



## UNDP-World Bank Water and Sanitation Program

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March 11, 1999

Dear Friend and Colleague:

*Resource Guide on Urban Environmental Sanitation*

I am pleased to inform you that the UNDP-World Bank Water and Sanitation Program has made significant progress in its effort to compile a Resource Guide on urban environmental sanitation. After careful analysis, a number of publications have now been selected for discussion in a preliminary draft of the Resource Guide, and a new outline has been prepared, revised to reflect the document's function as a resource guide rather than a sourcebook.

You may recall that the Resource Guide was originally conceived as a sourcebook on urban environmental sanitation. However, as indicated in our most recent update on this subject--the December Progress Report covering the October 1 to December 31, 1998 period--a number of sourcebooks devoted to urban environmental sanitation issues have already been, or are about to be published. Many of these sourcebooks address the technological aspects of urban environmental sanitation. Rather than repeat information readily available elsewhere, a decision was made to produce a Resource Guide de-emphasizing technology and focussing instead on cross-cutting issues. In preparing the enclosed outline we have therefore deviated substantially from the original list of search topics that was sent to you. While the outline might not now reflect all the comments that we received, we hope to address them more fully in the preliminary draft because some comments are more pertinent to the text than the outline. Nonetheless, your comments on any major omissions from the outline would of course be welcome.

Publications were chosen for inclusion in the Resource Guide with the preceding developments in mind. Potentially suitable documents were identified either upon the recommendation of a sector specialist such as yourself, or as a result of searching several databases. An initial list of more than 3,500 documents with some apparent relevance to urban environmental sanitation was assembled. Upon closer inspection of the abstracts and scope of coverage of these publications, this list was narrowed to 361 documents. These 361 publications were then prioritized for preliminary screening and commentary. The review of those documents with the highest priority is now nearly complete. As a result, some 51 publications have been designated for inclusion in the Guide as primary references, 18 as secondary sources, and 62 as outside the scope of the publication. These titles, Groups 1, 2, and 3 respectively, are noted in one of two attached lists of documents. The second list contains those publications remaining from the original list of 361; these documents are not at present scheduled for review unless we receive recommendations to the contrary.

These attachments are being sent to your attention as an update on this phase of the Resource Guide project and in the hope that you will share your views on the accuracy and completeness--or lack thereof--of the lists. While mindful of how very busy you are, we are nevertheless hopeful that you will

take a few minutes to look at the lists and share your reactions with us. We may well have been remiss in overlooking, including or omitting a reference and we would be very grateful for your input in this regard. Our work and by implication that of our target audience--sector professionals and practitioners--can only be enhanced by your candor and insightful commentary.

Please direct your comments to any member of the editorial team with a copy to the team's researcher, Denise Bennett. Contact information for team members follows immediately below the signature. Please know that the editorial team and the Program at large are very appreciative of the contributions you have already made to this project. We are duly indebted for your continued assistance and we look forward to learning from your advice and counsel.

Sincerely yours,

Bruce Gross  
Deputy Program Manager

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Enclosures:

Resource Guide Outline

Publications Reviewed

Publications Not Currently Scheduled for Review

# **A RESOURCE GUIDE IN URBAN ENVIRONMENTAL SANITATION**

## **Executive Summary**

### **1. Introduction**

#### **a) Origin of/need for the document**

- i) Definition of UES.
- ii) Past focus on water, not on UES.
- iii) Current service levels.
- iv) Impact of low coverage and poor UES services.
- v) “Western” solutions not sustainable.
- vi) Difficulty in obtaining reliable information on alternative approaches.
- vii) Hence original proposal for a source book, later evolving into a Resource Guide.

#### **b) Intended scope and audience**

- i) Primarily concerning services to low-income communities in developing countries.
- ii) Focussing on cross-cutting issues, not purely technical ones.
- iii) Aimed at decision-makers and task managers, not community-level workers.

#### **c) Arrangement of the document**

Brief presentation of arrangement and main issues/conclusions of each section<sup>1</sup>.

#### **d) Complementary studies**

- i) Parallel Gaps Study, to address unresolved problems.
- ii) UESNET.

#### **Chapter 1: End-of-chapter references**

(repeated for each chapter)

- Principal general sources of information
- Specific key references

### **2. Requirements for Sustainable Urban Environmental Services**

#### **a) General**

Without sustainability, even the best solutions have no permanent value. Major themes (amplified in later chapters) are:

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<sup>1</sup> Throughout, marginal notations as follows: {R} for references to the bibliography, {S} for suggestions for follow-up action, and {G} for topics to be considered for the Gaps Study.

**b) Environmental Sustainability**

All UES projects will have environmental impacts, mostly beneficial, but some negative. Project design should aim to minimize negative impacts. Environmental sustainability is then concerned with ensuring that in the long term any negative impacts do not exceed the capacity of the local ecosystem. Examples of potential areas requiring investigation include:

- i) Wastewater reused for irrigation.
- ii) Flood frequency and extent in relation to river regimes and riparian ecosystems.
- iii) Use of water resources (surface and ground) in relation to reliable yields, required minimum flows, or natural recharge.
- iv) Sewage and storm water discharges to rivers and coastal waters.
- v) MSW and hazardous wastes disposal, including leachate management.
- vi) Heavy metals and other pollutants possibly present in biosolids recycled for agricultural purposes.

**c) Technical Sustainability**

Technical sustainability refers to the capacity of the service providers (typically a combination of users of on-site systems, Community-Based Organizations, and public or private institutions) to operate and maintain the technology properly. In choosing sustainable technology, important factors include the following:

- i) Technology must be appropriate to local conditions and culture.
- ii) The intended user must be able to afford the technology, and willing to bear the costs.
- iii) The service provider must have the skills and facilities necessary for proper operation and maintenance.
- iv) The service provider must have access to expendable materials, spare parts and other necessary maintenance and repair services.
- v) A support structure must exist, capable of assisting CBOs and individual users in tasks they are unable to handle by themselves.

**d) Economic Sustainability**

UES services must not pose unsustainable demands on the local and national economy. Examples of possible problems:

- i) Technologies relying on imported equipment, expendable materials, spare parts, etc..
- ii) Institutional procedures beyond local capabilities, therefore depending on foreign expertise and imported equipment.
- iii) Unjustified subsidies from general revenues, depriving other sectors of needed support.

**e) Institutional Sustainability**

The institutions with responsibility for UES services must be able to maintain themselves in a position to provide effective service to their customers (or, in the case of community-based organizations, the community members). To support this, government has to establish an appropriate institutional and regulatory framework to provide a stable environment that enables institutions to perform their functions (see Chapter 6). Important factors contributing to sustainability include:

- i) Clearly defined and consistent responsibilities and standards, within an appropriate legal structure.
- ii) Participation in overall development planning.
- iii) Fiscal autonomy.
- iv) Cost recovery subject only to regulatory controls.
- v) Management and operational autonomy.
- vi) Consistent Human Resource Development policies, within institutions and across sectors.

**f) Social Sustainability**

Key factors include:

- i) Public awareness campaigns to inform communities, encourage participation, and introduce and reinforce improved hygiene behavior to ensure full benefits of selected UES services.
- ii) Community participation in planning, especially establishing priorities, implementation sequence, and responsibilities of various stakeholders.
- iii) Participation of women as active planners and managers rather than just as beneficiaries.
- iv) Development of culturally appropriate and socially acceptable alternative UES solutions.
- v) Service provision based on effective demand (i.e., user selection of level of service, based on costs and benefits expected).
- vi) Community participation in developing methods for recovering costs.
- vii) Equitable access to services and benefits.
- viii) Community-based management of services, and community selection of service provider.
- ix) Appropriate and equitable remuneration (agreed with the community) for community inputs.
- x) Effective provision of “downstream” support services not under the community’s control (e.g., septic tank emptying, MSW removal, cleaning of trunk drains and sewers).

**g) Financial Sustainability**

Choice of service level must be based on clear understanding of financial implications (both initial capital costs and subsequent operating and maintenance costs) and on effective demand - willingness to meet those costs. Factors include:

- i) Construction costs and terms of repayment.
- ii) Operating and maintenance costs.
- iii) Contributions in kind allowed as substitutes for financial contributions.
- iv) Availability, amount, duration and reliability of any grants or subsidies towards construction and operation and maintenance costs from outside the community to be served.
- v) Procedures for billing and collecting capital repayments and operating costs, and measures to ensure timely payment.

### **3. Environmental Considerations**

#### **a) General**

UES impacts at 4 levels: household; community; city; and region. Past environmental failures have been largely due to considering only one level, at the expense of others, and to preoccupation with short-term solutions rather than long-term damage.

#### **b) Household level**

Environmental sanitation deals with all aspects of providing a healthy environment. This includes affordable access to sustainable UES services, but these also have to be culturally acceptable and appreciated and used by all members of the household. The household must also understand and accept its role in community-level improvements.

#### **c) Community level**

Household priority is to “disappear the waste” - export it downstream. Then the other households in the community, or other communities, suffer. So community awareness needs to be created, and complete systems constructed (generation to final treatment and disposal or reuse). Where municipal authorities cannot or will not deal with these problems, communities themselves will need to mobilize to handle them as far as possible.

#### **d) City level**

Exporting problems from one community to the next or to the city at large is not acceptable. Wastewater, stormwater and MSW management all need to be fitted into a city-level environmental strategy. This should include measures such as:

- i) Treating environmental concerns as important in UES planning.
- ii) Introducing land use controls that assist environmental measures (e.g., no small industries mixed into residential areas or ground water recharge zones).
- iii) Insisting on proper wastewater disposal as a condition of having water supply.
- iv) Constructing storm water detention facilities (supported by proper MSW management) in upstream catchments.

Unfortunately, lower-income people, with least influence on city services, tend to be on the receiving end of the city's problems. Therefore:

- v) Low-income communities' concerns need to be addressed in city-wide planning.
- vi) Special attention needs to be paid to environmental problems often affecting such communities (e.g., landfill siting, with impacts through poor air quality, blown garbage, leachate pollution of shallow wells; MSW haulage routes; dumping of septage or untreated sewage into watercourses).

Major unresolved environmental/resource utilization issue: groundwater beneath cities. Uncontrolled industrial abstraction plus excessive municipal leads to aquifer depletion, ground settlement, intrusion of pollutants and seawater. At the same time, lack of sanitation and proper MSW landfills pollutes the resource. The economics of pollution control and aquifer recharge/remediation need to be compared to developing alternative sources (including reallocating peri-urban irrigation abstractions to municipal use and replacing them with recycled wastewater).

**e) Regional level**

Megacities in particular can have serious environmental impacts far beyond their boundaries. UES programs should aim to reduce (at a minimum, not increase) this impact within the city's "footprint". This entails:

- i) Designing for environmental sustainability (Chapter 2).
- ii) Careful mitigation of unavoidable environmental damage (e.g., use of land for MSW disposal; haulage routes and pipeline alignments; sewage treatment; storm water drainage canals, storage and treatment).

**f) Recycling opportunities**

Cities are huge consumers of resources (water, fertilizer, energy, raw materials of all sorts, etc.), and recycling opportunities are equally huge.

- i) Cost-effective technologies (in both financial and economic terms) for recovery (e.g., water reuse and aquaculture; MSW sorting and recycling; biogas; humus replacing chemical fertilizers).
- ii) Limits of recovery (e.g., at the margin, 100 per cent recycling may use more energy than it saves; recycling biosolids carelessly can lead to accumulation in soil and crops).
- iii) Implications for UES (technologies, institutional framework, cost recovery, etc.)

#### **4. Technological Options**

**a) Basic technical alternatives**

- i) Description of technical options, by UES service, in just enough detail to support the RG, and with maximum references to existing Sourcebooks and a few key documents.
- ii) Selection algorithms, boundary conditions (e.g., population density)

**b) Costs**

Both capital and O&M (including local vs. foreign; suitability for community inputs, other factors relevant to shadow-pricing/policy decisions)

**c) Inter-relationships between services**

- i) Interdependencies (e.g., water and on-site sanitation, MSW and drainage);
- ii) Maximizing synergism (or, at a minimum, avoiding interference)

**d) Impacts**

Impacts of various alternatives, especially those impacts which differ markedly between alternatives (e.g., demands on water resources, health, potential for reuse, etc.)

## **5. Planning**

### **a) General**

- i) UES is concerned with provision of sustainable service, not of specific technology. Therefore planning is concerned with creating institutional frameworks and financing methods to achieve sustainability, matched to users' expressed interest in services.
- ii) Decision-makers and other responsible for UES services therefore need to consider not just a single service in isolation, but a much broader spectrum of activities designed to better people's lives, improve conditions in the city, and benefit the nation as a whole.

### **b) Planning processes**

- i) Strategic planning (including SSA; planning under uncertainty, rapid urbanization, and dynamic conditions).
- ii) Integrated infrastructure planning (including broad-based urban upgrading projects).
- iii) Maximizing synergies, ensuring balanced development.
- iv) Maximizing cost-effectiveness (contrasting financial and economic optimal solutions).
- v) Planning institutional development and transitional processes.
- vi) Costs and duration of planning approaches involving beneficiaries, compared to "top-down" solutions.

### **c) Demand-responsive approaches**

- i) DRA principles.
- ii) Determination of "effective demand" or other means of determining WTP.
- iii) Planning for "second best" solutions with subsequent upgrading.
- iv) Application of DRA to more than one UES service.
- v) Reconciliation of DRA findings with externalities.
- vi) Comparative costs and inputs, DRA vs. conventional planning.
- vii) Ex-post evaluations of reliability of effective demand assessments.

### **d) "Learning by doing"**

- i) Determining what elements can and must go ahead immediately, what has to be piloted, what has to be demonstrated; implications for project design, and for ESA involvement.
- ii) Pilot activities: design, duration, evaluation and cost.
- iii) Demonstration activities: promotion and delivery (vs. false expectations).
- iv) Issues of "going to scale".

### **e) Planning tools**

(excluding specialized or commercial design programs, CAD, etc., left to technical Sourcebooks)

- i) Algorithms (technology selection; others).
- ii) Packaged computer programs (design; selection between technical alternatives; "expert systems"; others).
- iii) Financial analysis tools
- iv) Economic analysis tools



**f) Special considerations: unplanned settlements**

- i) Planning for rapidly-evolving unplanned settlements (complications include: lack of land use control; mixed-land use, including small or cottage industries; uneven development and corresponding uneven demand for services and ability to pay; unpredictable future patterns of development).
- ii) Illegal settlements (to be included or excluded? Treatment of legal title-holders).
- iii) Landlord-tenant problems (who pays for improvements? Subsequent security of tenure?).

**g) “Economics”**

- i) Methods of estimating and valuing externalities as a basis for planning decisions (e.g., health; environment; shadow pricing of inputs; resource recovery)
- ii) Issues raised by “engineering economics” and similar approaches (e.g., high discount rates “eliminate” O&M costs, favor high energy content, lower concessional capital financing, and hence rely more on long-term tariff increases; high discount rates favor multi-stage implementation, increasing transaction costs and funding uncertainty; shadow prices favor labor-intensive, minimal foreign exchange options, but financial prices do not).

**6. Institutional and Regulatory Framework**

**a) Government Responsibilities**

The need to establish clear roles and responsibilities for:

- i) establishing objectives and defining policies.
- ii) regulating agencies and setting standards.
- iii) formulating strategic plans.
- iv) financing investments and operations.
- v) providing services.
- vi) coordinating inter-sectoral activities and establishing priorities.

**b) Decentralization**

The implications of government moving from provider to enabler and facilitator, including:

- i) devolving responsibilities to second- and third-tier government.
- ii) establishing regulatory and monitoring mechanisms and legal framework .
- iii) creating the institutions necessary to develop and implement regulations and monitor the performance of sector organizations.
- iv) creating the institutional framework to support and encourage participation by local communities and the private sector, including the establishment of public and private environmental sanitation service providers.
- v) providing capacity-building support at the level of government assuming responsibility for service provision.

**c) Private Sector Participation**

Assessment of the benefits and problems of private sector participation in the different sub-sectors, in single- or multiple-sector organizations, and the creation of the environment for successful private sector participation or efficient public sector service provision: Key topics include:

- i) Options for private sector participation.
- ii) Community management of UES services.
- iii) Reconciling private sector profit motive and the government/community imperative of equitable access by all.
- iv) Encouraging the establishment and monitoring the relationship between the user community (however defined), local government and private sector service providers.
- v) Incentives for community management of infrastructure services, including the establishment of support service organizations (public or private).
- vi) The role of small entrepreneurs .

**7. Financing and Cost Recovery**

**a) General**

- i) Sustainability and replicability require full coverage of all capital and O&M costs. But “demand-driven” approaches to UES may come up short if they only reflect users’ perceptions, since externalities are so important.
- ii) Hence the need for analysis of all costs and consequences (e.g., a water connection requires wastewater collection and disposal) to permit informed judgements by all stakeholders.
- iii) There is a corresponding need for analysis of all benefits, so that anyone other than immediate beneficiaries who derives benefits also contributes to costs.

**b) Capital financing**

- i) Options include: ESA loans and grants; loans and grants from national, state/province or municipal revenues; revolving funds; and user contributions.
- ii) Issues include: grant dependency, reducing sustainability; over-complex and protracted procedures for obtaining ESA funds; communities’/users’ lack of access to credit; inequity between high- and low-income areas (e.g., subsidized sewers vs. all-cash latrines).

**c) O&M financing mechanisms**

- i) Options include: agency funding from revenues; user direct contributions; ESA support.
- ii) Issues include: equity and sustainability (do the poor pay more, or contribute more inputs, than the rich?); political commitment to adjust tariffs in line with costs and inflation; distortions (O&M supported by revenues from the “wrong” source, encouraging initial choice of inappropriate non-sustainable systems).

**d) Cost recovery approaches**

- i) Cost recovery targets (what is to be recovered from whom? Transparent identification of external costs and benefits).
- ii) Cost recovery options (betterment levies; fees and charges; repayment of improvement loans; general property taxes; usage- or consumption-based charges; special approaches for external benefits).
- iii) Cost recovery mechanisms (municipal and private billing and collection; community-based cost recovery, e.g., “wholesale-retail” arrangements; enforcement and sanctions).
- iv) Equity issues (charges, collections and sanctions reflecting costs and benefits received, and neutral between different consumer classes).

**e) Subsidies**

- i) Justifications for subsidies (social policy, employment generation, health, import substitution, water resources protection, tourism promotion, etc.).
- ii) Extent and allocation of subsidies (economic and/or financial costs and benefits, and parties meeting costs or receiving benefits).
- iii) Recipients of subsidies (intended vs. unintended).
- iv) Impacts/implications of subsidies (long-term dependability and impact on sustainability; “wrong signals” - may encourage and support non-optimal solutions; social and equity impacts, such as “wrong” beneficiaries, or effective informal sector displaced by subsidized public sector).

**8. Monitoring and Evaluation**

**a) General**

- i) Vital but least effective part of the project cycle. Should be Monitoring & Evaluation & Feedback, MEF; there is no point in finding out what went wrong if nothing is done about it.
- ii) All agencies should at least follow the Minimum Evaluation Procedure: Was it done? Did it work? Is it used? Ideally, more complete and specific targets and indicators, with a fully-funded implementation mechanism, should have been developed during project planning and design.

**b) Program/project performance and sustainability**

This is the basic issue to be addressed (for factors to be considered see Chapter 2):

- i) Environmental aspects.
- ii) Technical aspects.
- iii) Economic aspects.
- iv) Institutional aspects.
- v) Social aspects.
- vi) Financial aspects.

**c) Coverage/replication**

- i) Many projects and programs are limited in scope, essentially pilot or demonstration activities (in comparison with the UES shortfall). MEF should therefore assess whether improved sustainable programs have subsequently been developed and extended to other areas.
- ii) The extent of “graduation” from dependence on ESA or other external support.

**d) Planning sustainability**

Planning, especially SSA, has to be a dynamic approach, responding to changing circumstances and to feedback from MEF. Relevant monitoring questions include

- i) Actual vs. intended outcomes?
- ii) Deviations reflected in updated plans?
- iii) Planning process itself modified to work better in future?

**9. Unresolved issues and recommendations**

- a) Unresolved issues already being studied
- b) Unresolved issues awaiting further investigation
- c) Gaps Study status
- d) UESNET status
- e) Recommendations for additional follow-up

**ANNEXES**

**1. Acronyms**

[Or inside cover]

**2. Glossary**

**3. Bibliography**

Principal references (taken from chapter-end lists)

**4. Sources of information**

Recommended search tools

Suggested keywords

Major relevant Internet networks, discussion groups, etc.

## **Publications Reviewed for Urban Environmental Sanitation Resource Guide**

### **Group 1 - Primary References**

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