



***A FRESH APPROACH***

***TO***

***WATER RESOURCES***

***DEVELOPMENT***

**Overseas Development Administration**  
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**ODA**

## INTRODUCTION

Several international initiatives in the broader water sector commenced in the early 1990s following the conclusion of the International Drinking Water Supply and Sanitation Decade (1981-1990). In the World Bank's development report for 1992 clean water and sanitation were put at the top of developing country priorities and a programme for more efficient management of water resources was recommended. The Dublin Conference on 'Water and the Environment' in January 1992 recommended a change in water resources development to a more holistic and multidisciplinary approach. International concern with water culminated in June 1992 at UNCED in Rio de Janeiro - the Rio Summit. A major output of this conference was Agenda 21 (for the 21st Century) with Chapter 18 concerning itself with "Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the Development, Management and Use of Water Resources".

The joint Natural Resources and Engineering Advisers Conference of July 1992 selected "Priorities for Water Resources Allocation and Management" as its theme because of this increasing international consultation on water, and the perceived need within ODA for greater linkage across its Divisions in water related issues.

Arising from the Advisers' Conference was the recommendation that a multi-disciplinary group should be established to define the key areas of a water resources strategy aimed at helping ODA to define its policy and determine priorities in the sector. This recommendation was accepted within ODA and a working group was established comprising the following members:

Brian Jackson (chairman)	-	Engineering Division
Michael Scott	-	)
Peter Landymore	-	)Natural Resources Division
Jane Cocking/Sam Bickersteth	-	)
David Nabarro	-	Health & Population Division
Peter Kolsky (LSHTM)	-	
Roger Iredale	-	Education Division
Michael Schultz	-	Economic & Social Division
Barry Hefferon	-	EC & International Division
Greg Toulmin/Gareth Aicken	-	Asia Division
Carol Norman (Secretary)	-	Engineering Division

This review of the sector, and the guidance it contains for ODA's future approach to water related development, represents the outcome of the Working Group deliberations.

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# A FRESH APPROACH TO WATER RESOURCES DEVELOPMENT

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## 1. NEED FOR A FRESH APPROACH

1. Water is a natural, but often scarce, resource, essential for human life and all other bio-systems. It is a key element of natural processes (climate, weather systems, land formation and soil erosion), and productive activities (agriculture, fisheries, industry, power and transportation). As a result water has an extremely varied influence on global and local communities, and their environment. It plays a significant part in ODA's programmes, and affects ODA's departmental activities.

2. The 1992 UK National Audit Office report "Overseas Aid: Water and the Environment" suggested a need for a broader and more long-term view of the impact and sustainability of UK aid in water-related sectors. "Agenda 21", arising from UNCED, and the World Bank's Development Report, 1992 demonstrated the need for an integrated approach to ensure a sustainable economic and social environment in the 21st Century.

3. There is a need for greater awareness in ODA of water resources as a sector and for reviewing the approach taken to water related projects. This is not because of any special priority attributable to the water sector, nor the need to define another cross-cutting theme. It is rather a need to bring together common issues that arise from water use with ODA's departmental objectives - especially poverty reduction, environmental protection, and increasing women's role in development. It is relevant to note that the DAC considers the participatory role of women, along with capacity building and integrated water resources management as necessary subjects for consideration at its 1994 meeting on "Water Management".

4. At the outset it is necessary to define the scope and limitation of this review of the sector. It does not cover water resources in the oceans and seas or (in the context of rainfed agriculture) analyse land and water management issues at field level. Both are crucial aspects of the global water cycle, but are better discussed within the context of a renewable natural resources strategy. The focal point of this paper is fresh water resources on the surface and below ground, which affect agriculture (irrigated and rainfed), domestic supplies, hydro-electric power and industrial use.

5. This review should assist with improved identification, formulation and implementation of water related projects, and increase the relevance of research. It considers significant water related problems faced by developing countries and how these are being tackled in-country, and with the help of donors. ODA's own assistance in this sector is examined along with lessons learned from evaluations and policy reviews. The importance of integrated water resources management in achieving successful development is discussed, focused on reducing

technical and socio-economic constraints which hinder successful innovation, transfer of technology and management practices.

## 2. WATER-RELATED PROBLEMS IN DEVELOPING COUNTRIES

### (i) Scarcity, Shortages and Lack of Access

6. Water is a scarce resource in large parts of many developing countries, particularly in Africa and the Middle East. Table 1 shows the countries which suffer from the lowest water availability. Competition between domestic, industrial and agricultural use will intensify as populations grow. Rainfall, and hence river flow, is often unreliable, both temporally and spatially. Despite the ability to conserve surface water in reservoirs or groundwater in aquifers, water shortages are common because of growing population concentrations. This phenomenon, which is particularly noticeable in Asia, also magnifies the problems of flooding when rainfall is in excess.

7. Despite the progress made during the International Drinking Water Supply and Sanitation Decade (IDWSSD), 1981-1990, at least 1.3 billion people, or a quarter of the world's population, still do not have reasonable access to clean water or sanitation. The number of urban inhabitants without these facilities actually grew during the Decade with consequential health affects. The August 1993 report of the WHO/UNICEF Joint Water Supply and Sanitation Monitoring Programme shows coverage on a country basis as a percentage of population served by water supply and by sanitation. An indication of this coverage for countries receiving British aid is given in Table 2.

### (ii) Vulnerability of the Environment

8. In rural and urban areas water resource exploitation impacts on the environment. Farming of fragile land increases soil erosion rates. In marginal areas ecosystems can be disrupted, whilst in rural and urban areas water courses and aquifers can be polluted with human, industrial or agricultural waste. Such misuse of water is unsustainable. Many developing country governments give insufficient priority to prevention of environmental degradation.

### (iii) Inadequate Valuation of Water Resources

9. Water is rarely treated as an economic good, in the sense of a scarce resource to be used as productively - in both the technical and economic senses - as possible. The chief factor is the absence of charging at the point of use. As a consequence water is frequently wasted; its provision does not recover the costs of operation and maintenance - let alone capital outlay; it is misallocated to low-value uses; or is used in a harmful way. Pollution diminishes water quality, with ill effects for

downstream users, but the polluter rarely has to pay. The willingness of people to pay for improved water provision is insufficiently recognised. The design of improvement schemes has not adapted to demand, with over-provision of unreliable facilities. By ignoring demand management, rational allocation between different uses has been prevented, and potential gains in water use efficiency foregone.

(iv) Absence of Policies, Legislation and Planning Capability

10. Few developing countries have clearly defined water policies with agreed priorities for water use. A coordinated approach is required in which various water use sectors cooperate. Institutional deficiencies need rectifying to ensure the effective implementation of sensible water policies.

11. Appropriate legislation to manage water use efficiently is often missing at municipal, national and international levels. Water conflicts could escalate unless bylaws are introduced and enforced, particularly in cities. Water abstraction rights and pollution discharge consents are required for both surface and groundwater. Water-sharing, international treaties are still needed for many major river basins.

12. Water resource planning is insufficiently integrated, and is too often carried out in an ad hoc manner. Few countries recognise that the watershed provides the best unit for the management of water systems at either the upper catchment level or river basin management level, irrespective of where local authority boundaries occur. There is a dearth of reliable long term hydrological data; often due to a lack of appreciation of its importance in the design of sustainable water resource development.

(v) Lack of Participation

13. Centralised and sectoral (top down) approaches are invariably insufficient to address local water management issues. Decisions should be taken as close to the root of problems as possible, ie at the lowest appropriate level, with higher levels providing an enabling environment for integrated management. Participation of users, especially women, is often neglected in the design, operation and maintenance of water projects.

(vi) Technical Constraints

14. There are a wide range of technical problems: wastage of expensively conserved water, (eg 60% of piped water in Manila), and widespread waterlogging and salinisation problems in irrigation schemes. Urban areas face water supply, drainage and sanitation problems due to large demands and waste disposal

problems. Water supply and waste water treatment systems are frequently based on inappropriate designs from the developed world. Severe pollution can be due to poor or absent sewage treatment, discharge of untreated industrial effluent, seepage of agro-chemicals and siltation from deforested upper catchments.

15. Water recycling (an increasing need) requires an interdisciplinary approach to tackle research needs and project development. Wastewater reuse for crop production and aquaculture can cause health problems, and appropriate methods for treating and reusing sewage effluent has not been widely developed. Technical issues remain to be solved on rain-fed land and with irrigation water management in order to increase water-use efficiency and the integrated production of crops, livestock and aquaculture, and to reduce the attendant health risks.

(vii) Shortcomings in Education and Training

16. Education on the origin of water, and on practical aspects of its collection, storage and purification is often missing from school curricula. There is a greater shortage of water technicians than engineers or agriculturalists in most developing countries. Practical training of such "key cadre" staff has also too often been neglected.

3. **HOW THE PROBLEMS ARE BEING TACKLED**

(i) Imperfect Distribution

17. Water is traditionally conveyed from areas of abundance to drier areas by canal or pipeline. Development of the huge Indus basin irrigation system in an otherwise semi-arid area is a good example. Cloud seeding to induce greater rainfall and fog-water harvesting have limited potential. The scope for desalination of seawater is constrained by high energy costs which restrict its use mainly to oil-rich desert states.

18. Seasonal shortages can be alleviated by dam construction, or the development of deep tubewells in both the public and private sectors as in Bangladesh, but all such developments have their attendant environmental and sociological concerns. Likewise seasonal or intermittent flooding can be reduced by flood control measures as planned under the Bangladesh Flood Action Plan; again with its associated social and environmental consequences.

19. Access to treated drinking water in conurbations can be achieved by conventional water abstraction, transmission, treatment and distribution as in the Karachi Water Project. Sewerage can be installed in city centres as in the Cairo Wastewater Project. There is increasing interest in oxidation ponds or lagoons rather than western style sewage treatment

works. ODA funded research at Leeds University on pond design, and at Stirling and the Asian Institute of Technology on aquaculture, is appropriate for further developing lagoon sewage treatment for cities such as Calcutta, and Tunis.

20. Access to safe water and sanitation is declining in many slum and peri-urban areas, and installation of water borne sewerage is of limited value without adequate water supply. ODA slum drainage improvement in Indian cities and the Loughborough (WEDC) development of small bore sewerage systems is relevant in this context. There is also increasing interest by private vendors and entrepreneurs in supplying water and sanitation facilities in such areas where the public authorities are incapable of providing adequate infrastructure. In the rural environment there is much emphasis on shallow groundwater development by means of family and community wells and boreholes for both human and livestock needs. Handpumps for abstraction are now frequently of VLOM (village level operated and maintained) design. Treatment for small scale surface water supplies needs to be simple, robust and effective, and ODA research at Surrey University on filter design, with reduced dependence on disinfection, is particularly relevant.

(ii) Protection of Environment

21. The watershed approach is appropriate for the management of water systems as it can be disaggregated by scale to small scale upland catchment management issues and downstream river basin management. For example the Soil and Water Conservation Branch in the Kenya Ministry of Agriculture has adopted this approach. Extension officers work in rainfed farming areas with local people to analyse local ecological and social conditions and develop an action plan. The study of the farming systems (livestock, agriculture, forestry and aquaculture) and of the people themselves is necessary to understand the social and environmental implications of change. Rainwater harvesting using contour ditches and terraces was promoted in the EMI project in Kenya, and soil and water conservation measures adopted without external assistance in the Machakos Hills. Multiple opportunity water use in rainfed areas is being used in ODA's Aquaculture Outreach project in NE Thailand.

22. Prevention of water pollution from agro-chemical use, particularly in areas of intensive, irrigated agriculture is slowly receiving more attention, but the problems are generally poorly understood. Improvement of irrigated agricultural practices using levelled land, with better inlet control, rehabilitated canal distribution, installation of vertical or horizontal drainage systems, and construction of outfall drainage have all been undertaken with benefits to the agricultural and social environment.



23. Urban and industrial discharges into large rivers such as the Ganges may have limited harmful effect because of the substantial dilution from the receiving river water, but studies such as the ODA funded Ganges Project have enabled the river authority to monitor the impact of the polluting load.

(iii) Water Resource Values

24. LDC interest in comparing the value of water in different uses, against the costs of supply, and the lesser values of its polluted forms, has been limited to date; and there are few appropriate models available for transfer from developed countries. ODA has commissioned research into appropriate pricing policies in the urban environment; and has reconsidered the problems associated with the over-optimistic expectations of health benefits from rural water supply schemes. Following an ODA-funded water conservation study in water-short Bulawayo, block tariffs were introduced in order to reflect the cost to the municipality of supplying varying quantities. There is scope for donors to encourage more attention to the economics of water resource development and use. Hitherto neglected uses may have an enhanced place: for example aquaculture is not widespread in Africa, the reasons for which are currently being explored by an ODA-funded project.

(iv) Policies and Planning

25. Development of water resource policies has attracted donor assistance in a variety of ways. ODA has arranged twinning in St Lucia and in Delhi with UK water authorities in an endeavour to pass on the relevant experience of UK institutions - so far with limited success because of inappropriate procedures. UNDP strongly advocates institutional capacity building, but implementation has proved difficult. It requires long and patient donor involvement, by dedicated and experienced administrators who can rarely be spared from their parent organisations.

(v) Participation

26. Water projects which failed to achieve all their objectives because of inadequate participation by the end users (who did not perceive themselves as "stakeholders") range from the Bura irrigation project in Kenya to those involving unused latrines in the slum areas of India. The important role of women in ensuring the success of water supply and sanitation (WS&S) projects is now better appreciated by recipient countries and donors. Recent examples are the integrated rural WS&S projects in Zimbabwe where the villagers are involved in borehole siting, and women often become pump "mindes" following appropriate training.

(vi) Technical Constraints

27. Projects to ensure improved water treatment, leak detection, introduction of appropriate sewerage technology, increased recycling of water, adoption of aquaculture, enhancement of irrigation efficiencies, maintenance of soil and water fertility etc are all being supported by ODA and other donors. Research to improve the technology across all these areas of interest is also being undertaken. Water related technology development and transfer activities currently promoted by ODA are listed in Table 3.

(vii) Education and Information Collection

28. ODA and other donors are encouraging the introduction of water related educational courses, and the intensification of water and health programmes in rural areas. An example of the latter is the Nepal Eastern Regional Water Supply Programme.

29. Projects to train hydrologists on hydrometric and sedimentation data collection have been undertaken, using the IH developed Hydata system, in countries including Grenada, Honduras and Tanzania. Concern at hydrometric analysis led to an ODA funded review of the hydrology for the Sardar Saravar Dam project in India. Funding for the ODI "Irrigation Management Network" is an example, amongst other networks, of ODA's support for information collection and dissemination.

4. **ASSISTANCE BY DONORS AND LESSONS LEARNED**

(i) Assistance given by ODA

30. It was seen in Section 3 how ODA has been assisting to resolve some of the water related problems outlined in Section 2. However, these problems have not been addressed in a prioritised manner nor within an overall strategy.

31. An indication of priorities attached by the UNCED Conference can be seen in Chapter 18 of Agenda 21 which was concerned with Freshwater Resources. The following seven "programme areas" were selected for attention:

- A. Integrated water resources development and management.
- B. Water resources assessment.
- C. Protection of water resources, water quality and aquatic ecosystems.
- D. Drinking water supply and sanitation.
- E. Water and sustainable urban development.

F. Water for sustainable food production and rural development.

G. Impacts of climate change on water resources.

These programme areas have been used by the EC Expert Group on Freshwater Resources as the basis for reporting by the EC countries to the Commission for Sustainable Development (CSD) as follow-up to UNCED. Although alternative categories can be used, the UNCED programme areas provide a useful and agreed comparative basis for measurement, and have therefore been adopted in this review. Areas D and E together constitute the water supply and sanitation (WS&S) category which has traditionally been used for water sector analysis.

32. Data collection and analysis has concentrated on bilateral project and research work over the last five years for which data is readily available (1988-1992/3). During this period ODA has been active in the water sector in more than 70 countries (see Table 4). ODA has allocated around £40m pa to water related projects, which represents 7.4% of the total allocable bilateral aid for the period. If hydropower expenditure associated with electricity generation and transmission activities is also added, the mean annual expenditure rises to £54m pa.

33. Details of ODA's bilateral expenditure on project activities are shown in Table 5 from which the following is derived:

<u>Programme Area</u>	<u>Project expenditure (1988-1992/3)</u>	
	<u>Mean Annual (£m)</u>	<u>Percentage of Total</u>
A Integrated WR development	2.0	5%
B WR Assessment	1.3	3%
C Protection of sources/ aquatic systems	2.3	6%
D Rural WS&S	8.5	21%
E Urban WS&S	12.3	31%
F Water for food supply	13.1	33%
G Climate change study	0.1	1%
<hr/> TOTAL	<hr/> 39.6*	<hr/> 100%

\* Including country TC funded technology development averaging £2m pa.

34. The combined WS&S programme areas incurred the greatest project expenditure. This represents 3.8% of total bilateral funding. During the Decade the proportion was 4.5% compared with 3.8% for the preceding seven years, largely due to high expenditure on the Malaysia Rural Water Supply ATP Project. From British Aid Statistics, 1987/88-1991/92 it can be seen that the "Water and Sanitation" sector is alone amongst the Public and Communities Services sectors in showing no increase in expenditure during the 5 year period.

35. Details of ODA's expenditure on water related technology development and transfer (TDT) for the latest four years for which data are available are given in Table 6. A summary is given below:

Programme Area	TDT expenditure, 88/89-91/92	
	Mean Annual (£m)	Percentage of Total
A. Integrated WR Development	0.174	5%
B. WR Assessment	0.705	19%
C. Protection of Sources/ Aquatic Systems	0.909	25%
D. Rural WS&S	0.190	5%
E. Urban WS&S	0.442	12%
F. Water for Food Supply	1.122	31%
G. Climate Change Study	0.110	3%
<b>TOTAL</b>	<b>3.653</b>	<b>100%</b>

Study of Table 6 indicates a growing attention by ODA to the protection of water sources and aquatic systems, well ahead of recommendations resulting from the UNCED declaration.

(ii) Work of other Donors

36. Discussions with the World Bank, USAID, CIDA and certain EC donors have determined statistics and policy developments of interest to ODA, and details are given in Annex B. Water supply and sanitation attracts significant support from German, Danish and Dutch aid (10-15% of lending) compared with around 5% for

World Bank and USAID, 4% for ODA and less than 3% from CIDA. Aid for new large scale irrigation and drainage projects in almost all cases has declined to less than 5% since the early 1980s. Greater emphasis is now paid to less costly rehabilitation schemes and improvements to operation and management. For geographical cultural reasons the proportion of such aid from the Asian Development Bank still exceeds 10%, compared with recent UK expenditure of around 2-3%.

37. The post IDWSSD Decade deliberations and the UNCED preparations, coupled with the Southern Africa drought and food shortages elsewhere, have led donors to appreciate the need for more comprehensive and better integrated water resources policies. The Asian Development Bank (ADB), for example, has observed that project formulation in isolation does not contribute a strategy, and recommends that sub-sector activity should be conditional on satisfactory programmes in meeting general water resource objectives. One of USAID's five strategic objectives concerns water resources, with the aim of increasing the efficient use of water, enhancing water quality and improving water management.

38. The World Bank in its Water Resources Management Policy Paper of May 1993, has accepted that a more comprehensive approach will require major policy reform and institutional changes, which will not be easy to achieve as governments will need to relinquish some control of water sector management. Problems such as the need to reflect the true economic value of water, the inadequate or late participation of users, and the necessity to secure reliable data are highlighted in this and other recent reports.

(iii) Lessons of Experience

39. Donor's experience (including ODA's) in water related project assistance has resulted in several lessons being learnt. The following gives an indication of some of the more important:

- (a) Increased domestic water use in urban environments must proceed alongside improved sanitation; lower cost sewerage technologies are required with scope for donors to purchase from LDC sources.
- (b) Expectations of health benefits from rural water supply enhancement have been unrealistic. Social preconditions for health gains are hygiene education, improved sanitation, increased quantities - and then improved water quality.
- (c) All water use changes will have an environmental impact which should be investigated before development. Donors need to ensure that uncertainties

concerning environmental risks are reduced as far as possible, and should not support projects where governments ignore the interests of vulnerable (including unrepresented) social groups.

- (d) Are LDCs persuaded that it is necessary to address water related issues in an integrated manner? Have they the institutional capacity and capability to appreciate the need for a more comprehensive approach?
- (e) The national government role should be to assume primary responsibility for water sector management, including planning donor coordination, policy reform, regulation and institutional and financial aspects of development. (This and similar recommendations for national governments at the highest political levels to take responsibility for water sector planning was made by the USAID funded Water and Sanitation for Health (WASH) project in its 1990 Booklet on "Lessons Learned from the WASH Project.)
- (f) The NGO role is most effective if it is played out in the context of national development plans.
- (g) The quality of management and cost recovery for irrigation schemes should be studied at project appraisal.
- (h) Drainage is an essential component of irrigation; adequate measures including funding are required to counteract health risks from irrigation schemes.
- (i) Groundwater is especially vulnerable to over-exploitation and to long term pollution.
- (j) Adequate incentives must exist for water users to economise and avoid polluting the supply, and for providers to ensure adequate operation and maintenance.
- (k) Pricing of water - ultimately at full opportunity cost - should be encouraged. Users should bear charges in relation to the social costs of abstraction or discharge, with due regard to ability to pay and wealth inequalities.
- (l) Water projects will fail unless they are based on adequate assessment of the water sources and arrangements are in hand for protection of these sources.

- (m) Information deficiencies, for example, regarding ecological impacts of abstraction can be met by external TC and training, if appropriate institutional structures can be found to receive and use them.

## 5. WHAT ODA SHOULD DO

### (i) Overview

40. ODA's bilateral programme has several, well-defined objectives, which must feature prominently in water resources initiatives. The efficient management of water contributes to longer term economic growth - eg improved industrial and hydropower production and inland waterway navigation; helps to alleviate poverty - e.g. increased agricultural production; improves the quality of life of women - e.g. regular domestic water supply; prevents environmental degradation - e.g. watershed management and pollution control; and facilitates economic reform - e.g. introduction of water pricing policies.

### (ii) Our capabilities

41. ODA's water expertise is extensive (see Fig 1). Furthermore, ODA has access to associated bodies and resource centres with strong water sector traditions, such as NRI, HR Wallingford, Institute of Hydrology, university centres in water treatment, irrigation, public health, aquaculture etc (see Annex C). Many British consultants and NGOs have strong water related capabilities. This ability and tradition, gives Britain a comparative advantage over multilateral and many bilateral donors. It is appropriate that this capability should be nurtured and coordinated, enabling ODA to better address water related problems in developing countries within its priorities for assistance.

### (iii) The wider context

42. Sections 1-4 indicate that the quality of aid in many of ODA's priority areas for assistance such as help for the poor, the environment and women in development, would benefit from a more integrated approach to water related activities.

43. There will be a need to target aid for poverty alleviation on countries which suffer from water shortages which curtail agriculture, and where lack of access to clean drinking water and sanitation inhibits social development. It will also be necessary to demonstrate how the natural environment can be protected as a result of water use changes or transfers, developing further the guidance to programme managers in the ODA Manual of Environmental Appraisal. ODA should look for opportunities to cooperate with governments in the development

of systems which recognise the economic cost of supplying treated water and disposing of wastewater, and which establish cost-recovery schemes reflecting consumers' ability and willingness to pay. Projects should be designed to introduce methods for more economic and equitable distribution and improved operation.

44. ODA should promote integrated water resources planning through the development of legislation, institutions and national level policies - again in full cooperation with country officials taking account of cultural practices and political realities, while appreciating that the task will involve difficult decisions and touch on sensitive areas. The comparative advantage of higher level institutions in marshalling resources such as national and regional budgets and integrating planning and implementation should be considered against the advantage of lower level institutions in matching community needs, user accountability and assuring sustainability. Ideas need to be carefully considered to ensure that the beneficiaries of recommendations such as water privatisation are the intended ones.

45. Participation by appropriate user groups is recommended where possible, with local communities encouraged to identify priorities, and implement, operate and maintain systems, particularly in rural and urban fringe areas. Local and British NGOs have an important role to play in developing a sense of ownership. In countries with sympathetic governments ODA can provide assistance in fostering partnerships between user groups and district/regional authorities in order to link water projects with local interests.

46. The report on "Water Resources Planning and Management in Developing Countries", which Engineering Division commissioned from HR Wallingford in 1991, provides useful suggestions for ODA's water resource planning activities. Examples include the recommendations to develop simple procedures to enable ODA to assess the countries which will face critical water resource constraints in the near future, to establish research initiatives in support of strategic planning, and to promote greater international cooperation in regions where shared water resources are significant.

47. Technical problems which constrain efficient water resource development should continue to be addressed by ODA via its technology development and transfer activities, with a greater emphasis on collaboration with local technologists and on linkage between the generic water related research of ODA's associated bodies and country specific requirements. There is scope, for instance, for ODA funded technology development to investigate why many engineering solutions to water problems have failed and to determine which water institutions work best and why. Better dissemination of the benefits of ODA funded water research to



programme managers could improve the quality of country programmes, and assist in ensuring that future research is more needs led.

48. There is considerable scope for health and conservation aspects of water to be taught at schools. This can be encouraged by ODA with its educational work as part of adult literacy projects, especially for women. If communities are to have the capacity to help install and maintain safe water systems themselves, the school curriculum and the teaching that interprets it should concentrate on the practical aspects of water use and delivery. Existing patterns of hygiene behaviour should be considered before health education programmes are developed. Training as well as education should be in-country to the greatest extent possible, where trainers are regularly confronted with the problems that trainees face. ODA should support training courses which face up to the water related problems encountered in the region concerned, allocating regional TC funds as appropriate. Funding of effective information networks should be encouraged.

(iv) The programme area level

49. The above considerations have focused on the priorities for ODA's assistance worldwide, and opportunities that should be taken to address the major water related problems, as discussed in Sections 2 and 3, within these priorities. To focus more closely on the programme areas for water activity discussed in Section 4 the following more specific recommendations are made for consideration within ODA:-

A. Integrated Water Resources Development and Management

50. The importance of water resource management has been stressed. It is recommended that ODA's assistance with river basin management planning and, institutional capacity building should encourage appropriate enabling environments in selected countries to permit optimal water-related development. Where we consider that an assessment of a country's water resources is required we should concentrate on building up the organisation to undertake it. Our economic pricing studies should continue, in dialogue with relevant institutions, aiming at a more consistent approach to the economic justification of water related projects, and the introduction of better pricing mechanisms in the countries concerned.

B. Water Resources Assessment

51. Scientific study of aspects of water resources which is undertaken at research establishments on behalf of ODA should continue where shown to be relevant in assisting the needs of developing countries and improving the quality of ODA's

assistance. Hydrometric (meteorological, hydrological and hydrogeological) data collection and archiving should be actively promoted by ODA, and the opportunity taken to stimulate an interest in the importance of this aspect of water resource development amongst politicians and decision makers.

#### C. Protection of Water Resources, Water Quality and Aquatic Ecosystems

52. Interventions influencing water use must take account of environmental concerns such as pollution through agro-chemicals which can damage human health and aquatic ecosystems. Recycling schemes need to be encouraged as they have the potential to both prevent environmental damage and allow scarce resources to be used more effectively.

53. ODA may be required to advise governments on industrial water requirements or the consequences of effluent discharges including cooling water. The hydrological and water quality modelling capability of the UK water industry, universities and research institutions should be borne in mind for such work. Major hydro-electric projects, as well as large irrigation schemes, require significant storage to even-out the flows for supply. ODA can draw upon extensive experience to advise on reservoir design (and the attendant environmental, ecological and social disturbances), and should be prepared to promote this experience for use in multi-donor or IFI financed projects.

#### D/E Water Supply, Sanitation and Sustainable Urban Development

54. Access to the basic human requirement of safe drinking water and adequate sanitation is still denied to large sections of developing country populations. Britain has considerable expertise in this important sub-sector. Bilateral project funding and technology development expenditure in operational and post-project analysis should reflect its importance.

55. Opportunities could be considered for more concentrated involvement in WS&S work in peri-urban areas where so many of the poor live without reasonable access to safe water or hygienic sanitation, and where the need for relief will increase at the greatest rate. The aim should be to improve health and the quality of life, drawing on relevant research of such resource centres as WEDC and LSHTM. The quality of our input should also benefit from a continued, active participation in the UNDP/World Bank WS&S Programme and professional working parties of the Water Supply and Sanitation Collaborative Council which held its second general meeting in Morocco during September 1993.

56. The needs of the city centre populations should not be ignored. ODA should be prepared to consider requests in targeted countries for assistance to extend or rehabilitate urban WS&S

reticulation, treatment and disposal facilities. The dialogue between ODA advisers and UK manufacturing industry needs to be maintained. Sustainability needs to be addressed through consideration of local cost contributions and cost recovery at appraisal. ODA may need to assist urban WS&S projects financially for longer periods than in the past.

57. ODA should take full account of research and evaluation findings when supporting rural WS&S projects. When collaborating with NGOs ODA should be aware of the administrative problems of small scale projects and the limitations of leverage. Up-dating of ODA's "Manual for the Appraisal of Rural Water Supplies", which was produced in 1984, will need to bear this in mind. When responding to emergency requests for assistance in times of drought and flooding ODA should consider the possibilities of refurbishing water systems which have failed rather than the introduction of new ones, to make this response more effective.

#### F. Water for Sustainable Food Production and Rural Development

58. Pressure on finite land and water resources will continue to increase in order to provide food for growing populations. Irrigation is seen as an appropriate option in many countries with unreliable or seasonal rainfall. On some projections irrigated agriculture will provide 60% of world food production by the early 21st century as compared to 40% now. Irrigation is a large, but often wasteful, user of water.

59. The emphasis of ODA's larger scale interventions in irrigated agriculture should be on the rehabilitation, operation and management of inefficiently run schemes. The philosophy underpinning the ODA's activities should be full cost recovery and the encouragement of community participation. The ODA's "Guidelines on the Appraisal of Irrigation Projects" provide a framework for designing such interventions. Success will depend not simply on the efficient distribution of water, but, crucially, on developing sustainable and profitable farming systems, including aquaculture, which are location and farmer-specific. In many parts of the world groups of farmers have developed small-scale, 'informal' irrigation schemes and ODA should encourage appropriate initiatives. Such schemes often supplement rainfed agriculture.

60. Rainfed agriculture provides a livelihood, in full or in part, for the majority of rural households in the developing world. The opportunity cost for water deposited as rainfall is often low and soil penetration to provide crops is the most effective if not the sole potential use. However, at watershed level there is often genuine competition for rainwater and an analysis of competing demands is required. Projects should be planned in the context of the overall water resources available using an inter-disciplinary approach.

G. Impacts of Climate Change on Water Resources

61. ODA will need to monitor the activities of the UK and international scientific community concerned with the causes and effects of climate change, to prepare in good time for calls of assistance from severely water-stressed countries. Technology development and transfer, and scientific institution building, in this area will also need to continue to enable LDCs to appreciate the extent and significance of man's impact on climate change and the consequential effect on water availability and resource development.

TABLE 1

## WATER AVAILABILITY IN SELECTED COUNTRIES

(Annual internal renewable water resources, 1990)  
(Source - "World Resources, 1992-93")

Country	1000m <sup>3</sup> /capita	Country	1000m <sup>3</sup> /capita
<b><u>AFRICA</u></b>		<b><u>ASIA</u></b>	
Main recipients <sup>1</sup> of UK aid:		Main recipients:	
Kenya	0.59	India	2.17
Malawi	1.07	Bangladesh	11.74
Mozambique	3.70	Pakistan	2.43
Zambia	11.35	Indonesia	14.02
Uganda	3.58	Malaysia	26.30
Zimbabwe	2.37	China	2.47
Tanzania	2.78	Sri Lanka	2.51
Sudan	1.19	Nepal	8.88
Ghana	3.53		
Nigeria	2.31		
Egypt	0.03 <sup>3</sup>	Other Countries:	
Ethiopia	2.35	Cambodia	10.68
-----		Maldives	N.A
Other countries <sup>2</sup>		Thailand	1.97
Somalia	1.52	Philippines	5.18
Senegal	3.15	Myanmar (Burma)	25.96
Lesotho	2.25	Jordan	0.16
Niger	1.97	Turkey	3.52
Botswana	0.78	West Bank/Gaza	< 0.10 e
Mauritius	1.99	Yemen	0.12
Seychelles	N.A		
Burkina Faso	3.11		
Cameroon	18.50		
Gambia	3.50		
Liberia	90.84		
Sierra Leone	38.54		
Swaziland	6.82		
Zaire	28.31		
Namibia	N.A		

**Notes:**

<sup>1</sup> Countries among the annual top ten recipients during the period 1988-1992.

<sup>2</sup> Other countries receiving water-related aid during the last five years.

<sup>3</sup> Egyptian water resources are almost entirely dependent on R Nile inflow.

N.A = Not available.

e = estimated

Country	1000m <sup>3</sup> /capita	Country	1000m <sup>3</sup> /capita
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**AMERICAS**

Main recipients:

Jamaica 3.29

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Other countries:

Honduras 19.85  
 Mexico 4.03  
 Bolivia 41.02  
 Brazil 34.52  
 St Lucia N.A  
 Grenada N.A  
 Barbados 0.20  
 Antigua N.A  
 Colombia 33.63  
 Dominica N.A  
 Guyana 231.73  
 Paraguay 21.98  
 Peru 1.79  
 St Vincent N.A

**EUROPE**

UK (for comparison purposes) 2.11

**DEPENDENCIES**

Main recipients:

St Helena N.A

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Other countries:

Anguilla N.A  
 Turks & Caicos N.A  
 Falklands N.A  
 Gibraltar N.A  
 Montserrat N.A  
 British Virgin Islands N.A

**OCEANIA**

Fiji 33.12  
 Kiribati N.A  
 Solomon Islands 149.00  
 Vanuatu N.A

TABLE 2

**WATER SUPPLY AND SANITATION COVERAGE IN COUNTRIES  
RECEIVING BRITISH AID IN THE WATER SECTOR**

(sector status at 31 Dec 1991 - Data from WHO/UNICEF)

	Percentage of Population Served			
	Rural WS	Urban WS	Rural Sanitation	Urban Sanitation
<b><u>AFRICA</u></b>				
Main recipients:				
Kenya	42	74	35	69
Malawi	N.A	N.A	N.A	N.A
Mozambique	N.A	N.A	N.A	N.A
Zambia	28	70	12	75
Uganda	N.A	43	28	63
Zimbabwe	33	80	N.A	N.A
Tanzania	45	65	62	74
Sudan	43	55	65	89
Ghana	35	93	32	64
Nigeria	30	81	30	40
Egypt	N.A	N.A	N.A	N.A
Ethiopia	19	91	7	76
-----				
Other countries:				
Somalia	N.A	7	N.A	N.A
Senegal	26	84	36	85
Lesotho	N.A	N.A	N.A	N.A
Niger	N.A	N.A	N.A	N.A
Botswana	N.A	N.A	N.A	N.A
Mauritius	N.A	N.A	N.A	N.A
Seychelles	N.A	N.A	N.A	N.A
Burkina Faso	N.A	78	N.A	77
Cameroon	27	100	64	100
Gambia	N.A	N.A	N.A	N.A
Liberia	N.A	35	55	55
Sierra Leone	37	33	49	92
Swaziland	N.A	N.A	N.A	N.A
Zaire	N.A	N.A	N.A	N.A
Namibia	35	98	N.A	N.A
<b><u>ASIA</u></b>				
Main recipients:				
India	85	87	2	53
Bangladesh	81	82	26	63
Pakistan	45	80	10	55
Indonesia	43	68	36	64

Percentage of Population Served				
	Rural WS	Urban WS	Rural Sanitation	Urban Sanitation
Malaysia	N.A	N.A	N.A	N.A
China	81	N.A	95	N.A
Sri Lanka	64	100	56	73
Nepal	39	67	3	52
-----				
Other countries:				
Cambodia	33	65	8	81
Maldives	33	100	N.A	100
Thailand	72	87	72	80
Philippines	79	85	62	78
Myanmar (Burma)	N.A	37	35	39
Jordan	N.A	N.A	N.A	N.A
Turkey	N.A	N.A	N.A	N.A
West Bank/Gaza	N.A	N.A	N.A	N.A
Yemen	30	61	60	87

### AMERICAS

Main recipients:

Jamaica	100	100	80	100
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Other countries:

Honduras	63	98	43	98
Mexico	68	81	17	70
Bolivia	27	77	13	40
Brazil	N.A	N.A	N.A	N.A
St Lucia	N.A	N.A	N.A	N.A
Grenada	N.A	N.A	N.A	N.A
Barbados	100	100	100	N.A
Antigua & Barbuda	N.A	N.A	N.A	N.A
Colombia	N.A	N.A	N.A	N.A
Dominica	95	97	98	100
Guyana	51	90	89	90
Paraguay	24	50	67	56
Peru	9	76	20	76
St Vincent/Grenadines	85	100	100	100

### DEPENDENCIES

Main recipients:

St Helena	N.A	N.A	N.A	N.A
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Percentage of Population Served				
	Rural WS	Urban WS	Rural Sanitation	Urban Sanitation

Other countries:

Anguilla	N.A	N.A	N.A	N.A
Turks & Caicos	N.A	N.A	N.A	N.A
Falklands	N.A	N.A	N.A	N.A
Gibraltar	N.A	N.A	N.A	N.A
Montserrat	27	100	N.A	100
British Virgin Islands	100	100	100	100

OCEANIA

Fiji	N.A	N.A	N.A	N.A
Kiribati	N.A	N.A	N.A	N.A
Solomon Islands	N.A	N.A	N.A	N.A
Vanuatu	N.A	N.A	N.A	N.A

N.A - Not available

TABLE 3 AREAS OF WATER RELATED TECHNOLOGY DEVELOPMENT  
AND TRANSFER PROMOTED BY ODA

NATURAL RESOURCES

- Desertification
- Crop water use, dryland farming constraints
- Soil and water management and conservation.
- Soil pollution by fertilisers and leaching processes.
- Land degradation and future research requirements.
- Forestry practices and stream flow, sedimentation and water quality.
- Natural and agro-forestry conservation and management.
- Hydro-dams and the sustainability of forest ecology.
- Deforestation and climate.
- Rainfall monitoring.
- Applied meteorology and Satellite forecasting.
- Climate change.

EDUCATION

- Female participation in education.
- Curriculum studies.

ECONOMIC & SOCIAL

- International aid and the environment.
- Land, housing and urban development.
- Agricultural and rural development.
- Small scale agro-forestry and food security.
- Cost-benefit Studies.
- Managing water as an economic resource.

ENGINEERING

- Water resources management and environment impacts.
- Trees and land use systems, water use, productivity, soil structure, environmental and surface water resource impacts. Rain forest processes.
- Impacts of irrigation and urbanisation on groundwater quality. Groundwater development processes, iron removal processes, saline intrusion modelling.
- Soil stability, erosion and control processes.
- Reservoir and channel hydraulics, sedimentation and control, leakage, linings and maintenance.
- Local and international irrigation management and resource planning. Use of shallow aquifers, small-scale processes, disease control.
- Climate, meteorology and micro-meteorology, rainfall estimates, remote sensing techniques, hydrometry, hydrology and hydrogeology, mapping and source location.
- Water treatment and disinfection processes, pipe and handpump testing supply system maintenance and rehabilitation. Quality evaluation and service surveillance techniques.
- Wastewater treatment using stabilisation ponds, hydroponics and coagulants. Reduced cost sewerage. Pit emptying technology. Soakage of effluents to ground. Service surveillance. Drainage and sewerage infrastructure manuals.
- Water turbines and micro-hydro generator and software testing. Environmental management. Wind and solar pumping systems. Geothermal exploration.

HEALTH AND POPULATION

- Hygiene and health interventions, monitoring and assessment of impacts, diarrhoeal diseases, requirements during slum improvements.
- Pathogen removal in stabilisation ponds. Health risks of wastewater reuse.
- Water related disease vectors, control methods and epidemiology.

TABLE 4

RECIPIENTS OF WATER-RELATED AID<sup>1</sup> 1988 TO 1992

Number of projects in main programme areas				
	WS & S D/E	Water for Food Supply F	Others A/B/C/G	Tech & Dev (1990-91)
<b><u>AFRICA</u></b>				
Main recipients <sup>2</sup> :				
Kenya	6	1	5	3
Malawi	7	1	1	-
Mozambique	3	1	2	-
Zambia	2	-	1	1
Uganda	5	-	1	-
Zimbabwe	6	2	4	12
Tanzania	1	-	-	-
Sudan	3	12	3	-
Ghana	9	3	3	1
Nigeria	1	-	3	2
Egypt	4	1	4	5
Ethiopia	3	-	2	-
-----				
Other countries:				
Somalia	1	3	1	2
Senegal	4	1	2	-
Lesotho	13	-	1	-
Niger	-	-	-	2
Botswana	3	1	1	2
Mauritius	1	1	4	3
Seychelles	4	-	-	-
Burkina Faso	1	1	-	-
Cameroon	3	-	-	-
Gambia	2	-	-	-
Liberia	1	-	-	-
Sierra Leone	3	-	-	-
Swaziland	3	-	1	-
Zaire	-	-	1	-
Regional	1	-	1	3
SADC	-	-	1	-
<b><u>ASIA</u></b>				
Main recipients <sup>2</sup> :				
India	12	3	20	6
Bangladesh	4	9	6	-

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Number of projects in main programme areas

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	WS & S D/E	Water for Food Supply F	Others A/B/C/G	Tech & Dev (1990-91)
Pakistan	7	32	4	2
Indonesia	-	3	5	1
Malaysia	2	1	6	2
China	5	2	6	-
Sri Lanka	4	1	6	3
Nepal	6	-	-	2
-----				
Other Countries:				
Cambodia	-	-	1	-
Maldives	1	-	-	-
Thailand	2	3	3	4
Phillipines	-	-	-	4
Myanmar (Burma)	-	-	-	1
Jordan	1	-	2	1
Turkey	1	-	1	-
West Bank/Gaza	1	-	-	-
Yemen	3	-	-	-
Regional	1	6	1	-

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**AMERICAS**

Main recipients<sup>2</sup>:

Jamaica	2	-	-	1
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Other countries:

Honduras	4	-	-	-
Mexico	1	1	-	3
Bolivia	1	1	-	1
Brazil	2	-	4	4
St Lucia	4	-	-	-
Grenada	3	-	1	-
Barbados	1	-	-	1
Antigua & Barbuda	1	-	1	-
Colombia	2	-	-	-
Dominica	1	-	-	-
Guyana	-	1	-	-
Paraguay	1	-	-	-
Peru	3	-	2	-
St Vincent/Grenadines	-	-	1	-

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Number of projects in main programme areas

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	WS & S D/E	Water for Food Supply F	Others A/B/C/G	Tech & Dev (1990-91)
<b><u>DEPENDENCIES</u></b>				
Main recipients <sup>2</sup> :				
St Helena	11	2	1	-
-----				
Other countries:				
Anguilla	2	-	1	-
Turks & Caicos	4	-	-	-
Falklands	2	-	-	-
Gibraltar	9	1	1	-
Montserrat	3	-	-	-
British Virgin Islands	2	-	1	-
<hr/>				
<b><u>OCEANIA</u></b>				
Fiji	2	-	1	-
Kiribati	1	1	-	-
Solomon Islands	2	-	-	1
Vanuatu	2	-	1	1
Regional	-	-	1	-
<hr/>				
<b><u>EUROPE</u></b>				
Cyprus	1	-	1	1
<hr/>				
<b><u>WORLD</u></b>				
(Unallocated)	8	7	6	4

<sup>1</sup> Not including disaster relief or JFS projects

<sup>2</sup> Countries among the top ten recipients in any of the years 1988-1992 (generally averaging about £10m pa)

TABLE 5

WATER RELATED PROJECT EXPENDITURE, 1988-92

(£'000)

(Derived from Statistics Dept Economic Sector Data)

Agenda 21, Chapter 18 Programme Area	1988	1989	1990	1991	92/93 <sup>2</sup>	5 year Mean
A. Integrated W.R Development <sup>1</sup>	1640	2251	2279	2241	1503	1983
B. W.R Assessment	936	1101	1231	1620	1698	1317
C. Protection of Sources	1045	1429	2963	2815	3163	2283
D. Rural WS&S	10097	12514	6288	6984	6659	8508
E. Urban WS&S <sup>1</sup>	10588	10911	13372	14866	11567	12261
F. Water for Food Supply <sup>1</sup>	15663	10798	20127	9670	9062	13064
G. Climate Change Studies	74	86	79	121	144	101
<b>TOTAL</b>	<b>40043</b>	<b>39090</b>	<b>46339</b>	<b>38317</b>	<b>33796</b>	<b>39517</b>
Percentage of allocable Bilateral Aid	7.7%	7.9%	8.6%	6.7%	6.1%	7.4%
WS&S (D&E) as % age of Bilateral Aid	4.0%	4.7%	3.5%	3.7%	3.3%	3.8%
Total including hydro-power activity such as power generation & transmission	53327	57682	58108	52490	46636	53649

**NOTES:**<sup>1</sup> Including water resources activities also associated with hydro-power development<sup>2</sup> Financial Year

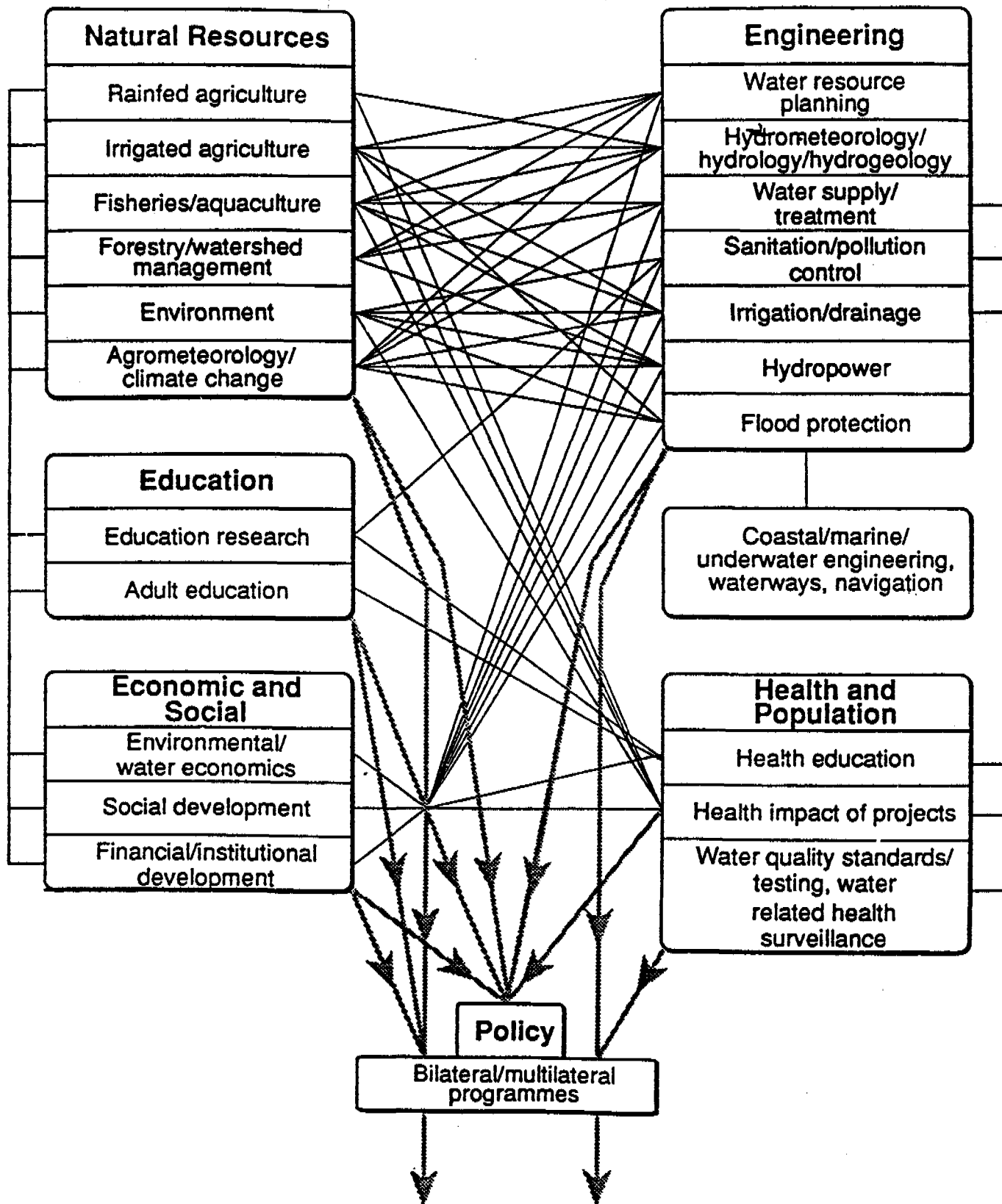
TABLE 6

EXPENDITURE ON WATER RELATED TECHNOLOGY DEVELOPMENT AND  
TRANSFER 1988/89- 1991/92

(£'000) (Data from NRI collated research statistics)

Agenda 21, Chapter 18 Programme Area	88/89	89/90	90/91	91/92	Four Yr Mean
A. Integrated W.R Development	188	112	189	206	174
B. W.R Assessment	747	629	653	791	705
C. Protection of Sources	759	602	1069	1213	909
D. Rural WS&S	167	155	233	205	190
E. Urban WS&S	292	265	678	531	442
F. Water for Food Supply	1068	1197	1037	1184	1122
G. Climate Change Studies	93	115	103	130	110
<b>Total</b>	<b>3314</b>	<b>3075</b>	<b>3962</b>	<b>4260</b>	<b>3653</b>

**NOTE:** Some of the above expenditure from country TC funds is also included in project related expenditure shown in Table 5.



**Figure 1 Water Related Inter-disciplinarity within ODA**



## ANNEX A

### BIBLIOGRAPHY

Asian Development Bank; Asia Water Resources Study, December 1991.

Bolton P; Water Resources Planning and Management in Developing Countries, HR Wallingford, February 1992.

Danida; Sector Policies for WS&S, Copenhagen, April 1992.

Danida; Copenhagen Report: Implementation of Mechanisms for Integrated Water Resources Development and Management. Nordic Freshwater Initiative for UNCED (Rio de Janeiro) 1992 and ICWE (Dublin) 1992. Ministry of Foreign Affairs, Denmark.

Elahi A; Review of Irrigation Strategy in Sub-Saharan Africa. AFTAG/AGRTN Regional Study Initiating Memorandum (Draft Revision 01). World Bank, Washington DC (unpublished), September 1992.

IHE/UNDP; A Strategy for Water Sector Capacity Building, Delft, June 1991.

Johnson S.H; Progress and Problems of Irrigation Investment in South and South East Asia, Water International 15 (1990) 15-26 IWRA, USA.

Kalbermatten J, De Anne S, & Gunnerson C; Appropriate Technology for Water Supply and Sanitation: Technical and Economic Options World Bank, Washington DC, USA, December 1980.

Le Moigne G and Briscoe J; Water Resources Problems in Developing Countries: New Approaches and Policy Changes. Paper presented at WSSCC Conference, Oslo 18-20 September 1991.

National Audit Office; Overseas Aid: Water and the Environment. Final Report 24 March 1992.

OAU/UNICEF; Africa's Children, Africa's Future. Background Sectoral Papers for the OAU International Conference on Assistance to African Children. Dakar, Senegal, 25-27 November 1992. OAU, Addis Ababa, Ethiopia. UNICEF, New York.

ODA; Report of the Natural Resources and Engineering Advisers Conference, July 1992.

ODA; Evaluation of ODA-Funded Development of Hydraulics Research Limited Numerical Model for long-term Prediction of Salinity Intrusion of Estuaries: EVSUM EV284 Renewable Natural Resources.

ODA; Salinity Control and Reclamation Programme: Pakistan 1989. EVSUM EV 474, Renewable Natural Resources.

ODA; Indonesia: Water Consultancies - 1984 EVSUM EV309 Renewable Natural Resources.

ODA; North Somalia Sprinkler Irrigation project: 1979 EVSUM EV103 Renewable Natural Resources.

Summary of Paper on GTZ experience, October 1992.

Ramachandran A; Keynote address at Conference on Water and the Environment, Royal Institute of International Affairs, London 18 November 1992.

Rogers P: Comprehensive Water Resources Management. A Concept Paper. WPS 878. Infrastructure and Urban Development Dept, World Bank, Washington DC, March 1992.

Safe Water 2000 Global Consultation, Delhi, 1990

SDC, Swiss Development Corporation Sector Policy on WS&S, Berne, August 1993.

Tiffen M (Ed); Environmental Change and Dry Land Management in Machakos District, Kenya: Production Profile. ODI Working Paper No 55, 1991.

UNCED; Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the Development, Management and Use of Water Resources. Agenda 21 Chapter 18 UNCED Conches Switzerland, June 1992.

UNDP-World Bank; Improving Services for the Poor. A Program Strategy for the 1990's. UNDP - World Bank Sanitation Programme, Washington DC, July 1992.

USAID, Bureau for the Near East; Water Resources Action Plan for the Near East, Washington, January 1993.

WASH; Lessons Learned from the Wash Project - Ten years of WS&S Experience in Developing Countries, USAID Washington, April 1990.

White J.M: Quantification of Rural Water Supply Benefits. Draft report for ODA. September 1991.

WHO/UNICEF; WS&S Sector Monitoring Report 1993, Geneva, August 1993.

Winpenny J.T; Economic Policies for Water Management in Developing Countries. A report on Phase I of a research project for ESCOR. Overseas Development Institute, December 1991.

World Bank; Annual Report 1992. Washington DC, USA.

World Bank; India: Irrigation Sector Review. Volume II Supplementary Analysis. Report No 9518-IN. Washington DC, USA December 1991.

World Bank; Water Resources Management: A Policy Paper Washington DC, May 1993.

World Bank; Water Supply and Sanitation projects. The Bank's Experience 1967-1989, Washington DC, June 1992.

World Bank; Portfolio Management. Task Force Report, Washington DC, October 1992.

World Bank; World Development Report 1992: Development and the Environment, Oxford University Press, 1992.

World Health Organisation; Global Forum. Main Report. Volume 1. Proceedings of the Water Supply and Sanitation Collaborative Council (WSSCC) Conference, Oslo 18-20 September 1991. WHO. Geneva, Switzerland, January 1992.

World Meteorological Organisation; Keynote Papers for International Conference on Water and the Environment (ICWE): Development Issues for the 21st Century. 26-31 January 1992, Dublin, Ireland. ICWE Secretariat; WHO, Geneva, Switzerland.

## ANNEX B

### WATER-RELATED AID/POLICY OF ODA COMPARED WITH OTHER DONORS

Discussions with the World Bank, USAID and CIDA and others have determined statistics and policy developments of interest to ODA. The following data cover varying periods, and are categorised slightly differently for each donor.

#### ODA

(i) FUNDING STATISTICS (1988-1992 5 yrs)

<u>Sub Sector</u>	<u>Percentage of Bilateral Aid</u>	<u>Comment</u>
WS and Sanitation	3.8%	Steady over long period
Irrig & Drainage	2.4%	Declining since mid 80's
Wat Resources Management, etc	1.2%	Recently increasing
<hr/> Total Water Related	7.4%	(Declined to 6.1% by 1992/93)
<hr/> Total including all hydropower	10.0%	

#### WORLD BANK

(i) STATISTICS (1967-1989, 23 years)

WS & Sanitation	4.8%	Peaked at 9.2% in 1979
Irrig & Drainage	6.4% <sup>1</sup>	Reducing. Now less than 3%
<hr/> Total Water Related	11.2%	Currently nearer to 10%
<hr/> Total including all Hydropower	14%	

Note <sup>1</sup> For 32 period, 1960-1992

(ii) POLICY

Board approval of a new Water Resources Management Policy was given in July 1993. Water resources management should now follow

the principles of comprehensive analysis, opportunity cost pricing, decentralisation, participation and environmental protection based on integrated river basin management, aiming for:

- (i) more efficient water service delivery and sewage collection, treatment and disposal;
- (ii) modernised irrigation practices, greater attention to cost recovery drainage and salinity control & agric input pollution;
- (iii) more extensive and effective industrial pollution control and groundwater protection;
- (iv) more vigorous attention to the protection of the environment and to minimising resettlement.

Giving priority to countries with significant water resource management problems the Bank will assist in formulating policy and water sector strategies. Lending will be restricted if such policies are not undertaken. Two regions (MENA) and (S.Asia) are producing Strategies for Managing Water. For each MENA country the Bank will prepare a Water Sector Issues Paper, and Bank sector work will reflect the Country Water Assessment requirements prepared by government. The new water policy will be reviewed in two years.

#### USAID

- (i) STATISTICS (1991-93, 3 years)  
(very approximate)

Water Quality (WS & San) -	5%	
Irrigated Agriculture -	1%	Declined very sharply since 1970s
Water Res Management (broad category) -	3%	Increasing
<hr/>		
<u>Total Water Related</u> -	<u>9%</u>	

- (ii) POLICY

The era of large scale USAID funded irrigation and water projects is ending. USAID supports programmes such as WASH (Water & Sanitation for Health) which is active in Africa, and Latin America, and ISPAN (Irrigation Support Project for Asia and the Near East). ISPAN is the focus of water resources thinking within AID. Of USAID's five strategic objectives one is concerned with water resources with the aim of increasing the efficient use of water, enhancing water quality and improving water management. (Other strategic objectives concern private sector activity, governance, contraceptive measures, maternal and child health services). The Bureau for the Near East has launched its Water Resources Action Plan for the Near East where

water scarcity, competition, quality and management are the concerns. Egypt will continue to dominate USAID water resources investments in the region. Asia Bureau is preparing its Action Plan, and competition, quality and management are the prime concerns. Water resources assistance is likely to become more pronounced globally in the next few years, both due to political (top down) and bottom-up interest. In the Dominican Republic, for example, water resources is USAID's top aid priority.

#### CIDA

(i)	<u>STATISTICS</u>	(1988/89 - 90/91, 3 yrs)
WS & Sanitation	-	2.5% Declined since 75/76 peak
Irrig & Drainage	-	1.7% Steady throughout 80's
Multipurpose	-	0.5% Declined since early 80's
<hr/>		
Total Water Related	-	4.7% This represents a large fall since the peak when it reached 15-20%

Total including all Hydropower 6.0% HEP has declined since early 1980s.

#### (ii) POLICY

CIDA is likely to increase its aid to WS&S but with greater emphasis on training, and a possible switch in emphasis from Asia to Africa. Many WS&S projects will continue via Canadian NGOs, but CIDA is generally moving to larger projects for programme concentration. Of five new thematic programmes CIDA is likely to have a water related input with three of them. CIDA is active on international water issues because of its US/Canada water boundary experience. It thus gains international credit with modest expenditure.

#### GERMANY

##### (i) STATISTICS (1990-92, 3 yrs)

WS & Sanitation (including WR Management)	11.5%*	growing steadily since 1983 when its was 4%
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\*expected to reach over 20% in 1993, of which nearly nine tenths will be capital aid.

#### OECD COUNTRIES

The DAC is collecting data during 1993 from member countries on their water-related aid expenditure as part of their response to the CSD. This will be reviewed in March 1994 at a meeting on water resources development and management. Aid expenditure information from all OECD member countries will then be available.

## ANNEX C

### BRITISH AREAS OF STRENGTH IN THE WATER SECTOR

#### 1. General

There is an extensive British tradition of involvement with developing countries (DC). This occurs not only at government level but also includes commercial and educational organisations, NGO's etc. To a great extent this is based on active and historic links with Commonwealth countries, resulting in a wide range of experience, knowledge and expertise in many aspects of development. Areas of particular experience include Water and Sanitation and Irrigation.

#### 2. Multidisciplinary Approach

There is a recognition that many problems cannot be solved by one set of experts working in isolation. This is reflected in many of the educational programmes that exist and increasingly in the research and consultancy sectors too, involving engineers, agronomists, environmentalists, health experts, economists sociologists, etc.

#### 3. Education and Training

UK is a leading country for the training of water and sanitation engineers for DCs, training British, European and DC engineers. Increasingly this training is being transferred to DCs and includes a strong emphasis on practical experience and appropriate, sustainable technology. Similar training occurs in irrigation and other agricultural sectors.

#### 4. Commercial

The comparatively small size of the UK market encourages consultants and organisations to seek overseas work, while the recent changes in the UK water sector have strengthened theoretical and practical skills in river basin management, institutional strengthening, pollution, the environment etc.

#### 5. NGO's

Oxfam, Water Aid, Save the Children, VSO, Red R and Intermediate Technology are among many NGO's recognised as having wide-ranging skills and experience in the sector, presenting models for other organisations nationally and internationally. Other UK NGO's have similar experience, particularly in the rural and peri-urban communities.

#### 6. Resources and Research

Particular institutions and resources include:

Hydraulics Research (Wallingford)  
British Geological Survey (Hydrogeology Unit)  
Institute of Hydrology

Natural Resources Institute  
Institute of Aquaculture, Stirling University  
Overseas Development Institute (ODI)  
Cranfield Institute of Technology (Silsoe)  
Dept of Civil Engineering (Wastewater Treatment), Leeds  
University  
London School of Hygiene and Tropical Medicine  
Water Engineering and Development Centre (WEDC),  
Loughborough University  
Institute of Irrigation Studies, Southampton University  
Centre for Environmental Health and Water Engineering,  
Surrey University  
Irrigation Management Network (IMN) (via ODI)  
Global Applied Research Network (GARNET) (via WEDC)  
International Program for Technology Research in Irrigation  
and Drainage (IPTRID) (via HR Wallingford)  
International Water Supply Association (based in London)  
International Association for Water Quality (based in  
London)  
Water Research Centre (Swindon and Medmenham)  
Water Training International, Tadley