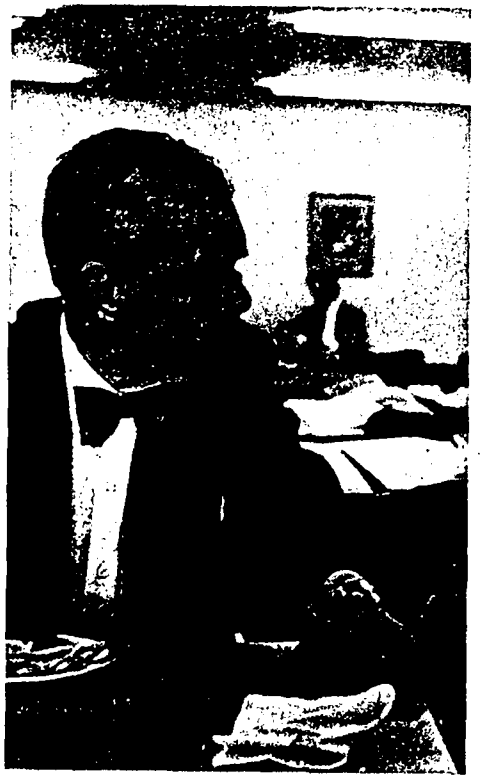

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Maintenance of The Biosphere

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"Urban wastes & sustainable development: a comment"

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tial inventory, now comprised of over 2000 people from more than 75 countries. Built up through a process of contacts, inquiries, and referrals, countless strands run through it, representing virtually every field of study. Nearly 100 institutions around the world where human ecology is being taught are identified – ranging from elementary school programmes to post-doctoral training.

Stimulation of Professionals

The ideas of human ecology likewise have stimulated many professionals in the applied fields who face problems that go beyond any single profession or the capacities of individuals working alone. These practitioners are reaching out of the confines of their professions in search of academic collegiality and integrating frameworks for complex decision-making and planning. Many of them also seek opportunities for enhancing the two-way flow between interdisciplinary academic human ecology and practical problem-solving.

Taken together, these developments provide a unique opportunity for coalescing diverse interests in human ecology. Current networking is focused on the preparation and distribution of a cluster of publications that will summarize these individual, programmatic, and information aspects of human ecology. Briefly, the publications currently in preparation are:

1. *An International Directory of Human Ecologists*, with descriptions of each person's background, current work, and areas of interest, including a topically cross-referenced index.
2. *Education for Human Ecology*: A world-wide guide to institutions and educational programmes at all levels at which human ecology is taught and/or research is conducted.
3. A comprehensive *Human Ecology Bibliography* which pulls together, categorizes, and cross-references, several thousand items from the literature of human ecology.

The preparation and joint distribution of the three publications is a co-ordinated response to the current situation, based on recommendations from the people who comprise it. Making the comprehensive body of information available to the entire network at once,is seen as having several important advantages. It will inform the network about itself and multiply the accumulated knowledge of the people in it. It will provide an overview of the current state of human ecology for those involved with its development and application, as well as for others who may be interested. Finally, it is expected that it will encourage fresh combinations of ideas and the creation of novel collaborations and working combinations, expanding and unifying human ecology – in thought and action, individually and globally – by bridging disciplines, connecting established and innovative educational institutions, allying educators and practitioners, and facilitating international collaboration.

Appendix IV

[**Furedy** circulated this paper to accompany her remarks during the Conference and as a reminder that action on the 'Brundtland Report' was not always immediately obvious or easy! Eds]

Urban Wastes and Sustainable Development: A Comment on the Brundtland Report*

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Introduction

The World Commission on Environment and Development rightly recognizes that urban growth in the more rural countries will pose increasing challenges for environmental quality and the concept of sustainable development. The disposal of wastes is an urban function that few of the rapidly growing cities in those countries can perform adequately at present. The Commission rightly suggests that cities will need to tap more of their own resources, including their own wastes, in their quest to achieve more sustainable ways of life (World Commission on Environment and Development 1987 pp. 235–55).

Chinese cities such as Shanghai are often cited as *the* examples of waste recycling, because their city waste recovery companies and neighbourhood committees co-operate in segregating and trading reusable wastes for agricultural and industrial production. The tapping of wastes as resources in cities of other Asian countries is rarely recognized because, although the recycling practices are extraordinarily diverse and undoubtedly significant for the cities' economies, they are organized 'informally', without official approval, technical assistance, or research support.

Example of Calcutta

The case of Calcutta, India, is now receiving attention. It can be said that, among the world's large cities, this one makes the most effective

* Relating particularly to the Commentary to Session II. *See* footnote on p. 64. [Eds]

Figure 1. Calcutta's sewage is recycled into polyculture fish-ponds beyond the eastern boundary of the metropolitan district. There are 4,500 ha of ponds using sewage and storm-water as their principal water-source. Water-hyacinth (*Eichornia* sp. fringing the ponds takes up trace-metals in the water.

informal use of its wastes for the production of food, fuel, and industrial resources. A better understanding of the remarkable 'garbage farms' and sewage-based fish-ponds (Figures 1 and 2) on the eastern fringe of the metropolitan district, perhaps the largest example of integrated waste-based urban-fringe farming anywhere, could promote the discussion of the relation of waste re-use to urban ecology (Furedy and Ghosh 1984).

The main garbage farms, which had their origins in the beginnings of refuse dumping in the eastern wetlands in the 1860s, consist of 350 ha of plots for vegetable farming established on old dumping land (Furedy & Ghosh 1984). Here the mixture of organic refuse with coal ash, street sweepings, and animal dung, has created a rich medium that can produce vegetables year-round with only short fallow periods. Another type of garbage farm is to be found in adjacent villages where farms contract for regular supplies of fresh refuse off the city disposal-trucks. These farms contribute a further 973 ha to city vegetable production (Ghosh 1986).

Together these farms produce an estimated 150 tonnes of vegetables daily for Calcutta. Bengal's dry season presents no problem, because most of the farmers can draw upon the ponds of the wetlands and the canals of the sewage disposal system (Ghosh and Sen 1987). About 3000 farmers, together with a further 1000 labourers, are employed in garbage

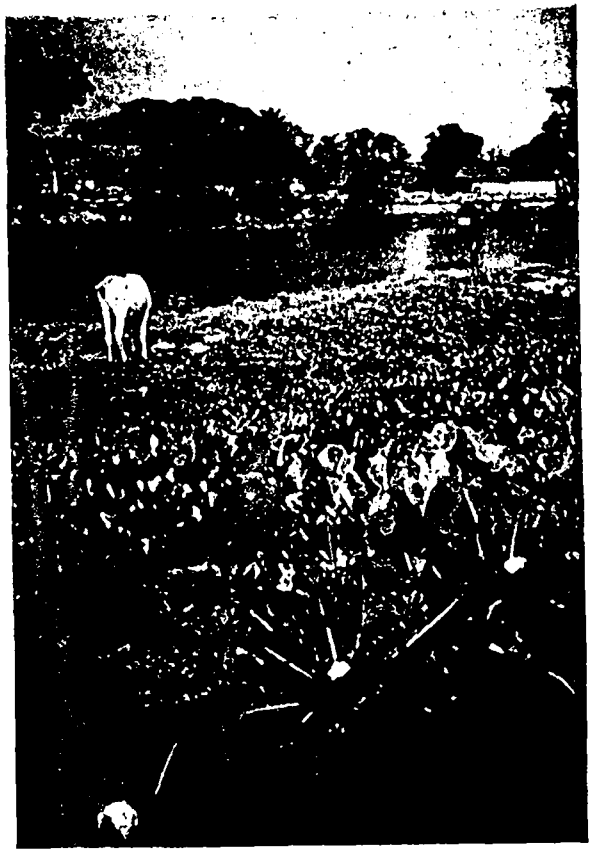

Figure 2. Cows are grazed and vegetables grown on the pond embankments. The fish-pond waters are used for irrigation.

farming in the area (Institute of Wetland Management and Ecological Design 1986).

The fish-farms, established in the wetlands from the late nineteenth century, have for many years found their main source of water in the sewage canals that are designed to carry Calcutta's sewage- and storm-waters to the river system further east. The large, shallow ponds, fringed with water-hyacinth (*Eichornia* sp.), act as oxidation ponds and sustain polycultures of several kinds of carp (*Cyprinus* spp.) and *Tilapia* spp. in their naturally-purified waters. There are currently 4500 ha of ponds that, besides producing fish, constitute, in effect, Calcutta's only form of sewage treatment (Ghosh & Sen 1987).

The success of Calcutta's garbage farming can only be understood in conjunction with the thoroughness of the removal of manufactured

Figure 3. Old dumping-land provides 350 ha for 'garbage farms' at Calcutta's Dhapa dump. The current dumping area is in the background. Remnants of the original wetlands are a convenient water-supply for the vegetable farms.

materials and recyclable organic items, such as green coconut-shells, by poor people who live by waste recovery and recycling within the city and in the villages of the urban fringe. So complete is the removal of all rubber, glass, metals, plastics, and other synthetics, as well as pieces of wood, coal cinders, bones, and broken bricks, by many pickers at various points in the waste-disposal system, that the farmers can hoe the compost or dig in the fresh refuse with little further picking and reworking (Figures 3 and 4).

Health and Social Implications

Does the Calcutta case hold a clue to the redesign of city services to meet the goal of sustainable development? Many city administrators will find these practices difficult to accept. There are important issues of public health to be considered, including the occurrence of heavy-metals and other contaminants in the garbage and sewage as industrialization progresses, as well as potential hazards for pickers, farmers, fisherfolk and fish-handlers. At present, levels of industrial pollution in the canals are judged to be low and research to date has not revealed specific health problems beyond those common to waste-workers in Asia, but no

Figure 4. Coal cinders, pieces of wood, and green coconut shells, form the bulk of pickings from the Dhapa dump. The cinders are crushed and mixed with dung to make fuel-balls that are widely used by the city's poor. The low status of garbage pickers is an intractable social problem.

thorough study has been conducted of the workers and the consumers of their produce.

More difficult to resolve are the social and political issues associated with intensive manual waste-recovery and recycling such as the poor of Calcutta practise. Persons who traditionally do such 'dirty work' are usually regarded as degraded and suffer multiple barriers to achieving decent living conditions.

Mohandas K. Gandhi, who almost alone amongst modern political leaders, concerned himself with the condition of his society's waste-workers, believed that the solution lay in reducing societal abhorrence for waste disposal by requiring every person to share in the unpleasant but necessary tasks of human settlements using improved, but simple and affordable, methods (Ghandi 1942). Positive societal attitudes to waste re-use, and widespread co-operation with effective collection and recycling, would appear to be the only ways to remove the stigma associated with waste-handling.

Significance for Urban Design and Administration

What does the Calcutta case suggest in terms of a comment upon the 'Brundtland Report's' analysis of urban policy? First, we cannot assume that cities such as Calcutta, with diverse industrial structures and large numbers of low-status citizens, have vast quantities of wastes that remain to be tapped as 'resources'. Rather, we should assume that these

wastes form the basis for the employment and essential needs of thousands of city and urban-fringe dwellers. Can we say, then, that these wastes are 'poorly used'? Bureaucratically conceived schemes for waste recycling are likely to overlook the current uses of urban wastes in the absence of substantial research aimed at understanding these practices. Ignorance has already led to costly and inappropriate projects, such as mechanical recycling plants, as noted by the Commission.

We need to place issues of waste recycling in the framework of a fresh approach to urban development and design – that of the new urban ecology which sees the city as a system of interlinked 'ecosystems' and seeks to restore natural processes to urban environments (Hough 1984, Brown and Jacobson 1987).

At the same time, an ecologically sound, resource-using approach to urban development must also be humane. The Commission rightly calls for health-care services for those who live by dump-picking (p. 255). A further step would be to insist that policies for waste recycling must address the rights to social status and political participation of the waste-workers (many of whom are women and children) in poor countries.

Piecemeal projects for waste recycling, justified as resource-exploiting, may help the waste disposal problem, but are unlikely to contribute to a change in the philosophy of urban development. Besides, they are vulnerable to cancellation if waste recovery and recycling suffers from a lack of, or a decline in, profit-making. Environmental education must address a holistic concept of urban functioning that goes beyond economics to embrace an ecological view of the city.

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