



Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the Development, Management and Use of Water Resources 1995

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Protection of the Quality and Supply of Freshwater Resources:
Application of Integrated Approaches to the Development,
Management and Use of Water Resources*
Report of the Secretary-General

INTRODUCTION

1. Key issues of concern regarding the state of the global freshwater resources have emerged during the preparatory process of the Comprehensive Assessment of the Freshwater Resources of the World. The use of water in many regions of the world give serious reasons for concern as to the long-term sustainability, particularly when the need for the preservation of natural ecosystems is taken into account. The Comprehensive Assessment shows that, at the present time, as much as one-third of the world population live in countries suffering from moderate to severe water resources stress in terms of water use relative to availability. Furthermore, by 2025, as much as two-thirds of the world population could be living in water-stressed countries. With population increases, economic growth and rising living standards, it may be necessary to use most of the world's readily-accessible renewable water resources to satisfy the needs of agriculture, industry and households, as well as the need to maintain adequate river flows and to protect aquatic ecosystems.

2. Because of the significant link between water resources and agriculture, forestry, terrestrial and aquatic ecosystems and urban development, degrading water quality and the misuse of available water resources further impose a major threat to the health and development possibilities of the population in large areas of the world, even in areas currently with abundant water resources. The present life-style changes and aspirations including significant increases in standard of living and per capita income, continued rapid population growth, industrial development, agricultural trends and increased urbanization, all demands higher water consumption in the decades to come. This require close attention to water management issues and to the adequacy of production and consumption patterns

I. KEY OBJECTIVES

3. Chapter 18 of Agenda 21 contains the following seven programme areas:

- 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.

4. The key objectives continue to be the provision of adequate supply of good quality water for the entire world population, while preserving the hydrological and biological functions of ecosystems, combating vectors of water-related diseases and adapting human activities within the limits of sustainability. It is now increasingly recognized that the latter objective requires a more efficient water resources management and use.

II. SUCCESSES AND PROMISING CHANGES

A. Integrated water resources development and management

5. Three of the most important contributions of chapter 18 are (a) the establishment of thematic areas under which individual countries can formulate and implement national agendas, (b) its stress on integrated water resources planning, development and management and (c) its emphasis on water as an economic and social good, whose quantity and quality determine the nature of its utilization. Effective implementation of the recently-adopted Global Programme of Action for Protection of the Marine Environment from Land-Based Activities requires this integrative approach be used to facilitate simultaneous consideration of freshwater and marine issues as components of a single water management continuum. This approach has encouraged, inter alia, the development of an iterative approach to policy formulation and resource planning, paying particular attention to the failures as well as the successes of various water-related projects throughout the world. This innovative approach is currently being tested through on-going technical cooperation activities in many developing countries, such as, for example, Bolivia, Central African Republic, India, Jordan, Morocco, Nepal, Niger, Peru, Senegal and Yemen. Through water sector assessments, diagnostic studies and national programmes related to water resources planning and management at the river basin level, an integrated approach is taken to water use and equitable allocation of water among various users. This approach is also characterized by the participation of users and local communities in the decision-making process, including decisions related to financing of infrastructure. It is also encouraging that the role of women in water resources management is beginning to be increasingly recognized at both national and local levels.

B. Water resources assessment and impacts of climate change on water resources

6. Recent studies carried out by various UN agencies all indicated that, in recent times, national hydrological services and agencies, particularly, but not only, in developing countries were becoming less capable of assessing their respective water resources. Many national agencies had been facing reductions in observing networks and staffing deficiencies at a time when water demand is rising rapidly in many countries and when the need for sustainable water resources use is becoming increasingly urgent. Steps are now being taken to remedy the reduction in observing networks and staffing deficiencies. Several UN funding agencies are supporting initiatives being taken at both national and global levels. One example is the World Hydrological Cycle Observing System (WHYCOS), whose overall objective is to contribute to the improvement of national and regional water resources assessment capabilities. This initiative is already under way in countries of the Mediterranean basin and southern Africa, and projects for other African regions and the Caribbean are in the pipeline. The IAEA, in cooperation with WMO and IGBP, is strengthening the operation of the Global Network for Isotopes in Precipitation (GNIP). The GNIP has

accumulated more than 220,000 items of data from 505 meteorological stations in some 80 countries. The IAEA also assists countries in the management of water resources through integration of isotope methods with other hydrological techniques. This assistance includes capacity building and implementation of water resources assessment programmes in member states. The need to strengthen hydrological networks is also being addressed in UN system-wide Special Initiative on Africa.

C. Protection of water resources, water quality and aquatic ecosystems

7. The development, application and surveillance of drinking-water quality guidelines, and progress in the eradication of dracunculiasis are clearly two of the most important success stories in this area of chapter 18. Community intervention in preventing contamination of water sources, the use of filters and chemical treatment have brought dracunculiasis to a 97% reduction level as of December 1995. The link between inappropriate water resources development and other vector-borne diseases, such as malaria and schistosomiasis, is also widely recognized.

8. The interagency Panel of Experts (PEEM) has been promoting the application of environmental management for the control of diseases' vectors in agricultural development projects. PEEM also prepares guideline documents, conducts national workshops and training courses and supports country level pilot and demonstration projects. A thorough international assessment of the risks to human health from the exposure to microbial and chemical contaminants in drinking-water was conducted after UNCED and recommended guidelines were published in 1993. Health criteria and other supporting information was further published in 1996. These guidelines provided the basis for introducing updated national drinking-water standards in many Member States. Considerable progress has been made in the establishment of water quality monitoring programmes world-wide as many international river basins are now covered by multilaterally-agreed monitoring networks. Examples are the Danube, the Mekong, the Plate and the Nile river basins. Further, the global and regional monitoring efforts of the UNEP GEMS/Water Programme provides water quality data and information for both assessment and management purposes. The receipt of monitoring data from national water quality laboratories and authorities also suggests that capacities have been improved in a number of countries.

D. Drinking-water supply and sanitation

9. It is estimated that an additional 800 million people have been provided with safe water supply and that the total number of people without access fell by almost 500 million since the beginning of the 1990s. No reliable global inferences are possible concerning increases in sanitation services over the same period because of the use of significantly more stringent criteria through time regarding what constitutes safe sanitation. It appears, however, that progress in expansion of sanitation coverage has not been very significant. In spite of an acceleration in the rate of progress over previous decades, it is estimated that at least another 1,100 million people remain unserved and the number of people without access to sanitation has increased to a total of almost 3,000 million. One major reason for optimism, however, is the evidence that many countries have started to integrate their drinking- water supply and sanitation programmes more closely with both their water resources development strategies and their environmental protection planning. As a result, increasing attention has been paid to the potential health and environment and socio-economic benefits of effective water resources planning, development and management and the crucial roles of women and community.

E. Water and sustainable urban development

10. National and city authorities are still finding it difficult to cope with the rapidly increasing urban population. During the first half of the 1990s, an additional 170 million urban dwellers were provided with safe water and 70 million with appropriate sanitation in developing countries. However, because of fast urban population growth, about 300 million urban residents still lacked access to safe water supply while close to 600 million lacked adequate sanitation at the end of 1994. While the number of urban dwellers with access to safe water in Africa and in Latin America increased by 20 million and 70 million respectively, between 1990 and 1994, the percentage of people served actually fell in both regions during the same period because of fast urban population growth. Similarly, the situation concerning urban sanitation and pollution from urban waste gives cause for concern and, in the case of Africa, for outright alarm. The current rate of service expansion is, in fact, insufficient to prevent increase in the number of dwellers without access to at least minimum standards of sanitation in all developing country regions.

11. Nevertheless, there is still room for optimism for several reasons, including the fact that, since UNCED, a number of countries have begun to implement policies and programmes related to major activities specified in

chapter 18. In addition, several joint activities by various UN organizations have been undertaken to create awareness and build regional and national capacity on the treatment and safe use of municipal wastewater in agriculture and aquaculture. The launching of the UN system-wide Special Initiative for Africa, the adoption of the Beijing Declaration for managing water resources for large cities and towns, and the Habitat Agenda also provide further reasons for optimism. A consultation including government leaders, private developers, leading NGOs and UN organizations, planned to be held in March 1997, is expected to speed up the implementation of the Habitat Agenda in Africa.

F. Water for sustainable food production and rural development

12. A key objective of this priority area of Chapter 18 is assisting Member States to achieve food security, sustainable agriculture and rural development through efficient and effective water resources development and management. Progress achieved on this key objective is related to the implementation of several initiatives, such as national action programmes, water policy review and reform, promotion of increased water use efficiency, irrigation expansion in support of food security and irrigation technology transfer. Several National Action Programmes (NAPs) on Water for Sustainable Agricultural Development (WASAD) have been formulated and are beginning to be implemented in a number of countries or regions, such as, China, Egypt, Indonesia, Mexico, Tanzania, Syria, Zimbabwe and the Lake Chad basin. WASAD is an "upstream activity" which focuses on water sector and irrigation sub-sector reviews, irrigation policies and strategies, irrigation master planning and project proposals to address technology adaptation, environmental protection and national capacity building. It is, however, too early to judge the success or failure of these initiatives, although there are reasons for optimism. Despite economic hardships, water scarcity and environmental concerns, irrigation acreage has continued to expand in developing countries, although at a slower rate than in previous decades. In many developing countries, national governments have allocated a relatively high proportion of their development budget for irrigation expansion and modernization of existing projects. It is also evident that many countries are embarking on national water resources planning as a means to resolve inter-sectoral competition for water and to deal with water scarcity. Other favourable trends include: transfer of irrigation management responsibilities to farmers, enhanced role of farmers and communities on decisions relating to irrigation management and private sector involvement in irrigation development.

13. The aquaculture sector continues to be the fastest growing system for the production of fish protein and is now interacting seriously with the environment. This calls for increased assessment and monitoring of the environmental impacts of aquaculture. FAO has elaborated an agreed Code of Conduct for Responsible Fisheries, which includes provisions for both aquaculture and inland fisheries management.

III. UNFULFILLED EXPECTATIONS

A. Integrated water resources development and management

14. Major impediments to the implementation of chapter 18 exist largely because of the fragmentation of responsibilities and mandates for water resource management and the somewhat inferior status of water-related activities in relation to other sectoral activities. The practical realities facing many governments in developing countries, some with extremely limited water resource bases and most with inadequate institutional arrangements, pose several constraints for the effective introduction of integrated water resources management. Most developing countries have severe financial and capacity constraints to extending water-related services and managing and regulating water resource use. In addition, many countries lack adequate legislation and policies aimed at the efficient and equitable allocation and use of water resources. Another serious constraint is that water resources planning is rarely integrated into national macro-economic planning. In spite of the importance of women's involvement in environmental protection and development, their role and participation in the planning and management of water resources are far from reaching desired levels. Water resources planning, development and management have sometimes had unexpected side-effects due to the lack of consultation and participation at the local level, particularly women, user associations and community groups.

B. Water resources assessment and impacts of climate change on water resources

15. The fragmentation of institutional responsibilities and the low level of priority given to water resources assessment at the national level is widely recognized as an impediment to the establishment of integrated national databases. The lack of financial and human resources also continue to be major constraints to improving water resources assessment, particularly in developing countries. Recent cutbacks have taken their toll both in terms of the poor operation and maintenance of networks, and the availability and lack of reliability of water information. The

lack of sufficient and reliable data on water availability, its use and quality in many areas of the world makes effective national, regional and global water resources assessment difficult, if not impractical. A theme common to many countries is that of problems in training and retaining water resources assessment staff, and in updating their abilities to implement more advanced technologies and to use modern equipment. From a global perspective, there is serious concern about the ability of the national agencies which are responsible for water resources assessment to meet the growing needs for data and information, especially as these relate to sustainable development.

C. Protection of water resources, water quality and aquatic ecosystems

16. There is a global concern over the deterioration in water quality, which is rapidly reducing the potable water resource base. Our scientific understanding of the processes is far from adequate. Water quality data bases are very limited, restricting development of models required for the application of land and water management guidelines within the framework of water pollution and environmental health. The main obstacles are the lack of effective legislation for the monitoring and control of pollution and the absence of effective cost recovery systems at the local or national level to meet the costs of treatment, protection of water sources, cleaning-up polluted water and other essential measures. Continuous international funding will be required to maintain the momentum in dracunculiasis eradication, given that the required monitoring and certification process is beyond the means of the countries still affected by the disease. Despite the progress achieved in water quality monitoring, our knowledge on a global, regional and sub-regional scale is considerably less than that of water quantity. This is due to the number and complexity of polluting materials being discharged into receiving waters, inadequate knowledge about the pathways and ultimate sinks of many pollutants, the need for expensive and sophisticated analytical procedures for some pollutants and insufficient knowledge of the human and environmental impacts of many pollutants, particularly synthetic organic materials.

D. Drinking-water supply and sanitation

17. One of the main constraints in this area remains the dispersed nature of the responsibility for the protection of health and the environment, and inadequate policies and mechanisms for efficient and equitable allocation of water resources among competing users, particularly in circumstances where water is relatively scarce. Additionally, the lack of education/training, public awareness, promotional campaigns, low-cost affordable and appropriate techniques, adequate financial resources and, in particular, pricing policies aiming at generating funds to cover at least operation and maintenance, is also a serious problem in most countries. Another obvious constraint to water resources protection has been the low priority given to sanitation, which is highlighted by the significant increase in the number of unserved people. One innovative way of dealing with this problem, besides greater investments in sanitation and treatment, is to promote increased awareness through health and hygiene education/training of various target groups, primarily women and children, and behavioural change. In addition, with regard to rural sanitation, little progress in expansion can be achieved without integrating sectoral policies into poverty alleviation schemes and rural development strategies.

E. Water and sustainable urban development

18. Rapid urbanization in developing countries and the lack of integrated planning and management of water resources and environmental infrastructure services has been one of the major constraints to achieving the main targets for this programme area. Investments in water supply, sanitation, drainage and solid waste management services are well below the required levels. Most developing countries still depend on insufficient public funds for investments in the sector. In addition the user charges levied are usually inadequate to cover operation and maintenance costs, let alone investment costs. Lack of security of tenure resulting from bureaucratic obstacles to obtaining land titles in peri-urban or slum areas has also been an important factor behind the lack of investment in such areas, while lack of community involvement in the decision-making process has resulted in many wrong decisions about priorities and the levels of services required. In addition, the long-held misconception about the inability and unwillingness of the urban poor to pay for water supply and sanitation has been a major constraint to the introduction of appropriate pricing policies that promote efficient water use and the financial autonomy of water companies. Inadequate operation and maintenance of networks and installations reduces the lives of assets and has resulted in high levels of unaccounted-for water due to leakages and illegal connections. Public sector institutions responsible for service provision have proven inefficient, lacking transparency and accountability. Because of inadequate remuneration, they have been unable to attract or retain trained personnel which has significantly affected their ability to manage urban water resources and services.

F. Water for sustainable food production and rural development

19. In many countries, fragmented institutional structure, notably among agriculture, water and environmental ministries or agencies, remains a major constraint. Implementation of important economic instruments designed to improve water use efficiency, such as, water pricing, water markets and cost recovery schemes, continues to be faced with serious problems throughout the world. Another frequent problem is inadequate funding support for investment and technical assistance in irrigation, from both internal sources and donor countries or institutions. Some countries have well-formulated irrigation expansion and rehabilitation projects which require supplementary donor funding for their effective implementation but which is not available or forthcoming. On the other hand, funding is often unavailable because many irrigation projects throughout the world are characterized by heavy subsidization and poor rates of performance. Despite huge investments and subsidies, irrigation performance indicators are falling short of expectations throughout the world. In addition, inland fisheries production has fallen drastically over the last decade in many areas of the world because of pollution and environmental modification of waterways. Aquaculture is also experiencing some local problems with unavailability of water and in some cases its expansion is limited by the need to conform to regulations regarding the quality of effluents.

IV. EMERGING PRIORITIES

20. The world faces many challenges over the use of the environment as a source of natural resources and as a sink for wastes. As the Comprehensive Assessment of the Freshwater Resources of the World concludes, water must be considered one of the most vital issues facing future human use of the environment. Major issues, such as climatic change, deforestation, protection of biodiversity and desertification are all linked to water resources management. The present situation and current trends is likely to have particularly serious implications in terms of economic development and food production. Unless managed with a view to achieving efficiency and equity, water resources could become a serious limiting factor to socio-economic development in many developing countries. As many of the negative trends in water resources management will take years or decades to reverse, it is imperative that actions to reverse them begin immediately.

A. Integrated water resources development and management

21. There are at least five important principles without which the path to achieving the goals of integrated water resources development and management will remain blocked. First is the need to establish a process of open and transparent consultation in discussing water resource issues. This involves building bridges between technocratic and often centralized water institutions and the much more diffuse set of water users in rural and urban settings. Secondly, there is an urgent need to separate regulatory and operational functions. It is now increasingly accepted that an independent water authority which is in charge of defining policy and strategies for all water uses is a sound means to implement integrated water resources management. Thirdly, the role of legislation should basically be to enable rather than restrict integrated water resources management. It can be argued that a system of stable and identifiable water and land rights will, particularly in relation to irrigation, tend to increase productivity and conservation of water resources. Equally, recognition of customary uses and water rights might enhance trust in Government activities and programmes. Fourthly, more emphasis needs to be put on demand management and, in particular, water pricing as a means to promote efficient water use and generate funds for operation and expansion of existing facilities. Fifthly, as is stated in the Platform for Action from the Beijing Conference 1995, it is important to ensure that policy makers and planners recognize the benefits of including women in water resources planning, development and management.

22. At the international level, priority should be given to the successful completion of the ongoing inter-governmental negotiations for a global framework convention on the uses of shared river basins, given that the growing scarcity of freshwater calls for greater international cooperation in the planning, development and management of shared water courses. A global framework convention with specific agreements for regions or shared drainage basins is aimed to establish an agreed set of general principles and rules governing all international watercourses and to apply and adjust those principles and rules to the unique conditions of each international watercourse and the needs of the states concerned. The Draft Articles of the Law of the Non-navigational Uses of International Watercourses adopted by the International Law Commission (ILC) in 1994 have been recommended as the basis for a Convention on the subject by the ILC. In March 1997, the General Assembly will reconvene a Working Group of the Whole to continue the work started in October 1996 on the elaboration of a framework convention on the basis of the Draft Articles adopted by the ILC.

B. Water resources assessment and impacts of climate change on water resources

23. The pooling of resources among countries, particularly within international river basins, is one approach to

improving water resources assessment. The expansion of above-mentioned WHYCOS initiative and its regional observing systems constitutes a possible solution to the problem of inadequate water resources assessment in many countries and regions. More funding (from both internal and external sources) will also be required for improvements in capability at the national and river-basin level, including human resources development and institutional capacity building. As regards the impacts of climate change on water resources, the projections of the recently-published Second Assessment of the Intergovernmental panel on Climate Change (IPCC) state that the hydrological cycle would intensify with global warming. This could lead to more severe droughts in some areas and catastrophic flooding in others. The IPCC's best estimates of a likely rise of 50 centimeters in average sea level by the end of the twenty-first century will result in salt water intrusions affecting coastal cities and heavily-populated delta regions. Data collection and monitoring systems will need to be geared specifically to these issues.

C. Protection of water resources, water quality and aquatic ecosystems

24. There is a need for Governments to enhance their water quality monitoring and assessment programmes. Sustained socio-economic development requires accurate information on the quality and quantity of freshwater resources, as well as the coastal areas into which they ultimately drain. Such efforts, at first glance, are expensive and time-consuming activities with no immediate payoffs. Nevertheless, without such information, nations could easily make development decisions with costly, sometimes even catastrophic, consequences over the long term. As one example, safeguarding and improving the quality of drinking-water requires intensive backstopping of the national health, water and environmental authorities through advisory services, expert consultant services and inter-sectoral training programmes. This situation has a precedent in the 1960s, when recognition of our insufficient understanding of global hydrology for water resources management prompted the International Hydrological Decade (IHD), 1965-1974. That global programme facilitated establishment of a network of representative basins, improving our understanding of hydrology and water resources management. This was achieved through UN inter-agency cooperation, underpinned by strong support at the national level in many countries. As a cooperative effort of UNESCO, UNEP and UNU, a comprehensive water quality programme is being developed. The programme is to be based on a global network of representative drainage basins encompassing the broad spectrum of environments, to allow future extrapolation to unmonitored basins.

D. Drinking-water supply and sanitation

25. In urban areas, the ultimate solution will be to integrate water supply and sanitation services for the peri-urban poor with the established urban systems. This will require the full physical integration of these systems, and the assignment of responsibilities to the appropriate urban utilities. It will also require the establishment of an enabling environment for the financial and administrative autonomy of water and sanitation utilities and for institutional capacity building. More research and information exchange is required on innovative technical and administrative approaches. With regard to rural water supply and sanitation, the challenge is to maintain at least the progress reported to date and, in particular, to strengthen the household water supply component of rural development and agricultural projects. In addition, more responsibility has to be delegated for rural sanitation to the local level, with corresponding budget allocations and accountability, with particular emphasis on community participation, self-reliance and the central role of women in water resources management. Emphasis should be given to the gradual introduction of economic mechanisms aimed at ensuring that rural water supply becomes self-financing, at least in terms of operation and maintenance. At the same time, additional external funding will also be required for the expansion or improvement of water supply and sanitation facilities, particularly in developing countries. The issue of sustainable water use and sanitation supply demands high priority at the country level. It is thus encouraging to note that the countries of the African Region have established the AFRICA 2000 Initiative for Water Supply and Sanitation and have proposed that it be linked to the UN System-wide Special Initiative on Africa.

E. Water and sustainable urban development

26. The Habitat agenda calls for an integrated approach to water resources management and the links between water, sanitation and health, between economy and the environment and between cities and their hinterlands. There is a need for further strengthening the capacities of national and city authorities to provide the right legal and regulatory framework for the participation of all stakeholders, including women, in planning, provision and management of services. Planning should be at the water basin level, and should consider both short and long term needs of all uses and users of water resources. Public-private partnerships should be encouraged as well as community participation in decision-making, service provision and management. Private sector funds should be sought to bridge the widening supply-demand gap, and tenure issues in peri-urban areas should be regularized to encourage investments. Adequate tariff levels should be charged to recover investment as well as operation and

maintenance costs, with mechanisms to ensure that the needs of the poor are adequately catered for. Strategies for demand management and control of wastage should be promoted to reduce the levels of unaccounted-for water and wasteful uses as a first alternative to investments in new installations. Pollution control should be more vigorously pursued, including through economic instruments of pollution abatement.

F. Water for sustainable food production and rural development

27. As a matter of priority, irrigation development should be addressed on a more systematic basis. There is a need for better-designed projects at the national level, with particular attention being paid to environmental impacts and economic performance, together with policies aimed at creating an environment that encourages private sector investment (internal and external) and donor support. The challenge is to move towards means of irrigation that are economically more efficient or crops that are less water-intensive, that is to produce more food with less water so that more of it can be transferred to higher-value uses. More emphasis should be given to rainfed agriculture and more efficient economic alternatives to irrigated agriculture. While developing countries should demonstrate their willingness and ability to make irrigation economically sound and environmentally viable, technical assistance programmes should also be better-designed and "tailor-made" to match individual country needs. Broadly speaking, these programmes should focus at least on national policy review and reform, including institutional mechanisms to implement economic and environmental principles; and on building national capacity so that the countries should be able to design, implement, operate and maintain their irrigation systems on a sustainable manner. Given that water management for sustainable food production and food security goes beyond the farm boundaries, it is also essential to integrate agricultural strategies into broader regional or rural development strategies. In this regard, emphasis should also be given to the central role of local communities, and particularly women, not only in rural water resources planning, development and management, but also in small-scale agriculture as a source of both income generation and local food self-sufficiency.

28. Inland fisheries can only be conserved in a framework of basin planning where the elements needed for the survival of the fish are guaranteed such as in-stream flow needs, channel diversity, wetland conservation, etc. Further growth of aquaculture will depend on intensification of inputs with attendant risks to environment. Much of these can be avoided by development and dissemination of more efficient use of water, improved feeds and more efficient water treatment systems.

Note

*This report reviews progress made in the implementation of the objectives set out in Chapter 18 of Agenda 21 (Freshwater Resources), taking into account the decisions taken by the CSD on this subject at its Third Session in 1995. The report was prepared by the ACC Subcommittee on Water Resources, as task manager for chapter 18 of Agenda 21, in accordance with arrangements agreed to by the Inter-Agency Committee on Sustainable Development (IACSD). It is the result of consultation and information exchange between United Nations agencies, international and national science organizations, interested government agencies and a range of other institutions and individuals.

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