PRIORITY AREAS FOR RESEARCH IN THE WATER AND SANITATION SECTOR

Second draft to be discussed at the third meeting of the CC Working Group on Applied Research to be held 29-30 March 1993 in Thun, Switzerland
(prepared by Roland Schertenleib and Margaret Mwangola))

1. Background

During its meeting in Oslo on 20 September 1991, the Water Supply and Sanitation Collaborative Council endorsed seven working groups on different topics. The "Applied Research" group held a first "core group" meeting in June 1992 to discuss the ToR, the specific work plan and agreed to the following general goal and overall purpose of the working group:

> *To promote support for an increased level of applied research, particularly in identified priority areas.*
>
> *To enhance the quality of the research process and improve the dissemination and application of research findings.*

It was also agreed for the working group to focus on specific research issues and prepare the following outputs to be presented at the next meeting of the WSS Collaborative Council in Morocco:

a) Report on most important research areas in the sector;

b) General overview of the "research process": main problems and issues;

c) Report on how to improve the quality of research proposals;

d) Report on problems and issues related to research funding

e) Recommendations for GARNET (Global Applied Research Network)

This paper is the second draft of item a) to be discussed at the third meeting of the working group to be held in Thun (Switzerland) on 29 - 31 March 1993. The revised paper, reflecting the recommendations of the working group members, shall then constitute the first chapter of the report to be submitted by the working group to the Collaborative Council at its Morocco meeting.

2. Purpose of paper and target group

This paper identifies the main areas where more applied research is needed if the water and sanitation sector is to meet the goal of expanded and sustainable water supply, sanitation and solid waste services in developing countries. It shall discuss general research areas deserving special attention in future research activities. However, since there is no one best way of organising and ranking appropriate research, **there is no intention to provide an exhaustive list of specific research topics and activities with given priorities.**

The list of priority research areas recommended in this paper is intended to set the tone for future applied research and to assist research organisations in developing their individual research programs for the 1990s. It will also help ESAs in the formulation and implementation of their policies with regard to the funding of research activities. The target audience of the paper is therefore decision makers in research organisations, policy makers, external support agencies, and to some extent individual researchers.

3. General Purpose of Research Activities

The most important purpose of conducting applied research in the water and sanitation sector is to address problems and obstacles which prevent those active in the sector, including the beneficiaries, from achieving the goal of expanded and sustainable water supply, sanitation and solid waste services especially for the poor. In other words, applied research is the application of research techniques to questions of current concern for practitioners in the area of water supply, sanitation and waste management. It is important to make the distinction between *applied research*, which involves the investigation of a single limited issue, and *operational research* which involves the investigation of multi-aspect problems that occur in real life.

In any research effort, the direct outcome and the obtained results are obviously of prime importance. However, building up and strengthening national research capacities in developing countries is yet another very important factor in conducting applied and operational research. This aspect should never be neglected when designing, assessing and funding research activities.

4. Obstacles and Constraints to expanded and sustainable systems

This section addresses the question what are the main obstacles and constraints to expanded and sustainable water supply, sanitation, solid waste management, and surface water drainage systems. It focuses on those areas where more research is necessary in order to overcome these obstacles and constraints and where more knowledge will produce greater impact on the implementation of expanded and sustainable water and sanitation services.

Community awareness and community participation:

The role of the community in the implementation of water supply and sanitation projects has been under discussion for a long time. In the early '80s, the community was viewed primarily as a source of unskilled labour, and community participation was generally limited to its mobilisation in order to lower project costs. Most schemes were conceived, directed, and financed by central government agencies or other organisations outside the community concerned. As the Decade progressed, it became increasingly clear that project success, particularly in rural and peri-urban areas, is highly dependent on a higher degree of community participation and responsibility for continued operation. It is now evident that the full participation of the community and enhanced women's involvement are

critical elements in providing safe drinking water supply to rural and peri-urban areas on a sustainable basis.

Appropriate and affordable technology:
Water supply and sanitation schemes in rural and peri-urban areas can only be managed and operated by the community if a technology appropriate to the means and possibilities of the users is utilised, particularly as regards the technical level, the reliability as well as the financial affordability of any equipment. Although funding of more affordable appropriate technology projects has increased significantly throughout the Decade, a comparatively small percentage of total external sector funding for urban and rural water supply and sanitation has been allocated for such projects.

Supply-oriented instead of demand-oriented:
A considerable gap in motivation has quite often been observed between those who finance and construct water supply and sanitation projects and those who profit from them in the village and/or in peri-urban areas. Any changes/improvements are often not given high priority especially if additional financial input is required by the people. In addition, it is becoming apparent that the difficulties in levying charges and collecting payments for water and waste management systems are frequently related to weak institutional systems and failure to meet users' perceived needs.

Operation and maintenance:
Inadequate operation and maintenance procedures have traditionally been a major stumbling block in the improvement of water supply, sanitation and solid waste services. A major difficulty facing many countries with regard to operation and maintenance of installed systems has been their lack of financial and institutional capacity.

5. The Different Subsectors of the Water and Sanitation Sector

In order to determine in which specific areas more research is necessary, it is useful to divide the water and sanitation sector into the following subsectors:

Water Supply: This subsector includes the withdrawal, collection, storage, treatment and distribution of drinking water in rural, peri-urban, and urban areas.

Sanitation: This subsector includes the collection, treatment and disposal/reuse of municipal liquid waste as well as the management of sanitation systems

Solid Waste Management: The collection, treatment and disposal/reuse of municipal solid waste and the management of solid waste services is considered to be an other subsector

Surface water drainage: The collection of stormwater and the management of stormwater systems are the main components of this subsector. The lack of proper storm water drainage particularly affects the urban poor as they often have little alternative to living in poorly drained and flood prone

areas. Water supply and excreta disposal is in fact practically impossible to implement in areas subjected to frequent flooding and/or landslides. In addition, the surface water drainage systems are very often used for the collection and disposal of domestic wastewaters. This leads to great adverse epidemiological problems relating to the expansion of malaria and other vectorial diseases. Indeed, many of the urban poor in the developing countries would probably rate surface water drainage more highly than water supply if consulted about the relative importance.

Hygiene Behaviour/Hygiene Education To regard "hygiene education" as a subsector of the water and sanitation sector is rather unusual. However, several health impact studies have clearly established that the improvement of water supply and sanitation alone is usually necessary but not sufficient to achieve broad health impacts if personal and domestic hygiene are not given equal emphasis. This is the reason why it is suggested to regard hygiene behaviour/education as a subsector where specific research needs can and should be identified. Hygiene behaviour/education is rather different to the previous sub-sector in that technology plays only a minor role.

Water Resource Management Undoubtedly, there is a growing shortage in domestic and industrial water supply which has adverse consequences for both economic development and poverty alleviation.

All of the subsectors are of course somewhat related to each other. A common denominator in the subsectors is the fact that the existing problems in each subsector are to a greater or lesser degree related to technical, institutional, socio-cultural, and financial issues.

It is also important to keep in mind, that the needs and problems are quite different in rural and urban areas, particularly in the subsectors water supply and sanitation. Solid waste management and surface water drainage, however, are typically urban problems and this paper, therefore, focuses in these two subsectors on the needs in peri-urban and urban areas.

6.. Priority Research Areas in the Past; Present Knowledge

Water Supply:

The problems of inadequate water supplies in developing countries have already been addressed by researchers for quite some time. However, until recently they were mainly regarded as technical and/or economic problems. Up to the 1980s, not only urban water supplies, which are indeed susceptible to engineering solutions, but also rural water supplies were frequently dealt with from a purely engineering point of view, with only a mere reference to social or institutional aspects. Therefore, although a considerable amount of research has been carried out in the field of water supply, much of the efforts concentrated on technical issues. Only very recently have research activities on "software" (non-technical) issues been given greater attention. Consequently, the general technical know-how with regard to the design and construction of water supply installations is relatively high and certainly not the main factor limiting the extension and

sustainability of water supply systems. In contrast, little is known still today on the planning and implementing a water supply system that can be maintained and operated in the long run.

Sanitation:

For a long time, sanitation has been largely neglected. Since urban sanitation was usually understood to mean sewerage, the middle and low-income population of most cities in developing countries, for whom conventional sewerage is neither feasible nor affordable, were automatically excluded. Until the 1980s, with the exception of the work of a few pioneers, no serious research efforts went into the question of finding and testing feasible technical solutions for the problem of excreta disposal in the great mass of overcrowded slums and shanty towns of developing countries. In rural areas, the promotion of sanitation was largely neglected and had usually a much lower priority than improving water supply. Only during the International Drinking Water Supply and Sanitation Decade (1980-1990) has the importance of sanitation gained wider recognition and led to an increase in research activities in this subsector. Consequently, knowledge of sanitation options, including both on- and off-site solutions for dealing with human wastes has expanded significantly in the last 10 years. However, similarly to the water supply subsector, the past research activities in sanitation focused mainly on technical issues. Therefore, also in the sanitation subsector, the most serious gaps in knowledge are related to non-technical (i.e., institutional, financial and socio-cultural) issues.

Solid Waste Management:

Compared to water supply and sanitation, the problems related to solid waste management in developing countries have received, even during the International Water and Sanitation Decade, very little attention in the past. This is mainly attributed to the fact that the improvement of water supply and the safe disposal of human excreta have been considered more important from a public health point of view. However, on account of rapid urbanisation taking place in Asia, Latin America and Africa, urban SWM is becoming one of the most immediate and serious environmental problems confronting urban governments in developing countries. Inadequate collection and disposal of solid waste is nowadays a major factor in the spread of gastrointestinal and parasitic diseases caused primarily by the proliferation of insect and rodent vectors. Nevertheless, ESAs support to developing countries in the past was basically restricted to the financing of large numbers of expensive refuse collection vehicles and very little research has been done on the basic question how to achieving expanded and sustainable solid waste services to lower income urban areas. In the past, solid waste was merely regarded as refuse. Today, however, it is increasingly considered as a resource, particularly by the informal sector whose role is gaining in importance.

Surface Water Drainage

Storm water drainage is another environmental health intervention measure that is given low research priority in the past. However, the conventional solution, providing large diameter drainage pipes, is often not affordable. Such systems are also vulnerable to blockage in cities where solid wastes collection is inadequate.

e) *Hygiene Behaviour/ Hygiene Education*
Since only few systematic research and studies have been conducted in the past on the socio-economic and cultural influences which affect hygiene behaviour, comparatively little is known why in many cases only a small percentage of the target population is actually using newly installed water supply and sanitation systems.

f) *Water Resource Management*
The Water and Sanitation sector has, in the past, taken a relatively narrow view of the cross-sectoral issue of Water Resource Management. Major emphasis was placed on identifying sufficient water sources to meet supply requirements and very little attention was given to conservation and demand management. Although most ESAs and some borrowing country governments are now prepared to recognise that water is an "economic good" and should be managed as such, very little has been done to date to internalise the actual implications of doing so for sector policy, finance, pricing, and utility management.

7. Needs for Future Research

This section will describe in general terms the suggested future priority research areas. As mentioned earlier, no exhaustive list of specific research topics and activities with given priorities shall be provided.

First of all it should be emphasised, that the principal challenges of the immediate future will not be technological questions - the "hardware" of water supplies, sanitation and waste management- but the "software" issues: How are water, sanitation and solid waste services to be organised and financed ? How can people be trained, organised, and motivated to install, use, and maintain the facilities ? How can institutions develop the sector further and make improvements more sustainable ? How to make better use of existing assets ? How to provide alternative types of systems to serve low-income neighbourhoods.

Institutional issues
There is now an overwhelming evidence of the poor performance of many agencies involved in the water and sanitation sector, especially with regard to providing expected services. It is increasingly clear that, on the one hand, institutional and managerial failures in the public sector are often the major causes for poor performance. On the other hand, in the majority of cases in developing countries, water, sanitation and solid waste services have been provided through the public sector mainly because of concern about "market failure" due to externalities, economies of scale, imperfect consumer information and other "natural monopoly" considerations. Therefore, there is an urgent research need in finding the optimal role of the public and the private sector with regard to planning, designing, building, operating, maintaining, and monitoring water supply, sanitation and waste management schemes. The optimal "division of labour and responsibility" certainly varies for the different subsectors considering the variations in economy of scale, economy of contingency, type of ownership, etc.

Socio-cultural issues

Socio-cultural issues are of course closely related to all of the other issues. Additional research efforts on socio-cultural aspects are mainly needed with regard to hygiene behaviour and with regard to finding appropriate ways of mobilising community support for and participation in the provision of sustainable water supply, sanitation and solid waste schemes in rural, urban fringe and slum areas.

Economic and financial issues

Willingness to pay for alternative technologies and service levels are key information for setting up financially sustainable water supply, sanitation and solid waste management services. Past research efforts in developing methodologies for determining the willingness to pay for water supply has to be expanded to sanitation and solid waste services. The research on willingness to pay should also study how health and hygiene education influences the willingness to pay. Additional research efforts are also needed in studying and developing alternative cost-recovery mechanisms. This research should include investigation of alternative models for financing the sector if or when the costs cannot be covered by beneficiaries.

Technology issues

As referred to in the last section, technology issues have commanded a great deal of attention in the past and water supply has received much more attention than sanitation and solid waste management. Although there is still undoubted need for applied research on specific technological developments in water supply (e.g. simpler techniques for borehole siting and drilling, durable and accurate water meters in intermittent water supplies, simple disinfection methods, defluoridation methods, etc.), the need has shifted towards the development of sanitation and waste management technologies. In the sanitation subsector, there are urgent research needs on questions such as actual sludge accumulation rates in different types of excreta disposal systems, treatment alternatives of septage and nightsoil, a lowering of the construction costs of pit latrines, simple and hygienic techniques for emptying and treating pit latrine contents. More research is also needed on the choice of the appropriate technology-mix in urban areas with high- middle- and low income neighbourhoods. In solid waste management, the use of sophisticated and expensive collection trucks difficult to operate and maintain and generally not suitable for the narrow and unpaved lanes of urban and peri-urban low-income areas is often an important reason for inadequate service coverage. Therefore, the development of appropriate and sustainable collection equipment is necessary. There is also a need for technical research in small-scale composting plants in order to reduce transportation and disposal costs. In all subsectors, special emphasis should be given to technologies which can be managed/operated by the community of beneficiaries.

Water Supply and Sanitation Collaborative Council
Third Meeting of the Working Group on Applied Research
(March 29-31, 1993; Hotel Bellevue, Thun-Hilterfingen)

TENTATIVE AGENDA

Sunday, 28 March 1993

Arrival of participants in Thun-Hilterfingen

Monday, 29 March 1993

09:30-10:00	Welcome; Introduction of participants; Objective and agenda of the meeting; Selection of the rapporteur of the meeting
10:00-12:15	Presentation of the background paper on "Improving the Quality of Research Proposals"; Discussion
12:30	Lunch
14:00-15:30	Continuation of the discussion on the paper on "Improving the Quality of Research Proposals"
15:30-16:00	Tea/Coffee break
16:00-17:30	Presentation of the revised paper on "Priority Areas for Research in the Water and Sanitation Sector"; Discussion
19:00	Dinner

Tuesday, 30 March 1993

08:30-10:00	Presentation of the background paper on "Problems and Issues related to Research Funding"; Discussion
10:00-10:30	Tea/Coffee break
10:30-12:00	Continuation of the discussion on the paper on "Problems and Issues related to Research Funding"
Afternoon	Field trip (**bring a warm jacket and good shoes !**)

Wednesday, 31 March 1993

08:30-10:00	Presentation of the revised paper on "The Process of Applied Research in Water and Sanitation"; Discussion
10:00-10:30	Tea/Coffee break
10:30-12:15	Presentation of the External Review and the present status of GARNET; Discussion on conclusions and recommendations;
12:30	Lunch
14:00-15:30	Discussion on the final product(s) to be presented at the next meeting of the WSS Collaborative Council in Rabat, Morocco.
15:30-16:00	Tea/Coffee break
16:00-17:15	Final dicussion; future actions Closing of the seminar

The authors of the background papers (Margret Mwangola, Andrew Macoun, Cheick Tandia, Terry Pike, Roland Schertenleib) are kindly requested to stay on until Friday, 2 April 1993 in order to finalize the report to be presented in Rabat.

20 March 1993/RSCH

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