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5. Sociocultural Aspects of Water Supply and Excreta Disposal
6. Country Studies in Sanitation Alternatives
7. Alternative Sanitation Technologies for Urban Areas in Africa
8. Seven Case Studies of Rural and Urban Fringe Areas in Latin America
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ANNEX I

**Guidelines on Environmental Health
Impact Assessment Produced By
National and International organisations**

A1.1 INTRODUCTION

In this annex we give examples of guidelines on environmental health impact assessment published by national and international agencies relevant to urban development projects. Health factors have often received inadequate attention during preparation of environmental impact assessment, and the number of guidelines is limited. The development of specific methods for EHIA is a comparatively new phenomenon upon which relatively little has been published. However, a number of publications do give some useful guidance for EHIA, and we copy this in the remainder of this annex.

'Housing' includes the living unit for man and his family, the immediate surroundings, and the related community services and facilities; the total being referred to as the residential environment.

LIVING UNIT AND STRUCTURE

The living unit and the structure in which it is located should provide for the following basic health requisites:

Human Factors

1. Maintenance of a thermal environment which will avoid undue, and permit adequate, heat loss from the human body.
2. Shelter against the elements.
3. An atmosphere of reasonable purity.
4. Adequate illumination and avoidance of undue glare.
5. Admission of direct sunlight.
6. In family units, facilities for sanitary storage, refrigeration, preparation, and service of nutritional and satisfactory foods and meals, and for adequate ventilation to remove cooking heat, steam, and odours.
7. Adequate and suitable space for all normal household functions.
8. Adequate space, privacy, and facilities for the individual.
9. Space, arrangement, and separation for normal family life.
10. Opportunities and facilities for home recreation and social life.
11. Protection against excessive noise from without, from adjoining units, and from within certain rooms of the unit.
12. Design, materials, and equipment which facilitate performance of household tasks and functions without undue physical and mental fatigue.
13. Design, facilities, and maintenance to provide aesthetic satisfaction in the unit, structure, accessory buildings, premises, and the surroundings.
14. Concordance with prevailing social standards of the local community.

Sanitation and Maintenance

1. Design, materials, and equipment to facilitate clean, orderly, and sanitary maintenance of the dwelling and personal hygiene of the occupants.
2. Water piping of acceptable, safe materials with system and fixtures which protect the water supply against contamination.
3. Adequate private sanitary toilet facilities within family units.
4. Plumbing and drainage system designed, installed, and maintained so as to protect against leakage, stoppage, or overflow.
5. Facilities for sanitary disposal of food waste, storage of refuse, and sanitary maintenance of premises to reduce hazard of vermin and nuisances.
6. Design and arrangement to properly drain roofs, yards, and premises and conduct such drainage from the buildings and premises.
7. Design and maintenance to exclude and facilitate control of rodents and insects.
8. Facilities for the suitable storage of belongings.
9. Programme to assure maintenance of the structure, facilities, and premises in good repair and in a safe and sanitary condition.

Safety

2. Construction, materials, arrangement, facilities, and maintenance to minimize danger of explosions and fires or their spread.

3. Design, arrangement, and maintenance to facilitate ready escape in case of fire or other emergency.

4. Protection against all electrical hazards, including shocks and burns.

5. Design, installation, and maintenance of fuel-burning and heating equipment to minimize exposure to hazardous or undesirable products of combustion, fires, or explosions, and to protect persons against being burned.

6. Design, maintenance, and arrangement of facilities, including lighting, to minimize hazards of falls, slipping, or tripping.

7. Facilities for safe and proper storage of drugs, poisons, and deleterious substances and avoidance of use of materials for construction or surface protection which may be toxic under use conditions.

8. Facilities and arrangements to promote security of the person and belongings.

RESIDENTIAL ENVIRONMENT

The community facilities and services and the environment in which the living unit is located are essential elements in healthful housing and are part of the total residential environment. Therefore the following should normally be considered necessary elements of the residual environment:

Community or Individual Facilities

1. An approved community water supply or, where not possible, an approved individual water supply.

2. An approved community sanitary sewerage system or, where not possible, an approved individual sewage-disposal system.

3. An approved community refuse collection and disposal system or, where not possible, arrangements for sanitary storage and disposal.

4. Avoidance of building on land subject to periodic flooding, and adequate provision for surface drainage to protect against flooding and prevent mosquito breeding.

5. Provision of vehicular and pedestrian circulation to provide for freedom of movement and contact with community residents while adequately separating pedestrian from vehicular traffic.

6. Street, through-highway location, and traffic arrangements to minimize accidents, noise, and air pollution.

7. Provision of such other services and facilities as may be applicable to the particular area, including public transportation, schools, police and fire protection, electric power, health, community, and emergency services.

8. Community housekeeping and maintenance services, like street cleaning, tree and parkway maintenance, weed and rubbish control, and other services requisite to a clean and aesthetically satisfactory environment.

Quality of Environment

1. Development controls¹ and incentives to protect and enhance the residential environment.

2. Arrangement, orientation, and spacing of buildings to provide for adequate light, ventilation, and admission of sunlight.

3. Provision of conveniently located space and facilities for off-street storage of vehicles.

4. Provision of useful, well-designed, properly located space for play, relaxation, or recreation and community activities for daytime and evening use in all seasons.

5. Landscaping, planting of trees, and green areas properly arranged and maintained.

A1.2 cont'd

7. Suitable lighting facilities for streets, walks, and public areas.

Environment Control Programmes

To promote maintenance of a healthful environment necessitates an educational and enforcement programme to:

1. Control sources of air and water pollution, and local sources of ionizing radiation.
2. Control rodent and insect propagation, pests, domestic animals, and livestock.
3. Inspect, educate, and enforce so premises and structures are maintained in such condition and appearance as to not be a blighting influence on the neighbourhood.
4. Control sources of noise and vibration.

AL.3 World Bank: Guidelines for Assessment of Sanitation and Water Supply

(a) Existing Physical Facilities

Types, sizes, capacities, amounts, locations, sketches (as needed to quantify the facility from the engineering point of view):

- (i) Water Supply (wells, public taps, connections to piped systems) (amounts produced/used) (safety and quality of supply).
- (ii) Excreta Management (toilet and plumbing facilities) (individual disposal units of various types, connections to public sewers or drains).
- (iii) Communal Units for Washing/Bathing/Toilets.
- (iv) Solid Waste Management (collection, storage, transfer, and disposal).
- (v) Surface Drainage (surface drains, special drainage problems such as areas of low elevation).
- (vi) Others (including access ways and related desludging problems).

(b) Operation and Maintenance

- (i) Acceptance and Use (extent to which the facilities are being or are not being used as planned and why) (extent of use by non-intended beneficiaries).
- (ii) State of Repair of Facilities (condition of facilities, needs for repair, records and evidences of repairs).
- (iii) Administration (who has responsibility) (adequacy of O&M with explanations) (role of householder and of local political chiefs and other officials) (role of vendors or other middle-men) (contributions by beneficiaries in money or services) (deficiencies) (extent of fees and of compensation to maintenance personnel and who sets them).
- (iv) Levels of Service (per capita use of water, both total and for various purposes) (adequacy of toilet and excreta disposal facilities for meeting family needs) (adequacy of solid waste management service, adequacy of drainage, etc.) (for various categories of population by income levels, including squatters).

(c) Institutional Support

What other institutions contribute to the success of planned improvement? (Health agencies, clinics in teaching value of personal hygiene; local clinics monitoring health status; health officers checking water quality; schools teaching health/water/sanitation/nutrition relationships; adult education teachers and community workers organizing and motivating users in the construction and maintenance of facilities)? How are the actions of these and the project agency planned and coordinated?

A1.3 cont'd

(d) Impacts on Environment

Adequacy of facilities for protecting public health and other environmental values; water contamination and pollution hazards; insect and rodent vector hazards; environmental cleanliness.

(e) Periodic Monitoring

Whether any agencies make periodic evaluations of the performance, status, adequacy, and acceptance and use of the facilities, and if so, what reports are produced and who gets them.

While the listing above serves to illustrate the complexity of the problem, through the use of sample areas, standardized questionnaires, and computerized processing it is possible to obtain a quantified description of the overall existing situation and of the extent to which it is meeting the needs.

A1.4

US Department of Housing and Urban Development: Guidelines for Assessment of Physiological, Psychological, Community and Safety Related Impacts

Safety Environmental Assessment Summary Table

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----|--------------|--------------------------|---|---|---|---|---|
| | Subcomponent | Goals/Objectives | Impacts | Necessary Information | Methodology | Findings/Measurements | Standards/Guidelines |
| 9.1 | Structure | Prevent personal injury. | Do design and proposed construction techniques conform to USHUD <i>Minimum Property Standards</i> or more stringent state and local building and construction codes? | Architectural and engineering drawings of project. | Tests defined in USHUD <i>Minimum Property Standards</i> or state and local building codes. | Fire resistance (hours); glass breakage resistance; resistance to damage and collapse from structural weight; dead loads, live loads, snow loads, wind loads and other structural requirements. | State and local codes. (L. Min) USHUD <i>Minimum Property Standards</i> (Care-type Housing). One and Two Family Dwellings and Multifamily Housing). Washington, D.C.: USHUD, 1973 (L. Min) |
| 9.2 | Materials | Prevent personal injury. | Will the residents be exposed to hazards to safety from the type of materials used in a project? Do the materials used comply with USHUD <i>Minimum Property Standards</i> or state and local building codes? | Project's specifications for construction materials; type of paint and other structural materials used—interior and exterior; existence of lead pipes; existence of asbestos insulation and filters | Document lead content in paint; asbestos; existence of lead pipes; type of glass used and other materials used. | Percent lead content; potential toxic fumes and accidental injury. | USHUD <i>Minimum Property Standards</i> —Maximum 1% lead content by weight—paint. State and local codes (L. Min) Lead-Based Paint Poisoning Prevention Act. PL 91-606 |
| 9.3 | Site Hazards | Prevent personal injury. | Do site conditions and those in the surrounding area create potentially hazardous situations? | Knowledge of project site and surrounding area; demographic information on project residents. | A reconnaissance of the site and surrounding area must be made to determine potential hazardous situations such as pools and lakes, excavation and other industrial activities, culverts, transformers, golf courses (stray balls), firing ranges (stray bullets), etc. | Potential hazardous situations and need for actions and methods to reduce hazards. | State and local health and safety codes. (L. Min) USHUD <i>Minimum Property Standards</i> , 1973. (L. Min) |

Notes: (L. Min) — Legal Minimum Allowable (Reco) — Recommended, a Goal
(L. Max) — Legal Maximum Allowable (Ave) — Average or "Rule-of-Thumb" Guide

AL4 cont'd

Safety Environmental Assessment Summary Table

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------------------------------|--|---|---|---|--|--|
| Subcomponent | Goals/Objectives | Impacts | Necessary Information | Methodology | Findings/Measurements | Standards/Guidelines |
| 9.4 Circulation Conflicts | Prevent personal injury. | Will design of the project and conditions in the surrounding area expose project residents and users to hazards due to circulation conflicts? | Knowledge of project site and surrounding area; traffic volumes for surrounding roadways; age and sex of residents of the project and in the area; pedestrian generation. | A reconnaissance of the site and surrounding transportation connections and pathways must be made to determine potential conflicts and hazards to safety; compare traffic and pedestrian volumes with needs for signalization and separation. | Potential hazards from traffic/pedestrian/bike conflicts and need for reduction actions and methods. | State and local safety regulations. (L. Min) USHUD. <i>Minimum Property Standards</i> , 1973. (L. Min) |
| 9.5 Road Safety and Design | Prevent personal injury and property damage. | Will the project residents and users be exposed to increased risk due to roadway and street design and lack of traffic controls? | Type of road or street; location of roadway; average vehicle speed; average daily, hourly, and 15-minute traffic; intersections—type, number. | Predict accident potential from input information on roadway within and around project. | Accident potential; accident and death rate. | State and local safety regulations. (L. Min) USHUD. <i>Minimum Property Standards</i> , 1973. (L. Min) |
| 9.6 Ionizing Radiation | Prevent physiological and genetic damage. | Will there be a risk that project users will be exposed to excessive levels of ionizing radiation? | Knowledge of local geology; presence of nuclear facilities. | Facilities: Review permit and related environmental documentation to identify restricted and other high risk areas. Natural materials: For suspected radioactive materials, use ionization counters or chemical analysis. | Facilities: Potential risk from normal facility operation. Materials: Exposure to radiation (roentgens/hr or rads) or to radon daughters (working levels or WL) | External gamma radiation ≤ 0.05 mR/hr. Indoor radon daughter concentration ≤ 0.01 WL. (Recd) AEC. 10 CFR Part 12, 1972. General exposure ≤ 0.5 rem/yr. AEC. 10 CFR 20 amended, 1974. (L. Max) |

Notes: (L. Min) — Legal Minimum Allowable (Recd) — Recommended, a Goal
(L. Max) — Legal Maximum Allowable (Ave) — Average or "Rule-of-Thumb" Guide

A1.4 cont'd

Safety: Types of Environmental Information Necessary for Assessment

| 1 | 2 | 3 | 4 | 5 |
|--------------|------------------------|---|---|---|
| Subcomponent | Initial Screening Test | | Higher Level Tests | |
| | Informational Needs | Sources | Informational Needs | Specialists |
| 9.1 | Structure | <p>Whether or not project will meet USHUD <i>Minimum Property Standards</i>.</p> <p>State and local building codes.</p> <p>Incorporation of safety considerations such as:</p> <ul style="list-style-type: none"> - Stairs with proper dimensions—interior and exterior - No swinging doors - Walk and wall railings—elderly or handicapped - Ramps between 7 and 15 degrees - Handrails on long flights of stairs - Doors open away from stairs and hallways - Hydraulic door returns - Open doors do not touch each other - No windows over or near bathtubs - Light switches at top and bottom of stairs - No hard surfaces (e.g., asphalt) under children's play areas - No steps in children's play areas - No free standing brick walls - Slots on balcony railings less than 5". | <p>USHUD field office.</p> <p>Local building inspector.</p> <p>Project plans—architectural plans.</p> | <p>Same as Initial Screening.</p> <p>Same as Initial Screening.</p> |
| 9.2 | Materials | <p>Whether or not project will meet USHUD <i>Minimum Property Standards</i>.</p> <p>State and local building codes.</p> <p>Incorporation of safety considerations such as:</p> <ul style="list-style-type: none"> - Marked sliding glass doors - Use of safety or tempered glass in showers, patios, storm and entry doors - Non-skid floor materials - Fire-proof carpeting - Children's play areas placed away from exposure to traffic. | <p>USHUD field office.</p> <p>Local building inspector.</p> <p>Project specifications.</p> | <p>Same as Initial Screening.</p> <p>Same as Initial Screening.</p> |

Safety: Types of Environmental Information Necessary for Assessment

| 1 | 2 | 3 | 4 | 5 |
|---------------------------------|--|--|----------------------------|----------------------------|
| Subcomponent | Initial Screening Test | | Higher Level Tests | |
| | Informational Needs | Source | Informational Needs | Specialists |
| 9.2 Materials (continued) | For rehabilitation projects: - Replace ordinary glass with safety glass in accident-prone areas - Lead pipes and old paint are removed - Filters and insulation in air conditioning and heating systems do not contain asbestos. | Project specifications. | Same as Initial Screening. | Same as Initial Screening. |
| 9.3 Site Hazards | Demographic characteristics of project residents. Existence of safety hazards such as: - Nearby golf courses, driving ranges, firing ranges, and ball fields without proper shielding - Unsupervised recreation areas for children - Litter—broken glass, etc. - Unusual numbers of stray cats and dogs - Inadequate street lighting - Uncontrolled access to lakes, ponds, swimming pools and rivers - Improperly screened storm water catchment areas and drains - Poorly constructed and/or maintained drainage systems and ditches - Poisonous plants, insects, or animals - Pedestrian paths of rocks or cobbles - Circuitous, steeply graded walkways - Overgrown brush and trees in bicycle paths. Incorporation of: - Side and rear entrances and cul-de-sacs which allow ease of access to emergency vehicles; | Developer. Site visit. < | | |

A1.4 cont'd

Safety: Types of Environmental Information Necessary for Assessment

| 1 | 2 | | 3 | | 4 | | 5 |
|-----|--------------------------|--|--|--------|---|--|--|
| | Subcomponent | Initial Screening Test | | Source | Higher Level Tests | | Specialists |
| | | Informational Needs | | | Informational Needs | | |
| 9.3 | Site Hazards (continued) | Projects for the elderly: <ul style="list-style-type: none"> — Gently sloped terrain which does not require many steps and ramps — Pedestrian connections to activity centers. Snow removal service available if in snow area. | Site plan. Local public works department. | | Same as Initial Screening. | | Same as Initial Screening. |
| 9.4 | Circulation Conflicts | Incorporation of: <ul style="list-style-type: none"> — One-way streets — Traffic signals — Marked crosswalks — Proper street lighting — Grade separated crossings for pedestrians — Ramps for handicapped at all curbs and steps to public use buildings — Separate pedestrian and bicycle pathways — No visual obstructions at intersections. Location of existing traffic circulation conflicts. | Site plan; site visit. Local traffic department; site visit. | | Same as Initial Screening. | | Same as Initial Screening. |
| 9.5 | Road Safety and Design | Existence of: <ul style="list-style-type: none"> — Shelters at bus stops — Adequate street lighting — Properly marked roads, shoulders, and curbs — No obstructions (e.g., parking areas, narrow or windy streets) to emergency vehicle access — No blind corners. Use of high design standards for roadways Accident potential of project and its surrounding area. | Site visit. Local traffic department. Traffic engineer. | | Same as Initial Screening. | | Same as Initial Screening. |
| 9.6 | Ionizing Radiation | Locations of any nuclear facilities in vicinity of project. Sources of fill, aggregate and related materials, if there is possibility of radioactivity. | Nuclear Regulatory Commission. Developer; state or local health department. | | Permit and related documentation; measurements of radiation levels and estimates of exposure. | | Nuclear engineer or health specialist. |

A1.4 cont'd

Physiological Well-Being Environmental Assessment Summary Table

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|------|--------------|--|--|---|---|---|---|
| | Subcomponent | Goals/Objectives | Impacts | Necessary Information | Methodology | Findings/Measurements | Standards/Guidelines |
| 10.1 | Noise | Physical discomfort, pain, hearing loss, psychological well-being. | Will the project be exposed to exterior & interior noise levels which exceed HUD's noise standards? Will the project create unacceptable noise levels? | Land use inventory; traffic characteristics; terrain characteristics; distance from noise sources; duration of noise; impulse or impact noise, location of major land uses. | Use methods provided in USHUD's "Noise Assessment Guidelines" and methods in National Cooperative Highway Research Report No. 117 to predict future highway traffic noise; use noise exposure forecast or composite noise rating contours to predict aircraft noise levels; statistical distribution analyzer and its associated equipment; impulse meter; sound level meter. | Noise level in decibel A weighting (dBA) noise acceptability. | External and internal noise exposure standards given in USHUD, Circular 1290.2 (L. Max) USEPA, "Noise Emissions Standards for Construction Equipment--New Portable Air Compressors," Federal Register, Vol. 38, No. 209, Oct. 29, 1974, p 38196-38208. (L. Max) |
| 10.2 | Vibration | Discomfort, distraction, physical injury, property damage. | Will the project be exposed to vibrations annoying to humans? Will construction and operation of the project cause damage to nearby structures due to vibration? | Location of project; construction techniques; soil type; distance to source of vibration; location of major land uses. | Field survey of people's reactions to any existing vibrations; measure by accelerometer and preamplifier. | Vibration intensity in terms of amplitude (inches) and frequencies (cycle/second or Hertz). | Local building codes. (L. Min/L. Max) |
| 10.3 | Odor | Distraction, annoyance. | Will the project be exposed to any intense odors? | Location of project; location of industrial activities, sewage treatment plants, sanitary landfill, incinerators, bakeries, florists, etc. | Field survey when wind is from direction of potential odor source, scentometer and odorometer. | Type of odor; odor intensity. | Threshold number greater than 2 is unacceptable. (Reco) USHEW, Air Pollution Control-Field Operations Manual Washington, D.C.: USGPO 1982. PHS Document No 937. |

Notes: (L. Min) - Legal Minimum Allowable (Reco) - Recommended, a Goal
 (L. Max) - Legal Maximum Allowable (Ave) - Average or "Rule-of-Thumb" Guide

A1.4 cont'd

Physiological Well-Being Environmental Assessment Summary Table

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|------|--------------|---|--|--|--|---|---|
| | Subcomponent | Goals/Objectives | Impacts | Necessary Information | Methodology | Findings/Measurements | Standards/Guidelines |
| 10.4 | Light | Health. | Will the residences of the project receive adequate light? | Building height and location; height and location of surrounding buildings; window area and floor area of major rooms; interior lighting levels. | Determine whether interior lighting is adequate; determine whether natural light is adequate; determine amount of area from which light will be blocked by surrounding structures. | Area of light access; adequacy of natural and artificial light. | USHUD <i>Minimum Property Standards, 1973</i> (L. Min) Local building codes also define interior lighting requirements. (L. Min) |
| 10.5 | Temperature | Discomfort; health maintenance, conserve energy | Is the project located and designed to ensure comfortable temperatures with the least expenditure of energy? | House orientation on site; direction of sun's rays; prevailing wind direction; latitude, surrounding vegetation. | Determine potential for using natural assets to maintain comfort zone. | Potential for energy reduction for heating and cooling. | 70°F inside design temperature regular housing. 75°F inside design temperature for housing for the elderly. (L. Min) USHUD <i>Minimum Property Standards, 1973</i> . |
| 10.6 | Disease | Health maintenance; freedom from disease. | Will the project be exposed to a high potential for disease? | Location of project; accumulation of garbage and trash; crowdedness; incidence of disease; incidence of rat bites. | Reconnaissance of site and area; document incidence of disease and rat bites in project environs. | Potential for disease-carrying vermin and insects; crowdedness; incidence of disease and rat bites. | |

Notes: (L. Min) — Legal Minimum Allowable (Recd) — Recommended, a Goal
 (L. Max) — Legal Maximum Allowable (Ave) — Average or "Rule-of-Thumb" Guide

AL4 cont'd

Physiological Well-Being: Types of Environmental Information Necessary for Assessment

| 1 | 2 | 3 | 4 | 5 |
|--------------|---|--|--|--|
| Subcomponent | Initial Screening Test | | Higher Level Tests | |
| | Informational Needs | Source | Informational Needs | Specialists |
| 10.1 | Noise Existence of: — Commercial and/or military airports within 15 miles of project site — Major roads (either four or more lanes or two lanes with heavy truck traffic) within 1000 feet of site — Above ground rapid transit lines or railroads within 3000 feet of site. Any new or expanded highways, railroad, mass transit or airport facilities planned for vicinity of site. Existence of noise-sensitive land uses within one mile of project (schools, hospitals, nursing homes, theaters, etc.). Size of project. | Existing land use maps; site visit. Local planning, airport and transportation agencies. Existing land use maps; site visit. Developer. | Existing and future sound levels from aircraft, roadways, railways and project. Necessary noise buffer actions. | USHUD. <i>Noise Assessment Guidelines</i> , 1390, acoustical engineer. Acoustical engineer. |
| 10.2 | Vibration Existence of the following within 100 feet of project: — Railroads — Heavy highway traffic — On-going construction activities — On-going operation of heavy equipment such as generators — Low-flying aircraft. Any laboratory equipment, computers and other vibration-sensitive equipment in project; blasting, hammer operations, or pile-driving during construction; large generators in project. | Site visit. Developer. | Existing annoying vibrations. Possible mitigative actions. Vibration caused by project, should consider: — Intensity of activity at construction site — Vibration propagation — Ground transmission — Building type and material — Dampening — Building resonance. | Survey of existing residents. Structural engineer. Mechanical engineer. |
| 10.3 | Odor Undesirable or persistent odors in site area. | Site visit (preferably by team). | Odor intensity, local air pollution codes. | Local air pollution agency. |

A1.4 cont'd

Physiological Well-Being: Types of Environmental Information Necessary for Assessment

| 1 Subcomponent | 2 Initial Screening Test Informational Needs | 3 Source | 4 Higher Level Tests Informational Needs | 5 Specialists |
|-------------------|--|--|--|---|
| 10.4 | Light Plan view of site and architectural plans. Height of surrounding buildings and their relation to project. | Site and architectural plans; developer's architect. Site visit. | Unnecessary. | Unnecessary. |
| 10.5 | Temperature Whether or not project meets USHUD <i>Minimum Property Standards</i> for heating and cooling systems. State and local building codes. Whether site plans incorporate energy-saving principles such as: — Wind rows of trees — Roof overhangs — Fewest windows on north side (northern hemisphere) — Overhead (6") and sidewall (3.5") insulation — Broad surfaces of high rises face north and south — Windows which open — As much vegetation as possible preserved and planned. | USHUD field office. Local building inspector. Site plan—developer's architect. | Unnecessary. | Unnecessary. |
| 10.6 | Disease Disease incidence in area. Highly polluted water in area. Population density in area. Harbors for disease—garbage and trash piles, abandoned lots and buildings, stagnant water. | Local health department. Local water pollution control agency. Local planning agency. Site visit. | Not applicable due to state of the art. | Not applicable due to state of the art. |

AL4 cont'd

Sense of Community Environmental Assessment Summary Table

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|------|--|--|---|--|---|---|----------------------|
| | Subcomponent | Goals/Objectives | Impacts | Necessary Information | Methodology | Findings/Measurements | Standards/Guidelines |
| 11.1 | Community Organization | Community strength; provision of sufficient suitable meeting places. | Is there an existing structure within the community with which the project will have to interface? | Type and number of existing organizations and groups; location of existing structures which serve formally or informally as meeting and gathering places; community opinion. | Document numbers of members and frequency of meetings; determine number of structures, the type and the distance to the proposed site. | General sense of community interaction, concern and strength; existence of structures to house and/or encourage human contact and interaction. | |
| 11.2 | Homogeneity and Diversity | Preserve, maintain ease of communication within the community, more balanced patterns of settlement. | Will the project change the character of the community in terms of the distribution or concentrations of income, ethnic, racial, or age groups? | Census blocks and tracts surrounding proposed project site; projected incomes and educational levels of future residents of project; projected ethnic, racial and age makeup of future residents of project; community opinion. | Compare existing annual per capita and household income and educational levels with future residents; compare existing ethnic, racial, and age mix with that of future residents. | Potential conflict with or ease of accommodation of project in existing situation. | |
| 11.3 | Community Stability and Physical Characteristics | Preserve neighborhood quality and soundness of structures; adequate provision for housing need. | Will the project be placed in an area that is unstable? | Census blocks and tracts surrounding proposed project site; sale and rental turnover rates; type and external appearance of stock surrounding site; type of housing in project; reconnaissance of surrounding neighborhood and areas, community opinion. | Document internal conditions of surrounding housing through adequacy of plumbing, overcrowding, percentage ownership and rental turnover rates, length of residency in house; document external conditions and housing type by local reconnaissance, compare existing housing type with proposed, observations of presence of trash, street and curb conditions, people housing types and conditions, use conflicts, e.g., traffic/pedestrian, etc. | Indicates general type and stability of existing neighborhood, potential conflicts between proposed housing types and existing; sense of existing general conditions in area. | |

Notes: (L. Min) - Legal Minimum Allowable (Reco) - Recommended, a Goal
 (L. Max) - Legal Maximum Allowable (Ave) - Average or "Rule-of-Thumb" Guide

A1.4 cont'd

Sense of Community: Types of Environmental Information Necessary for Assessment

| 1 | 2 | 3 | 4 | 5 |
|--------------|--|--|--|---|
| Subcomponent | Initial Screening Test | | Higher Level Tests | |
| | Informational Needs | Source | Informational Needs | Specialists |
| 11.1 | Community Organization | <p>Existence of religious structures and formal and informal community meeting places.</p> <p>Level of community activity; types and number of community groups.</p> <p>Number of potential residents in project.</p> | <p>Site visit, existing land use maps.</p> <p>Discussions with local citizens.</p> <p>Developer.</p> | <p>Community opinion on proposed project.</p> <p>Hold public hearing.</p> |
| 11.2 | Homogeneity and Diversity | <p>Historic and existing profile of demographic characteristics of area—age, race, income, and ethnic characteristics.</p> <p>Changes in population since last census.</p> <p>Demographic profile of future residents.</p> | <p>U.S. Census. <i>Census of Population and Housing</i> (most recent and decade preceding it).</p> <p>Site visit; local planning agency.</p> <p>Developer.</p> | <p>Community opinion on proposed project.</p> <p>Hold public hearing.</p> |
| 11.3 | Community Stability and Physical Characteristics | <p>Overall character of project area—street and open space maintenance, exterior condition of buildings.</p> <p>Historical perspective of conditions in area.</p> <p>Interior condition of existing residences.</p> | <p>Site visit.</p> <p>Local planning agency.</p> <p>U.S. Census. <i>Census of Housing</i> (most recent and previous decade).</p> | <p>Statistic on area housing values, vacancy rates, proportion of ownership and rental properties; turnover rates on sales and rental units.</p> <p>Proposed or scheduled public improvements in area.</p> <p>Local real estate agents; U.S. Census. <i>Census of Housing</i> (most recent and previous decade). Local planning agency and public works department.</p> |

A1.4 cont'd

Psychological Well-Being Environmental Assessment Summary Table

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|------|-----------------|---|--|--|--|---|--|
| | Subcomponent | Goals/Objectives | Impacts | Necessary Information | Methodology | Findings/Measurements | Standards/Guidelines |
| 12.1 | Physical Threat | Insecurity; fear of physical harm. | Will the project and/or the surrounding area create a feeling of insecurity among the residents and users in that they are apprehensive about exposure to physical threat? | Building type and size (project surroundings); location of doorways, windows, entrances; socio-economic characteristics of existing and future residents; surrounding land uses; sampling of neighborhood residents; general perception of crime in area; crime statistics, alcoholism and drug addiction rates in the project area. | Observation of existing area and site plans of proposed buildings; sample survey of perception of crime potential by existing residents in area. | Potential for crime; perception or anticipation of physical harm (as compared to reality of crime). | |
| 12.2 | Crowding | Physical and mental health; lack of personal privacy. | Will the residents and users be exposed to stressful situations in their physical living environment? | Number of persons or dwellings in an area; number of rooms in dwelling (excluding bath and kitchen); number of residents in unit. | Calculate number of persons or dwellings; number of acres, number of rooms in dwelling unit/number of residents in unit; sample survey of perceived crowding. | Density: units/acre Crowding: persons/room. | Land Use Intensity Rating. (L. Min, L. Max) USHUD <i>Minimum Property Standards—Multi-family housing</i> , 1973 Housing with more than 1.01 persons per room (excluding kitchen and bathroom) is overcrowded. (L. Max) US Bureau of the Census, <i>1970 Census of Population and Housing</i> (by SMSA), Washington, D.C.: USGPO 1972. |
| 12.3 | Nuisance | Physical and mental health. | Will the project be exposed to or generate factors that may be considered as nuisances? | Information on proposed project site and surrounding area; examination of proposed land use plan for possible conflicting uses. | Visual reconnaissance of proposed site and surrounding area; document alcoholic and drug addiction rates in the area of project; interviews with people in the area—policemen, social workers, residents, etc., as to existence of nuisance. | Existence of specific nuisance such as abandoned cars, undesirable activities, weeds in park, etc. | |

Notes: (L. Min) — Legal Minimum Allowable (Recd) — Recommended, a Goal
 (L. Max) — Legal Maximum Allowable (Ave) — Average or "Rule-of-Thumb" Guide

A1.4 cont'd

Psychological Well-Being: Types of Environmental Information Necessary for Assessment

| 1 | 2 | 3 | 4 | 5 | |
|--------------|------------------------|---|---|--|--|
| Subcomponent | Initial Screening Test | | Higher Level Tests | | |
| | Informational Needs | Source | Informational Needs | Specialists | |
| 12.1 | Physical Threat | Adjacent land uses such as industrial or commercial warehousing, large high schools or large, unprotected open or vacant areas. Crime statistics for area. Drug addiction and alcoholism rates. Level of activity on streets (day and night); poorly-lighted areas; barred windows and doors and other crime protection architectural features—high walls; high, small windows, etc. Project design—particularly the existence of large unprotected open spaces, poor outdoor lighting. | Existing land use maps; proposed land use plans; site visit. Local police department. Local health department. Site visit. Project plan and design. | Attitudes toward crime of existing residents; specific reasons for any feelings of insecurity. Alternative designs to make area more secure such as: improved lighting or pathway configurations, windows placed to survey open areas, compatible land uses, etc. | Survey of residents. Architect. |
| 12.2 | Crowding | Existing residents living in conditions of more than 1.01 persons per room. Open space and general building density in area. | U.S. Census. <i>Census of Population and Housing</i> (most recent decade). Site visit. | Same as Initial Screening. | Same as Initial Screening. |
| 12.3 | Nuisance | Existence of dilapidated buildings; high noise levels; abandoned cars; weeds; broken glass; garbage; cockroaches. Project design—particularly the consideration of trash and storage areas, unmaintained open spaces. | Site visit. Project plan. | Public opinion of any existing nuisance. Possibilities of eliminating any nuisance. | Survey of residents. Local sanitation department. |

Source: US DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT; "Interim Guide for Environmental Impact Assessment". Field Office Edition, 1975.

A1.5 Skidmore, Owings and Merrill: General Guidance on Assessing Future Health and Social Services Requirements

Careful identification of existing services and service recipients is a necessary first step in projecting local requirements for health and social services. Generalizations about health and social services demanded by a population that are based on aggregate data are almost inevitably wrong. Therefore, the analyst must evaluate current local service levels to determine the appropriate ratios of population to services to be used in projecting future needs. Moreover, a community that is expected to change drastically in terms of socioeconomic characteristics must be addressed with care. In particular, the analyst should be aware of growing or shrinking populations of low income or young or old people. It is suggested that the analyst confronted with estimating the requirements of a rapidly changing population look for comparable areas in nearby communities.

For example, assume that a downtown-area is to be redeveloped over the next five years and a major portion of the resident low-income population will be replaced by middle or upper middle income individuals. The health and social service requirements of the individuals living in the downtown area after five years would be more accurately estimated if the estimation is based on the requirements in an area with similar income characteristics.

The projection of service provision capacity for health and social services is dependent upon proposed levels of funding by federal, state and local agencies. Of all local community services, health and social services are the most likely to be sensitive to state and federal funding changes. Therefore, the analyst should seek information on programmed state and federal expenditures, as well as on programmed local expenditures.

A1.6 World Bank: Checklist of Environmental Health Factors that may be Affected by Development Projects

Effects on inhabitants of project area

Communicable disease
Housing and sanitary facilities
Dietary change
Effects on groundwater
Changes in ecological balance
Changes in agriculture
Increased risk of road accidents
Risks to community health from certain industrial processes

Effects on workers

Work accidents
Exposure to chemical and physical hazards
Exposure to local diseases
Nutritional status of workers.

Indirect effects

Introduction of new disease vectors
New infection or reinfection of existing vectors
Increased propagation and spread of existing vectors

Effects on existing health services

Source: WORLD BANK; "The Environment, Public Health and Human Ecology".
Washington: World Bank, 1982.

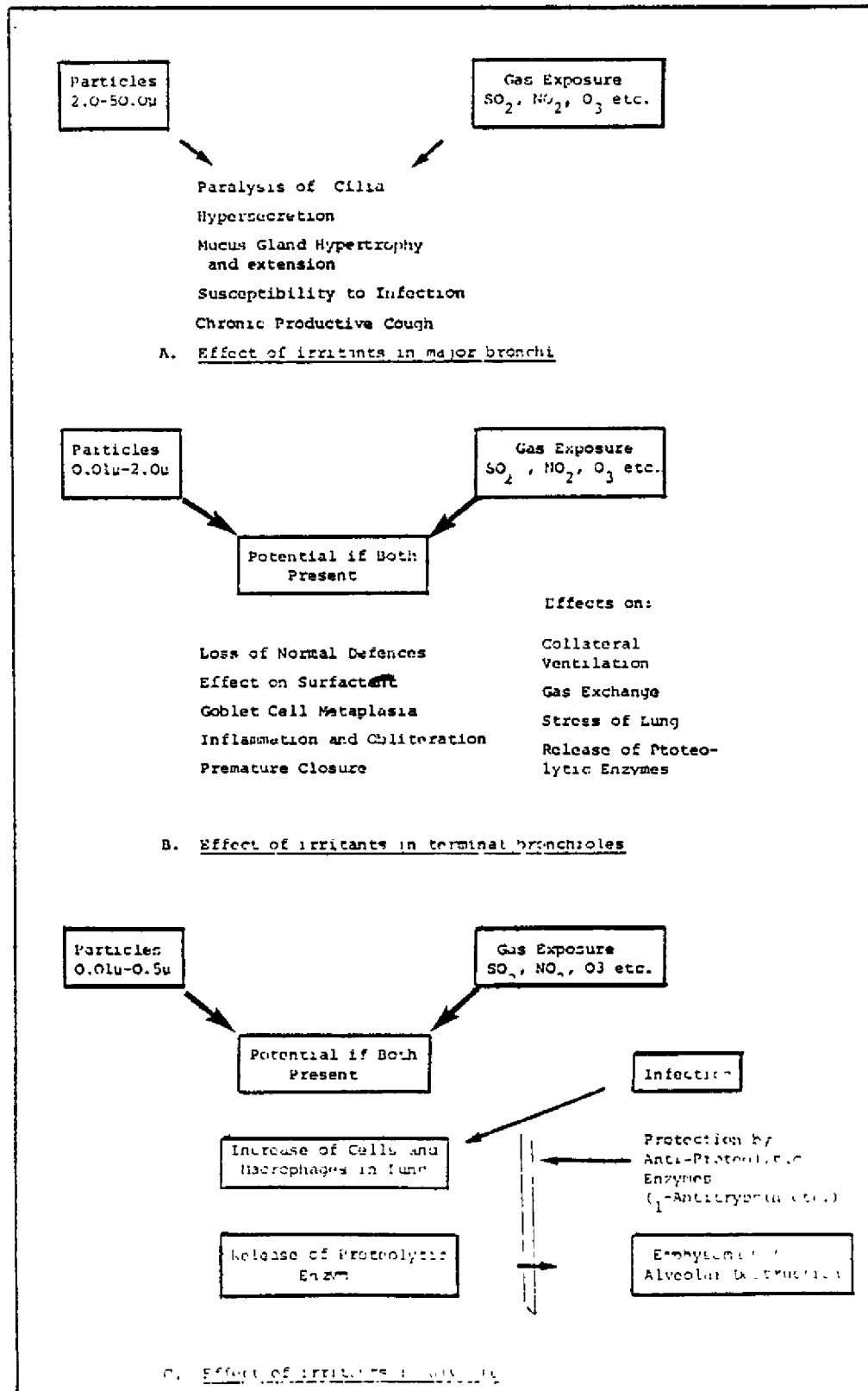
Any gas or aerosol can damage health at some concentration, if through no other means than dilution of oxygen. However, the specific concentration at which a contaminant will damage health depends on a variety of factors: the nature of the pollutant, the length of time the receptor is exposed to the pollutant, the concentration of the pollutant, and the general health of the receptor.

There are three common methods for determining the effect of various concentrations and dosages of pollutants on people (dose-response relationships): experimental exposures of animals (toxicological studies); clinical studies; and, epidemiological studies. The advantages and disadvantages of each of these approaches are discussed in some detail in Chapter VIII.

Although studies of the above types have not yet produced adequate data to relate specific diseases to specific concentrations of pollutants, they have revealed a number of general relationships (National Air Pollution Control Administration, 1969-1971; Goldsmith and Friberg, 1977.) For example:

- (i) People have died as a result of polluted air, e.g. the London smog of December 5-9, 1952 caused 4,000 excess deaths, principally among the old, the infirm and those with respiratory disease (Anon., 1954). Similarly, in the air pollution episodes in Donora, Pennsylvania in 1948, and the Meuse Valley, Belgium in 1930, 20 and 63 people died respectively.
- (ii) Chronic pulmonary disease (bronchitis, asthma, emphysema) is aggravated by sufficiently high concentrations of sulphur dioxide, nitrogen dioxide, particulate matter, ozone, etc.
- (iii) Some pollutants (e.g. sulphur dioxide, photochemical smog) irritate sensitive membranes, particularly of the eyes, nose, throat and lungs, but the irritation varies greatly from one person to another (see Section V.(i).2.2.).
- (iv) Cardiovascular diseases are related to atmospheric pollution in that any pollutant placing sufficient stress on the pulmonary function may affect the heart.

Model of the Effects of Atmospheric
Pollutant Irritants on the Pulmonary System (Bates, 1972)



A1.7 cont'd

| Agents, Pollutants | Effects |
|---|---|
| Sulphur dioxide (effects of sulphur oxides may be due to sulphur, sulphur trioxide, sulphuric acid, sulphate salts) | Aggravation of respiratory diseases, e.g. asthma and chronic bronchitis Impairment of pulmonary function Irritation of eyes and respiratory tract Leaf injury and reduced growth in plants Corrosion of metals. Deterioration of building materials, textiles, leather etc. |
| Sulphur oxides and particulate matter from combustion sources | Short-term increase in mortality and morbidity Aggravation of bronchitis and cardiovascular disease Contributory role in etiology of chronic bronchitis and emphysema Contributory role in etiology of lung cancer (?) |
| Particulate matter (not otherwise specified) | Directly toxic effects or aggravation of effects of gaseous pollutants Increase in chronic respiratory disease Impairment of visibility Alteration in incident sunlight Interference with plant photosynthesis Soils surfaces and materials Abrasion of building materials and textiles |
| Oxidants (including ozone) | Aggravation of emphysema, asthma, and bronchitis Impairment of cardiopulmonary function Eye and respiratory irritation Impairment of visibility Leaf injury and reduced growth of plants Deterioration of rubber, textiles etc. |
| Hydrocarbons | Contribution to cancer (?) Contribution to formation of photochemical oxidants Sensory irritation |
| Carbon monoxide | Increased general mortality and coronary mortality rates Reduced tolerance for exercise Impairment of mental function Causal factor in atherosclerosis (?) |
| Nitrogen dioxide | Aggravation of respiratory and cardiovascular illnesses. Discolours atmosphere Damage to vegetation Fading of paints and dyes |

| Agents, Pollutants | Effects |
|--|---|
| Lead | Increased storage in body Impairment of haemoglobin and porphyrin synthesis Impairment of learning and intelligence in schoolchildren Lethal to animals eating contaminated feed |
| Hydrogen sulphide | Increased mortality from acute exposures Sensory irritation and impairment of sensory detection or reflexes Damage to paint |
| Mercaptans and other odorous compounds | Sensory irritation Headache, nausea, and sinus affections |
| Fluorides | Damage to vegetation; harms animals Fluorosis of teeth |
| Ethylene | Damage to vegetation and hastening of fruit ripening |
| Asbestos | Production of pleural calcification Malignant mesothelioma, asbestosis Contribution to chronic pulmonary disease (asbestosis and lung cancer) |
| Chlorinated hydrocarbon pesticides | Stored in body, mostly from milk and animal fats Ecological damage |

SOURCE: UNEP, "Guidelines for Assessing Industrial Environmental Impact and Environmental Criteria for the Siting of Industry," 1982.

Al.8 UK Department of Trade: Guidelines for Assessing the Effects of Emissions from Vehicles

3.3 EFFECTS ON PEOPLE

3.3.1 The main effects fall into 3 categories:-

- a. possible long term hazard to health;
- b. short term or temporary effect on health;
- c. nuisance.

The extent of the effect will depend on the length of exposure and the concentrations of the relevant pollutants in the atmosphere. These factors are, in turn, dependent on the traffic composition and density, climatic conditions and the road layout.

3.3.2 In the UK concern has focussed mainly on the long term hazard to health from lead. The Report to the Secretary of State for Health and Social Security on Lead and Health (the Lawther Report) reviewed the contribution that lead in petrol makes to the body burden. It noted that airborne lead from car exhaust emissions may be deposited directly on food or crops or it may contaminate dust which may then be blown onto food or crops, particularly fruit and vegetables grown near busy roads. The Report concluded, however, that crops grown near sources of airborne lead generally make only a small contribution to the diet. Taking account of all sources of lead the Committee recommended that the annual mean concentration of airborne lead should not exceed 2 micro-grammes per cubic metre in places where people might be continuously exposed for long periods. This level forms the basis of a European Community Air Quality Directive which becomes effective in 1987.

3.3.3 The Government has accepted this recommended level and has decided that the limit for lead in petrol should be reduced from 0.40 grams per litre to 0.15 grams per litre. This new limit will be compulsory by the end of 1985 and should enable the air quality standard of 2 micro-grammes per cubic metre to be met in virtually all residential areas alongside trunk roads.

3.3.4 A possible long term health hazard is provided by potential carcinogenic materials in the environment. Amongst vehicle emissions one of the important groups are the polycyclic aromatic hydrocarbons which are also emitted from all forms of combustion. It has been estimated that at least half the concentration of polynuclear aromatic hydrocarbons in the urban atmosphere can be attributed to motor vehicles. The exposure levels in urban areas are equivalent to those produced by smoking one cigarette per day.

3.3.5 A short term effect which may pose long term hazards to health for certain people is produced by the photochemical oxidants (ozone, nitrogen dioxide and peroxyacetyl nitrate (PAN)) formed in the atmosphere from hydrocarbons and nitrogen oxides as these pollutants disperse away from the highway. The necessary climatic conditions for their formation in any significant amount exist in the United Kingdom only on warm, sunny anticyclonic days.

3.3.6 Possibly the most important pollutant producing short-term effects on health is carbon monoxide. It is rapidly absorbed into the blood stream, reducing the oxygen supply to the body and giving rise to headaches, dizziness and ultimate collapse. Fortunately carbon monoxide is removed from the blood stream when the subject moves to an area of lower carbon monoxide concentration. The level of carbon monoxide in the atmosphere required to produce the slightest of these effects is much higher than those normally prevalent around highways except in extremely congested traffic in tunnels with poor ventilation. As an indication of the scale of the problem caused by traffic it has been found that cigarette smoking produces significantly higher exposure to carbon monoxide than that experienced by pedestrians from exhaust emission on heavily trafficked roads.

3.3.7 Under certain conditions a health hazard can be produced by nitrogen dioxide. Whilst the oxides of nitrogen emitted from a vehicle consist mainly of nitric oxide, which at normal concentrations, has no demonstrable effect on human beings, some nitrogen dioxide is produced as the material disperses in the atmosphere. This may adversely affect the human respiratory system, as well as acting as a powerful oxidising agent on all organic matter. The few available data relating to the concentrations of nitrogen dioxide found around the most heavily trafficked roads in the UK show that in some cases they exceed the levels recommended in other countries which "... allowing an adequate margin for safety are requisite to protect human health".

(US National Primary and Secondary Air Quality Standards) This pollutant should be investigated where an Air Quality Report is called for and attention drawn to places where likely annual average levels of NO₂ exceed 0.05 parts per million.

3.3.8 Exhaust fumes produce a marked adverse reaction from people. This reaction probably involves a combination of the sight of black smoke and the smell of malodours. These are both nuisances and are not thought to constitute a direct hazard to health. A large number of compounds, some of them hydrocarbons, contribute to the malodorous smell of exhaust gases.

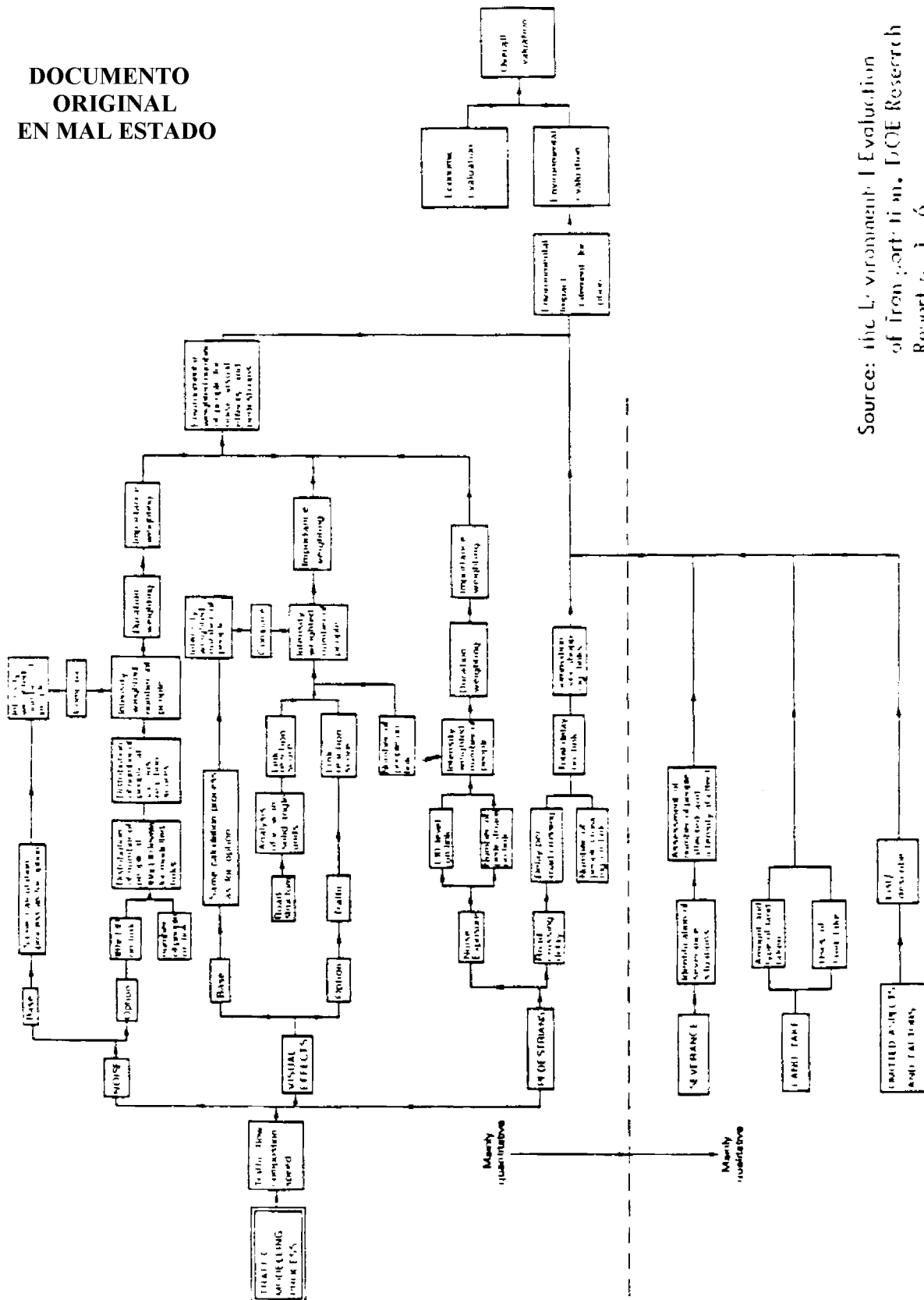
3.4 POLLUTION AND VEHICLE MOVEMENT

3.4.1 Dust and dirt arising from vehicle movements is deposited on surfaces near the highway. This has a detrimental effect on surroundings and one that, so far, cannot satisfactorily be quantified. A rough indication of the extent of dust and dirt deposition is given by other pollutants. For example, an area with high lead levels due to normal driving conditions will also be exposed to high levels of dust and dirt. The nuisance of dust and dirt from haul roads and construction sites is discussed in section 8 of this Manual.

3.5 NEED FOR AN INDICATOR OF POLLUTION

3.5.1 The effects of air pollution on an area near a highway, are complex and for the purposes of highway scheme appraisal it is desirable to select one component as a general indicator of the level of vehicle pollution and of the need for an Air Quality Report. The currently recommended component is carbon monoxide for which a method of prediction and instrumentation for its validation are both available. Although carbon monoxide is an acceptable indicator of traffic pollution, the ratios of CO:PB and CO:Nox will vary considerably with traffic and driving conditions and such variations may be as important as pollution from local fixed sources and may need to be taken account of in the Air Quality Report. It should also be kept in mind that there may be cases where existing non-traffic sources of pollution due to lead or NO₂ are sufficiently high for one or more of the recommended levels to be exceeded with a traffic component less than that indicated by the carbon monoxide indicator. Consultation with the local Environmental Health Officer is advisable if there are any suspicions that such a situation exists.

**DOCUMENTO
ORIGINAL
EN MAL ESTADO**



Source: the Environment - Evaluation of Iron Pollution, DOE Research Report 7, 1, 6.

URBAN ROADS APPRAISAL : REVIEW OF METHODS

ENVIRONMENTAL EVALUATION OF TRANSPORT PLANS

Source: UK Department of Environment, "The Environmental Evaluation of Transportation," Research Report 8. 1976

