European Cooperation on Environmental Health Aspects
of the Control of Chemicals – Interim Document 2

MANPOWER DEVELOPMENT FOR TOXIC CHEMICALS CONTROL

OCCUPATIONAL PROFILES AND CURRICULUM DESIGN

WORLD HEALTH ORGANIZATION
Regional Office for Europe
COPENHAGEN
1981

NOTE

This report has been prepared by the Regional Office for Europe of the World Health Organization for governments of its Member States in the Region. A limited number of copies is available from the WHO Regional Office for Europe, Scherfigsvej 8, DK-2100 Copenhagen Ø, Denmark, to persons officially or professionally concerned with this field.

During the course of implementing the activities reported here, the Regional Office for Europe has been given a global mandate by the International Programme on Chemical Safety in relation to manpower development in toxicology. While this report has been prepared against a European background, it is believed that it has worldwide applicability. Future activities of this programme component will be implemented in the global context of the International Programme on Chemical Safety.

This volume does not constitute a formal publication. It is an interim report meant to facilitate discussion and action and has not received such detailed editorial revision as other WHO publications. It may be re-issued in an expanded and revised version when the remaining programme components are completed and when comments on the ideas expressed in this volume have been received. Comments are solicited and should be sent to the Director, Promotion of Environmental Health, at the address given above.

The views expressed are those of the authors and do not necessarily represent the stated policy of WHO. The designations employed and the presentation of the material in this report do not imply the expression of any opinion whatsoever on the part of the Secretariat of the World Health Organization concerning the legal status of any country, territory, city or areas or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

CONTENTS

INTRODUCTION

Following the resolution adopted at the twenty-ninth session of the Regional Committee in Helsinki in September 1979, the Regional Office launched an intensive programme on toxic chemicals control.

Funds available for this purpose under the Regular Budget of the Regional Office were considerably amplified by voluntary contributions made by several European governments for this programme. The UNDP approved the Project on European Cooperation on Environmental Health Aspects of the Control of Toxic Chemicals. Funds earmarked by the UNDP for this project are used to facilitate participation in the programme of those countries which are entitled to UNDP support.

In line with the Regional Committee's Resolution, the regional activities related to environmental health aspects of the control of toxic chemicals are centred on:

- development of trained manpower of all categories, including medical toxicologists;
- contingency planning for emergencies involving the release of chemicals into the environment;
- development of health aspects of environmental impact assessment; and
- collaboration and exchange of information concerning the development of methodologies and control procedures.

The basic task of establishing dose-response relationships and health criteria is the function of the Central Unit for the International Programme on Chemical Safety (IPCS) in WHO Headquarters in Geneva. It is expected that the regional programme will utilize the outputs of that activity and may contribute to it, but they should not duplicate it. Therefore, the regional programme is centred on problem solving rather than on basic investigations of health effects.

Specific activities under each of the above priority headings implemented or launched during 1980 and 1981 are described below.

PROGRAMME PLANNING AND PRIORITIES

The establishment of priorities for toxic chemicals control in Europe is an important component of the European Programme on Environmental Health Aspects of the Control of Chemicals, being carried out by the WHO Regional Office for Europe in conjunction with the UNDP-supported project on this subject. Fig. 1 shows the flowchart of activities leading to the publication of a document on priority setting.

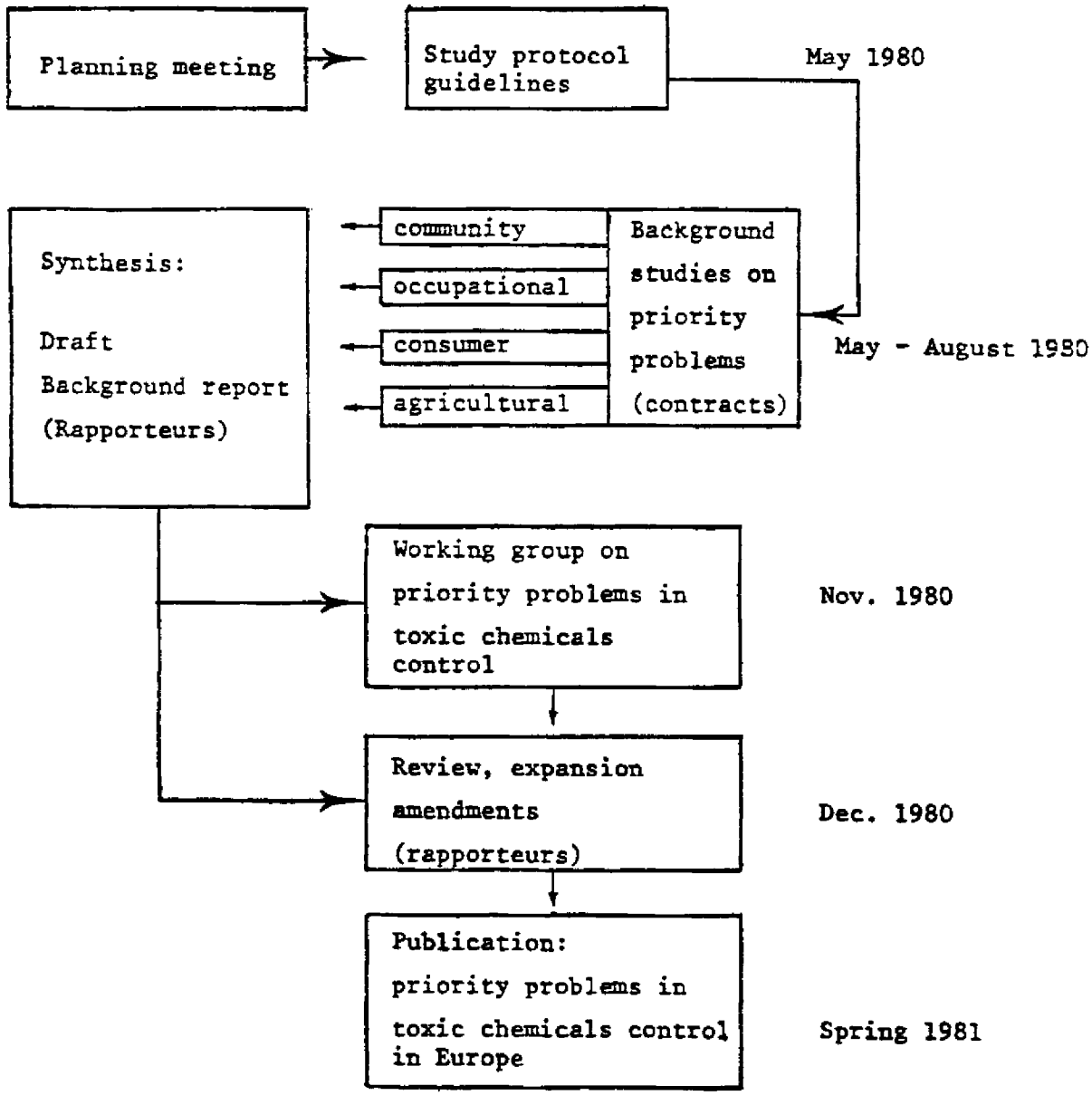
The Consultation on Priority Problems in Toxic Chemicals Control in Europe was organized by the WHO Regional Office for Europe with the support of the Austrian Government. The meeting was held in Baden, Austria, from 3 to 6 November 1980 and was chaired by Professor M. Haider. Dr J. Daimer welcomed the participants on behalf of the Austrian Government.

The purpose of the Consultation was to establish priorities for investigations and action by the national institutions and government agencies concerned. The discussions were based on a comprehensive background study aimed at identifying and defining the toxic chemical problems which arise during the entire economic cycle of extraction of raw materials, primary and secondary manufacturing, storage, distribution, consumption or use and, finally, wastes disposal. At each stage, various categories of the population, e.g., workers, consumers and/or members of the community, may be exposed to toxic chemicals contained in the raw materials, products, by-products or wastes. These toxic chemicals may affect the various groups by any one or a combination of routes, such as food, contact, water, air or soil, producing a range of known or suspected health effects.

An important element in the study was an attempt to identify major constraints which prevent the solution of the problems, such as lack of precise knowledge of sources, exposure and effects, inadequate technology for prevention of exposure, excessive cost of preventive measures, cost or other disadvantages of substitutes or alternatives, lack of adequate legislation or regulation and considerations of trade and competition.

The result of this effort was presented in the form of a multidimensional matrix identifying the products and

FIG. 1 ACTIVITY FLOWCHART OF PRIORITY SETTING PROCESS IN TOXIC CHEMICALS CONTROL IN EUROPE



processes which involve exposure to toxic chemicals, the types and routes of exposure, the categories of population affected, the types of effect and the predominant constraints on preventive action. It became clear that the multiplicity of sources, chemicals and their effects is such that any attempt to produce a complete catalogue at this stage would be self-defeating. Therefore, the background study was not exhaustive but rather meant to develop a rational approach to the problem as a basis for setting priorities.

The discussion at the meeting was structured into three major sections according to the types of population primarily exposed, i.e., workers, consumers and members of the community. It was stressed that the above classification, useful as it is for the purpose of analysis, is arbitrary because individuals may belong to more than one of the above categories and, thus, be subject to multiple exposure. An attempt was made to illustrate this by analysing one major human activity, i.e., "agriculture", where occupational, community and user types of exposure are closely interrelated and superimposed. The relationship between exposure and sociocultural aspects was highlighted in discussing problems arising in the use of pesticides in less developed countries. The Consultation stressed the importance of international cooperation in dealing with priority problems in toxic chemicals control in Europe. The WHO European Regional Programme on Chemical Safety was considered the appropriate vehicle for achieving pan-European collaboration in this field. The objectives of the regional programme on toxic chemicals control were considered to be highly relevant to the perceived priority problems in Europe, and the foreseen outputs and activities to be appropriate for the creation of a framework of regional cooperation in dealing with these problems.

It was felt that the priority problems identified by the Consultation were relevant to European countries, including the less developed ones, and that full participation of these countries in the regional programme would be essential for its success. The Consultation welcomed the prospects for continuation and extension of current UNDP support for this purpose. The Consultation expressed its appreciation of the donations made by certain countries for the European component of IPCS and

expressed the hope that the number of countries making voluntary contributions would increase in the future.

The Consultation noted with satisfaction the coordination of the European component of the global work of IPCS and the cooperation achieved with a number of intergovernmental organizations and expressed its hope that the cooperative effort would be further broadened and strengthened. The Consultation noted with approval the recommendation of the IPCS technical committee that the Regional Office be entrusted with global responsibility for elements of the programme, namely: manpower development and contingency planning for response to accidents and emergencies involving release of toxic chemicals.

The Consultation identified priority problems requiring urgent consideration and attention by the governments and national institutions concerned, IPCS and other organizations, as listed in the recommendations cited in Annex 1.

MANPOWER DEVELOPMENT AND TRAINING

Background

Safeguarding human health and environment against deleterious effects of potentially toxic chemicals requires extensive testing and evaluation of toxicity of chemicals as well as adequate control mechanisms. These indispensable activities are presently hampered by lack of personnel adequately trained to perform the multitude of tasks involved in evaluation and control of chemicals.

Since the awareness of the need for evaluation and control emerged very recently, there is little precedent and experience in developing professional and auxiliary personnel needed for the job. In well-established professions such as medicine, engineering or law, the designations "physician", "engineer" or "lawyer" imply a person possessing certain skills and capabilities acquired by a certain process of education, training and experience and performing a reasonably well-defined range of functions and tasks.

The word "toxicologist", on the other hand, is interpreted in various countries and various societies in totally

different ways, depending on recent historical developments governed, in many cases, by purely local circumstances or by chance. At present, toxicologists come from many different backgrounds, such as medicine, biological sciences, chemistry, pharmacy or even nuclear physics. Some become toxicologists after formal academic specialist training; others through more or less structured apprenticeship programmes; and still others acquire the necessary capabilities from the experience of doing the job, supplemented by reading scientific and technical literature.

Similarly, the functions and tasks performed by toxicologists vary widely, ranging from interpretative and advisory functions at the highest levels of decision making to performance of routine analytical tasks. It is generally recognized that not all the functions related to testing, evaluation and control of chemicals are, can or should be performed by toxicologists. A wide range of other professions must be involved in this truly interdisciplinary activity.

Therefore, in addition to developing a core of professional toxicologists of various categories, it will be necessary to impart various degrees and types of knowledge of toxicology to a wide range of people who are involved in various degrees with chemicals control in their normal work. These include biologists, chemists, zoologists and technicians in the laboratories, public health and occupational health inspectors, agricultural and environmental inspectors and, last but not least, decision makers who are faced with a very difficult task of making far-reaching decisions, often on tenuous and always on imperfect evidence.

Fig. 2 shows the main components of our manpower development programme, which is described in some detail below.

Occupational Profiles

The objective of this activity is to define the final product or products of the manpower development programme, namely, "the toxicologist" and the various categories thereof. As mentioned in paragraph 3.1 above, there is presently no broad consensus on this subject. It is necessary to define the profession in objective, widely applicable terms: namely, in terms of tasks to be

FIG. 2 MAIN COMPONENTS OF MANPOWER DEVELOPMENT PROGRAMME

OCCUPATIONAL PROFILES	DEMAND	RESOURCES AND TOOLS
Analysis of Tasks and Skills	Assessment of future demand	Post-Graduate Programme
Professional Profiles of: - various types of toxicologists - members of toxicology team - others	Survey of Existing Facilities	Peripheral Academic Programmes
	Assessment of needs	Medium-term Continuing Education Courses
	Assistance in Development of Additional Capacity	Short Ad Hoc Courses

NATIONAL AND INTERNATIONAL RECOGNITION OF QUALIFICATIONS

TO ACHIEVE

Rationalization of Training Programmes

Expansion of Capacity of Training Institutions

Institution of New Training Programmes

Improved Career Development Opportunities

Adequate Supply of Personnel of Various Categories

performed and skills required for the performance of these tasks. By grouping these tasks according to selected criteria, professional profiles of various categories of toxicologists may be obtained.

A Working Group on Occupational Profiles in Toxic Chemicals Control was convened in Brussels in December 1980, in collaboration with the Commission of the European Communities. The Group agreed on the following approach in development of occupational profiles:

- description of tasks

- description of areas of knowledge

- description of the knowledge required as a function of tasks

- description of occupations requiring toxicological knowledge.

The following categories of tasks were established:

- experimental animal toxicology
- experimental phytotoxicology
- clinical toxicology
- epidemiology
- exposure evaluation
- risk assessment
- advice and consultation
- management and training in toxic chemical assessment

The Group considered each category but paid particular attention to experimental animal toxicology.

It was concluded that a toxicologist is in effect defined by the tasks he could be expected to perform, in many cases in collaboration with other toxicologists or allied scientists. The concept of the toxicological team was particularly emphasized in the light of the increasing number of scientific disciplines involved in toxicological assessments. The leader of such a team would be a senior toxicologist. The tasks for which a toxicologist should be responsible were established.

The Group strongly endorsed the importance of the role of the senior toxicologist, both in giving advice to governments and in developing toxicological services.

Urgent attention should be given to the training and the development of such key scientists.

The Group considered several other professions or occupations for which extensive knowledge of toxicology is required (e.g., occupational health physicians and epidemiologists) and their professional profiles in relation to toxicology. The Group also identified a series of other professions for which some knowledge of toxicology is desirable and recommended that their profiles in relation to toxicology be developed. It drew up a preliminary list of these professions, recognizing that this could be extended.

The Working Group developed a number of specific recommendations which are quoted in full in Annex 2.

A comprehensive publication on "Occupational Profiles in Toxic Chemicals Control" is now in the final stages of preparation and will be available soon.

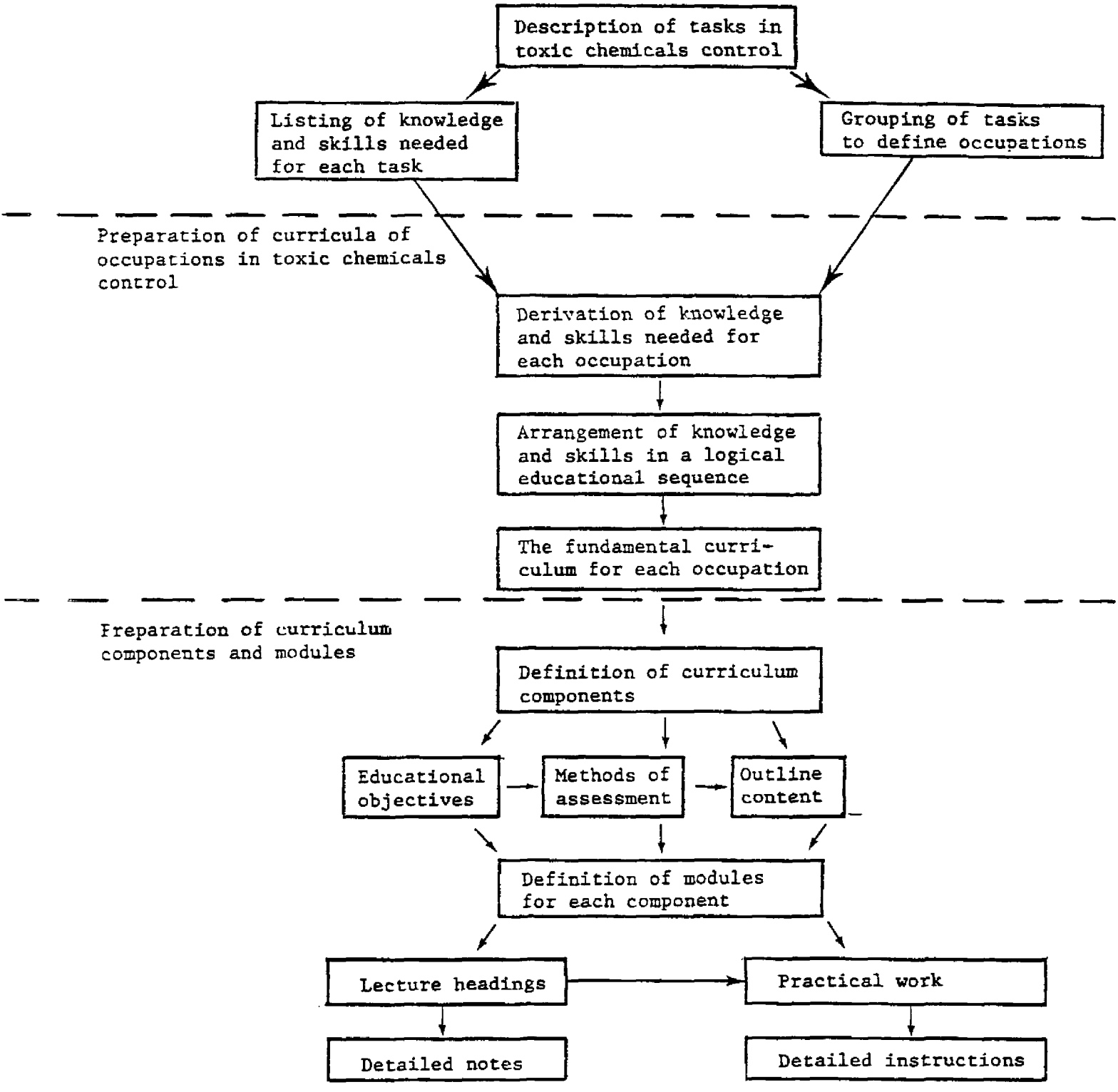
While it is believed that the basic classification of tasks to be performed and skills needed will be applicable globally, the criteria for grouping these component tasks into professional profiles may vary from region to region and from country to country.

It is, therefore, necessary to organize regional or subregional consultations to examine and adapt the model to local circumstances.

Training Curricula

Based on the activities described above, a target curriculum for toxicologists has been developed for adaptation and use by training institutions. A Planning Group on Development of Curricula for Manpower Training for Occupations in Toxic Chemicals Control met in Brussels from 15 to 19 June 1981. This group agreed on a strategy for the developmental process shown in Fig. 3. The strategy uses the occupational profiles derived at the previous meeting in December 1980 to define the component areas of knowledge required for each occupation. These components are then ordered in a logical educational sequence to form a target curriculum. Comparison of the target curriculum with the previous curriculum of any entrant to an occupation identifies educational deficiencies. Courses to supply these deficiencies can

FIG. 3 FLOWCHART OF THE PROCESS FOR DERIVING AND DEVELOPING CURRICULA FOR OCCUPATIONS IN TOXIC CHEMICALS CONTROL



then be made available. Alternatively, the target curriculum forms a basis for a full-time training scheme for entrants to the occupation who have had no previous tertiary education.

The Planning Group developed a target curriculum for a Category I toxicologist and considered the organizational structure and degree of detail required to implement such a curriculum. It supported a modular approach to the definition of component courses, the basic module being one which could be used *in extenso* or could be taught as a one-week intensive course to supplement curricular deficiencies for occupational entrants with otherwise acceptable background curricula. The Planning Group on Development of Curricula established educational objectives for all components of the target curriculum for a Category I toxicologist.

The target curriculum for a Category I toxicologist was found to be very similar to the preclinical training of most medical or veterinary students, the outstanding deficiency in current preclinical training being the absence of any course in general toxicology. A suitable course in general toxicology was described, and it was recommended that veterinary and medical schools should introduce a course of this kind as a matter of urgency, not just to help in dealing with the shortage of toxicologists but also to remove an obvious deficiency in general medical education.

The Planning Group also considered and approved a proposal for a short-term (2-3 month) course designed for people who now have a central role in toxic chemicals control but have no specific background in toxicology. The course may also be useful for other professionals who require such knowledge for performance of their normal tasks, e.g., public health inspectors, food control officers, factory inspectors, etc. It is intended that this course should be offered in three parts of not more than one-month duration each so that busy people can attend without being absent from their work for excessive periods of time.

A publication on occupational profiles and training curricula is in the final stages of preparation.

Forecast of Demand for Personnel

The objective of this activity is to obtain rough estimates of the future demand of the various categories of personnel, taking into account foreseeable developments in industry and the probable expansion of control activities. A methodological model for assessment and forecast of demand is being developed. It is intended to test this model by performing surveys of demand in one or two countries. After testing and adjustment as needed, the model will be put at the disposal of governments and educational institutions for adaptation, adoption and use in planning for expansion of existing programmes or institution of new ones.

Survey of Existing Training Programmes

A survey of all European institutions of higher learning is now in progress to determine the numbers, types, contents and scope of training programmes currently offered. The survey focuses on two types: programmes designed to produce toxicologists and programmes for professionals in other disciplines but which contain significant elements of training in toxicology.

Consultation on Manpower Development in Toxic Chemicals Control

The activities enumerated above, namely, the occupational profiles, survey of existing training programmes, forecast of demand and model training curricula, would constitute a base for development of rational training programmes.

It is proposed to call, probably early in 1983, a large consultation of toxicological experts and educators to review this material and to map out a strategy for implementation.

Short Training Courses

The strategy outlined above will take some time to produce the desired objective. In the meantime, it is proposed to hold a number of short training courses on subjects which are considered high priority. The courses are to be organized by national institutions with assistance and support from the regional offices.

The first of the series of training courses to be sponsored by the WHO Regional Office for Europe within the framework of the regional programme on chemical safety is the Course on Toxicology of Pesticides to be held in Sofia, Bulgaria, 31 August - 11 September 1981. The course is being organized by the Bulgarian Institute of Hygiene and Occupational Health with the participation of ILO, which will cover the aspects of workers' safety, and FAO, which will deal with the problems of agricultural product safety and environmental protection.

An international course on Health Effects of Combined Exposure to Chemicals in Industrial and Community Environments is scheduled to take place in Lodz, Poland, 15-20 February 1982. This course is being organized by the Institute of Occupational Medicine, Lodz, within the framework of the UNDP-supported project POL/81/004 and in cooperation with the Regional Office of WHO and with the International Programme on Chemical Safety (IPCS).

Also tentatively scheduled for 1981 is a course on detection of mutagenesis, to be organized within the framework of the IPCS.

Global Aspects of the Programme Component

The Regional Office for Europe has been entrusted with global responsibility for the implementation of the manpower development and training component of the International Programme on Chemical Safety. Funds have been made available to the Regional Office by IPCS for some activities in 1981.

These funds will be utilized for:

- participation of non-European experts in selected activities, e.g., the planning group to develop training curricula previously described, on page 9;

- provision of non-European lecturers and participants in training courses described on pages 12 & 13;

- provision of advisory expert services to non-European developing countries.

CONTINGENCY PLANNING FOR ACCIDENTS AND EMERGENCIES INVOLVING THE RELEASE OF TOXIC CHEMICALS

Contingency planning

As the first step towards development of a European contingency response system for emergencies and accidents involving the release of toxic chemicals, the Regional Office had commissioned two background studies:

- a conceptual model of countrywide emergency response system for chemical accidents which identified system components such as the definition of responsibilities at various levels, communication channels, access to information, equipment and manpower, etc.; and

- a survey of existing system components in European countries which was conducted by the Monitoring and Assessment Research Centre, UK, with the cooperation of UNEP/IRPTC and designed to provide information on existing emergency response systems related to toxic chemicals in European countries.

These two background documents were submitted to the Working Group on Contingency Planning for, and Response to, Emergencies and Accidents involving Potentially Toxic Chemicals held in Bilthoven, Netherlands, 9-13 February 1981.

The main purpose of this meeting was to help structure a model of a comprehensive contingency plan, at various levels, for effective response to accidents involving the release of toxic chemicals. This model will then be included in a guideline document which governments can use to set up or complete their emergency response systems.

In addition, two case study reports were presented at the meeting, one dealing with the accidental release of 2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD) at Seveso, Italy, from an industrial plant and the other describing a train accident which involved the release of chlorine at Mississauga, Ontario, Canada.

The case studies were used to analyse the adequacy and completeness of the conceptual model of the emergency response system in order to ascertain if the existence of

such a system at the time of the accidents would have improved the speed and effectiveness of the response.

The Working Group recommended, int. al., that the WHO Regional Office should develop and publish a guideline document on model contingency plans for response to accidents and emergencies involving release of toxic chemicals. The discussion resulted in certain modifications to the model submitted at the meeting. This guideline document is currently in preparation.

The Working Group adopted a number of recommendations which are summarized in Annex 3.

Rehabilitation of Affected Areas

Rehabilitation of areas affected by accidents involving the release of potentially toxic chemicals presents a complex problem involving scientific, health, administrative and public relations aspects. To promote a rational approach to this difficult task, it is planned to develop a guideline document which will deal with the assessment of health and environmental hazards, physical processes of rehabilitation and restoration, monitoring and surveillance, reporting and public information as well as with organizational aspects of the process. Consultations are now in progress with the view to assigning the task of development of this guideline document to two national institutes possessing complementary expertise needed for this purpose

Accident Prevention

Identification of accident-prone situations and processes is an essential first step in the development of preventive measures to avoid or minimize accidents. It is planned to use an epidemiological approach to this problem, whereby the causes and the circumstances of past accidents will be analysed to detect weak points in the cycles of extraction, production, transportation, storage, use and disposal.

Global Aspects of Programme Component

Although the Regional Office for Europe has been assigned global responsibility for this programme component of the International Programme on Chemical Safety (IPCS), no funds have been made available by IPCS to the Regional

FIG. 4 CONTINGENCY PLANNING FOR EMERGENCIES

ALERT SYSTEM	RESPONSE SYSTEM	RESOURCES
Definition of Emergency	Expertise	Rosters of Experts
Focal Points	Testing and Monitoring	Rosters of Institutions
Responsibilities	Materials, Equipment and Manpower	Data Banks or Access
Communication Channels	Evacuation and Care	Reserves or Access to Equipment
	Rehabilitation	Manpower and Materials
	Public Information	Procedures

FRAMEWORK FOR INTERNATIONAL COLLABORATION

PREVENTION: "EPIDEMIOLOGY" OF ACCIDENTS

REHABILITATION: GUIDELINES FOR REHABILITATION OF AFFECTED AREAS, INCLUDING GROUND WATER, SOIL, ETC.

TO ACHIEVE

More Rapid and Effective Function of Alert System

More Effective Response System, Including Pre-Arranged Procedures for Rapid Delivery of Information, Expertise, Equipment and Materials

Analysis of Causes of Past Accidents to Assist in Prevention

Improved and More Rational Rehabilitation Procedures

Improved Public Information Process

Office for this purpose, due to the existing financial constraints. Therefore, unless some other source of external financing can be found, the Regional Office contribution to this global programme component will be limited to making available globally the outputs of the European regional programme on this subject. Attempts are being made to secure external financial support for the extension of activities on this subject to non-European regions, especially to the developing countries. Additional activities on this programme component are shown schematically in Fig. 4.

MONITORING AND EPIDEMIOLOGICAL STUDIES FOR CHEMICALS CONTROL

The overall approach was developed on the basis of a paper on "Monitoring and Epidemiological Programmes in the Control of Toxic Chemicals", which was a working paper for the Planning Meeting on Monitoring and Epidemiological Studies for Toxic Chemicals Control, held in Copenhagen, 5-8 May 1981. The main aspects of this programme component are shown diagramatically in Fig. 5.

The Planning Meeting was convened by the WHO Regional Office for Europe. It was attended by 14 specialists in monitoring and epidemiological studies from 11 countries. The Meeting considered aspects such as: the integration of studies for occupational and general population exposures and health effects; the development of exposure assessment methods; the role of epidemiology in chemicals control; and problems of availability of, and access to, relevant data.

The Meeting made recommendations for the overall development of monitoring and epidemiological studies on toxic chemicals in the European Region. In addition, proposals for nine specific monitoring and epidemiological studies were submitted for consideration by the Regional Office as candidates for internationally coordinated projects. These are:

- health effects of cadmium exposure in the general population
- process dependent risks of delayed health effects due to occupational exposure to chromium and nickel