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**JOINT WHO/FAO/UNEP PANEL OF EXPERTS  
ON ENVIRONMENTAL MANAGEMENT FOR VECTOR CONTROL**

**ANNUAL REPORT**

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WHO/FAO/UNEP PANEL OF EXPERTS ON  
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## 1. INTRODUCTION

In 1987, the World Commission on Environment and Development, established by the U.N. General Assembly in 1983, published its report "Our Common Future". This event marked the beginning of a broad international discussion on sustainable development. Within the U.N. system, all specialized agencies have been asked to review their policies and programmes in the light of the Commission's recommendations.

The mandate of the Panel focuses on a well-defined area within the overall framework of environment and development. The relevance of the Brundtland report, as the publication is also known, for the work of the Panel will be spelled out in a special document prepared for the eighth PEEM meeting (PEEM/8/88.05). It seems timely to jump on this bandwagon, and, moreover, the Panel does not jump on empty-handed: it brings its experience in a variety of aspects, such as forecasting, institutional arrangements and cost-effectiveness analysis, in relation to resource development associated vector-borne disease problems.

In the period under review, elections for the post of Director-General took place in both FAO and WHO. In November 1987, the FAO Conference re-elected Mr E. Saouma for a third term in office, and in May 1988 the World Health Assembly elected Dr Hiroshi Nakajima as WHO's new Director-General, succeeding Dr H. Mahler. The Division of Vector Biology and Control in WHO was reorganized with effect on 1 January 1988, and this means that the PEEM Secretariat, from that date, is attached to the Director's Office. This change follows directly from the recommendations made by the external evaluators, and will facilitate the liaison of PEEM with other relevant Divisions in the World Health Organization.

The last phase of the external evaluation exercise was completed with the receipt of the responses from the executive heads of the three organizations. The responses were discussed by the Steering Committee at its 10th meeting. The concepts thus developed open the way for a balanced approach of policy making and field orientation in the Panel's programme of work for the coming years. The choice of policy reviews as the subject of the ninth PEEM technical discussion, and preliminary discussions on using the 10th meeting as an occasion to present proposals for field-oriented activities to the donor-community, fit in with these concepts.

## 2. MEMBERSHIP STATUS

The term of membership of the following members expired during the 1987/88 period, and was not renewed:

Dr M. Falkenmark (Sweden)  
Dr L. Herath (Sri Lanka)  
Prof. M. Holy (Czechoslovakia)  
Mr C.L. Tech (Philippines)

Membership of the following members was renewed:

Dr M. Abu-Zied (Egypt)  
Prof. A.A. Alekseev (USSR)  
Prof. E. Laing (Ghana)  
Prof. M. Sasa (Japan)  
Prof. W.A. Schmid (Switzerland)

Eight new Panel members were designated:

Dr F.P. Amerasinghe, Entomologist, Department of Zoology, University of Peradeniya, Peradeniya, Sri Lanka (by WHO)

Dr S. Ault, Public Health Biologist, Grass Valley, California, USA (by UNEP)

Dr A.A.M. Chaudhary, Senior Scientific Officer (Entomology), Directorate of Malaria Control, Ministry of Health, Islamabad, Pakistan (by WHO)

Dr M. Coosemans, Université Catholique de Louvain, Unité d'Ecologie et de Biogéographie, Louvain-La-Neuve, Belgium (by WHO)

Professor Z. Kaczmarek, Scientific Secretary, Polish Academy of Sciences, Warsaw, Poland (by FAO)

Dr M. Mogi, Chief, Division of Parasitology, Department of Microbiology, Saga Medical School, Saga, Japan (by WHO)

Professor J.K. Olson, Entomologist, Department of Entomology, Texas A & M University, College Station, Texas, USA (by WHO)

Dr V.P. Sharma, Director, Malaria Research Centre, Delhi, India (by WHO)

As a result of these mutations, the Panel has at this moment 39 members. Of these, 20 have been designated by WHO, 9 by FAO and 10 by UNEP.

The secretariat has reformulated the criteria for the selection of new Panel members. In addition to geographical and agency distribution, the need for representation of certain disciplines, and an improved balance between policy makers and research workers will receive increased attention in the selection process.

### 3. MEETINGS

#### 3.1. The seventh PEEM meeting

The seventh meeting of the Panel was held from 7 to 11 September 1987 at the headquarters of the Food and Agriculture Organization of the United Nations in Rome. The meeting was attended by eleven Panel members, six temporary advisers, six observers and ten secretariat members.

Progress made in the programme of work for the period 1986/1987 was reviewed, and the proposed programme of work for 1987/1988 was approved. A special ad-hoc group drew up terms of reference for the field evaluation of the proposed curriculum and syllabus on health aspects of water resource development for inclusion in engineering courses. Considerable progress had been made in the Panel's publication programme. A visit to the FAO Remote Sensing Centre was included in the meeting's programme with introductory presentations as well as a review of the potential use of remote sensing techniques in vector-borne disease monitoring.

Two entire days were dedicated to the technical discussion, which gave a broad coverage of the subject "Effects of agricultural development and changes in agricultural practices on the transmission of vector-borne diseases".

#### 3.2. Secretariat meetings

Two secretariat meetings were held during the period under review: the 18th meeting took place on 11 September 1987 in Rome and the 19th meeting on 15 April 1988 in Geneva. Discussions on administrative matters related to programme implementation, selection of Panel members and financial aspects were complemented by talks on fundamental and conceptual policy issues in connection with the Panel's future strategy.

### 3.3. Steering Committee meetings

In a brief meeting on the eve of the seventh Panel meeting the Steering Committee dealt with some topics needing immediate attention and agreed on the agenda for the 10th Steering Committee meeting. Discussions at the 10th meeting (Geneva, 14-15 April 1987) mainly concerned the responses of the three executive heads and the options for the Panel's future strategy. Also discussed were the results of a survey about the draft forecasting guidelines and a detailed proposal for a workshop on forecasting and monitoring methods in 1989.

An outline for the next phase of interagency collaboration prepared on the basis of the Committee's discussions is presented in document PEEM/8/88.08, and the report of the Steering Committee in document PEEM/8/88.06.

### 3.4. Travelling Seminar USSR/India

Under joint sponsorship of UNEP and WHO, and hosted by the Governments of the USSR and India, an Interregional Travelling Seminar on Environmental Management Measures for Vector Control in Water Resources Development Projects took place from 16 November to 6 December 1987. Fifteen participants from 13 countries in five of the six WHO regions participated in a programme of presentations and field visits, with major hubs being the Martsinovsky Institute in Moscow, the Virsaladze Institute in Tbilisi and the Malaria Research Centre in Delhi.

Three distinct components of the seminar's programme were: (1) presentation of introductory and technical papers, and discussions; (2) field visits to projects in both countries; (3) presentation and discussion of case studies. The report of this travelling seminar is expected to be available in August 1988 and will be distributed to all Panel members and Collaborating Centres.

## 4. PUBLICATIONS

### 4.1. Publications during the period under review

\*Publication and distribution of the report of the seventh meeting.

The report of the seventh PEEM meeting was published in January 1988. Its distribution, according to a special, updated mailing list, was carried out as follows:

6 copies to each of the 39 Panel members.

835 copies for circulation in WHO headquarters and the Regional Offices, and through these to WHO Country Representatives, ministries of health and UNDP ResReps.

800 copies for circulation in FAO headquarters, and to FAO Regional Offices, Country Representatives, and through these to ministries of agriculture, ministries of water resource development and national irrigation boards.

415 copies for circulation in UNEP headquarters and the UNEP Regional Offices, and through these to ministries of the environment.

120 copies distributed by kind courtesy of the International Commission for Irrigation and Drainage (ICID) to their national committees.

100 copies distributed by kind courtesy of the International Commission on Large Dams (ICOLD) to their national committees.

21 copies to other UN Organizations

32 copies to development banks and bilateral donor agencies.

183 copies to interested individuals and institutions, including the collaborating centres

\* Effects of Agricultural Development on Vector-borne Diseases: edited versions of the working papers presented at the 7th PEEM meeting.

In February 1988, FAO published the edited versions of all 20 working papers prepared for the seventh PEEM meeting as document AGL/MISC/12/87, under the title: "Effects of agricultural development on vector-borne diseases". Five hundred copies of this document were produced, of which 200 copies were forwarded to the secretariat in WHO (in-house circulation; Panel members, collaborating centres and meeting participants; interested individuals and institutions), 50 copies to UNEP, 150 copies to FAO Representatives in the Member States, 50 for in-house circulation in FAO, with the remaining balance of 50 still available in FAO.

\* The PEEM Newsletter

In December 1987, a double issue of the Newsletter was published, which was almost entirely dedicated to the IRRI/PEEM/USDA Riceland Mosquito Workshop held in Los Banos in March 1987. So far in 1988, one regular issue has been published, and another is scheduled to be ready for distribution before the 8th PEEM meeting.

As the introduction of desktop publishing in the Division of Vector Biology and Control has been delayed, quotations from several publishing companies have been asked for the continued production of the newsletter outside of WHO.

The latest status report of the Newsletter's mailing list dates from May 1988, and shows a global distribution of 2 331 copies of the English version, 722 copies of the French version and 730 copies of the Spanish version (as against 2 105, 716 and 542 reported in June 1987, respectively).

\* Assignment report Dr M.H. Birley "Field evaluation of the guidelines for forecasting the vector-borne diseases implications of irrigation projects in Zambia".

This assignment report was published by WHO/VBC as document VBC/88.1, for restricted distribution. Copies have been forwarded to Panel members, collaborating centres, the other two participating Organizations, the WHO Regional Office for Africa and the Zambian authorities.

\*Distribution of Conclusions and Recommendations of the Workshop on Research and Training Needs in the field of Integrated Vector-borne Disease Control in Riceland Agro-ecosystems of Developing Countries

In March 1988, 263 copies of this booklet were distributed by WHO to medical research institutes in 26 rice producing countries (9 in Asia, 14 in Africa and 3 in Latin America), using a mailing list of selected addresses provided by TDR.

An accompanying letter announced the publication of the full proceedings of this workshop, and the researchers were asked to inform the secretariat of any work they were planning to undertake or already undertaking in this field.

\* A selection of working papers prepared for the 3rd, 4th, 5th and 6th Panel meeting.

This document, VBC/87.3, is in print and scheduled to be available at the time of the 8th PEEM meeting.

#### 4.2. Articles

Two articles on topics relevant to environmental management for vector control were produced by members of the secretariat for publication in the period under review. The secretary prepared a contribution for a TDR sponsored meeting on research needs in the field of Chagas' disease vector control (Panama City, 28 September - 20 October 1987), entitled "The importance of peri-domestic environmental management for the control of Chagas' disease vectors". This was published, together with all other papers prepared for the meeting, in a supplement of the Revista Argentina de Microbiologia 20 (Supl.): 1-3. On the request of the editor of Parasitology Today an article was prepared on the results of the first phase of the community based environmental management demonstration project for vector and rodent control in Saint Lucia. The article, co-authored by the secretary, the principal investigator and the PAHO entomologist for the Caribbean, will appear in the October issue of Parasitology Today. Through the contacts of the FAO secretariat member, the editor-in-chief of the Water Quality Bulletin has offered to dedicate a special issue of this journal to water resource development and its impact on vector-borne disease transmission.

The Collaborating Centre in the Netherlands, ILRI, reports the publication of an article by its FEEM focal point, Mr W.B. Snellen, entitled "Malaria control by engineering measures: pre-World War II examples from Indonesia".

#### 4.3. Guidelines

The response to a survey for the evaluation of the preliminary draft version of the guidelines for forecasting the vector-borne disease implications in the development of a water resource project was submitted to the Steering Committee at its 10th meeting. The analysis of the results is attached as an annex to the Report of the Steering Committee (PEEM/8/88.06). In conclusion to the review of this analysis, the Steering Committee recommended that a further revision of the document, based on the comments received, was necessary before its final publication. This recommendation was conveyed to WHO's Publications Office. Dr M.H. Birley also received the analysis of the survey and the comments. With support from WHO, he carried out a feasibility study of the guidelines in Thailand and Malaysia during the months of June and July. In the coming months, the secretariat will follow up the revision of the guidelines with the author.

After exploratory visits by the secretary to a number of institutes in the U.K. and Netherlands, the Overseas Development Institute in London was selected to carry out the finalization of the "institutional arrangements" guidelines, previously commissioned to ILRI in the Netherlands. The revised title of these guidelines now reads "Guidelines for the incorporation of safeguards against vector-borne diseases into irrigation projects through intersectoral collaboration." In consultation with the ODI staff member who will author the guidelines, Dr Mary Tiffen, a strict timetable for their preparation was designed, which entails the submission of a first draft in August, and of a final draft in December.

In December 1987, the preparation of the guidelines for carrying out cost-effectiveness studies of vector control programmes was commissioned to Ms. Anne Mills and Ms. Margaret Philipps of the Evaluation and Planning Centre of the London School of Hygiene and Tropical Medicine. A first outline has been received, and the first draft of the guidelines is expected to be ready in October 1988. Three countries have been selected for brief feasibility studies of the concepts developed for these guidelines: India, Ethiopia and (tentatively) El Salvador. Visits to these countries will take place between October 1988 and April 1989. The final draft is expected to be ready by the autumn of 1989.

#### 4.4. Progress in the publication programme

Of the remaining items of the PEEM publication programme the Proceedings of the IRRI/PEEM/USDA Workshop have been subject to a delay. The Communications and Publications Department of IRRI informed the secretariat that publication is now scheduled for the end of September 1988. As recommended, the Evaluation Report of the Incorporation of a Health component in Engineering Courses (Anna University, Madras, India) was deleted from the publications programme and the principal investigator was asked to submit the report as a working paper for the technical discussion of the 8th PEEM meeting. A French version was published of the preliminary Proposed Curriculum and Syllabus on Environmental Management for Vector Control in Water Resource Development Projects for Inclusion into Engineering Courses. Progress in the field testing of the proposed curriculum and syllabus will be presented below, in section 7, Training Activities. Still no final report has been received from Sri Lanka, on the results of the nature and magnitude of irrigation development associated vector-borne disease problems. For the PEEM Introductory Brochure possibilities are being explored to insert the material produced in a one of series of WHO/VBC information brochures under preparation. Preparation of the document "Case studies on Environmental Management for Vector Control" has not made any progress, because the necessary review and input of additional materials by the secretariat could not be carried out due to time constraints.

### 5. ESTABLISHMENT OF AN INTERNATIONAL INFORMATION SYSTEM

#### 5.1. Collaborating Centres

The terms of reference of the collaborating centres whose redesignation was agreed on by the Steering Committee and the Panel were reformulated by the secretariat. Following the same outline, terms of reference were drafted for the collaborating centres to be designated for the first time. All terms of reference were reviewed by the Steering Committee and approved with minor modifications. The current status is as follows:

- (1) Institute for Land Improvement and Water Management, ETH, Zürich, Switzerland and the London School of Hygiene and Tropical Medicine, U.K. have been redesignated in June 1988.
- (2) Redesignation procedures are underway for the Tennessee Valley Authority, Knoxville, Tennessee, and the International Institute for Land Reclamation and Improvement, Wageningen, Netherlands.
- (3) For the following institutions, designation procedures are being carried out through the WHO Regional Offices:
  - Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand;
  - International Irrigation Management Institute, Kandy, Sri Lanka;
  - Liverpool School of Tropical Medicine, Liverpool, U.K.
  - Oswaldo Cruz Institute, Rio de Janeiro, Brazil;
  - Queensland Institute of Medical Research, Brisbane, Australia.

Upon finishing the designation procedures, the secretariat will propose a system of regular planning, coordination and reporting by the collaborating centres.

Of the existing collaborating centres, the following activities can be reported. At the International Rice Research Institute in Los Banos progress

was made in the preparation of the proceedings of the IRRI/USDA/PEEM Workshop of March 1987, and the target publication date is now end of September 1988. Intense negotiations between IRRI and the PEEM secretariat concerning the secondment of a Dutch Associate Professional Officer were successfully concluded in July 1988, and the incumbent is scheduled to take up this post by the middle of September. The 1987 IRRI Irrigation Water Management training course (29 participants, 9 countries) included a one-hour presentation on vector-borne disease aspects of irrigated rice production. The Panel member at IRRI initiated a survey among deans of engineering schools with regards to feasible approaches of including a health component into regular engineering courses. (see below). At the International Institute for Land Reclamation and Improvement, Wageningen, the Netherlands the publication "Irrigation and Health" has reached the stage of final editing, and will appear in two volumes, the second volume containing a number of case studies. Several activities in the area of training were undertaken. The review of engineering measures for malaria vector control in the Dutch East Indies before 1940 was continued and a progress report on its findings is included as an annex to this report. The Institute for Land Improvement and Water Management, ETH, Zurich organized a second Seminar on Environmental Management for Vector Control in February 1988. The work of Mr M. Fritsch at the field station of the Swiss Tropical Institute at Ifakara, Tanzania, on engineering methods for schistosomiasis snail intermediate host control continued. Directly PEEM-related activities at the London School of Hygiene and Tropical Medicine include the preparation of the cost-effectiveness guidelines by staff of the School's Evaluation and Planning Centre, and collaboration with ODI in the preparation of the institutional arrangements guidelines, by providing input on epidemiology. Other regular programme activities of the School relevant to the Panel's objectives are (1) evaluation of various types of impregnated bednets in Tanzania; (2) testing of the application of polystyrene spheres in latrines in Zanzibar for Culex quinquefasciatus control; (3) involvement in malaria control programmes in Vietnam and Kampuchea; (4) schistosomiasis control studies in Gambia, with an environmental management component in flooded rice production areas. No report was received from the Tennessee Valley Authority, Knoxville, where recent internal changes have led to a review of its programmes. A new chairman of TVA was appointed in January 1988, and the Panel member in TVA, Dr R.H. Brooks, was promoted to the post of Director, Environmental Quality Staff during the period under review. TVA was featured in an article contributed by its staff in the PEEM Newsletter No. 20, in the series collaborating centre profiles.

All collaborating centres contributed in one or more ways to routine activities such as the writing of working papers, review of proposals and commenting on draft documents.

### 5.2. National Water Resource Development and Coordination Boards

In October 1987, the Chairman of the Panel, Dr R. Zeledon, used the occasion of a visit by the PEEM secretary to Costa Rica to organize a meeting aimed at increasing the awareness of the possible health implications of irrigation development. The meeting was attended by the vice-Ministers of Health and of Agriculture, and by the Director of the Irrigation Development Authority (SENARA), together with representatives of other ministries and institutions. As a direct result, the vice-Minister of Health established a multi-disciplinary group to address this issue in connection with planned irrigation development in the northwestern Guanacaste province of the country.

### 5.3. International Reference Centre for Environmental Management (IRCEM)

As pointed out in last year's report to the Panel, the implementation of the in-principle decision to establish the reference centre at WHO headquarters can only be achieved provided the secretariat is strengthened with additional

manpower. So far, the post of Associate Professional Officer, created for this purpose, remains vacant. There is, however, an interest from the side of the Japanese authorities to give support in the form of an APO, and in collaboration with one of the Japanese Panel members, Professor M. Sasa, identification of possible candidates is being actively pursued.

## 6. RESEARCH ACTIVITIES

### 6.1. FEEM coordinated research

During the 1987/1988 period the following research activities were supported by the three participating agencies and implemented in the framework of FEEM's programme of work:

- Field studies on the effect of Azolla on mosquito vector breeding in rice fields.

The second phase of the Azolla studies in China envisages experimental studies in rice fields in Jiangsu province (1988) and Hunan province (1989). In the experimental fields (and an equal number of controls) physical and chemical parameters will be measured at regular intervals; larval densities will be measured by conventional dipping, and adult densities will be assessed using emergence exit traps. In the experimental fields the percentage coverage with Azolla will be determined during the course of the study. Professor Lu Bao Lin has ensured the collaboration of the Jiangsu Provincial Hygienic and Antiepidemic Station in Nanking, and the Hunan Provincial Hygienic and Antiepidemic Station in Zhangsha, for the implementation of the fieldwork. Laboratory studies on the possible toxic effect of macerated Azolla on mosquito larvae will also be carried out.

- Demonstration project of community-based environmental management for vector and rodent control in Saint Lucia

After the successful completion of the first phase of this project in the communities of Ti Rocher and Bocage in December 1986, the implementation of the second phase of the project was initiated in January 1988. The main objectives of the second phase, which will run until 31 December 1988, are:

(a) consolidation of the achievements of phase one; (b) selection of suitable communities to where the project can be extended, based on vector/rodent surveys, and on a survey on health perceptions in candidate communities; (c) implementation of a programme of environmental management for insect-vector and rodent control in, and with the participation of, the selected communities; (d) evaluation of the programme's feasibility and effectiveness on this expanded basis.

A proposal for a similar project has been received from another country in the eastern Caribbean, Dominica. Possibilities are being explored of organizing a workshop in the Caribbean region on the subject of community-based approaches to vector and rodent control in 1989.

- Proposed study on the effectiveness of integrated malaria and schistosomiasis control in the Wonji Sugar Estate in Ethiopia

As recommended by the Panel at its 7th meeting the secretariat has circulated this proposal among the members and collaborating centres, within the three organizations and to a number of selected external experts. The comments were consolidated and forwarded to the Committee for Interinstitutional Collaboration in July. The Committee was asked to make the necessary

modifications to the proposal, and submit it to the National Planning Committee in Ethiopia for official endorsement, so donors may be approached for support.

#### 6.2. PEEM recommended research

At its seventh meeting, the Panel endorsed two research proposals which had been developed by the Vector Biology and Control Unit of the Queensland Institute of Medical Research in Brisbane:

\*evaluation of agronomic practices in ricefields in relation to the production of mosquito vectors, with special reference to neem

\*environmental management using livestock for the reduction of malaria and Japanese encephalitis virus transmission in the Mahaweli Irrigation Scheme, Sri Lanka.

The first project would be a collaborative effort between QIMR and IRRI; for the second project, IDRC Canada has shown interest in principle, and the PEEM secretariat informed the Secretary-General of the Mahaweli Authority of its endorsement by the Panel and asked for possible support from the Authority.

For a number of reasons no further progress has been made in the implementation of these two activities.

In reaction to the Conclusions and Recommendations booklet published by IRRI following the IRRI/USDA/PEEM Workshop of March 1987, the Director of the Centre for Research in Medical Entomology in Madurai, India, informed the secretariat of preliminary results of a study testing a combination of neem (in the early phases) and Azolla (in the later phases) for riceland mosquito vector control. These results seem to indicate incompatibility of the two methods, neem apparently slowing down the growth of Azolla, and Azolla reducing the effectiveness of neem. Contact with this centre will be maintained and further information on this subject will be disseminated through the PEEM Newsletter.

### 7. TRAINING ACTIVITIES

#### 7.1. PEEM coordinated training activities

- Inclusion of a disease vector management component into regular engineering courses.

The proposed curriculum and syllabus guide developed for the above purpose is currently being field tested as recommended by the Panel. Arrangements with the following institutions have been formalized under letters of agreement with WHO, stipulating terms of reference and protocol for the testing:

The Faculty of Engineering and Architecture, University of Khartoum, Sudan;

Centre of Excellence in Water Resources Engineering,  
University of Engineering and Technology, Lahore, Pakistan;

Faculty of Engineering, University of Malaya, Kuala Lumpur, Malaysia;

Department of Sanitary Engineering, All India Institute of Hygiene and Public Health, Calcutta, India

Department of Civil Engineering, University of Nairobi, Nairobi, Kenya

Negotiations are underway with the University of Ghana, Legon, Ghana, and the Universidad de San Carlos de Guatemala, Guatemala.

A survey among fourteen Schools of Engineering worldwide was initiated by FAO, and will add further information on the usefulness of the proposed curriculum and syllabus.

Another initiative in this area was taken by the Panel member at IRRI, Dr S.I. Bhuiyan, who started a survey among deans of schools of engineering, responsible for curriculum development. This survey aims at identifying alternative approaches of including a health component in engineering curricula, other than including new courses into already saturated study programmes.

Possibilities for a workshop in India of directors of institutes of technology to disseminate this activity to a network of institutes are being explored.

- Training aids on environmental management.

Adaptation of the text and lay-out of the draft brochure accompanying the slides to the format of other VBC visual training aids has progressed, but not as fast as anticipated. The final product is scheduled to be ready at the time of the 8th Panel meeting.

#### 7.2. Training activities not receiving PEEM support

- Training seminar in Zurich. On 29 February and 1 March 1988 the Collaborating Centre in Zurich organized for the second time a Seminar on environmental Management for Vector Control. Originally scheduled as a four-day seminar, it was found that the participation by practising engineers was limited for such a long seminar, and the programme was reduced as a consequence.

- Organization of lectures. Staff of ILRI Wageningen presented lectures on environmental management for vector control at the Agricultural University in Wageningen, and for students of the International Course on Hydraulic Engineering organized by the International Institute for Hydraulic and Environmental Engineering (IHE) in Delft. As in previous years, ILRI also included lectures on the same subject in its International Drainage Course.

#### 8. MISCELLANEOUS

The WHO Regional Centre for Environmental Health Activities (CEHA) in Amman, Jordan, organized from 28 May to 2 June 1988 a seminar on Water Resources and Water Quality Management. Sponsored by WHO/CEHA and the Economic Development Institute of the World Bank, and co-organized by the Jordanian Ministries of Health and of Irrigation and Water Resources, and by the Royal Jordanian Society, the seminar was designed to bring issues of water management to the attention of senior policy makers from the Eastern Mediterranean Region. A one day session was devoted to public health aspects of water resources development, and the secretary was invited to give a keynote presentation on health criteria and vector control in water resource development projects.

From 13 to 16 June 1988, the South East Asia Ministers of Education Organization for Tropical Medicine (SEAMEO TROPMED) organized a Seminar on the Impact of Water Resource Development on the Health of Communities and Preventive Measures for Adverse Effects, in Surat Thani, Thailand. Professor Sornmani, one of the two PEEM members in Thailand, reports that eighty participants from SEAMEO TROPMED Member States, from Europe and from Africa attended. The programme focused on health risk assessment at the planning stage, health monitoring during the implementation phase, and the design and incorporation of preventive engineering and water management measures throughout project development and operation. Dr M.H. Birley delivered a keynote address on forecasting methods, and gave a presentation on PEEM's objectives and activities.

Early July 1988 Professor Sornmani visited the Queensland Institute for Medical Research in Brisbane, at which occasion Dr B.H. Kay organized a workshop on "water resource management and its relationship to human disease". The workshop had seven speakers and the presentations were followed by constructive discussions. A major feature was the participation of the Queensland Water Resources Commission.

#### 9. FINANCIAL REPORT

As stated in last year's financial report, of the amount of US\$120,000 available in the PEEM allotment for the 1986-87 biennium (i.e., contributions of US\$20,000 per agency per annum), US\$40,613.79 was left available for the organization of the seventh PEEM meeting. Organization of the meeting on a normal scale would not have been possible without extra inputs provided by the three agencies. Travel and per diem costs of members and temporary advisers added up to US\$40,594.-. In addition, FAO sponsored the cost of attendance of two temporary advisers (Dr A.K. Biswas and Mr Ch. Abernethy), and it also covered the cost of local arrangements, and the production of the working papers document AGL/MISC/12/87. UNEP contributed extra funds for one temporary adviser (Prof. M. Way). WHO covered the cost of producing the annual PEEM report.

At the end of the 1986-1987 budget biennium, a number of PEEM recommended activities received support from the WHO/VBC regular budget:

- \$10,062 in support of the second phase of the community-based demonstration project environmental management for vector and rodent control in Saint Lucia.
- \$10,000 for the redrafting and finalization of the "institutional arrangements" guidelines by the Overseas Development Institute, U.K.
- \$18,720 for the first phase of the development of the cost-effectiveness guidelines by the Evaluation and Planning Centre of the London School of Hygiene and Tropical Medicine.
- \$4,000 for field testing proposed curriculum and syllabus in engineering institutes in Pakistan and Sudan (in collaboration with WHO's Delivery and Management of Vector Control Unit).

In 1988, the following contributions have been made by WHO/VBC in the first six months:

- \$10,000 in support of the two year field study phase on the effect of Azolla on riceland mosquito vector populations, in China.
- \$6,000 for field testing proposed curriculum and syllabus in engineering institutes in Malaysia, India and Kenya (in collaboration with WHO's Delivery and Management of Vector Control Unit).
- \$4,000 for feasibility testing of the forecasting guidelines in Thailand and Malaysia.

For 1988, the regular contributions of WHO, FAO and UNEP have been received, so that an amount of US\$60,000 is available in the PEEM allotment. Of this amount US\$7088,53 was spent for the organization of the 10th Steering Committee, leaving US\$52,911.47 for the organization of the 8th PEEM meeting, and the production of the report.

The last instalment of the newsletter contract with World Water was paid, and a decision will be made shortly on renewal of the letter of agreement.

ANNEX 1.

A review of publications on environmental management for vector control  
in the Dutch East Indies before 1940

PROGRESS REPORT

This review, carried out by the International Institute for Land Reclamation and Water Management, aims at preparing an inventory of the engineering methods applied for (mainly malaria) vector control in the Dutch East Indies (now: Indonesia) before 1940. Some 200 articles have been collected and methods have been described in terms of their working principle, their applicability and their (cost) effectiveness.

Effectiveness appeared to be highly variable, both in time and space. The outbreak of a malaria epidemic in 1938, in the harbour of the capital Batavia (now: Jakarta) -in spite of millions of guilders invested in malaria control measures- puzzled the malariologists considerably, to the extent that they started to question the basic soundness of their control strategies.

At the same time, however, Professor N.H. Swellengrebel -the leading Dutch parasitologist in that period, wrote: "At present,... species sanitation, i.e., the method of dealing with malaria by an action directed at one specific species of Anopheles to the exclusion of others, stands on a firmer basis than ever before"<sup>1</sup>.

To reconcile these views the researchers dug into the work of J. Kuipers, a civil engineer who wrote a Ph.D. dissertation in 1937, supervised by Prof. Swellengrebel, on "Mathematical-statistical investigations of observations on Anopheles in the Netherlands and in Java". By studying Kuipers' work, it became clear why malariologists in the Indies were often puzzled. Because of the complexity of the transmission cycle, they would monitor the effects of their sanitation programmes using only the spleen index and the mortality rate as indicators (fig. 1). They did not look at the fluctuations in vector populations and the developments in breeding sites again, unless the medical indices became very high. Kuipers presented an analytical approach for each of the steps involved, and while his mathematical models may have been crude, the step by step approach makes it possible to analyse past experience in a much more effective way than traditional approaches (fig. 2).

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<sup>1</sup> Swellengrebel, N.H. Malaria in the Netherlands Indies. Bull. of the Colonial Institute of Amsterdam 1: 1, pp 37-45

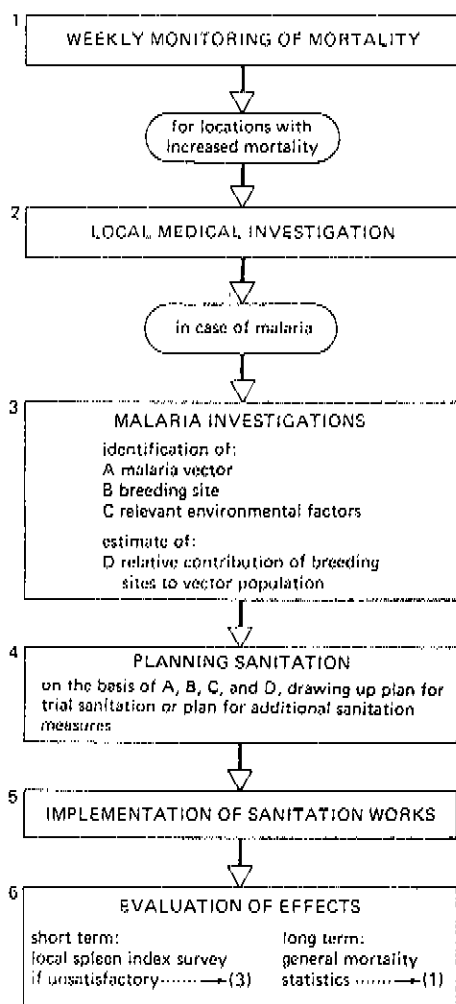


Figure 1. Flowchart for malaria control activities (species sanitation) in the Netherlands East Indies.

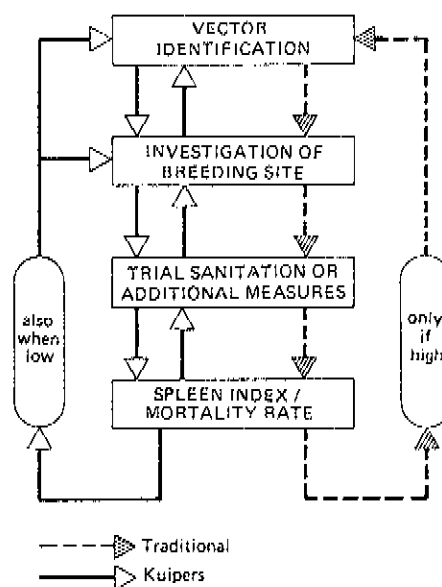


Figure 2. Comparison of the traditional sequence of activities and the approach proposed by Kuipers.