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REVIEW OF THE PROVISION OF INFRASTRUCTURE IN SLUMS  
AND SQUATTER AREAS AND IN RURAL SETTLEMENTS

Report of the Executive Director

SUMMARY

The paper sets out the background to the problem of providing infrastructure to low-income settlements in developing countries. After introducing statistics on the numbers of people yet to be served with water supply and sanitation and indicating the absence of data on the needs for other elements of infrastructure, the paper describes current national and international policies and actions. The build-up and progress of activities related to the International Drinking Water Supply and Sanitation Decade are covered in detail. Current approaches to the provision of infrastructure in rural settlements and in urban slums and squatter settlements are reviewed, and major issues of importance for expanded settlement upgrading programmes are discussed. Approaches to the provision of infrastructure as a major component of integrated community development programmes are introduced, and recommendations are made on national and international action. The role of the United Nations Centre for Human Settlements (Habitat) is outlined, and a medium-term work programme on infrastructure is recommended for consideration by the Commission.

## INTRODUCTION

### A. The Vancouver Conference

1. At Habitat: United Nations Conference on Human Settlements, held in Vancouver in 1976, the general principles guiding the provision of infrastructure in communities were established as follows:

- (a) Human settlements policy should aim at improving the quality of life;
- (b) Priority should be given to the needs of the most disadvantaged people.

2. Among the guidelines for action arising out of the Conference were several of relevance in the context of infrastructure:

- (a) Priority should be given to improving the rural habitat;
- (b) Progressive minimum standards for an acceptable quality of life should be developed;
- (c) Environmental health conditions and basic health services should be improved;
- (d) There should be a continuous co-operative relationship between a Government and its people at all levels.<sup>1/</sup>

3. The Vancouver recommendations for national action defined infrastructure in relation to human settlements as "the complex networks designed to deliver to or remove from the shelter people, goods, energy or information".<sup>2/</sup>

4. Many detailed recommendations for national action in respect of infrastructure were formulated, the most important of which are reproduced in annex III. In addition to these, all recommendations concerned with public participation (E.1 - E.6) and many aspects of those dealing with institutions and management (F.1 - F.10) are important when infrastructure is being considered.<sup>3/</sup>

### B. The concern of the Commission on Human Settlements for infrastructure

5. Several recommendations in the report of the Commission on Human Settlements on the work of its third session, held at Mexico City in May 1980,<sup>4/</sup> indicate an increasing awareness of the urgent need to improve infrastructure in low-income communities. The decision to review the provision of infrastructure in settlements as one of the two themes

<sup>1/</sup> Report of Habitat: United Nations Conference on Human Settlements, Vancouver, 31 May - 11 June 1976 (United Nations publication, Sales No.E.76.IV.7 and corrigendum), Chap. I.

<sup>2/</sup> Ibid., chap.II, sect.C, preamble, para.2.

<sup>3/</sup> Ibid., sects. C, E and F.

<sup>4/</sup> Official Records of the General Assembly, Thirty-fifth Session, Supplement No.8.

for discussion at the fourth session in Manila underlines the importance which the Commission attaches to the subject.

6. In its resolution 3/13, adopted in connexion with the topic of the development of rural settlements and growth centres, the Commission requested the Executive Director to attach special priority to rural-settlement matters in the Centre's work programme for the 1980-1981 period and in the medium-term plan for the period 1984-1989. During the discussion of the topic in question, it was suggested that the Centre should undertake pilot studies to quantify the investment returns on some existing programmes and carry out case studies on infrastructure-investment returns for settlements of different sizes in different contexts. It was felt that the Centre could make a particularly valuable contribution by establishing a systematic monitoring and evaluation procedure for following up pilot schemes and by disseminating information on successes and failures.<sup>5/</sup>

7. With regard to the theme of the upgrading of urban slums and squatter settlements, Commission, in its resolution 3/14, requested the Executive Director to place high priority on the development of approaches to the design of appropriate physical standards to be used in the upgrading process. Particular mention was made of the use of appropriate technologies and local materials, as well as of the fostering of public participation. In addition, the Executive Director was asked to place emphasis on assisting countries in practical programmes and pilot demonstration projects geared to the gradual improvement of slum and squatter areas. During the discussions on this theme, it was suggested that the Centre should compile an upgrading manual incorporating a broad range of experience in projects throughout the world.<sup>6/</sup>

8. In discussions on the 1984-1989 medium-term plan, it was suggested that priority should be given to the conduct of research regarding, inter alia: the technical and financial aspects of shelter, infrastructure and services; the development of rural areas and services; the provision of potable water and sanitation, including ways of reducing water consumption (for example, by use of non-water-borne sanitation systems); and the elimination of the pollution resulting from waste disposal. The importance of the Centre being involved in the development of training programmes in human settlements was also stressed.<sup>7/</sup>

9. The activities of the United Nations Centre for Human Settlements (Habitat) in the area of infrastructure must be geared towards the integration of infrastructure into the overall programme for human settlements development, as directed by the Vancouver Conference in its recommendation that shelter, infrastructure and services should be planned in an integrated way and provided in the sequence appropriate to circumstances.<sup>8/</sup> The obvious strengths of the Centre should be applied effectively and the limited resources of the small secretariat mobilized to achieve success in a relatively small number of infrastructure projects integrated into the overall development of human settlements

#### C. Purpose of the review

10. The primary aims of this review are to outline the present situation concerning infrastructure delivery in low-income settlements, to describe national and international responses to the problems and to outline unresolved issues and perceived needs. It is the intention to provide the Commission with enough background information to stimulate

<sup>5/</sup> Ibid., paras. 120-125.

<sup>6/</sup> Ibid., para. 139.

<sup>7/</sup> Ibid., para. 148.

<sup>8/</sup> Report of Habitat: United Nations Conference on Human Settlements, Vancouver, 31 May-11 June 1976, op. cit., chap.II, recommendation C.1.

~~discussion and exchanges of views on essential issues and to allow appropriate resolutions to be formulated in respect of national and international action.~~ Proposals for the future activities of UNCHS (Habitat) in the area of infrastructure will also be presented for consideration.

## I. BACKGROUND

### A. Extent of the infrastructure problem

11. In 1980, the total population in developing countries (excluding China) was 2211 million, approximately one half of the world's population. Of these 2211 million, about 72 per cent lived in rural areas, although the general trend was towards increasing urbanization. An urban-rural breakdown of figures based on data obtained from rapid assessments and national sources indicates that, with regard to safe drinking water, approximately 75 per cent of the urban population of developing countries received some form of service either through house connections or standpipes, as against only 27 per cent of the rural population. Accordingly, about 1285 million people were still without adequate water-supply services, and 1668 million lacked adequate sanitation, those affected consisting almost exclusively of residents of urban slum and squatter areas and rural settlements (see tables 1, 2, 3 and 4 in annex IV).

12. These statistics for water supply and sanitation, as produced by the Economic and Social Council, the World Health Organization and other sources (A/35/367), give some idea of the magnitude of the problem in this sector, and no improvement in the situation has occurred in recent years. However unreliable these figures might be, no such data are available for other elements of infrastructure of concern in low-income communities, primarily drainage, energy supply, road and path networks, solid-waste disposal, transport, communications, security and social services. As far as urban slums are concerned, it might be assumed that basic needs in respect of these other elements are satisfied, but no such assumption can be made about squatter settlements. In view of its health implications, the provision of an adequate safe water supply and minimum sanitation will generally be given high priority in the improvement of infrastructure in low-income settlements and will very often form the only infrastructure component of human settlements development projects.

### B. National policies

13. Until recently, the national plans of most developing countries showed a distinct bias towards urban development, and the needs of rural communities, constituting, by far the largest proportion of total population, were often overlooked. However, increasing emphasis is now being placed on rural development, and as a result rural water supply and, to a lesser degree, sanitation are becoming more prominent in development planning. Urban areas have traditionally been better provided with water-supply and sanitation services, as the statistics above show, but where deficiencies have occurred it has always been in low-income communities. Urban slums, defined as areas of authorized, usually older housing which is deteriorating in the sense of being underserved, overcrowded and dilapidated, <sup>9/</sup> are nevertheless generally better endowed with basic infrastructure than urban squatter areas. Squatter settlements are frequently unauthorized, and many Governments prefer not to do anything which might be considered as a step towards legitimizing them, with the result that even basic services are denied. Where a significant proportion of the urban population lives in squatter areas

<sup>9/</sup> D. Etherton, Water and sanitation in slums and shanty towns, unpublished review prepared for the Urban Section, Programme Division, UNICEF.

and resettlement is not economically feasible, this approach is unwise because disease knows no physical boundaries. Health considerations alone justify a positive official attitude towards infrastructure in squatter areas, but compassion should also motivate Governments in providing for such basic needs and preserving human dignity. Many developing countries are now considering comprehensive squatter upgrading schemes because of the failure or impracticality of resettlement policies.

C. United Nations action

14. Acknowledging the high level of infant mortality, the low life expectancy and the high incidence of gastro-intestinal diseases in developing countries, as well as the limited success achieved in providing water-supply and sanitation services, Habitat: United Nations Conference on Human Settlements first articulated the objective of extending the basic services in question to all people by 1990.<sup>10/</sup> This target was endorsed by the United Nations Water Conference, held in Mar del Plata in 1977, when the recommendation was made to designate the period 1980-1990 as the International Drinking Water Supply and Sanitation Decade.<sup>11/</sup>

15. Noting these recommendations, the Thirtieth World Health Assembly, in its resolution 30.33, urged Member States:

(a) To appraise as a matter of urgency the status of their community water supply, sanitation facilities and services and their control;

(b) To formulate within the context of national development policies and plans by 1980 programmes with the objectives of improving and extending those facilities and services to all people by 1990, with particular attention to specific elements...;

(c) To implement the programmes formulated in the preparatory period 1977-1980 during the decade 1980-1990 recommended by the United Nations Water Conference to be designated as the International Drinking Water Supply and Sanitation Decade;

(d) To ensure that people consume water of good quality, by periodic inspection of water sources and treatment and distribution facilities, by improving public education programmes in the hygiene of water wastes, and by strengthening the role of health agencies in this respect.<sup>12/</sup>

16. The World Health Organization (WHO) has continued to encourage and assist national Governments to develop water-supply and sanitation programmes to meet the 1990 targets. In co-operation with the World Bank, WHO carried out a rapid assessment exercise of Member States and prepared Rapid Assessment reports in 1978. These reports included anticipated coverage of urban and rural water supply and sanitation and indicated

<sup>10/</sup> Report of Habitat: United Nations Conference on Human Settlements, Vancouver, 31 May-11 June 1976, op.cit., chap.II, recommendation C.12.

<sup>11/</sup> Report of the United Nations Water Conference, Mar del Plata, 14-25 March 1977 (United Nations publication, Sales No.E.77.II.A.12), Mar del Plata Action Plan, para 15.

<sup>12/</sup> Official Records of the World Health Organization, No.240 (Geneva, 1977).

that at that time many countries were not contemplating achieving full coverage of the population with either service by 1990, particularly in rural areas.

17. The Water Conference's Action Plan, as it relates to community water supply and sanitation, calls for improved co-ordination at the country level and regular consultations among Governments, international organizations and relevant non-governmental organizations.<sup>13/</sup> A Steering Committee for Co-operative Action, whose members include the United Nations, UNDP, UNICEF, ILO, FAO, the World Bank and WHO, has since been set up to initiate necessary action, and UNCHS (Habitat) recently began to participate in the activities of this Steering Committee. WHO was chosen to serve as the technical secretariat for the Steering Committee and has a special unit, the Unit for Global Promotion and Co-operation for Water Supply and Sanitation (GWS), which will carry out this function. The Steering Committee's terms of reference are to review and develop policy, create a co-ordinated approach to the management of individual programmes and prepare for consultative meetings with representatives of Governments, international organizations and non-governmental organizations in a position to offer technical and financial co-operation. Although WHO provides the secretariat, the dominant co-ordinating role for these activities has been assigned to UNDP, and the UNDP resident representatives (now designated United Nations resident co-ordinators) act as the focus for international co-operation at the national level.

18. In its resolution 1979/31, the Economic and Social Council recommended that preparations should be made for the formal launching of the International Drinking Water Supply and Sanitation Decade. The Decade was officially launched at a special meeting of the General Assembly in New York on 10 November 1980, when the General Assembly adopted resolution 35/18. In his address to the General Assembly, Dr. Halfdan Mahler, Director-General of WHO, indicated that, at present, more than 80 per cent of the total disease load in developing countries could be directly related to the absence of safe water and adequate sanitation. He added that, because of what it would imply, both in planning and results, the number of water taps per 1 000 population would be an infinitely more meaningful health indicator than the number of hospital beds per 1 000 population. Noting that the Decade would require on average an estimated annual investment totalling about \$US 30 000 million, Dr. Mahler suggested that these investments were puny when compared with the socio-economic benefits they would bring. The global strategy for the pursuit of which WHO would co-ordinate its efforts with those of other United Nations agencies, would have six major objectives: to support Governments in developing and executing their strategies; to promote a sense of responsibility and self-reliance at the community level; to ensure adequate infrastructure development; to support the training of the manpower required at all levels; to help develop practical, low-cost technologies; and to mobilize additional resources and rationalize their transfer to the developing countries (A/35/PV.54).

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<sup>13/</sup> Report of the United Nations Water Conference, Mar del Plata, 14-25 March 1977 (United Nations publication, Sales No.E.77.II.A.12), chap.I, resolution II.

## II. SCOPE AND DIMENSIONS OF THE PROBLEM

### A. Statistics on water supply and sanitation

19. The report of the Secretary General on the International Drinking Water Supply and Sanitation Decade (A/35/367) included, inter alia, the most recent review of regional provisions in the water-supply and sanitation sector. Tables 1, 2, 3 and 4 in Annex IV summarize the situation in Africa, Latin America, Asia and the Pacific and Western Asia respectively. Of this group, Latin America is the exception in that it has a much greater proportion of the population in urban areas and has achieved a greater coverage of the urban population with water supply and sanitation, although there are still some countries in the region with a poor urban record. However, in terms of servicing the rural population, Latin America has achieved no better results than other regions in the world. Africa undoubtedly has the poorest record of rural water-supply service, and rural sanitation is almost non-existent in most countries. In all regions, urban populations are better served with water supply and sanitation than rural dwellers, but even in urban areas sanitation lags behind. The Asian and Pacific region presents the greatest overall problem because of the very large population still to be supplied with safe water and sanitation. The high rate of population increase in developing countries militates against any short-term improvement in coverage.

### B. The rural situation

20. The problem of supplying water and sanitation to rural populations in developing countries is exacerbated by the large number of communities lacking these services. Although most rural settlements have developed where water is available, many rural residents still have to travel large distances to a water source. Not all areas have groundwater resources, which generally represent the most satisfactory form of supply for small communities in terms of both quality and cost, and where surface supplies have to be used they pose serious health problems, particularly in densely populated countries. In the past, rural water-supply schemes have not always been designed to provide for basic needs at minimum cost, and this has limited the coverage that is possible with modest resources. Quite often, the systems installed are inappropriate in that they are either too sophisticated for rural people to manage or too costly for them to operate, and many such systems are lying unused. The water supply of rural communities is usually based on the use of standpipes, and untreated groundwater is generally the preferred source.

21. In most developing regions of the world, rural people traditionally use the fields or the bush for their personal relief, and sanitation is often considered unnecessary or unaffordable. However, the full health benefits of a safe water supply might not be achieved if there is no sanitary disposal of excreta. Sewerage is, of course, out of the question for rural settlements, and any progress in rural sanitation has been based on simple on-site systems. The form of sanitation device chosen has not always been accepted by the communities concerned, either because it offended their cultural or social mores or because they were not educated on how to use and maintain the system. Few Governments in developing countries have actively pursued a policy of improving rural sanitation, and no large population has as yet benefited from this important contribution to preventive medicine and a safe water supply.

22. Although rural settlements in developing countries might be considered organized in community terms, they are grossly deficient in the organization of infrastructure.

Even rudimentary drainage channels for surface run-off and the transport of household sullage are generally absent, and offensive waste streams are frequently found flowing down the main streets of villages. Electrification is not common, so modern amenities such as house and street electric lighting and telecommunications are rarely found. Roadways exist, although often in a primitive form, only where they serve a purpose considered strategic by the local government, otherwise access to and from many rural communities is by footpath. Village streets and footpaths are not properly designed, constructed or maintained and are often impassable to vehicles at times of heavy rainfall. Rural transport systems are at best deficient and at worst non-existent, and this seriously affects the quality of life in remote rural areas. Solid wastes are not usually a serious problem in rural settlements because of the relatively low population density and the space available, although villages in developing countries are not noted for their aesthetic qualities. Household refuse is often disposed of by being thrown out of a window to rot on the ground around the house, a practice which is feasible because of the high vegetable content of such waste.

C. Urban slums

23. The older established urban slums are usually located near the centres of large cities in well-defined and sometimes infamous areas, but more recent slum areas exist on the urban periphery where settlements have been developed for low-income workers as a result of a city's industrial expansion. Slums are characterized by very high population densities, and room occupancy rates are still growing rapidly in many urban areas.

24. Being legitimate, slum properties are usually served by municipal utility networks. However, because of the age of many slums and the problem of overcrowding, services are deteriorating and out-of-date and they cannot cope with the demands made on them. Water supply sometimes takes the form of a single tap in each house but is often a public standpipe shared by hundreds of people. Sanitation frequently consists of a primitive pit-latrine or bucket-latrine system. Municipal services and maintenance in slum areas are poor, and general environmental conditions are appalling. Landlords are unwilling and tenants unable to improve existing water-supply and sanitation systems, and conditions deteriorate as time goes by.

25. Slum areas are usually drained, but not always efficiently, and they have electricity supplied to ancient house wiring systems, but this creates a fire hazard. Such areas are usually also served by street lighting, but security is always a problem. Since they are located in cities, there is ready access to urban transport systems, but road and path networks through slum areas, although generally adequate, sometimes restrict the size of vehicles which can be used to approach houses. This has an effect on the solid waste collection service and, together with the fact that a large population has to be accommodated on the basis of a few pick-up points, results in the unsightly disposal of refuse in streets and pathways.

D. Urban squatter settlements

26. Between one third and three quarters of present urban populations in developing countries live in slums and squatter settlements. Over the next twenty years, the population of such settlements will rise by over 1 000 million, half as a result of immigration from rural areas and half as a result of natural growth. It is likely that



most of these 1.000 million will be accommodated in squatter settlements, and the official attitude that these communities have no legitimate place in cities is therefore unrealistic.

27. Squatter settlements have grown on sites unsuitable for more conventional developments, for example on cheap land originally outside municipal boundaries where official restrictions were not enforced or in inaccessible areas such as railway embankments, river-flood plains, road reserves, swamps and steep hillsides. Population density in squatter settlements varies greatly but is generally lower than in urban slums. The standard of squatter housing, however, is much lower than in the case of slums, and opportunities for connecting into municipal utility networks are not normally available.

28. A wide variety of water-supply sources is used by squatters in the different regions. Natural springs have often encouraged squatter settlement, but such springs, if they remain unprotected, are a hazard to health in densely populated urban areas. Shallow wells, although convenient, are easily contaminated where sanitation is poor and give rise to the transmission of water-borne diseases in squatter areas. Standpipes connected to the municipal supply are sometimes used by squatters who have reasonable access to them, but very large settlements cannot be served by such inadequate facilities. Many communities are served by mobile tankers selling water, and such communities usually pay more for their supply than communities legitimately connected to the municipal supply network. Very often, people in squatter settlements are forced to drink contaminated water and have to exist without an adequate supply for normal household needs.

29. Sanitation in squatter settlements is very primitive, where it exists at all. Some residents will rely on nearby waste ground for defecation, while others will adopt the "wrap and carry" approach when the sea or other dumping site is further from their dwellings. Dry-pit and wet-pit latrines are sometimes used where space is available, but such latrines are installed by the individual and may cause pollution of surface water or groundwater. Quite often, pour-flush toilets discharge directly into surface drainage channels. Communal sanitation blocks have not generally been found to be satisfactory, and the lack of collective action in squatter settlements has limited their development in these communities.

30. Sullage from squatter households is freely discharged onto the surface without concern for its ultimate fate. Consequently, naturally formed channels containing sullage, latrine discharges and solid waste are found throughout squatter settlements and give rise to unpleasant odours during dry periods. The same channels act as drainage for rainfall during wet periods, when they receive some degree of flushing, but whole areas are frequently flooded and pollution is widespread. Since squatter settlements are unofficial there is rarely any official collection of solid wastes, and decomposing refuse tends to accumulate, thereby contributing to the poor environmental conditions.

31. Few squatter settlements have any proper roadways or pathways, while boardwalks in areas subject to flooding are constructed by residents on an ad hoc basis and are rarely satisfactory. This limits the accessibility of dwellings, and few vehicles can even enter squatter settlements. Once outside the settlement, a squatter has little problem with transport because communities are usually well placed with respect to public transport systems and work centres. Any electricity supply in squatter settlements is usually based on the illegal tapping of the municipal network and is intended for household purposes. Street lighting is very rare in squatter areas and security is a real problem, particularly since the poorly-built dwellings are themselves so vulnerable.

The residents of squatter settlements perceive the need for many elements of infrastructure, but they will remain underprivileged as long as Governments adopt an inflexible policy with regard to the question of legality. Lack of access to municipal utility networks causes these poor people to pay more for certain essential services than richer urban dwellers do.

### III. CURRENT APPROACHES TO THE PROVISION OF INFRASTRUCTURE

#### A. International organizations

32. In November 1978, a first consultative meeting on the International Drinking Water Supply and Sanitation Decade was held and was attended by government representatives from the UNDP Governing Council and financing agencies. The Meeting recommended that developing countries should form national action committees as a way of overcoming the problem of overlapping ministerial responsibility in the water and sanitation sectors. In addition, the UNDP resident representative in each country was encouraged to form a technical support team consisting of local representatives of the various United Nations agencies participating in the co-operative action, with the specific duty of assisting the national action committee, or other competent government body, in its efforts to meet the Decade's targets. A second consultative meeting was held in Geneva on 16 June 1980 to consider how donor agencies and the international community might respond to the action plans being developed by Governments. The GWS Unit of WHO prepared background documentation for the meeting and was able to report that there had been a generally enthusiastic response, both from the 116 Governments invited to respond and from UNDP resident representatives, to questionnaires aimed at establishing the current status of water supply and sanitation in developing countries and determining national capabilities with regard to achieving the aims of the Decade. Many countries were found to have formed national action committees already. A separate survey conducted by the GWS Unit of WHO has provided data for a "donor catalogue", identifying policies and the type and volume of aid provided to the sector by donors, financial organizations, United Nations agencies and non-governmental organizations.

33. The Steering Committee for Co-operative Action has identified and put into effect five major activities in support of the Decade, as follows:

- (a) Studies of low-cost alternatives for water supply and sanitation;
- (b) A system to provide information for potential donors on developing countries' plans and projects and for countries on donor-aid availability and criteria;
- (c) A programme on exchange and transfer of information (POETRI);
- (d) Support activities for national Decade planning;
- (e) A public relations programme to develop and maintain the momentum of Decade activities.

34. A World Bank/WHO Co-operative Programme was initiated in 1971 to carry out water-supply and sanitation sector studies and to undertake the implementation of plans resulting from these studies. Sector studies have been instrumental in the inclusion of water supply and sanitation in national development plans in recent years and in the identification of sector-wide needs. They have also served to indicate the potential roles of the different national agencies concerned, as well as those of United Nations agencies, bilateral assistance organizations and lending agencies. WHO has also provided pre-investment planning assistance for national planning efforts in the water-supply and sewerage sector. As the United Nations agency providing technical services for all national programmes related to environmental health, WHO often acts as a clearing house through which external aid is channelled into water-supply and sanitation projects.

35. UNICEF is also deeply involved in the provision of water supply and sanitation through infrastructure projects; its participation in rural water-supply projects has increased five-fold since 1974. UNICEF aid involves the supply of equipment and materials for the installation of wells, standpipes and latrines, as well as training and the promotion of community participation in water-supply and sanitation improvements. The aid is directed mostly towards projects in areas not assisted by the World Bank, and it is therefore of great importance for the most neglected sectors.

36. The other United Nations agencies represented in the Steering Committee have their own particular interests in the provision of water supply and sanitation and contribute accordingly.

37. Until recently, the lending programme of the World Bank in the water-supply and sanitation sector had not been benefiting the rural and urban poor. Realizing this deficiency, in 1976 the Energy, Water and Telecommunications Department of the World Bank initiated a two-year research project on Appropriate Technologies for Low-Cost Water Supply and Sanitation in Developing countries (RP 0671-46). The research tended to concentrate on excreta and waste disposal, although it was not confined to this area. Very briefly, the findings of the study indicated that low-cost technically-viable alternative technologies to conventional sewerage do exist and that these technologies can have a public-health impact similar to that of water-borne sewerage. A number of sanitation alternatives, some consisting of traditional excreta disposal systems with minor modifications, were recommended for use in different situations. The costs of simple systems providing satisfactory levels of service were thought to be affordable, even for low-income rural and urban communities. One major contribution of the research was to focus attention on the sociological aspects of providing low-cost sanitation systems and to suggest methods which might do much to ensure the success of such systems in socio-economic as well as technical terms.

38. In 1978, as a result of this World Bank research project and as part of its preparations for the Decade, UNDP sponsored a Global Project on Low-Cost Water Supply and Sanitation (GLO/78/006), for which the World Bank is the executing agency. This project has so far been endorsed by 14 countries: Bangladesh, Botswana, Brazil, Egypt, India, Indonesia, Kenya, Lesotho, Malaysia, Nepal, Nigeria, Philippines, Sudan and the United Republic of Tanzania. An initial approach by a Government to the UNDP resident representative is required before a country can be included in the programme. To facilitate the design, implementation and monitoring of demonstration projects, the World Bank has established a Technology Advisory Group (TAG), and in some countries TAG is working with housing agencies to ensure that housing programmes include provision for appropriate sanitation.

39. The United Nations Environment Programme (UNEP), working in collaboration with the United Nations Centre for Human Settlements (Habitat), has been involved in the pilot testing of innovative infrastructure technology in a few urban squatter projects with a view to improving the overall environment in an integrated fashion. Upgrading projects in the Philippines and Indonesia have incorporated solar water heaters and waste-water distillation units, composting toilets, communal latrines, drain and pathway construction, bio-gas plants and self-help refuse collection and disposal. Evaluations of these projects are in the process of being finalized.

40. A recent review of 21 World Bank water-supply and sanitation loans, amounting to about \$US 890 million for 1979, indicates that an estimated 27 million people will benefit directly, of whom 12 million (44 per cent) are in what the World Bank describes as "the urban poverty group". In individual projects, the percentage of "urban poverty beneficiaries" ranges from 11 per cent to 80 per cent. Water-supply and sanitation projects constitute an essential part of the World Bank's commitment to allocating at least one third of its urban loans to the relief of urban poverty, and planning approaches have been adjusted to ensure that assistance to the poor will increase significantly in future projects. The World Bank and many bilateral agencies have supported low-cost housing, sites-and-services and squatter-upgrading projects in the past, and these projects have involved elements of infrastructure other than water and sanitation - primarily roads, paths, drains and electricity supply. However, the extent to which the very poor have actually benefitted from low-cost housing and squatter-upgrading projects is debatable, and it is likely that most dwellings built as a result of sites-and-services projects end up being owned by middle-income people who sublet individual rooms to poor families.

41. Most voluntary organizations emphasize rural rather than urban water supply and sanitation, although many such organizations do work in urban slums and squatter settlements. There is a notable trend away from "relief" work towards more forward-looking development and "intermediary" involvement. The Urban Industrial Mission (UIM) of the World Council of Churches is committed to this type of work, and there is an increasing number of professional agencies whose work focuses on the needs of poor communities, including needs related to water supply and sanitation; such agencies include, for example: OXFAM, United Kingdom; the Ahmedabad Study Action Group (ASAG), India; the Association for the Development of Traditional African Urbanism and Architecture, Switzerland; and Group 8, Tunisia.

B. Actions at the national level

42. Each developing country should by now have established targets for the Decade which it believes can be achieved. Unfortunately, the Secretary General's regional review of activities pertaining to the decade (A/35/341) indicates that many developing countries have not yet reached a decision on their targets and that most others have come to the conclusion that complete coverage of the population with water supply and sanitation is beyond their capability. In some countries, Decade objectives have not been indicated because national development plans do not extend beyond 1982 or 1983.

43. In the African region, many countries have re-oriented their policy to place emphasis on providing water supplies for the urban poor and for rural populations, but sanitation is given little attention. Various types of water-supply projects have been identified in the different countries of this region, but very few projects have been studied to assess their engineering feasibility. Not all countries have established national action committees. Common constraints affecting progress in the sector have been identified as: shortage of professional and sub-professional staff; lack of training facilities; lack of funds; problems with regard to educating the public; lack of co-ordination among agencies responsible for settlements improvement; lack of national settlements policies; and institutional problems.

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44. The Latin American region has already completed two decades of intensive investment in water supply and sanitation since the adoption of regional targets in the Charter of Punta del Este in 1960. Emphasis has been placed on urban water supply and sewerage, and the majority of countries have ongoing programmes of investment. However, few countries in the region have delineated specific goals for coverage or services or initiated the programmes required to meet such goals. Programmes already prepared not only include plans for the extension or construction of new water-supply and sewerage systems but also make provision for improvements in the general management of the sector, its financial stability and the availability of trained manpower at all levels. Only eight countries of the region have established national co-ordinating committees, and little progress has been made in the preparation of specific plans for the Decade in general.

45. In the Asian and Pacific region, although many countries have announced a policy of placing emphasis on providing water supplies for rural areas, no definite national plans or programmes for community water supply and sanitation covering the whole Decade have been formulated or prepared. Sanitation has been given lower priority than water supply in most countries. The constraints affecting progress in the sector are considered to involve primarily a shortage of internal financial resources and a shortage of technical staff at all levels. An important problem encountered is the proper maintenance of existing facilities, many of which have fallen into disuse.

46. Most of the Western Asian region consists of arid or semi-arid zones, and a high percentage of the population, particularly in rural areas, uses untreated water. Financing for community water supply is always given top priority in water resources development, but sanitation is generally given low priority. In some countries of the region, major projects have been identified and formulated, and implementation is planned for the early stages of the Decade. Only a few countries have established national action committees, while in others the disadvantages of having a centralized authority responsible for the sector have been recognized.

47. Because of the absence of any international impetus for improving the provision of elements of infrastructure other than water supply and sanitation, national efforts in this respect have been extremely limited. Apart from measures involving new low-cost housing or sites-and-services projects, which generally tend not to benefit the poorest members of the urban community, the major attempts at improving infrastructure in the context of upgrading projects have involved drainage and pathway construction in squatter areas. Some projects have attempted to improve systems for solid-waste disposal and energy supply in squatter settlements, and one project provided a fire-fighting system after the community concerned had identified this as its top priority. Many of these upgrading projects have received some form of international or bilateral assistance.

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#### IV. MAJOR ISSUES IN THE PROVISION OF INFRASTRUCTURE FOR LOW-INCOME SETTLEMENTS

##### Basic problems

48. The provision of infrastructure to low-income settlements in developing countries has been largely overlooked in the past, and these settlements should now receive a fair share of the resources applied to development. Lack of essential elements of infrastructure gives rise to poor health conditions in the communities concerned and to an environment which is not conducive to a reasonable quality of life, even though social conditions are often satisfactory. National development plans have only recently started to include rural development as a priority issue, whereas urban conditions have improved significantly. However, low-income urban communities have not generally benefited from the large investments that have been made in urban infrastructure. Increasing urbanization is causing the rapid expansion of populations living in urban slums and squatter settlements, and health and environmental conditions are deteriorating. Unwillingness to overlook the illegality of squatter communities on the part of many Governments has prevented any action to improve services to these areas. Even where such a barrier has been overcome, deficiencies in planning, programming and implementation policies and strategies have limited progress in the provision of infrastructure, and there has also been resistance to change from wealthier sections of the population. The need to have infrastructure integrated into comprehensive approaches to human settlements development is apparent.

49. Various factors have affected the delivery of infrastructure to low-income settlements in developing countries in the past, and most such factors are common to all countries. Quite often, institutional arrangements are so complex, with many different agencies having responsibility for different elements of infrastructure, that the administrative problems of co-ordination and delivery have not been overcome. Without a national human settlements policy or plan, agencies have approached the provision of infrastructure to low-income settlements on an ad hoc basis in terms of the selection and implementation of projects. Target communities have rarely been involved in the planning or implementation of projects, and after completion they have had no interest in the continuing success of what they see as a Government responsibility. Agencies generally have not budgeted for system maintenance, with the result that systems fail rapidly and fall into disuse. Qualified manpower is in short supply in most developing countries, and agencies responsible for infrastructure services have been handicapped by inadequate staffing as well as limited budgets. The quality of staff in many agencies has not allowed imaginative approaches to be taken, and all too frequently costly developed-country technology has been adopted. Design criteria and standards used in the provision of infrastructure for low-income settlements have not been appropriate, and this has seriously affected the coverage achieved using the budgets available. Thus, while financial restrictions have undoubtedly affected performance in the sector, there is doubt as to whether existing delivery systems would have accomplished much more even if more funds had been made available. It is essential in future programmes to ensure that investments in infrastructure actually benefit target groups, that the community is involved in project selection, that as broad a coverage as possible is achieved and that infrastructure components are integrated with other improvements.

50. The need to improve rural settlements by upgrading infrastructure is now recognized in most developing countries, but the ability to implement projects is still limited. Urban slum areas have yet to receive any great attention because they are already served with some elements of infrastructure, although these are usually inadequate.

However, there is evidence that urban master planning, including planning for water supply and sanitation, is now taking account of these communities, and upgrading of water-supply and sanitation services will occur irrespective of the type of neighbourhood. On the other hand, there is still resistance in many developing countries to improving infrastructure in squatter settlements. However, the magnitude of the squatter problem will inevitably convince Governments that a policy of upgrading is the only feasible approach. Few countries will be able to think in terms of the resettlement of slum and squatter populations, and to continue to ignore the increasing problems of inadequate infrastructure in existing communities is not only socially irresponsible but unwise from the health point of view.

B. Rational approaches

51. Two fundamental factors must govern the approach to the provision of infrastructure in human settlements as a component of settlements policy; the first is concern for underprivileged people, and the second is the financial need to aim at satisfying the basic human requirements of the largest number of people possible. Consequently, the Commission should be concerned primarily with infrastructure in upgrading and development projects in low-income settlements and with the machinery for integrating the infrastructure sector into settlements policy and planning. The following table outlines the types of rural and urban projects of greatest interest and the elements of infrastructure which are likely to be associated with each type. The priority given to these elements will depend on the characteristics of the community being served and the preferences of the target population. Generally, however, the objectives in providing infrastructure will be to promote health, improve the environment and provide amenities, in that order.

Infrastructure elements as part of comprehensive settlements development	Rural settlements		Urban settlements			
	Upgrading	Growth centre development	Squatter upgrading	Slum upgrading	Sites and services	New communities
Water supply	*	*	*	(*)	*	*
Sanitation	*	*	*	(*)	*	*
Drainage	*	*	*		*	*
Solid waste disposal	(*)	*	*		*	*
Energy supplies	*	*	*		*	*
Road networks	*	*	*		*	*
Transport	(*)	*				*
Communications		*			*	*
Security and social services		*	*		*	*

\* Indicates probable inputs  
 (\*) Indicates possible inputs



52. Water supply and sanitation together play a key role in promoting health and should always be taken into account in human settlements projects. These elements will often be the only infrastructure provided in upgrading projects, but their delivery should be integrated into programmes designed to improve low-income communities in a social as well as material sense. If a particular community gives priority to a different element of infrastructure, the wishes of the people should be considered before any decision is taken concerning the project components in order to prevent failure through lack of public acceptance of what might have been provided with the best of intentions. After water supply and sanitation, perhaps next in importance from both the health and environmental improvement standpoints would be drainage and solid waste disposal. Squatter settlements will frequently be situated on land subject to flooding, and drainage and pathway construction will often have a high priority for residents. Solid waste disposal will sometimes not rate highly with low-income residents because of lack of awareness of health hazards and lack of sensitivity about the quality of the environment. To overcome such ignorance, public education should be an essential component of any infrastructure project in low-income communities. Amenities such as roads, electricity supplies, transport, communications, security and social services are considered essential by wealthy communities but will generally not be included in projects for low-income settlements in developing countries over the next decade. Basic needs for the more important elements of infrastructure will have to be supplied to the majority of poor people before any resources can be devoted to amenities. In all cases, local needs should be evaluated and action should be designed to be consistent with local resources and capabilities.

53. In view of the high rate of failure of many infrastructure projects in the past, it is now accepted that the target population should be involved at all stages of a project, from conception through planning and design to implementation and operation. Planning from the bottom up is now recognized as the only practical means of improving a project's chances of success and therefore of making the best use of resources. Furthermore, public participation is not only a means of ensuring project acceptance but is now frequently used as an input to project financing. A willingness to pay for infrastructure indicates a desire to benefit from a project and, even when the ability of a poor person to pay is very limited, individuals can still contribute labour. For this to be possible, the project must be designed to accommodate this form of assistance. Another way in which a community can reduce the costs of delivery of infrastructure to a low-income settlement is through the development of community skills to create an informal-sector manufacturing capability for the production of essential components at low cost. Here again, the project must be conceived with this in mind, and definite steps must be taken to select, train and finance appropriate members of the community. For this approach to be successful, existing strict quality standards for materials and components will have to be relaxed, and this will sometimes create problems where building codes have been established. Another advantage of developing such an informal sector is that unemployment, a common problem in low-income communities, will be reduced, and this will be particularly important if the products can be utilized in other projects over an extended period.

54. Much work has been carried out on innovative and low-cost infrastructure technologies in recent years, and many pilot and demonstration projects have been implemented, although not within the context of human settlements improvement. Only some of this research and development work has been reviewed and publicized. A critical evaluation of relevant material and past projects will facilitate the transfer of appropriate technological, organizational and financial approaches. Such an evaluation should look at infrastructure in relation to the overall development of low-income settlements and should attempt to identify deficiencies which might have affected the integration of past infrastructure projects into general community development.

55. A major deficiency in the development of appropriate approaches for the delivery of infrastructure to low-income communities is the lack of information flows among developing countries and regions. Successful techniques, designs and administrative arrangements are at present not given the wide publicity necessary to support expanded programmes around the world. There is a great need for housing authorities and other agencies concerned with the provision of infrastructure to be informed on these matters for both motivation and guidance purposes. Reports and films would serve a useful purpose in transferring information on project planning, design, construction and maintenance. In addition, educational workshops for different levels of personnel would be invaluable in terms of training teams within agencies to develop programmes with a greater chance of success by drawing on past experience around the world.

56. Finally, the reluctance on the part of many housing authorities to undertake settlement upgrading projects in low-income settlements and the lack of experience in carrying out projects on the part of others can only be overcome if more demonstration projects are initiated. Particularly in those countries where infrastructure upgrading has not been attempted in recent years, the value of demonstration projects will lie not only in their training value for the agencies involved but also in their catalytic effect on public demand for improved infrastructure. Such demonstration projects should normally be based on known successful techniques, but innovations could be tested under suitable conditions if properly planned and integrated into community improvement efforts. Public education should be an important component of all demonstration projects. Thorough monitoring and evaluation of projects is essential in order to provide the best justification for expanded programmes. Sociological and economic evaluations of projects are as important as technological evaluations.

## V. CONCLUSIONS AND RECOMMENDATIONS

### A. National action

57. Serious attempts should be made to reverse the trend whereby the poor subsidize the provision of infrastructure to richer urban dwellers. Realistic charges should be applied in urban areas already served by public utilities, and the resulting revenue should be made available for infrastructure development in low-income settlements.
58. National policies on the upgrading of low-income communities should be established. Political and administrative impediments hindering the delivery of infrastructure in upgrading programmes must be overcome.
59. Housing authorities should be prepared to expand upgrading programmes for low-income settlements and to co-ordinate the activities of the different agencies concerned with different elements of infrastructure. They must be provided with the resources and staff to do this, and Government policy must be such as to provide incentives for agencies to collaborate on these programmes.
60. To ensure the coverage of the greatest numbers with available budgets, a basic needs approach will be necessary in selecting elements of infrastructure and levels of service. This will often result in lower standards being adopted in low-income settlements than has normally been allowed under existing building codes, and arrangements should be made to allow the relaxation of restrictive regulations.
61. To gain experience in undertaking such programmes, housing authorities and other relevant agencies should develop demonstration projects serving communities where no previous infrastructure project has been attempted. Consideration should be given to taking advantage of international agency expertise in selecting and planning demonstration projects.
62. The objectives of demonstration projects should include, in particular, the development of community skills and the encouragement of the informal sector to produce low-cost components for the project and for any subsequent expanded programme. Both training and financial support will be necessary, and assistance from international agencies should again be considered.
63. In all infrastructure upgrading projects, the target community must be involved at all stages. Sociological techniques for soliciting public opinion and ensuring active participation must be developed at the beginning of any upgrading programme for low-income settlements. The elements of infrastructure installed must be socially acceptable and affordable.
64. National housing authorities and other relevant agencies should take advantage of appropriate international and regional workshops to upgrade their staff in the specialized field of upgrading low-income settlements. They should also plan to hold national training seminars and workshops for all levels of staff involved in the sector, possibly requesting the assistance of international agencies and taking advantage of educational materials and visual aids prepared for the purpose.

65. Finally, in all these suggested activities, housing authorities must collaborate with the national action committees that have been set up in most countries in connection with the International Drinking Water Supply and Sanitation Decade.

B. International action

66. Many United Nations agencies have been involved in the provision of infrastructure for many years, each with its own particular approach and area of specialization. The tendency in recent years has been to give priority to serving the basic needs of low-income communities. All assistance of an international or bilateral nature is now presumably co-ordinated as a result of the International Drinking Water Supply and Sanitation Decade. Any additional activities in providing infrastructure for low-income settlements which the Commission might wish to support should be integrated with the ongoing programmes of other agencies in order to avoid duplication of efforts.

67. In spite of the likely increase in activity in the water-supply and sanitation sector in the course of the Decade, in most countries there is still a need for international assistance specifically related to the provision of infrastructure to low-income communities and the integration of infrastructure projects into overall settlement upgrading. The United Nations Centre for Human Settlements (Habitat) is in a position to provide this type of assistance, which will become increasingly necessary to developing countries as upgrading programmes expand. In undertaking activities in the area of infrastructure, the Centre, guided by its primary interest in overall community development, must take account of the interaction and trade-offs between the provision of infrastructure and other aspects of settlement development.

68. The Centre's recommended work programme on infrastructure for 1982-1983 and recommended medium-term work programme on infrastructure for 1984-1989, given in annexes I and II, address major issues and are designed to produce and transfer information considered essential for the success of national programmes. These recommended work programmes take advantage of the strengths of the Centre and aim at developing additional expertise and involvement in housing projects. The perceived needs of national programmes related to the provision of infrastructure in low-income communities, as addressed by the Centre's recommended work programmes on infrastructure, concern the following:

- (a) Collection and critical analysis of data;
- (b) Project evaluation;
- (c) Transfer of information;
- (d) Production of visual aids and training materials;
- (e) Organization of seminars and workshops;
- (f) Involvement in demonstration projects.

Annex I

RECOMMENDED UNCHS (HABITAT) WORK PROGRAMME ON INFRASTRUCTURE FOR 1982-1983

1. The primary aim in designing a work programme on infrastructure research and development for the period 1982-1983 is to build up an authoritative and up-to-date body of information on all aspects of infrastructure in the context of the upgrading and development of low-income rural and urban communities in developing countries, taking account of the question of environmental protection, particularly solid-waste disposal and drainage. Once this has been accomplished, the Centre will be in a strong position to provide a useful advisory service to countries in all developing regions and to play an active role in improving the quality of life in human settlements. Work carried out under this programme will also generate direct inputs for the preparation of the Quinquennial Global Report on Human Settlements. The work programme delineated herein can be actively pursued and has been designed so that it is consistent with projects outlined in the work programme for 1980-1981. It has also been organized so as to provide a basis for projects recommended in the medium-term programme for 1984-1989. The objectives and resources implied are consistent with the programme budgets for 1980-1981 and 1982-1983.

2. Much of the information to be collected during the period 1980-1981 will not be immediately available in published form, and a great deal of effort will be required to contact other agencies and to evaluate projects on-site. Given the limited manpower resources of the Centre, the expertise of research institutions and outside consultants will have to be drawn on if the objectives of projects are to be achieved within the biennium. A modest start should be made with infrastructure demonstration projects, and, whenever possible, these should form an integral part of technical co-operation projects and/or research-and-development demonstration projects executed by the centre. The specialist expertise of other United Nations agencies, external consultants and research institutions should be called upon for these early efforts to ensure that sound technological and socio-economic approaches are introduced.

3. Detailed descriptions of the recommended work programme for the period 1982-1983 are provided below:

Project 1. Human Settlements infrastructure projects evaluation (duration two years)  
(Subprogramme 3, sub-element 3.2.3.3.)

A. Objectives

4. The objectives of this project will be to evaluate, assess and compare provisions for infrastructure in past human settlements upgrading and development projects for low-income families throughout the world, with a view to establishing:

(a) Appropriate infrastructure technologies and their relationship to geographical, topographical, site-specific, demographic, institutional, managerial, social, cultural and religious factors and conditions;

(b) The inter-relationship between infrastructure provision and other aspects of settlement development;

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(c) The financial and economic implications of alternative infrastructure technologies and their components and possible trade-offs in settlement development;

(d) Possibilities for mobilizing the informal sector and for encouraging aided self-help for the provision of infrastructure in rural and urban low-income communities;

(e) Social priorities, degree of acceptability and manageability, willingness and ability to pay, benefits and disbenefits associated with infrastructure, as compared with other aspects of settlements development;

(f) Level of institutional support for infrastructure consistent with operational success;

(g) Successful approaches for integrating infrastructure development into human settlements projects.

#### B. Method

##### (i) Classification of human settlements projects

5. Information on projects for low-income communities should be divided into the following categories:

- (a) Rural settlements upgrading;
- (b) Rural growth-centre development;
- (c) Urban slum upgrading;
- (d) Urban squatter upgrading;
- (e) Sites-and-services schemes;
- (f) New urban community development.

##### (ii) Data collection (months 1-12)

6. It will be necessary to approach United Nations and bilateral agencies for data on well documented projects where infrastructure has formed part of integrated human settlements development activities. No attempt should be made to collect information on major urban schemes where particular elements of infrastructure have been provided on a city-wide basis. However, where a project has concentrated on the provision of infrastructure (even only one element, such as water supply or sanitation) to a low-income community in a developing country, data on that project will be useful. All types of infrastructure elements should be included in the project, but more information is likely to be available on water supply, sanitation, drainage, solid-waste disposal, pathways and roads than on electricity supplies, transport, communications, security and social services.

7. The World Bank began sponsoring sites-and-services schemes in 1972, and by March 1980 14 projects had been approved in 14 countries and a total of \$ US 106 million in loans and credits had been committed. From 1974, the World Bank extended lending to include squatter-housing upgrading in Calcutta, Dar-es-Salaam, El Salvador, Jakarta, Lusaka, Manila, Nairobi

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and Rabat. UNICEF and WHO have been active in the water-supply and sanitation sector for many years, and their more recent projects connected with low-income communities will be worthy of evaluation. Completed demonstration projects carried out under the UNDP Global Project on Low Cost Water Supply and Sanitation (GLO/78/006) will also provide up-to-date information on appropriate sanitation alternatives for low-income communities.

8. Bilateral agencies have likewise been involved in providing urban and rural communities with infrastructure, particularly water supply, and a large body of information will be available. To extract details in these cases, it might be necessary for UNCHS (Habitat) to contract consultants or universities in donor countries. Since 1975, the USAID Housing Investment Guaranty Programme, involving about \$ US 100 million per year, has included slum upgrading, sites-and-services schemes and core housing projects. The Canadian International Development Agency (CIDA) has also started to support upgrading and sites-and-services projects.

The Centre itself has acted as executing agency for many human settlements projects under its technical co-operation programme. These projects have not undergone detailed evaluation from the point of view of infrastructure and will provide an immediate and readily available source of data. Regional economic commissions will also be able to collect information on projects carried out with local resources in countries in their region.

10. In all cases, a detailed outline of data requirements will be required, and a standard format should be prepared by UNCHS (Habitat) before the agencies are approached. It would be unusual if the various agencies responded immediately with the quantity of data necessary for a detailed evaluation, and visits to agencies and to important project sites by UNCHS (Habitat) staff or consultants will often be necessary. A computer system for data storage and retrieval is probably essential for a global project, and this should be developed in the early stages of the project, but with data analysis in mind.

11. The ad hoc expert group meeting scheduled for 1981 under subprogramme 3, sub-element 3.2.3.3 in the 1980-1981 UNCHS (Habitat) work programme could form a useful preliminary input for this project and could be used as a means of assembling information and identifying consultants and research centres.

(ii) Data analysis (months 9-18)

12. Much of the raw data will have to be reduced, even before storage, to simplify its analysis, and it will therefore be necessary to define group classifications for such project characteristics as geographical location, topography, demographic and sociological conditions, etc. However, for a detailed analysis of the technological and financial aspects of projects, the relevant sections of the raw data will require extension, so that individual components and influencing variables can be identified and assessed.

13. Thereafter, the critical evaluation of projects should be carried out on the basis of the following guidelines:

- (a) Infrastructure components:
- (i) Technological suitability of materials, standards and design;
  - (ii) Financial and economic analyses;

Cost-sharing: /...

- (iii) Cost-saving alternatives;
  - (iv) Possibilities for informal-sector contributions and aided self-help;
  - (v) Interactions with other aspects of settlements development.
- (b) Social factors:
- (i) Community involvement in the planning, installation and operation of infrastructure;
  - (ii) Community priorities for infrastructure vis-à-vis other aspects of settlements development and the acceptability of the technology provided;
  - (iii) Ability and willingness to pay, cost recovery;
  - (iv) Community education programme;
  - (v) Benefits and disbenefits.
- (c) Institutional aspects:
- (i) Organizations involved in the planning, installation and maintenance of infrastructure;
  - (ii) Support levels required for infrastructure as compared with those required for overall settlements development;
  - (iii) Constraints on progress.

14. The manpower resources of the Centre are unlikely to be sufficient to permit the completion of the analysis within the time frame suggested, and specialized consultants, university research groups and other suitable research organizations should be contracted to carry out specific tasks on the project.

(iv) Regional workshops (months 18-24)

15. Upon the completion of the project, the intention is to disseminate the findings by means of regional workshops for senior executives from human settlements agencies in developing countries. These workshops will be designed as a series of working sessions, rather than discussion sessions, and information will be provided on appropriate forms of infrastructure and on their planning, financing, construction, operation and maintenance. Community participation and development aspects will also be covered, together with the interactions and trade-offs between infrastructure and other features of settlements development.

16. The documents prepared for distribution at each workshop should cover those infrastructure components and supporting features which are relevant to a particular region. It is likely that consultants will be required to assist Centre staff, both in the preparation of documentation and as lecturers at the workshops. These workshop sessions will also provide an opportunity for identifying possible sites for demonstration projects to be carried out as part of the 1984-1989 medium-term work programme.

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C. Outputs (months 18-24)

17. Project outputs will comprise the following:

- (a) A summary report on the findings of the study for circulation to major agencies concerned with human settlements in developing countries;
- (b) Organization of four regional workshops to disseminate the findings of the study, in collaboration with the Centre's Technical Co-operation Division;
- (c) Participation in international conferences, as appropriate, to communicate the activities of the Centre and the findings of the study; staff and consultants should also be encouraged to publish material from the study in reputable international and regional journals.

D. Resources required

18. The resources required for this project are as follows:

UNCHS staff (work months)	Consultants (work months)	Regional workshops (thousands of US dollar)	Travel (thousands of US dollars)	Print (thousands of US dollars)	Others (thousands of US dollars)
12	6	160	40	10	50 a/

a/ Direct support for research.

Project 2. Innovative infrastructure technology for human settlements (duration three years)  
(Subprogramme 3, sub-element 3.2.3.3)

A. Objectives

19. The objectives of this project will be:

- (a) To collect all project documentation and evaluation reports on human settlements development projects which have included innovative infrastructure technology as an integral part of the programme or as demonstration or pilot-scale additions;
- (b) To evaluate the present status of such projects and, where innovative infrastructure components are still in use, to make site assessments;
- (c) To prepare a critical review of available literature on innovative technology of relevance to the provision of infrastructure and services for human settlements in developing countries;
- (d) To analyse and evaluate the information collected on innovative infrastructure technology, to compare such technology with conventional approaches and to relate it to other aspects of settlements development;
- (e) To plan and implement, in collaboration with the Technical Co-operation Division, demonstration projects incorporating promising innovative approaches to infrastructure as an integral part of settlement upgrading, and to monitor their performance.

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## B. Method

### (i) Information collection (months 1-9)

20. The first step will be to compile a list of agencies and organizations interested in innovative and appropriate technology for human settlements development and to solicit information from them. Next, complete documentation should be collected on all demonstration projects involving experimental innovative approaches to the provision of infrastructure in human settlements. Attempts should be made to obtain information on all aspects of settlement upgrading in each case so as to place the innovative technological components in the general context of community development. The current status of these projects should be established and, wherever innovative approaches are still in operation, site assessments should be carried out.

21. To supplement the information collected from agency and government sources, a thorough search of existing literature to identify new ideas and unconventional approaches should be undertaken, possibly by a specialist consultant. All innovative technology considered relevant to the provision of infrastructure and services to low-income communities should be critically evaluated in terms of its functions, economics and applications.

### (ii) Evaluation (months 9-15)

22. All information on innovative infrastructure technology must be assessed in terms of its application to the major types of rural and urban settlements development and in the light of the basic needs approach necessary in developing low-income communities. The factors which should be considered include:

- (a) The implications for human settlements project planning;
- (b) System financing and implementation;
- (c) System operation and maintenance;
- (d) Suitability of technology, output benefits and downstream effects;
- (e) Community organizational requirements and acceptability;
- (f) System economics;
- (g) Informal-sector and self-help possibilities.

23. The primary purpose of this evaluation will be to identify promising but unproved innovative infrastructure technologies and to establish the conditions under which they might stand the most chance of success in low-income communities in developing countries.

### (iii) Demonstration projects (months 16-36)

24. The findings of the evaluation will be translated into demonstration projects designed to test the practical feasibility of promising innovative technologies under conditions approaching those identified as being ideal. In the planning of such projects, it should be understood that established life styles are very difficult to change and that "force-fitting" innovative approaches providing limited tangible returns on a community and thereby upsetting the communities normal routine will not produce success, even though the approaches concerned might be ecologically sound. Furthermore, low-income communities are not interested in esoteric research studies, and only technology which can form an integral and unobtrusive part of community life will be worth incorporating into human settlements projects.

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Downstream opportunities for the exploitation of the products of innovations must be available if the innovative approaches are to survive in the long term.

25. At this stage in the Centre's work programme on infrastructure, it would be appropriate to develop demonstration projects involving innovative technology in collaboration with the Technical Co-operation Division. If suitable projects presented themselves at the appropriate time in the different regions, designs could be subjected to replicate testing. Demonstration projects must be carefully planned, with detailed consideration being given to the socio-cultural context of the technology and the technology's integration into balanced settlement development activities. Initially, only one form of innovative technology should be applied in each demonstration project, but the technology in question should be introduced throughout the communities where trials are to be made. Even though the projects would be for demonstration purposes, the selection of the technology and the project design should be based on the assumption of continuing community use. Later demonstration projects could be designed to assess other innovative approaches, one at a time.
26. In the design of projects, advantage should be taken of local materials and skills wherever possible, but due consideration should be given to the use of new materials and techniques. Attempts should be made to involve and train the informal sector, and community participation and self-help should be important aspects of all projects. Downstream factors associated with the innovative technology must be systematically developed as an integral part of each project.
27. Past experience with demonstration upgrading projects involving an innovative technological component has indicated that the following basic steps are essential to success:
- (a) The establishment of institutional involvement and responsibilities;
  - (b) The identification of project components;
  - (c) The conduct of a preliminary survey of the target community;
  - (d) The holding of consultations with the community;
  - (e) The conduct of physical and socio-economic surveys;
  - (f) Integrated planning and project design;
  - (g) The setting of priorities and the scheduling of activities;
  - (h) The organization of informal-sector and self-help activities;
  - (i) The implementation of the project;
  - (j) Project monitoring and evaluation.
28. Such an approach requires a multi-disciplinary team, but care should be taken not to assign responsibility for specific components to individual professionals who might be tempted to develop their sector at the expense of the overall integrated plan.
29. With regard to disseminating information on successful projects, it is essential that visual aids be prepared during the planning, implementation and operational stages of demonstration projects. A film depicting the integrated nature of the project and community acceptance of and benefits derived from the innovative technology will be invaluable in transferring the technology concerned nationally and internationally.
30. It is likely that the time frame adopted for this project will not allow monitoring of demonstration projects for any length of time. As monitoring is a very important aspect, the Research and Development Division must prepare for longer-term monitoring of all demonstration

projects and, if necessary, for the provision of additional support for improvement schemes. It is considered that a settlements development project must operate for two years before reliable information can be obtained for evaluation purposes.

C. Outputs

31. Project outputs will comprise the following:

(a) A critical review of the application of innovative technology in the provision of infrastructure to low-income human settlements; this review could be distributed by the Centre to human settlements agencies in developing countries; the findings should also be disseminated through staff presentations at international and regional conferences and through the publication of articles in journals and newspapers;

(b) A field manual for each innovative infrastructure technology found to be successful in demonstration projects; each field manual would provide detailed designs and information on all aspects of the technology, thereby allowing use of the technology by interested agencies in the implementation of their own scheme;

(c) Tape and slide presentations to be used in conjunction with field manuals so as to provide visual and practical instructions on programme implementation;

(d) A colour film reviewing essential aspects of innovative infrastructure technologies and associated community activities; such a film, drawing on the successes of demonstration projects, would be instrumental in transferring appropriate technology to countries around the world and in supporting the Centre's catalytic role in this respect.

D. Resources required

32. The resources required for this project are as follows:

UNCHS staff (work months)	Consultants (work months)	Travel (thousands of US dollars)	Print (thousands of US dollars)	Others (thousands of US dollars)
12	2	20	8	60 <sup>a/</sup>

<sup>a/</sup> Vision Habitat visual-aid materials.

Project 3. Appropriate materials, equipment, techniques and standards for infrastructure in human settlements development (duration two years)

(Subprogramme 3, sub-element 3.2.3.3)

33. This project will, in fact, be part of the 1980-1981 sub-element 3.2.2.7 (Referral systems in building materials, plant and equipment) but is outlined here in expanded form to indicate the potential for follow-up action in the area of infrastructure. Resources required for the implementation of this project will be drawn from sub-element 3.2.2.7.

#### A. Objectives

34. The objectives of this project will be as follows:

- (a) To establish a pool of information which can be referred to by developing countries to determine the availability, sources and applications of suitable materials and equipment for use in providing water supply, sanitation, drainage, solid-waste disposal, roads and pathways energy supplies, transport, communications and other services to low-income rural and urban communities;
- (b) To review standards for the construction of infrastructure components and to examine their relevance to the basic needs of low-income communities in developing countries with a view to providing guidelines for acceptable levels of system quality and durability;
- (c) To prepare training manuals on techniques for: the local production of components used in infrastructure; the construction of infrastructure systems by the community or the formal sector; community repair and maintenance of infrastructure systems;
- (d) To produce visual aids which can be used in conjunction with operating manuals to illustrate details of infrastructure systems construction.

#### B. Method

35. The first step will be to compile a listing of manufacturers of basic construction materials such as cement, bricks, blocks, reinforcing wire and steel, pipes and tanks of all materials, cables, containers, etc., together with details on quality and prices in both developing countries and exporting countries. a/ Of equal significance will be a listing of manufactured items of importance in infrastructure construction, especially those now being produced in developing countries and capable of being exported. These listings should be updated regularly, particularly in respect of the exporting capability of developing countries. The identification of possible recipient countries which could use exported items effectively would be an essential part of this exercise.

In addition to formally manufactured items available for purchase, many human settlements development projects have utilized informally produced infrastructure components such as low-grade stoneware pipes, pre-cast concrete units, locally made hand-pumps, etc. An attempt should be made to collect information on all such items, with details on design, materials of construction, manufacture, skills and training required, costs, quality, durability and uses. Wherever possible, the performance characteristics of major items and their maintenance requirements should be established by on-site inspection. Building-research and appropriate academic and professional institutions in developing countries should be used to collect this information and assess performance.

37. Institutions in developing countries should be contracted to prepare a review of building codes and standards applied to infrastructure in low-income communities and of the relationship of such codes and standards to the basic-needs approach considered essential. The results of applying more relaxed standards should be evaluated by means of on-site surveys of identified projects. Institutional factors associated with the adoption of relaxed standards for materials and construction in the provision of infrastructure should be thoroughly investigated.

a/ The scope of this activity will have to be limited to include only those countries which normally export such materials to developing countries and which have reasonable access to developing countries.

(ii) Training manuals (months 12-24)

38. The information collected on infrastructure materials, equipment, techniques and standards will be drawn on to identify those infrastructure components which could be produced by a low-income community or its informal sector and to establish those construction and maintenance activities which could be carried out on the same basis. Separate training manuals should be prepared to cover different aspects of infrastructure, including water supply, sanitation, drainage, footpaths, roads and refuse collection. Each manual should include all techniques pertaining to unit fabrication and operation, system construction and maintenance.

39. These manuals must also include sections clearly outlining the responsibilities of government service agencies in terms of contributing to the infrastructure system. Of particular importance will be precise details on the interface between official and community activities and the training responsibilities of government agencies. Consideration will also have to be given to possibilities for financing construction activities.

(iii) Visual aids (months 18-24)

40. It is envisaged that two forms of visual aids will be prepared for distribution to interested human settlement agencies to complement operating manuals on infrastructure systems. The most obvious form consists of slide and tape presentations, but physical models or prototype units of infrastructure components to be manufactured will also be invaluable in the context of attempts to transfer technology. However, before these aids can be prepared, it will be necessary to identify projects where appropriate techniques have been developed and adopted and to arrange for staged demonstrations for photographic purposes. Models or prototype units might well be made of lightweight materials for ease of transport, and it will often be advantageous to produce templates which can be used in the construction of prototype units at any site.

C. Outputs (months 12-24)

41. Project outputs will comprise the following:

(a) A referral service on the availability, sources and applications of materials and equipment suitable for use in the provision of infrastructure and services to low-income communities in developing countries;

(b) A comprehensive report on acceptable standards for infrastructure in low-income communities; this report should be widely distributed by the Centre to government agencies involved in the provision of infrastructure to human settlements;

(c) Several training manuals concerned with community and informal-sector activities in the manufacture of infrastructure components and the construction and maintenance of infrastructure systems;

(d) Slide-tape presentations and/or model or prototype units/templates to be used in conjunction with operating manuals for community training purposes.

D. Resources required

42. The resources required for this project will be drawn from subprogramme 3, sub-element 3.2.2.7 (1980-1981 work programme), as necessary. No special allocation is needed for this activity.

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Project 4. Demonstration projects integrating infrastructure into settlements upgrading (duration three years)

(Subprogramme 3, sub-element 3.2.3.2)

A. Objectives

43. The objectives of this project will be:

- (a) To undertake technical co-operation projects and research-and-development demonstration projects;
- (b) To test approaches for the provision of infrastructure in upgrading projects when the approaches concerned appear to be appropriate for the situation, given the existing state of knowledge;
- (c) To demonstrate to national Governments low-cost approaches and appropriate standards for the provision of infrastructure to low-income communities;
- (d) To monitor and evaluate the infrastructure component and related factors in demonstration projects;
- (e) To prepare visual-aid materials for use in training and public education;
- (f) To publish and disseminate project results.

B. Method

(i) Project selection

44. This project will be developed as appropriate in the light of the technical co-operation projects and the research-and-development demonstration projects initiated during the period. Involvement from the very earliest stage of an intended project is essential, so projects which have already been planned should not be included in this project. However, all other technical co-operation projects discussed with the Centre should be considered for their suitability as infrastructure demonstration projects. Likewise, research-and-development demonstration projects should incorporate a demonstration infrastructure component integrated with the other activities.

At the present time it is impossible to anticipate suitable future technical co-operation projects, but steps are already being taken to develop a proposal for research-and-development demonstration projects on the upgrading of slums and squatter settlements in the African and Asian regions. A project in Zaire has been tentatively identified as being suitable for a collaborative effort involving the Technical Co-operation Division; the latter will handle the technical assistance part, which will be funded by UNDP under its country programme. Although it has not been possible to identify any particular project in Asia, Pakistan and Malaysia have been suggested as suitable countries in respect of their willingness to support upgrading schemes. Projects in Latin America and Western Asia should also be considered if suitable opportunities arise in the period 1981-1983. Although the proposed research-and-development demonstration projects in the African and Asian regions are related to the upgrading of urban slum and squatter communities, demonstration projects concerned with the upgrading of rural communities should also be developed.

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46. The criteria to be adopted in the selection of suitable upgrading projects for the inclusion of an infrastructure dimension should be as follows:

(a) The existing community should be deficient in basic infrastructure and should have a perceived need for certain elements;

(b) The authorities concerned should be willing to relax demanding building standards in the design of infrastructure elements for the upgrading project;

(c) The community should be willing to accept aided self-help in the provision of infrastructure in the demonstration area;

(d) Adequate government finance should be available to implement and operate the infrastructure component of the demonstration project, allowance being made for community contributions;

(e) No more than four types of infrastructure improvement should normally be attempted in any one demonstration project.

47. Typical infrastructure elements which might be included in an upgrading project are:

(a) Water supply, sanitation, drainage and pathways in urban areas subject to flooding;

(b) Water supply, sanitation, road and path network and solid-waste disposal in hilly urban areas;

(c) Sanitation, drainage, street lighting and communications in rural settlements with adequate water supplies.

48. The number of infrastructure elements to be included in a demonstration project will be limited by the resources available, but water supply and sanitation, where they are known to be deficient, should always take priority over other elements. It is possible that the early involvement of the Centre in the infrastructure component of demonstration projects will be limited to water supply and sanitation.

(ii) Project planning and design

49. When a suitable project has been identified and agreed upon, a UNCHS (Habitat) staff member must visit the site to familiarize himself with local conditions and to have preliminary discussions with responsible government agencies. Essential steps in the development of the project must be established and mechanisms for the implementation of the various activities necessary must be agreed upon. The factors discussed are likely to include the following (in the order given):

(a) Institutional responsibilities: the responsibilities of the various agencies involved in the project must be established and a co-ordinating agency selected at the earliest possible moment;

(b) Project components: those infrastructure components which are to be included in the project must be identified, and acceptable levels of service must be agreed upon; components must be reviewed in the context of the settlements upgrading programme as a whole and community priorities;

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(c) Preliminary survey: general information must be gathered on the number of people in the community and their distribution, existing infrastructure provisions, environmental conditions and the availability of services in the general area of the community;

(d) Consultations: it is widely accepted that community participation in the planning of upgrading projects is essential, and consultations should be held as early as possible; the opinions and preferences of the people must be taken seriously and must be accommodated in the design of infrastructure wherever possible;

(e) Physical and socio-economic surveys: complete information on the target community and existing conditions must be collected; of particular importance from the point of view of infrastructure will be the number of persons in an average household, their social, cultural and religious habits, the health and hygiene status of the community, economic conditions, details on the use of existing infrastructure, the availability of building materials and local skills; indigenous social and health workers should be utilized to collect much of this information and to identify community leadership and organization characteristics;

(f) Project planning: detailed planning for infrastructure should be possible when the above steps have been completed; however a continuous process of consultation with the community is necessary, and the planning of infrastructure must be co-ordinated with other aspects of settlement upgrading; at this stage, decisions should be taken on appropriate technologies, community participation in the implementation and management of infrastructure, and institutional activities; designs should be prepared;

(g) Priority-setting and scheduling of activities: at this stage in a project, the various agencies must set priorities among the various activities and agree on the co-ordination of clusters of activities which are essentially connected and must be integrated; the cluster or clusters including infrastructure must now be scheduled so that no conflicts arise during implementation; the manufacture of special infrastructure components must be organized ahead of their installation;

(h) Organization of the informal sector and self-help activities: if the informal sector is to play a significant role in infrastructure upgrading, the activities to be handled by selected groups within the community (entrepreneurs) or the community as a whole must be identified and organized; designs must be made available and training provided; arrangements must be made for the supply of essential materials;

(i) Implementation of project: the community, the informal sector, private contractors and agency workers must be assigned tasks according to a logical work programme, and they must then be continuously supervised; highly technical components of the programme, such as setting out, will be carried out by responsible agencies, and all other activities will be supervised by them; formal arrangements will have to be made by the agencies for the long-term operation and maintenance of the infrastructure, with self-help programmes being used wherever possible; the financing of these activities will need careful consideration if infrastructure is to continue to operate as designed.

### (iii) Project monitoring and evaluation

50. After the completion of a demonstration project, it is essential to monitor the performance of the infrastructure and related components over an extended period of time. At least two years is required to ensure that the system is working normally, and a better measure of long-term success would be obtained five years after project completion. The local team used

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in the physical and socio-economic surveys should perhaps be contracted for a few weeks at the end of the first, second and fifth years to collect detailed information on the technical performance of the infrastructure components and on the communities' use of and opinions on the systems provided. With this information, the Centre would be in a position to evaluate the project and to modify its advice in relation to other schemes which arise from the demonstration project.

(iv) Visual-aid-materials

51. During the planning, preparation, implementation and operating phases of demonstration projects, advantage should be taken of opportunities to prepare visual-aid materials. Colour slides and colour film footage should be taken for use in the training of government agency personnel and informal sector groups, as well as for public education purposes. This material will not only be of value in promoting the extension of demonstration projects to other communities at the national level but will also be useful in encouraging other countries to undertake upgrading schemes of a similar type when the technology concerned is readily transferable.

52. The sequences and material to be filmed and photographed must be carefully planned by the UNCHS (Habitat) staff member concerned with infrastructure, so that filming personnel will not only receive a schedule to guide them but will also be instructed on the scope of their activities. When plans are being made for the production of visual aids, the target groups and the training and educational objectives of the project must be taken into account.

(v) Dissemination of results

53. As a primary objective of demonstration projects is to illustrate how upgrading schemes in low-income communities can be successful within the context of the limited resources available to both the Government and the community, the results of project evaluation must be transmitted to all relevant agencies of national Governments. In addition to the circulation of project implementation and evaluation reports, manuals should be prepared to indicate appropriate standards for the design and construction of infrastructure systems in low-income communities in developing countries. Once a few successful project components have been evaluated, it should be possible to prepare useful manuals and make these available to interested Governments.

54. The positive and negative findings of demonstration projects can also be disseminated by organizing a series of national-level seminars for different groups of executives, engineers, technicians and community, social and public-health workers from different agencies. The possibility of the Centre assisting in training for future schemes should be stressed, and visual-aid materials should be displayed. Encouragement should be given to the promotion of public education through the showing of demonstration-project films on television. National seminars might well be held after two years of project evaluation, once successes and failures have become more apparent.

55. A similar approach could be taken to disseminate results at the regional level, where the transfer of infrastructure technology is likely to be possible. Project evaluation reports could be sent to each human settlements agency in countries receptive to the concept of upgrading, and senior executives from such agencies could be invited to a regional seminar to discuss the findings. This would not only provide a forum for exchanges of ideas and experienced but would also assist in identifying sites for an extended programme of

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demonstration projects over the medium-term period. A regional seminar should be organized in each region where a demonstration project has been completed, and the timing should be arranged so that at least a two-year evaluation period has elapsed.

C. Outputs

Project outputs will comprise the following:

- (a) A comprehensive report on the planning, preparation, implementation and management of the infrastructure component of each demonstration upgrading project;
- (b) Project evaluation reports prepared two and five years after the time of completion each demonstration project;
- (c) Manuals on appropriate standards for the design and construction of different element of infrastructure;
- (d) Slide-tape presentations for the training of agency personnel and informal-sector groups;
- (e) Colour film focussing on community participation, activities and costs and benefits related to the infrastructure component of the upgrading projects for use in educating the public to support infrastructure improvement actively;
- (f) National and regional seminars to disseminate the results of demonstration projects and to attempt to catalyse further community upgrading activity; unfortunately, the time taken for project evaluation will mean that these seminars will not take place until at least two years after the completion of the projects, and budgetary provision for the seminars should therefore be made under the 1984-1989 medium-term work programme.

D. Resources required

The resources required for this project are as follows:

UNCHS staff (work months )	Consultants (work months)	National and regional seminars (thousands of US dollars)	Travel (thousands of US dollars)	Print (thousands of US dollars)	Others (thousands of US dollars)
1981	1982	1983			
2	2	6	4	(240) <sup>a/</sup>	12
				10	20 <sup>b/</sup>

<sup>a/</sup> Expenditure to be incurred after 1983, so not included in this project.

<sup>b/</sup> Support for initial survey work and project monitoring by local community workers.

Annex II

RECOMMENDED UNCHS (HABITAT) MEDIUM-TERM WORK PROGRAMME ON INFRASTRUCTURE FOR 1984-1989

1. The norms contained in the International Development Strategy for the Third United Nations Development Decade provide the general context for the development of proposals for the medium-term plan. With regard to goals and objectives, the International Development Strategy states:

"The provision of basic shelter and infrastructure for all people, in rural as well as urban areas, is a long-term goal.... Well-balanced programmes for the development of human settlements are necessary so as to provide greater benefits to low-income groups.... Full and effective participation by the entire population at all stages of the development process should be ensured." (A/35/592/Add.1, paras.49 and 51).

2. With regard to policy measures, the International Development Strategy states:

"Developing countries will formulate policies for the provision of basic shelter and infrastructure. To this end, and so as to benefit from the multiplying effect of investment in the field of human settlements, countries will develop their construction industry, particularly for low-cost housing, support relevant financing institutions, stimulate research and disseminate findings on efficient methods of construction, low-cost design and technology for infrastructure, indigenous building materials and environmental protection." (A/35/592/Add.1, para.160).

3. The UNCHS medium-term work programme on infrastructure for the period 1984-1989 is difficult to delineate in detail because it will depend very much on the outcome of projects completed during the period 1980-1983 and on the opportunities afforded by technical co-operation projects at the time. However, likely directions can be reviewed and a format provided for the structured design of projects.

4. It is likely that the findings of the work programmes for the period 1980-1983 will indicate different requirements and approaches in respect of the provision of infrastructure in rural upgrading schemes, rural growth centres, urban slum community upgrading, urban squatter community upgrading, sites-and-services schemes in low-income communities and new urban community development. The medium-term work programme should aim at the demonstration and evaluation of alternatives available for each type of community project with the intention of catalysing the expansion of infrastructure elements in human settlements projects at the national level and assisting in the transfer of appropriate technology among developing countries.

5. The use of demonstration projects is not the only means the Centre can adopt in the medium-term to help Governments and communities improve the provision of infrastructure in human settlements. Training and public education are also important in creating an environment in which skills will become available to implement schemes and in which the public is receptive to the need for improved infrastructure. Visual aids are invaluable in both these activities, and the Centre's strength in this area should be exploited to the full. In particular, public information films for television could be instrumental in encouraging low-income communities to participate in and help pay for essential infrastructure projects.

6. Another area which needs attention is financing for infrastructure, and the Centre's medium-term work programme should include a project aimed at providing Governments with information on infrastructure costs and indicating alternatives in the financing of upgrading and development schemes. Savings resulting from aided self-help and contributions from the informal sector are likely to play an important role in minimizing external funding requirements. Accordingly, activities directed towards mobilization, training and utilization in respect of self-help and informal-sector inputs for the implementation of human settlements schemes should also form part of the Centre's medium-term work programme.

Theme 1. Monitoring and evaluating demonstration projects  
incorporating infrastructure

7. Demonstration projects initiated during the period 1981-1983 will have to be monitored during the period 1984-1989. Demonstration projects carried out during the period 1984-1989 will also require monitoring on an annual basis throughout that period. Monitoring and evaluation exercises should be carried out one, two and five years after the time of completion of projects. Hence, this theme is likely to concern the entire medium-term period.

8. Local multi-disciplinary teams should be trained to monitor ongoing projects and should be sponsored for a period of a few weeks whenever monitoring is necessary. A standard procedure should be developed so that all teams involved in project monitoring collect all technological, social and economic information necessary for a thorough evaluation. Each monitoring exercise should result in the submission of an evaluation report to the national human settlements agency concerned, but the Centre might also find it useful to produce an annual demonstration-project evaluations report for circulation to other interested Governments.

9. Throughout the medium-term period, the Centre should be prepared to participate in national training programmes aimed at the transfer of knowledge gained from demonstration projects for the expansion of activities in the upgrading and development of human settlements. The success of demonstration projects lies not in the proof of the suitability of a particular approach for a specific community but in the willingness of national Governments to accept the concepts and extend them to other communities. Demonstration-project evaluations must be used by the Centre in any way that will have a positive influence on the expansion of human settlements upgrading and development programmes.

10. In accordance with project 4, subprogramme 3, sub-element 3.2.3.2 of the recommended 1982-1983 work programme (see annex I), the Centre should organize national seminars to disseminate the positive and negative findings of demonstration projects to different levels of staff in the various agencies involved in human settlements development. These seminars should be attended variously by executives, engineers, technicians and community, social and health workers who are likely to contribute to future programmes. When sufficient useful information has been collected on a number of demonstration projects in any region, a regional seminar should be organized to assist in the transfer of technology. Senior executives from human settlements agencies in developing countries of the region, particularly those not involved in demonstration projects, should be sponsored to attend the regional seminar.

11. During the final year of the medium-term period, all demonstration projects of the Centre should be evaluated by an expert group and a major report should be prepared for discussion at a global meeting of senior executives from human settlements agencies in developing countries not involved in the regional seminars. At that meeting, the Centre's training manuals, training visual aids and public education films for television should be displayed, and participants should be encouraged to make use of both the Centre and these materials in their human settlements programmes.

Theme 2. Demonstration projects incorporating appropriate infrastructure

12. The Centre should become more active in its involvement in demonstration projects in the period 1984-1989. However, with the information acquired through project 1, sub-programme 3, sub-element 3.2.3.3 of the recommended 1982-1983 work programme (see annex I) and the experience gained in demonstration projects carried out during the same period, it should be possible to design a structured programme of demonstration projects for the medium-term period. This programme should incorporate research-and-development objectives so that alternative approaches and system modifications can be tested in different demonstration projects with similar basic characteristics.

13. Research and development should be concerned initially with three types of human settlements projects: rural settlements upgrading, urban squatter upgrading and urban slum upgrading. Alternative approaches and systems for infrastructure upgrading should be considered quite separately for the three types of community, and sets of demonstration projects should be organized independently for each. The first step in the selection of projects would be to identify, for example, four countries where the conditions in a particular type of settlement would justify a similar technological approach to infrastructure upgrading. Specific settlements would then have to be selected in each country, each settlement serving as the site for an upgrading project, assuming the national Government is willing to collaborate.

14. Thereafter, the sequence of steps for project planning and implementation outlined in project 4, subprogramme 3, sub-element 3.2.3.3 of the recommended 1982-1983 work programme on infrastructure (see annex I, para.49) should be followed in each case, allowance being made for differences in system technology or organizational procedures. The purpose of testing alternatives in this way is to attempt to improve on essentially proven systems in terms of cost and/or social acceptability. An alternative approach would be to arrange for modifications to be incorporated into the system design selected for a specific community. This has the possible disadvantage of creating divisions in the community and diluting community efforts.

15. Typical system modifications which might be tested are: intermittent versus continuous water supply; frequency of public standpipes or community sanitation blocks; alternative drainage and pathway designs; different degrees of self-help and informal-sector involvement; components manufacture and/or system construction by the informal sector or by contractors; different degrees of cost recovery; community versus institutional management of infrastructure operation and maintenance; etc. Any modification of a system to be tested must have a reasonable chance of significantly improving the economics or effectiveness of providing basic infrastructure with a view to encouraging the extension of settlement upgrading programmes. The basic approach and infrastructure technology adopted must always be suitable for the site and the social

conditions prevailing. Different basic approaches, for example pit-privies and pour-flush latrines, might be used in different regions but they would not be combined in a particular demonstration project for comparison purposes.

16. In conjunction with demonstration projects, the Centre must be prepared to support training courses for agency personnel and the informal sector and to assist in public education activities. A multi-disciplinary team should be assembled early in each project to carry out initial surveys and, eventually, to assist in monitoring the projects. Each team should consist of at least an engineer, an economist and a sociologist, preferably recruited from local agencies, as well as the local community or health worker. In the planning and implementation of demonstration projects, advantage should always be taken of opportunities to collect audio-visual materials on infrastructure activities and items of special interest, in order to supplement the Centre's holdings in this sector.

Theme 3. Training activities associated with the provision of infrastructure in low-income human settlements

17. During the period 1984-1989, the Centre should step up its involvement in training related to infrastructure. Some national training assistance has been suggested in connexion with theme 2 for the successful implementation of demonstration projects. Project 3, subprogramme 3, sub-element 3.2.3.3, includes the preparation of training manuals for community and informal-sector participation, and project 4, subprogramme 3, sub-element 3.2.3.2 suggests the preparation of manuals on appropriate standards for design and construction in the provision of infrastructure (see annex I). Suggestions have also been made concerning the preparation of audio-visual materials and models or templates for use in training. All these outputs from earlier projects must be assembled and the experience gained in demonstration-project implementation drawn on to prepare for regional training activities.

18. It is strongly recommended that the Centre should direct its attention in the medium-term work programme to the training of trainers. To pursue an extensive programme of training for the provision of infrastructure at the national level would be prohibitive in cost. Regional workshops or seminars on training for senior professionals in human settlements agencies would not be reaching the appropriate audience and would be unlikely to have any effect on national training in the sector. To take advantage of the "snowball" effect in passing on information, senior training officers from human settlements agencies must be given support to enable them to attend regional workshops on training for infrastructure provision and must be urged to organize similar national workshops for different groups on their return home.

19. These regional workshops should not only review the major factors contributing to a successful infrastructure programme but should deal in detail with the training of different groups active in the sector. Comprehensive training manuals should be prepared for the various groups such as planners and designers, agency construction technicians, informal-sector entrepreneurs, community participants, social and health workers, etc. The availability of teaching aids should be illustrated by the exhibition and demonstration of audio-visual materials, standard designs, prototype models and templates. Consultants should be used to supplement the Centre's staff resources both in the preparation of training materials and in the conduct of the workshops. All materials should be prepared so that they can be adopted or adapted by the participants for national training workshops

in their own countries. The Centre's current association with the World Bank's Economic Development Institute could be expanded to include joint training activities for the provision of infrastructure.

20. The Centre should consider setting aside a small budget to assist national training workshops so that regional-workshop participants will have some incentive to organize them after they return home. Eligibility for these funds might be conditional on the government agency embarking upon a settlement upgrading project.

Theme 4. Audio-visual aids for infrastructure provision in low-income communities

21. The need for the development of audio-visual materials for use in training and public education has been made apparent throughout this report. Demonstration projects, as recommended, have included the collection of audio-visual material with the intention of gradually building up a stock of descriptive items on the provision of infrastructure in low-income communities.

22. During the period 1984-1989, all materials should be reviewed and edited to produce:

(a) A series of tape-slide presentations to serve the needs of the regional and national training workshops recommended under theme 3; these would be prepared by the Centre's Information, Audio-Visual and Documentation Division;

(b) A colour film describing the planning, installation and operation of infrastructure, as successfully achieved in demonstration projects, to be used to promote settlement upgrading in national human settlements agencies; this film would be produced by the Centre's Information, Audio-Visual and Documentation Division;

(c) Several short film sequences for use on national television and in cinemas, each covering a specific aspect of human settlements infrastructure showing community participation in planning, installation, operation and maintenance, community use of infrastructure, the benefits derived from such infrastructure and the opinions of local people; these films would normally have to be produced in a vernacular language, and it would be advantageous for the Centre's Information, Audio-Visual and Documentation Division to liaise with national television networks in their preparation; the frequent airing of such informative sequences as a public service would encourage low-income people to press for improved infrastructure and teach them how to make best use of it so as to derive the maximum benefit.

Theme 5. Development of the informal sector in low-income communities for the construction of infrastructure units and systems

23. Given a relaxation of standards for infrastructure in low-income communities, the informal sector in rural and urban settlements can play a significant role in reducing project costs. Although some demonstration projects have been designed to include mobilization and training of the informal sector, most countries have no tradition or experience in this area. By the time the 1984-1989 period begins, some experience may have been gained from the execution of demonstration projects, but it will be necessary to look carefully into the various aspects of the problem and to formulate policy guidelines which will assist national Governments in promoting community initiatives.



24. The Centre should first identify those aspects of infrastructure technology in which the informal sector in both rural and urban areas can be involved. Standards and designs must be prepared in such a way as to allow for the informal manufacture of infrastructure components. Methods of encouraging community entrepreneurs and arranging finance to support manufacturing activities must be covered in the guidelines. Advice should also be provided on the administrative framework for the participation of the informal sector in the construction phase of infrastructure provision.

25. When a national Government is undertaking an extensive rural or urban settlements upgrading programme, the Centre should be prepared to offer assistance in identifying, training and managing informal-sector groups that could provide a nucleus of expertise within the communities to be upgraded. These core groups would expand naturally as the government programme developed and as more informal-sector productivity was required.

26. In countries with no experience in utilizing the informal sector in upgrading schemes, the policy guidelines could be launched at regional seminars. Senior executives from human settlements agencies in countries with little settlement upgrading activity should be given support to enable them to attend seminars in countries where major programmes are being pursued.

Theme 6. Infrastructure financing and cost recovery in low-income settlements upgrading

27. The medium-term work-programme should provide for the continuation of the activities outlined under subprogramme 3, programme element 3.5 of the 1980-1981 work programme in respect of the provision of infrastructure. Information on financial and fiscal policies, non-conventional financial approaches and methods of financing informal groups should be disseminated among national Governments reluctant to embark on large-scale infrastructure upgrading programmes.

28. In addition to being provided with basic information on finance, national Governments should also be made aware of the economics of infrastructure alternatives for low-income communities. Guidelines on feasible approaches to cost recovery in the field of infrastructure should be prepared and distributed.

29. Senior national economic development planners should be invited to participate in regional seminars organized by the Centre. The material collected in the implementation of this project and the experience gained in demonstration and technical assistance projects should be combined to provide complete coverage of the financial and economic implications of infrastructure upgrading in low-income settlements.

Annex III

HABITAT: UNITED NATIONS CONFERENCE ON HUMAN SETTLEMENTS - RECOMMENDATIONS  
FOR NATIONAL ACTION RELEVANT TO THE PROVISION OF INFRASTRUCTURE

Recommendation C.1 - Shelter, infrastructure and services should be planned in an integrated way and provided in the sequence appropriate to circumstances.

Recommendation C.2 - In meeting essential human needs the provision of shelter, infrastructure and services must be geared to achieving the over-all objectives of national development.

Recommendation C.3 - Standards for shelter, infrastructure and services should be compatible with local resources, be evolutionary, realistic and sufficiently adaptable to local culture and conditions, and be established by appropriate government bodies.

Recommendation C.4 - The choice of designs and technologies for shelter, infrastructure and services should reflect present demands while being able to adapt to future needs and make the best use of local resources and skills and be capable of incremental improvement.

Recommendation C.6 - In choosing alternatives for shelter, infrastructure and services account should be taken of their social, environmental and economic costs and benefits including that of future management, maintenance and operations as well as capital costs

Recommendation C.10 - A major part of housing policy efforts should consist of programme and instruments which actively assist people in continuing to provide better quality housing for themselves, individually or co-operatively.

Recommendation C.11 - Infrastructure policy should be geared to achieve greater equity in the provision of services and utilities, access to places of work and recreational areas, as well as to minimize adverse environmental impact.

Recommendation C.12 - Safe water supply and hygienic waste disposal should receive priority with a view to achieving measurable qualitative and quantitative targets serving all the population by a certain date....

Recommendation C.13 - In the development of human settlements the quality of the environment must be preserved. Pollution should be prevented by minimizing the generation of wastes; wastes which cannot be avoided should be effectively managed and whenever possible turned into a resource.

Recommendation C.14 - Policies on transportation and communication should promote desired patterns of development to satisfy the needs of the majority of the population, to assure the distribution of activities to favour mass transportation, and to reduce congestion and pollution by motor vehicles.

Recommendation C.17 - Governments should concentrate on the provision of services and on the physical and spatial reorganization of spontaneous settlements in ways that encourage community initiative and link "marginal" groups to the national development process.



Annex IV

Table 1. Levels of provision of water supply and sanitation, Africa.

Country	Per capita GDP in 1978 (US dollars) <sup>a/</sup>	Popu- lation (in millions)	Urban popu- lation (%)	Rural popu- lation (%)	Percentage of population covered			
					Urban		Rural	
					Water	Sanitation	Water	Sanitation
Algeria	1 260	19.6	56	44	100	100	61	40
Angola	300	7.1	18	82	48	30	10	NA
Benin	230	3.5	23	77	42	NA	16	5
Botswana <sup>b/</sup>	390	0.68	15	85	100	NA	28	NA
Burundi	140	4.5	5	95	NA	NA	NA	NA
Cape Verde <sup>b/</sup>	130	0.30	29	71	30	25	30	25
Central African Republic	250	2.2	36	64	40	NA	5	NA
Chad	140	4.5	13	87	NA	NA	NA	NA
Congo	540	1.5	33	67	40	NA	3	NA
Egypt	390	42.0	44	56	97	70	74	5
Ethiopia	120	32.6	12	88	82	NA	4	1
Ghana	390	11.7	32	68	94	NA	30	NA
Guinea	210	5.0	16	84	44	NA	3	NA
Ivory Coast	840	8.0	32	68	85	32	75	20
Kenya	330	16.4	12	88	100	50	13	NA
Lesotho	280	1.3	7	93	65	51	14	12
Liberia	460	1.9	32	68	20	13	5	3
Madagascar	250	8.7	16	84	76	NA	16	6
Malawi	180	6.2	20	80	70	100	37	80
Mali	120	6.6	17	83	42	63	18	5
Mauritania	270	1.6	25	75	16	12	NA	NA
Mauritius <sup>b/</sup>	760	0.9	43	57	99	100	NA	NA
Morocco	670	20.3	37	63	100	33	25	NA
Mozambique	140	10.5	7	93	65	60	2	5
Niger	220	5.3	9	91	38	36	50	3
Nigeria	560	77.1	18	82	92	41	14	NA

(Continued)

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Table 1. Levels of provision of water supply and sanitation, Africa. (continued)

Country	Per capita GDP in 1978 (US dollars) <sup>2/</sup>	Popu- lation (in millions)	Urban popu- lation (%)	Rural popu- lation (%)	Percentage of population covered			
					Urban		Rural	
					Water	Sanitation	Water	Sanitation
Rwanda	180	4.8	4	96	41	61	37	33
Senegal	340	5.7	25	75	68	NA	23	NA
Sierra Leone	210	3.5	20	80	31	22	5	NA
Somalia	130	3.6	18	72	58	NA	20	NA
Sudan	320	18.4	20	80	49	80	45	NA
Swaziland <sup>b/</sup>	610	0.53	12	88	75	NA	30	NA
Togo	320	2.7	15	85	35	NA	10	NA
Tunisia	950	6.4	48	52	96	64	29	60
Uganda	280	13.2	10	90	70	70	10	NA
United Republic of Cameroon	460	8.4	27	73	65	NA	43	NA
United Republic of Tanzania	230	17.9	9	91	82	93	28	40
Upper Volta	160	6.9	9	91	25	NA	12	NA
Zaire	210	28.3	32	68	43	8	5	6
Zambia	480	5.6	31	69	100	87	95	16

Source: Document A/35/367, annex V

a/ World Bank. World Development Report, 1980, table 1

b/ Not included in document A/35/367; figures taken from document A/35/341, annex I, table 1.

Table 2. Levels of provision of water supply and sanitation, Latin America

Country	Per capita GDP in 1978 (US dollars) <sup>a/</sup>	Popu- lation (in millions)	Urban popu- lation (%)	Rural popu- lation (%)	Percentage of population covered			
					Urban		Rural	
					Water	Sanitation	Water	Sanitation
Argentina	1 910	27.1	81	19	67	90	14	30
Bolivia	510	5.6	43	57	100	100	NA	NA
Brazil	1 570	126.4	60	40	75	35	5	25
Chile	1 410	11.1	82	18	99	64	43	8
Colombia	850	26.9	76	24	73	60	46	14
Costa Rica <sup>b/</sup>	1 540	2.1	NA	NA	95	42	60	4
Cuba	810	10.0	68	32	100	97	95	63
Dominican Republic	910	5.9	46	54	90	NA	36	80
Ecuador	880	8.0	49	51	82	63	13	11
El Salvador	660	4.8	29	71	67	79	34	26
Guatemala	910	7.3	36	64	89	34	16	18
Haiti	260	5.8	26	74	43	67	NA	NA
Honduras	480	3.7	35	35	65	91	42	26
Jamaica	1 110	2.2	45	55	96	95	NA	95
Mexico	1 290	70.0	67	33	62	50	42	12
Nicaragua	840	2.7	44	56	74	92	10	20
Norway <sup>b/</sup>	1 290	1.8	NA	NA	92	74	12	1
Paraguay	850	3.0	37	63	33	48	5	90
Peru	740	17.8	60	40	77	51	17	2
Uruguay	1 610	2.9	83	17	91	94	41	76
Venezuela	2 910	14.9	75	25	100	50	65	5

Source: Document A/35/367, annex V.

a/ World Bank, World Development Report, 1980, table 1.

b/ Not included in document A/35/367; figures taken from document A/35/341, annex II, table 1.

Table 3. Levels of provision of water supply and sanitation, Asia and the Pacific.

Country	Per capita GDP in 1978 (US dollars) <sup>a/</sup>	Popu- lation (in millions)	Urban popu- lation (%)	Rural popu- lation (%)	Percentage of population covered			
					Urban		Rural	
					Water	Sanitation	Water	Sanitation
Afghanistan	240	22.0	13	87	20	NA	8	NA
Bangladesh	90	88.7	10	90	43	38	71	1
Burma	150	35.3	25	75	31	23	15	10
Fiji <sup>b/</sup>	1 210	0.6	33	67	NA	NA	62	93
India	180	693.9	22	78	82	47	30	2
Indonesia	360	151.9	17	83	36	73	15	19
Iran	2 160	38.0	45	55	86	NA	33	NA
Malaysia	1 090	13.6	33	67	93	76	49	63
Maldives <sup>b/</sup>	90	0.1	20	80	NA	NA	5.3	NA
Mongolia <sup>b/</sup>	940	1.5	48	52	NA	NA	NA	NA
Nepal	120	14.2	6	94	81	18	6	NA
Pakistan	230	82.4	28	72	61	42	17	NA
Papua New Guinea	560	3.1	13	87	53	33	10	10
Philippines	510	51.0	32	68	73	32	46	27
Republic of Korea	1 160	38.0	40	60	85	68	75	100
Samoa <sup>b/</sup>	280	0.2	20	80	NA	NA	23	95
Singapore <sup>b/</sup>	3 290	2.3	100	0	NA	NA	NA	NA
Solomon Islands <sup>b/</sup>	250	0.2	10	90	NA	NA	24	20
Sri Lanka	190	14.9	22	78	51	78	13	60
Thailand	490	47.3	23	77	36	78	19	25
Tonga <sup>b/</sup>	NA	0.11	50	50	NA	NA	77	100
Viet Nam	170	52.3	20	80	40	NA	20	NA

Source: Document A/35/367, annex V.

a/ World Bank, World Development Report, 1980, table 1.

b/ Not included in A/35/367; figures taken from document, A/35/341, annex III, table 1.