HEM.
- (c) Preparing and undertaking workshops to define the specific needs of harmonization and to develop guidelines/handbooks to aid in the improvement of measurements, and analytical, data management, and assessment procedures.

- (d) Annual check of achievements by the international Programme and Technical Advisory Group.

Activities 6/92 - 3/93

Meetings convened by HEM:

UNEP-HEM GEMS/AIR Workshop on Sampler Methodologies in Air Quality Monitoring: Availability, Applicability and QA/QC Implications.

I. Gaseous Species, Munich-Neuherberg, 7-11 September 1992

II. Suspended Particulate Matter, Munich-Neuherberg, 14-15 September 1992

Meetings attended:

GEMS/AIR Management Meeting, Munich, Germany, 6-7 September 1992

WMO/GAW Meeting of Experts on the Role of QA/Science Activity Centres
Garmisch-Partenkirchen, Germany, 7-11 December, 1992

Outputs:

- Quality Assurance in Air Quality Measurement (Revision of Draft)
- Active and Passive Sampling Methodologies for Measurement of Air Quality (Draft)
- Primary Standard Calibration Methods and Network Intercalibration for Air Quality Monitoring (Draft)
- Measurement of Suspended Particulates in Ambient Air (Draft)

The latter three are the first revised drafts of the papers (originally five) prepared for the UNEP-HEM Workshops held in September. The 'raw versions' distributed to PTAG members incorporated all the changes and additions suggested during the course of the workshops, but without introduction and conclusions sections, as circulated to chairmen and rapporteurs for comments.

III - Natural Resource Classifications:

To obtain international agreement on practical classification systems for natural resources and therewith to provide outputs of value to the work of technical and legal experts e.g. towards a convention or protocol on biological diversity.

Activities related to vegetation and other resource classifications to be carried out in close contact with the World Conservation Monitoring Centre (WCMC), the International Union for the Conservation of Nature and Natural Resources (IUCN) and other relevant organisations:

- (a) Collection of relevant background information (catalogue) on existing systems of vegetation classification.
- (b) Expert Group Meetings to discuss the catalogue and evaluate the various systems in use, based upon this review, suggest a general vegetation classification system that can be used universally from the ground to space imagery.
- (c) After discussion in the PTAG (see I above) and according to the recommendations of the experts, design a strategy for testing the recommended system and obtaining its general acceptance and international use.

Activities 6/92 - 3/93

Meetings convened by HEM:

UNEP-HEM/WCMC/GCTE Workshop "Towards an Improved Vegetation Classification Scheme for Global Mapping and Monitoring", Charlottesville, Virginia, USA, 24 - 26 January 1993.

Meetings attended:

OSS/IGBP/UNESCO Workshop "Monitoring long-term changes in terrestrial ecosystems", Ury, France, 27-31 July 1992.

Aretusa Workshop: Erdbeobachtung und Umweltstrategie: Technikbewertung am Beispiel der Umweltprobleme 'Artenschwund' und Bodenerosion, 25 November 1992, Köln-Porz.

GCTE Workshop on "Plant Functional Types", Charlottesville, Virginia, USA, 19-23 January 1993.

Outputs:

- 'Vegetation Classification - a review for harmonization of maps', background paper for the workshop
- Meeting report (in preparation)

IV - Reference Materials Database and Directory:

To ensure adequate and proper analytical quality control and quality assurance procedures related to environmental measurements thus leading to improved harmonization of environmental measurements.

Activities related to the establishment of a reference materials database and directory:

- (a) Collection of information of existing organisations/groups dealing with reference materials and their mode of operation; development of a proposal for the design of a database.
- (b) Collection of information on the actual reference materials held at each centre, the methods of preparation, limitations to use, distribution practices, and ordering procedures.
- (c) Presentation of the material at the first PTAG meeting to discuss structure and format of a database on standard reference materials.
- (d) Development and operation of the database, its continuous update, and production of outputs.

Activities 6/92 - 3/93

Meetings convened by HEM:

HEM workshop "Role of Reference Materials in Environmental Measurement", Aachen, Germany, 14th May 1992 (in conjunction with the BERM-5 Conference.

Meetings attended:

BERM-5 conference, Aachen 11th-14th May 1992.

ISO/REMCO meeting Geneva, 22nd-24th October 1992.

Meeting with IAEA, Vienna, Austria, 14th-15th January 1993 (agreement on a joint project for the development of a directory and database for reference materials).

Outputs:

- "Survey of Organizations and Laboratories Manufacturing, Supplying or Using Reference Materials for Environmental Measurement" (in press - available at meeting)
- Report of the HEM workshop "Role of Reference Materials in Environmental Measurement", Aachen
- Article "Reference materials: global harmonization and the assurance of data quality" H. Keune and M. Delve, Fresenius vol 1 pp129-141 1992
- Report on the REMCO meeting, Geneva, 19th-21st October 1992.

V - Meta-database:

To collect, compile, and disseminate information on existing activities carried out at global, regional and national levels in fields related to environmental monitoring and assessment including quality assurance.

Activities related to the development of the HEM meta-database:

- (a) Development of the requirements and the design for the HEM information system by external system database experts together with HEM staff (concept, hardware, software etc.).
- (b) Establishment of a pilot meta-database.
- (c) Systematic collection, analysis and dissemination of information (test phase).
- (d) Operation of the HEM information System (meta-database) and periodical production of updated information on existing activities in the field of environmental

monitoring and assessment at global, regional and national levels.

(e) Expert Group Meetings:

- to discuss, review and finally agree upon the concept and design for the HEM information system put forward by the external design group, October-November 1991 in Munich, and
- to discuss, review and finally agree upon the test phase of the meta-database.

Activities 6/92 - 3/93

Meetings convened by HEM:

HEMIS user requirement meeting, Munich, 2nd April 1992.

ESA/ESRIN - UNEP/HEM Working Group on Thesauri and Conceptual Modeling for Environmental Information Services. First Meeting, 29-31 July 1992, Frascati, Italy

Meetings attended:

Intersecretariat Working Group on Environmental Data, ECE Statistical Division, Geneva, 21 May 1992.

GEMS/Water RAISON training course, Koblenz, Germany, 24 - 27 November 1992.

Intergovernmental Working Group on the Advancement Of Environmental Statistics, Third Meeting, Wiesbaden, Germany, 14 - 18 December 1992.

Outputs:

- HEMDISK and HEMDISK brochure
- HEMIS design proposal
- Report of the ESA/ESRIN - UNEP/HEM Working Group on Thesauri and Conceptual Modelling for Environmental Information Services. First Meeting, 29-31 July 1992, Frascati, Italy (in preparation)

- Report of the evaluation of RAISON as a possible software for HEMIS
- Questionnaire on environmental statistics and data (additional to original HEM project document)

VI Development of Contacts/Public relations

HEM is to establish links with relevant international organisations and national institutes.

This is done largely within the specific working areas. In general this is also achieved by participation in international conferences, workshops and exhibitions.

In addition to the workshops that HEM convened or participated in in relation to the specific working areas, HEM also participated in a number of other meetings including:

- the UN/ISY conference "Satellite Remote Sensing for Resource Management, Environmental Assessment, and Global Change Studies: Needs and Applications of Developing Countries", Boulder, USA, August 1992
- the International ECOINFORMA conference, Bayreuth, 14th-15th September 1992
- the 13th International CODATA conference in Beijing
- the European conference on the "Use of Satellite Data for Environmental Purposes", 16th-17th November, Bonn

Another way to establish contacts is to provide information about HEM's activities, which is done by producing the HEM newsletter, "HEMiSphere". Issues No 4. and No. 5. were published in Winter 1992 and Spring 1993. The HEMiSphere mailing list contains approx. 400 addresses.

ANNEX IV

Background paper for programme development HEM Phase III.**Global Harmonization of Environmental Measurement**

A new concept, an improved strategy for HEM.

What is needed?

The discussions and recommendations of the United Nations Conference on Environment and Development (UNCED) held in June 1992 in Rio de Janeiro, have highlighted yet again the urgent need for a clear picture of the state of the environment at local, regional, and global scales. This information is needed for decision-making processes at all levels both to combat pressing environmental problems and to fulfil international conventions.

Obtaining a global view

Many hundreds of environmental monitoring and research programmes have already been established, and many will follow in the future, as part of the endeavour to develop a global view of the state of the environment. Some of these concentrate on a sectoral approach, some on more integrated monitoring methodologies; many are more nationally or regionally oriented, a few have an essentially global approach. In order to obtain a comprehensive and reliable global view of the state of the environment it will be necessary to bring together information from all these different programmes. There are two major obstacles, however. The first is the problem of data comparability and compatibility, including consistent approaches to data aggregation to ensure that data remains comparable at different levels. The second is that a comprehensive view of the environment requires an integrative modelling approach and a comprehensive set of measurements covering different media, different biomes, different ecosystems, different regions etc. - and at present there is no overall coordination between programmes to ensure that in total all different aspects are covered equally.

There is an increasing emphasis within programmes on harmonization to ensure that the data gathered at different collection sites and/or analysed in different laboratories is comparable. Similarly, efforts are being made within programmes to develop and apply compatible methods for data handling. A number of programmes have developed, or are in

the process of developing, comprehensive lists of variables to be measured, specifying such details as type of measurement, sampling frequency, averaging times, accuracy, site selection for sampling, quality objectives, quality control procedures, necessary codata, and data presentation. Many of these lists show a marked degree of overlap with respect to the type of variable - monitoring for terrestrial impacts will generally include variables related to atmospheric and water chemistry, for example. But there is little or no attempt to ensure comparability between programmes. Variables are selected and optimized in each programme according to specialized needs - sectoral, regional, routine, research - without regard to wider applications. As these programmes become more detailed and sophisticated it may in some cases get more difficult to ensure overall cross sectoral harmonization of the data.

There is thus an urgent need to develop a scientific and methodological conceptual framework for long-term integrated environmental monitoring and research which can be applied worldwide. Such a framework is needed both to ensure that ongoing programmes with different aims produce compatible data which can be used in global assessments, and to coordinate research and monitoring efforts, with the aim of ensuring that all necessary data is being collected. Ideally such a framework would provide a starting point and reference for any programme of environmental measurements and would contain clear guidelines on the approach to be followed in specific measurement situations.

In order to develop and implement a global environmental research and monitoring programme within an international framework, administration and the scientific community must work together closely. Long-term (routine and research) monitoring programmes cannot be maintained without an administrative and financial framework, which is normally implemented by law. Equally, scientific knowledge of the ecosystems to be monitored is still limited and substantive research will be needed over the next decades to understand their structure and function. Thus any monitoring and assessment programme must maintain a flexible approach which can react easily to new scientific issues, and scientific research should consider the needs of future monitoring and assessment programmes. Both scientists and the administration can expect major gains in the medium to long-term from the development and application of such a framework - scientists through the improved availability of compatible data for research purposes, administrators through the improved availability of reliable high quality data as a basis for decision-making.

HEM's concern

HEM has the task of developing approaches which will result in the improvement of global harmonization of environmental measurement. Although efforts aimed at improving harmonization within single programmes are clearly very useful for determining the extent of the problem and developing approaches, additional measures must be taken to achieve harmonization at the global level. As far as global assessments are concerned, harmonization within a programme is only meaningful within a well-defined global framework for environmental measurement, interpretation, and evaluation.

UNEP has the mandate both to co-ordinate environmental matters within the UN-system, and to develop a global assessment of the state of the environment. Development of a global framework for environmental monitoring and assessment is a prerequisite for any genuinely integrated system of global environmental assessment, and is thus directly related to UNEP's mandate. Within UNEP, HEM has the task of improving harmonization of environmental monitoring and measurement both within and between programmes. Thus HEM, as a part of the Global Environmental Monitoring System (GEMS), which itself can be seen as the heart of the UN system-wide EARTHWATCH process, is not only in an ideal position to develop and implement a global framework for environmental research and monitoring, it also requires such a framework as a basis for effective coordination of its own tasks.

Aspects of Harmonization; Harmonization at different levels

There is no precise definition of harmonization and what harmonization of environmental measurement is aiming at. But a clear indication is given by the HEM mission which is:

"To enhance the compatibility and quality of information on the state of the environment world-wide in order to improve the provision to policy making bodies, international programmes and the scientific community of harmonized information required for the sound management of environmental resources."

At least three different aspects or levels of harmonization can be recognized within this mission statement. The actual process of harmonization will be rather different depending on which level of data collection, handling, and management is concerned.

The first and most general level is that of information on who is doing what, where, how

and why. This kind of 'meta-data' is very important for identifying the single pieces of the puzzle which will together generate a global picture of the state of the environment. This information is needed for all coordination activities, and as a basis for decisions on where to employ financial resources most effectively. Collection and distribution of this kind of information is a harmonization task in itself.

To provide decision-making bodies with "harmonized" information, the data collected in different environmental research and monitoring programmes and at different sites, have first to be integrated. This could be described as "horizontal" harmonization. The data must be further aggregated for local, national, regional and global assessment and for use at different levels of decision-making. This process can be seen as "vertical" harmonization. Both data integration and data aggregation are fundamental harmonization tasks. Integration and aggregation must be performed similarly both within and between different programmes. This implies reaching agreement on definitions of objects, the classification systems used, and the formats for data handling and exchange. Similarly the models applied should be comparable and compatible in supporting the integration and aggregation of data.

The most fundamental level of harmonization is that which takes place at the level of data collection and generation. Ensuring the comparability and compatibility of data at this level is a prerequisite for meaningful data integration and aggregation. Ensuring compatibility requires that the same value be recorded in the same way (e.g. units, averaging time, sampling frequency/time, codata where appropriate etc.). Ensuring comparability requires that data has a properly documented and defined level of quality. Since it is not possible to apply standardized measurement techniques globally, quality assurance and quality control (QA/QC) is the major task for achieving harmonization at this level. Thus it is necessary both to obtain agreement on ways of recording specific variables, and to develop and implement appropriate QA/QC methodologies and procedures.

A further important task which would help maximize the use of data generated in different measurement and monitoring programmes would be to obtain agreement on the core variables to be measured in specific situations and/or for specific tasks.

In order to be effective, activities which have the final goal of improving harmonization on a global scale must be properly coordinated, and developed with a view to their impact at different levels and scales of environmental evaluation. Thus it is imperative to have a conceptual framework for environmental measurement at the global scale which will allow single activities, large and small, to be focussed and structured in relation to the whole.

Such a framework would enable harmonization activities in different areas to be properly related to each other, would highlight those areas in need of attention, and would provide the basis for integration and aggregation of data obtained locally or within different programmes, at the global scale. In other words this framework would provide the sound scientific basis needed for a coordinated approach to environmental monitoring and measurement.

A framework for HEM's future activities

As stated above, HEM sees the development of a global framework for integrated environmental research and monitoring as the basis for any harmonization and thus as a priority task for the next phase. This activity would build on the experience gained in the first and second phase of the HEM programme and would proceed in parallel with the activities in specific areas of harmonization which have already been initiated. Such activities are an integral part of the concept. They provide the practical basis for identifying problems which need to be resolved, can be used to test the framework concept and can themselves be related to the global concept within this framework.

A pilot study is already underway to consider the best approaches to developing a framework concept for integrated environmental research and monitoring of the type outlined above. Integrated approaches to environmental assessment have been developed in a number of programmes at a local scale in the fields of ecosystem research and monitoring. Logically, these would provide the best starting point for development of an integrated global framework for environmental research and monitoring. The conceptual approach will be defined, together with the practical steps which would need to be undertaken in order to develop such a framework. An initial attempt will be made to identify those groups who need to be involved in the development of the concept at different stages, and to whom specific tasks can be allocated. The scientific community will play a major role in the development of the framework, ensuring that the basis is scientifically sound and identifying existing approaches of relevance.

There are a number of activities which are closely related to the development of a global framework for integrated environmental research and monitoring, and which in the long-term may determine the extent of its success. These are not directly within HEM's mandate, and are not tasks which HEM should perform. But HEM should consider approaches to stimulating the development of such activities related to the global framework, through cooperation with the responsible organizations and by involving these

organizations at an early stage in the development of the framework itself. These tasks include obtaining agreement on globally accepted terminology for data exchange, agreement on working levels, scales, and catalogues of variables, selection of representative monitoring sites, the development and establishment of a global network of information systems dealing with integrated environmental monitoring, and the development of and agreement on a global concept for research and development programmes.

A proposal for possible specific tasks for the HEM programme in its next phase is given in Annex VI.

Building on existing activities

There are many activities planned or in progress which are directly connected to the aims of a global framework for integrated environmental research and monitoring. These activities should be considered during the development of the concept, and will also provide a basis for cooperation, and for testing and implementation of the framework. Some relevant activities are summarized briefly in the following.

Recently, several activities have been started to observe global environmental phenomena, some of them in direct response to the UNCED process. These include the:

- Global Climate Observing System (GCOS), a cooperative effort by WMO, UNEP, UNESCO/IOC, and ICSU, using the operational network of World Weather Watch (WWW) and the newly established, more scientifically oriented, Global Atmospheric Watch (GAW);
- Global Ocean Observing System (GOOS) a cooperative effort by UNESCO/IOC, WMO and UNEP based on UNESCO/IOC's Global Sea Level Observing System (GLOSS) and Integrated Global Ocean Services System (IGOSS); and
- Global Terrestrial Observing System (GTOS) which is still under discussion between UNEP, UNESCO, WMO, FAO, and ICSU.

These global monitoring and observation activities are mostly performed in close association with, and are underpinned by, international scientific programmes coordinated by the International Council of Scientific Unions (ICSU). The most important of these for environmental assessment purposes are grouped under various core projects of the International Geosphere Biosphere Programme (IGBP), and SCOPE .

GEMS itself coordinates a number of global networks, many with more emphasis on the human environment, which are potential contributors to the global assessment process.

There are many more environmental monitoring and assessment programmes established at a regional scale (e.g. AMAP, CORINE, EMAP (US-EPA), etc.) which could potentially contribute to the global programmes in a coordinated and harmonized manner.

Remote sensing techniques and satellite observations may often offer the only means of obtaining a rapid and comprehensive global picture in a changing situation. Interpretation of images, however, must be based on properly validated ground truth observation and requires an understanding of the structure and function of representative ecosystems. The Committee on Earth Observations Satellites (CEOS) has undertaken the task of coordinating all satellite missions and respective sensors for earth observations. Effective coordination of these missions with ongoing observation programmes has not yet been fully achieved.

A clear framework for global environmental monitoring and assessment would provide a powerful instrument for ensuring that all these different but important environmental research and monitoring programmes can contribute effectively to the development of a global view of the state of the environment.

The UN has already established Earthwatch as a coordinating instrument for all environmental monitoring and observation activities within the system. A global framework for environmental monitoring and research would provide the scientific and administrative foundation for these activities.

The International Co-ordinating Council (ICC) of the UNESCO Programme Man and the Biosphere (MAB) suggested at its 12th session, 25 - 29 January 1993 in Paris that

"HEM could be an authorized body to harmonize the different approaches and methodologies of monitoring. Within the process for implementing Agenda 21 and the conventions signed on the occasion of UNCED, the Director-General of UNESCO might encourage contracting parties to request UNEP to assign adequate resources to HEM."

The Council of Environmental Advisors (SRU) to the Federal Government has stated in its report on "General Ecological Environmental Monitoring":

"In order to secure the required harmonization, the use of geographical information systems and of a compulsory data catalogue, in which all project data are referred to ecosystem types, is necessary for all areas of environmental monitoring."

ANNEX V

HEM Information Set: first draft text of possible overheads
To be simplified, reorganized etc.

HEM IS NOT

- Doing environmental monitoring
- In charge of or creating environmental measurement standards
- Involved in collecting, managing or archiving primary data
- Making national or regional environmental measurement policy
- Responsible for defining or creating scientific justifications for environmental measurements

In most cases HEM does not do what you are doing, but promotes your programme on a global scale

HEM DOES (or plans to).

Identifies, catalogues, describes, by employing a higher level meta-data base system:

- Environmental monitoring activities on a global scale
- Measurement standards in use
- Environmental data centres on a world wide basis
- Critical gaps in global data sets
- Multinational or regional environmental measurement policies to promote intercomparability and matching data sets
- Scientific measurement programmes, especially in different scientific disciplines and for different purposes, promoting the use of data across the disciplines

Stimulates, promotes and coordinates:

- Data comparability and compatibility
- Comparability of measurement standards
- Discussions about the comparability of environmental measurement instrumentation
- Harmonization of measurement strategies, regionally and globally
- Harmonization of data management and unification of data management systems on a global basis

Works to:

- Identify and coordinate available, individual, and limited measurement systems to help evaluate ecosystems that nurture the key processes that are determining global change
- Unify and make compatible different cross-discipline data to assess and resolve environmental studies

HEM identifies, stimulates, promotes and coordinates

Possible other vu-graphs**a) What is HEM?****b) Why should you support HEM?**

or What HEM can provide your research or monitoring programme.

(In this vu-graph - State the need and the HEM product that fulfilled the need)

c) Recent HEM products, copies of covers**d) Origins of HEM**

Information to be taken from the following:

- Because of the growing awareness of a changing global environment, there has been an explosion, and often chaotic creation, of data and information about the environment.
- These data sets often result from efforts measuring the same parameters or processes.
- The data are often incompatible as they are classified differently in time and space, or not comparable as they are gathered according to different protocols . Thus they cannot be aggregated or compared to give a broader view, or for cross-discipline analysis.
- The United Nations Environment Programme established the Harmonization of Environmental Measurement project to address and improve on:
 - environmental measurement and data comparability and compatibility
 - to further and promote connectivity of data gathered from different media, biomes, ecosystems, geographic regions etc., in order to develop a reliable picture of the state of the environment world-wide

ANNEX VI

General Programme Outline for HEM Phase III**1. Development and implementation of a conceptual framework for harmonization of environmental research and monitoring programmes.**

To co-ordinate a pilot programme for integrated ecological monitoring using biosphere reserves and other appropriate and representative monitoring sites. This could be a part of BRIM and GTOS (see recommendation of the ICC of UNESCO's MAB programme and of the SRU in ANNEX IV).

2. Harmonization at different levels:**A. Harmonization by providing information**

Improved information on who is doing what, where, how, and why will itself contribute to harmonization. Such information must be collected, ordered, and provided and distributed in standard formats. This information is also needed by HEM to identify areas where there is a need for improved harmonization and coordination.

Tasks:

- further development and implementation of HEM's meta-database (HEMIS)
- inclusion of HEMIS into a GEMS wide network of meta-databases
- cooperation with INFOTERRA; ESA, EEA and others in the development of an environmental thesaurus.
- continuation of the collection and updating of meta-data on environmental research and monitoring programmes, and on databases
- preparation of regional surveys for the region of the former USSR, South America, Africa, and others as appropriate, using the format of the HEM survey
- identifying and disseminating information on successful harmonization activities

B. Harmonization of methods for data integration and aggregation

If data integration and aggregation is not performed in a harmonized manner the comparability of the data will be lost at higher levels even though the data are comparable at the level of data collection.

Tasks:

- continuation of harmonization of vegetation classification and ensuring coordination with developments in the fields of ecosystem and landuse classifications
- collation and dissemination of information on integrative environmental models (co-operative effort with ICEM the International Centre of Ecological Modelling for Developing Countries).

C. Quality assurance as a tool for harmonization

Standardization of methodologies is not possible at the global scale. This development and application of agreed methods for QA/QC is the most important task for ensuring that data from different sources is genuinely comparable

Tasks:

- Continuation of HEM's participation in the GEMS/Air programme
- Co-operation with the GAW QA Science Activity Centre(s)
- Strategy for an improved usage of reference materials based on user requirements (cooperation with ISO, IAEA)
- Identification of the major common elements of a quality assurance system for environmental measurement (cf ISO 9000)
- Consider the feasibility of collecting and providing access to SOP's for methods of widespread interest
- Consider preparing publications on recommended methodologies for specific measurement tasks

3. Possible additional activities

The report of the first PTAG meeting contains suggestions and recommendations for a number of additional activities which HEM should consider as resources and staff become available (Report §7 and 8).