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**Proxy Indicators for Rapid Assessment of  
Environmental Health Status of Residential Areas:  
*The Case of the Greater Accra Metropolitan Area  
(GAMA), Ghana***

*Jacob Songsore, John S. Nabila, A.T. Amuzu, K.A. Tutu,  
Yvon Yangyuoru, Gordon McGranahan and Marianne Kjellén*

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## **PREFACE**

The development of guidelines for the application of “Proxy” Indicators for Rapid Assessment of Environmental Health Status of Residential Areas in the Greater Accra Metropolitan Area (GAMA) is one outcome of a long term collaboration between the Department of Geography and Resource Development of the University of Ghana and the Stockholm Environment Institute (SEI). More specifically, it is an action-oriented follow-up to a major study of household environmental problems undertaken in 1991, and summarised in an earlier SEI report (see inside cover).

The rapid assessment methodology described in this report has been designed to provide routine monitoring of the environmental health situation in the different neighbourhoods of GAMA, and thereby provide a better basis for environment and health planning and management. It is intended as a practical tool in an area where a strong scientific basis for quantifying risks is generally lacking, but some form of more systematic assessment is sorely needed. The details of the design are specific to Accra, but the approach and the lessons learned in applying it should be of relevance to others attempting to assess conditions in their own cities.

While the selection and weighting of indicators are based primarily upon expert judgement (in Accra), a wide range of indicators are employed, many of which are estimated with the help of local residents. In contrast with traditional indicators, based for example on physical tests of water quality, the indicators employed are more difficult to defend individually, but together better reflect the wide range of health threats experienced in a city like Accra. The indicators are more compatible with a holistic approach to environmental health, involving direct engagement with and the participation of local residents, than with central planning. However, they do provide information relevant to strategic planning at the city-level.

We are grateful for the continuing encouragement and support for the study by Prof. George Benneh, the outgoing Vice-Chancellor. We also gratefully acknowledge the valuable comments of members of our intersectoral network who participated in our consultations. They include the following experts - Dr. Eric Amuah, Dr. Philis Antwi, Dr. M. Armar-Klemesu, Dr. Derek Aryee, Mr. S. K. Avle, Mr. E. M. Bawa, Dr. Sam Z. Bugri, Mr. Ben Doe, Dr. Dan Maxwell, Prof. S. K. Odoom and Dr. Joe Vere. Their affiliations are provided in Annex I. Thanks are also due to the field researchers – Osman Alhassan, Francis Boakye, Cynthia Engman and Lawrence Pokua-Nimo.

Finally we are grateful to Pete Kolsky of the London School of Hygiene and Tropical Medicine and Anders Arvidson of the Stockholm Environment Institute for their valuable reviews.

This report is dedicated to the late A.T. Amuzu, who contributed greatly not only to this report, but to all the work upon which it builds and to the goals which it pursues.



## 1. INTRODUCTION AND BACKGROUND

### 1.1 Context

“All constituents of the environment of our planet - rainforests, troposphere, seas and biological environment - ultimately exert an influence on human health and well-being. However, the environment which exerts the greatest and most immediate influence on the lives of people, their health and well-being, is the intimate environment of their home and neighbourhood. A health-promoting home and urban environment embody the fundamental aspirations of the majority of people, where the quality of their lives depends on having a clean, decent, safe home in which to live and raise a family.

“While the importance of the home and neighbourhood environment to human health is generally recognised, environmental studies of human settlements tend to emphasise larger-scale environmental problems whose health implications are often less significant. Yet, the understanding of the inter-relationships between health, environment and urban development is crucial not only for the development of environmental health programmes, but also to urban environmental management. This applies especially to complex, large, but relatively poor agglomerations, such as the Greater Accra Metropolitan Area”. (Source: Songsore J and McGranahan G., 1993.)

Environmental inadequacies in deprived neighbourhoods probably remain the most important avoidable environmental causes of ill health. The 1993 World Development Report, which focused on health, estimated that improving household environments could avert the annual loss of almost 80 million ‘disability free’ years of human life - more than the feasible improvement attributable to all other identified environmental measures combined (McGranahan, Songsore and Kjellen, 1996, p.111; World Bank, 1993). For the world as a whole, each year:

- Three million children die from diarrheal diseases whilst hundreds of millions suffer physical and mental impairment from repeated diarrheal attacks resulting largely from contaminated food and water and unhygienic conditions.
- Two million people, mainly children, die from malaria each year with as many as 800,000 child deaths occurring in Africa from malaria alone in 1991. In addition, tens of millions of others suffer prolonged or repeated bouts of malaria.
- Hundreds of millions of people of all ages suffer from debilitating intestinal parasitic infections, and from respiratory and other diseases

(Mitlin and Satterthwaite, 1996, pp.27-28; See also WHO 1992<sup>a</sup>; WHO 1992<sup>b</sup>; and Kolsky and Blumenthal, 1995).

In the Greater Accra Metropolitan Area (GAMA), the ten most common health problems reported at outpatient facilities clearly demonstrate the importance of environmental conditions. Of these, malaria is the most prominent, followed by upper respiratory tract infections, diarrhoea, skin diseases, accidents, intestinal worms in descending order of importance. While visits to outpatient facilities tend to over-represent some health problems, there is no doubt that malaria, respiratory and diarrheal diseases are all major childhood killers both in urban and rural settlements in Ghana.

Parts of Accra are privileged relative to most of Ghana, but others present a wide range of health risks and commensurate ill health (Songsore and McGranahan, 1993, Benneh et al, 1993). Data on mortality differentials in Accra

indicate a high degree of covariation with levels of socio-economic and environmental deprivation of residential areas. Residence in the most socio-economically and environmentally deprived areas of Accra is associated with increased risk of mortality from all cause groups and for all ages. The mortality statistics also indicate the importance of environmental health problems. “Infectious and parasitic diseases contribute 18% of deaths in males and females in Accra. For all age groups, rates of mortality are up to five times higher for those living in areas with poor neighbourhood conditions and socio-economic status, compared to residents of the best areas. Respiratory conditions are another major cause of mortality in Accra”. (Stephens et al, 1994, p.ii).

The approach adopted in developing the assessment technique presented in this report builds upon a study of household environmental problems in Accra undertaken in 1991 by the Department of Geography and Resource Development of the University of Ghana and the Stockholm Environment Institute (SEI). The Accra study was itself part of a three city study coordinated by SEI, the other two cities being Jakarta, Indonesia and São Paulo, Brazil. Facing a lack of previous research on household environmental problems, the 1991 study gathered primary data on existing conditions, and included an analysis of intra-urban differentials. The environmental problem areas covered in the survey included water, sanitation and hygiene, solid waste, pests and pesticide use, food contamination, household air pollution and crowding. Special attention was given to the links between environment and health with a focus on children under 6 and women as the key household environmental managers. The results are summarised in a publication entitled, *Environmental Problems and the Urban Household in the Greater Accra Metropolitan Area (GAMA) - Ghana* (Benneh et al, 1993).

A seminar on Environmental Problems and the Urban Household in the Greater Accra Metropolitan Area was organised in Accra on the 9th and 10th of December 1993 to present the results. We were honoured to have the Minister for Environment, Science and Technology, Dr. Christine Amoako-Nuamah, provide an introduction clearly placing the study in context. Numerous representatives of governmental and non-governmental organisations involved in environmental improvement and health management attended the seminar. The results of this first phase influenced both local action and international perceptions of urban environmental problems. This report is written in an attempt to accelerate this process, working in co-operation with local policy makers and non-governmental organisations.

Further consultations with actor-audiences including metropolitan planners, health experts, environmental managers and non-governmental organisations indicated a general interest in the following policy-oriented work:

1. Developing a Geographical Information System (GIS) structure and using it as a framework to illustrate environment and health indicators from the above study and other relevant studies, such as the one on mortality by Stephens et al., 1994;
2. Development of guidelines for application of illustrative “proxy” Environment and Health Indicators (EHI) for monitoring.

These two themes have been addressed in a follow-up policy study, with this report focusing on the development of “proxy” indicators for the rapid assessment of environmental health status of residential areas in the Greater Accra Metropolitan Area.

## 1.2 Environment and Health: Some Conceptual Issues

Human exposure to life-threatening and health-threatening pollutants, pathogens and physical hazards occurs in a variety of different situations and via a range of different pathways. Human exposure may occur via the air, water, food or soil.

“The starting point in most cases is some form of human activity, or, more rarely, a natural process which releases pollutants into the environment. The process of release is termed *emission*. Once in the environment, pollutants typically undergo a process of *dispersion*, during which they are transmitted through the environment via the air, water, food or soil. *Exposure* occurs when humans encounter the pollutants in the environment” (Corvalan and Kjellstrom, 1996, p.7). The amount of any given toxin or pollutant that the individual absorbs either by inhalation, ingestion or dermal absorption is the *dose*. Finally, the *target organ dose* is the amount that reaches the human organ where the relevant effects occur (Corvalan and Kjellström, 1996, p.9).

While individual level epidemiological studies are preferred by many specialists, the costs are often prohibitive and likely to outweigh the benefits, especially where multiple and interrelated risks are pervasive. Consequently ecological methods, in which the statistical unit of observation is a population rather than an individual provides a useful alternative (Corvalan and Kjellstrom, 1996, p.3; Beaglehole et al, 1993).

A conceptual model based on the ecological method has been developed for the Greater Accra Metropolitan Area for household and neighbourhood level environmental problems encountered within GAMA. “According to this conceptual logic, the morbidity differentials in the population of GAMA are a function of the synergistic interaction between environmental risk factors (for instance the presence in the household environment of a pathogen or disease vector) and socio-economic defence systems as expressed or materialised in different residential areas of the city with their specific ecological conditions and their residents’ socio-economic circumstances” (Songsore and McGranahan, 1993, p.14).

Intra-urban variation in morbidity and mortality can be explained by the uneven access of social groups to critical resources that enable the individual or household to achieve some protection from environmental risk factors. Protection can derive from: access to environmental services; access to medical services (preventive and curative); adequate nutrition and shelter; hygiene practice or behaviour; and custom. The sum total of environmental risk factors a household or individual faces, can be taken to determine the probability of exposure to conditions inducing ill-health, and consequently the burden of ill-health. However, there is an added layer of uncertainty since the underlying processes and conditions are not, and never will be, fully understood.

Both individual level epidemiological studies and household surveys on which the second model draws can provide information on the morbidity factors, risk factors and underlying population characteristics of interest, thereby allowing for simultaneous analysis of cause and effect (Songsore and Goldstein, 1995). However, neither approach can fully resolve the practical problems inherent to developing priorities and policies in conditions of high uncertainty.

## 1.3 The Case for “Proxy” Environmental Health Indicators

“The key aspect of an indicator is the transition from ‘data’ to ‘information.’ In this context environmental health indicators can be understood as synthesised information regarding known environment-related diseases or contaminants with

known adverse health effects. Once identified, these indicators can be used to establish improved and more cost-effective environmental monitoring and management programmes” (Corvalan and Kjellstrom, 1995, p.75).

Government organisations, NGOs and other actors are interested in developing environmental health indicators as a policy tool. Such indicators, when applied to residential areas within the city, can assist in identifying and prioritising problems, and monitoring improvements (or degradation). The household surveys undertaken in 1991 provide considerable depth, and demonstrated the need to consider a range of environmental conditions beyond the traditional water and sanitation sector. However, the survey data lack coverage and continuity. Proxy indicators, developed on the basis of this more in-depth analysis, can be applied more widely and repeated at a relatively low cost.

The use of “proxy” indicators for the rapid assessment of the environmental health status of urban settlements is in some ways analogous to rapid urban environmental assessment methods developed through the Urban Management Programme (Leitmann, 1994; McGranahan et al., 1997). “The methodology has been explicitly designed to be low cost, rapid, locally managed, and participatory” (Leitmann, 1994, p.1). The difference in this case lies with our explicit focus on environmental health problems in different residential areas.

## 2. SUMMARY OF APPROACH

A three-step process was developed to enable the study team to produce a list of proxy environmental health indicators that reflects informed expert opinion in the Greater Accra Metropolitan Area. These steps include the following:

- Development of a profile of “Proxy” Environmental Health Indicators by the study team;
- Development of a method for weighting the indicators by the study team in consultation with a statistical expert;
- Informal consultations between the study team and an inter-sectoral network of environmental health experts to discuss and validate the indicators and weighting procedure. The group also developed a general set of indicators, appropriately weighted for application in the field.

### 2.1 Profile of Proxy Environmental Health Indicators

Drawing on the results of the 1991 study, the team identified the need to collect data on the following major themes for individual residential areas within the metropolitan area:

- I. Socio-demographic conditions;
- II. Environmental hazards; and
- III. Major health problems that could be attributed to environmental hazards.

Information on the socio-demographic context serves as a screening device, and helps to contextualise the environmental and health problems identified. Nine major environmental problem areas were identified as having strong implications for the health outcomes of residents. These problem areas include the major themes in the 1991 study (Benneh et al 1993). They are:

- A) Water
- B) Sanitation
- C) Hygiene
- D) Sullage/Drainage
- E) Pests
- F) Housing Problems
- G) “Indoor” and “Outdoor” Air Pollution
- H) Food Contamination
- I) Solid Waste

For each of these problem areas a number of environmental health indicators or risk factors/hazards were identified (see below). The indicators selected signal the presence or absence of some circumstance considered to adversely affect health.

The health problems related to the environment that were identified as being persistent in the metropolis were:

- A) Children’s Diarrhoea Problems
- B) Children’s Respiratory Problems
- C) Respiratory Problems of Principal Homemaker/Other Adults
- D) Malaria
- E) Skin Diseases
- F) Intestinal Worms
- G) Other water related diseases e.g. Schistosomiasis, Typhoid, Cholera.

All but the last category are among the top ten most frequent causes of ill-health as reported at outpatient facilities in GAMA with malaria alone accounting for about 40% of the total.

## 2.2 Procedure for Weighting of Environmental Indicators.

Having identified a preliminary set of indicators, the next step was to develop the system for weighting them, and combining them into an index. The individual environmental health indicators or hazards identified are not themselves of equal importance, and nor are the nine environmental problem areas they represent. Thus a weighting of the individual indicators/hazards was necessary.

### 2.2.1 Weighting Procedure

It was decided to develop a simple scheme assigning (maximum) scores to every problem area, and then distributing these scores across individual indicators. In effect, the sum of the (maximum) scores for the individual indicators in a given problem area was set equal to a pre-determined (maximum) score for that problem area. This was considered preferable to employing a rank-order technique, or no weighting at all, but does raise some methodological questions.

One such question is how to ensure consistency across the problem areas *after* their relative weights have been devised. Since the actual scores achieved for each problem area depends upon the particular indicators chosen, the choice of indicators needs to be compared across the different problem areas. Ideally, maximum scores in different problem areas should imply the existence of conditions envisaged in determining the weights for the problem areas, while a score of zero should imply that the problems have become insignificant (or, in the case of cross-boundary problems, that the neighbourhood itself is not contributing to these problems). This ideal is not likely to be achieved, however. Moreover, there is a danger that if, for example, comparatively rare hazards are used to generate a score in one problem area and common hazards to generate a score in a second, the results could inadvertently give undue weight to the second area. The results of the survey undertaken in 1991 provided an indication of how common most of the indicator conditions were likely to be, and were used in developing the indicators. However, it should be kept in mind that even a simple weighting system, such as the one used here, must be applied with care.

There is also a methodological question concerning who should assign the weights. It was decided to rely on inputs from epidemiologists, environmentalists, planners, statisticians and other “experts” from Accra, to help create a simple yet scientifically informed scheme that could easily be applied by the non-specialist. As such, the preferences of the residents were not taken into account in the design stage. Thus, the results should be treated as technical inputs to a political process wherein lay knowledge and stakeholder preferences should be brought to bear independently. Also, it must be recognised that, whoever is deciding upon the indicators and their relative importance, their judgements inevitably involve a strong normative component, which cannot be rigorously defended on scientific grounds.

The resulting scoring system is composed of two main steps, each of which can be broken down further into two stages:

*Step 1. Weighted Scoring of Problem Areas.* This involved distributing a total score of 100 over the problem areas (eg. water, sanitation, hygiene, sillage/drainage, pests, housing problems, indoor and outdoor air pollution, food contamination and solid waste). The experts were asked to allocate the scores in proportion to the relative importance of the problem area to health, basing their assessment on the background results of our initial study, and their own knowledge



of existing conditions and health problems. These assessments were then combined. Thus, the first step involved two stages:

*Step 1a.* Having individual members of the informal consultation distribute 100 points across the problem areas, according to their relative contribution to ill health.

*Step 1b.* Pooling these scores, and calculating a final weight based upon the average score for each problem area. Table 1.1 portrays an illustration of a subset of the resulting scores for the top ranked problem areas. Insect vectors/pests scored 30, water scored 15 and sanitation 10. The higher the score the more severe the problem.

**Table 1.1: Interpretation of Results: An Illustrative Example on Problem Areas**

Rank	Score	Problem Area
1	30	Insect vectors/pests
2	15	Water
3	10	Sanitation etc
To the n <sup>th</sup> rank	-	-
<b>Total</b>	<b>100</b>	-

*Step 2. Weighted Scoring of Indicators/Hazards Within Individual Problem Areas.* This involves selecting and weighting the individual indicators for each problem area. The weighting was developed with a view towards reflecting the relative importance of different (but often interrelated) hazards within each problem area, while still taking account of the overall importance of the problem area as identified in step one. Again, this involved two stages:

*Step 2a.* The average score for each problem area from step 1 was doubled and then distributed across the hazards/indicators listed under each problem area. This was done in a manner ensuring that if all hazards/unfavourable indicators were present, the sum total of all scores for all hazards/indicators within a problem area would equal twice the total score allocated to that problem area in step 1. The only reason for doubling the scores was to make the job of assigning scores easier: 100 points was found to be too few, given the number of individual indicators involved.

*Step 2b.* The final (maximum) score for each hazard/indicator within problem areas was calculated by averaging the scores allocated by the different experts. Table 1.2 summarises the results for the high ranking indicators in the water area, with the overall maximum score for water preset at 30: exactly twice the score for the problem area.

**Table 1.2: Interpretation of Results: An Illustrative Example on Indicators**

Rank	Mean Score	Indicator/Hazard
1	5	Regular water supply interruption
2	4	High price of water at selected water points
3	4	Potable water stored in open container
4	3	In-house storage of water in pots
To the n <sup>th</sup> rank	-	-
<b>Total</b>	<b>30</b>	-

In sum, the scoring procedure yields scores for both problem areas and for individual indicators. The higher the score the more significant the environmental problem area has been judged, in terms of health outcomes. Step 1 above assigned weights (scores) to each problem areas, and Step 2 assigned weights (scores) to each individual indicator within each problem area. The sum of scores for

individual indicators in one problem area equals the weight assigned to that area. The higher the score, the more severe health hazards are at least indirectly associated with the presence of the indicated condition.

### ***2.2.2 Use of Weighted Pooled-Scores to Determine Environmental Health Status of Residential Areas***

The scoring procedure described above provides a simple technique for rapid assessment of intra-urban environmental health status (burdens) at different levels of spatial resolution, e.g. between districts, sub-metropolitan areas, residential areas, or between sub-areas within residential areas in the case of community surveys. It all depends on the level of disaggregation of the urban residential space that is required. This methodology hopes to achieve the following results:

1. Identification of environmental problem areas and their ranking e.g. water, sanitation etc.;
2. Identification of environmental health indicators within these problem areas and their ranking;
3. Computing the weighted environmental health index for individual problem areas for residential areas in the city;
4. Computing the total weighted environmental health index for residential areas in the city; and
5. Using (3 and 4) for the classification of residential areas based on: their scoring on the weighted index for individual environmental problem areas (e.g. water, sanitation etc); and their scoring on the aggregate weighted environmental health index for all environmental problem areas.

This will facilitate targeting of areas for intervention and monitoring conditions from season to season, over time and after interventions to improve the situation.

### 3. RESULTING INDICATORS AND WEIGHTING SYSTEM

After the study group developed a draft set of indicators and the methodology described above for weighting the indicators, the next step was a process of consultations. The aims of the consultations were as follows:

1. To develop a core inter-sectoral network consisting of the members of the study team and other experts in the field of environmental health to help in the development of the proxy environmental health indicators;
  2. Drawing from the results of our initial study and the draft list of indicators, to develop a consensus within the group of experts on the indicators/hazards that are easy to monitor and are locally relevant to include in measuring the environmental health status of residential areas in GAMA. Members of the network were to judge the validity and quality of information available on the draft indicators;
  3. To agree on a list of indicators and a valid procedure for applying them in the field; and
  4. Application of the weighting system to the approved list of indicators in order to develop a standard weighted set of indicators for application in the field.
- The members of this consultation included epidemiologists, environmentalists, planners, nutritionists and statisticians etc. who had a sound technical knowledge of the issues and who were key managers on the urban environmental health scene. The affiliations of the list of members of the consultation is contained in Annex 1. The end product was the development of a standard list of weighted proxy indicators for field-testing and a list of key environment related diseases together with their symptoms for monitoring.

#### 3.1 Indicators Approved for Field Testing

The first process of the consultation was the review of the list of relevant indicators developed by the study team with some additions and modifications. The list below provides the outcome of this first step. Section I of the list provides the background socio-demographic context to be observed. Section II, which is the most important for the model of rapid assessment developed, gives the environmental indicators/hazards desired. Section III provides a listing of the most critical environment-related health problems in the metropolis and their symptoms. As indicated in the section on the field testing, some simplification was required in order to make the indicator system operational.

##### *List of Suggested “Proxy” Indicators Emerging from Consultation*

###### **I: Background Socio-Demographic context (Screener)**

This provides the general context for understanding the environmental health conditions in human settlements and should be evaluated separately. Some possible underlying causes of poor environmental health are indicated below:

- Evidence of low educational status within community
- Evidence of high levels of unemployment or underemployment within community
- Absence of active community-based organisations within community
- Number of children under five years of age per household

## **II: Environmental Indicators<sup>1</sup>**

### **A: Water**

- Ponds/streams as principal source of water supply within community (c)
- Principal source of potable water supply outside house compound (c)
- Frequent water supply interruptions within community (c)
- Pay as you use for water at selected water points (c)
- Potable water stored in open containers (h)
- Use of common dip cup for drinking water (h)
- Vendors as principal source of potable water supply within community (c/h)
- Pipelines on ground surface and in drains (cross contamination) (c)
- Community self-assessment of water quality using their own indicators (c)
- Queuing time of 20<sup>+</sup> minutes at water collection points (c)
- Distance above 200 metres from water collection points (c)

### **B: Sanitation**

- Communal toilets as principal toilet facility within community (c)
- Queuing time above 10 minutes at selected toilets within community (c)
- Toilet user fee payment for toilet use (c)
- Toilet sharing between households within house compound (h)
- Open defecation by neighbourhood children and/or adults (c)
- Littering of polythene/paper bags of faecal matter within community (c)
- Presence of public toilets in the midst of human dwellings (c)
- Presence of overflowing septic tanks and aqua-privy systems in the community (c)
- Use of chamber pots for storage of faecal matter/urine in-house (h)
- Odour nuisance around toilets/garbage dumps/drains etc. (c)

### **C: Hygiene**

- Evidence of unwashed plates/dishes in house compound (h)
- Hands not washed before food preparation/eating (i)
- Hands not washed after toilet (i)
- No facility for hand washing attached to toilet (c/h)
- Presence of children/adults with open sores/running noses (c)
- Presence of barefooted children in community (c)
- Absence of household bath-house facility (h)
- Inadequate public bath-house facilities (c)
- Evidence of spitting around in community (c/h)
- Communal handwashing practices within home/chopbars etc. (c/h)

### **D: Sullage/drainage**

- Absence of/narrow drains in the community (c)
- Pools of stagnant water (cesspools) (c)
- Drains choked with garbage, weeds and silt (c)

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<sup>1</sup> (c) = Community Level Observations  
 (i) = Individual Level Observations  
 (h) = Household Level Observations

- Evidence of children playing in and around stagnant water (c)
- Evidence of mosquito and other larvae within stagnant water bodies (c)
- Evidence of flood risks within community (c)
- Pools of stagnant water in drains (c)

**E: Pests**

- Presence of many flies within kitchen/chopbars (cooking area) (c/h)
- Presence of many flies within toilet (c/h)
- Presence of many cockroaches in cooking area and house compound (h)
- Presence of mice within house (h)
- Presence of mosquito larvae in water storage containers (Entomologists?) (h)
- Complaints about bed bugs in sleeping area (i/h)
- Evidence of lice in children's hair within community (i)

**F: Housing Problems**

- Evidence of sleeping outside of rooms in community (c/h)
- Evidence of crowding in sleeping places (h)
- Evidence of domestic animals sharing dwelling places with humans (h)
- Droppings of domestic animals in and around house compound (h)
- Evidence of leaking roofs during rains (h)
- Evidence of dirty floor of house compound (h)
- Presence of noise pollution from artisanal works/micro-enterprises etc.(c)
- Evidence of damp walls (c)
- Evidence of cracks in walls (c)
- Evidence of crowding and unplanned layout of houses (c)
- Absence of mosquito/insect screens in building (c/h)

**G: "Indoor" and "Outdoor" Air Pollution**

- Wood as principal cooking fuel in community (c/h)
- Charcoal as principal cooking fuel in community (c/h)
- Use of mosquito coil/burning of leaves as repellent (h)
- Use of pump-spray insecticide (h)
- Smoke pollution from corn mills and micro-enterprises/vehicles (e.g. garages, fish smoking, rubbish burning etc.) in community (c)
- Evidence of frequent cigarette/pipe smoking within home (h)
- Evidence of cooking done indoors (in sleeping rooms) (h)
- Evidence of cooking with wood/charcoal in kitchens (h)

**H: Food Contamination**

- Food sold near drains (c)
- Food sold near public toilets (c)
- Food cooked in the open for sale (c)
- Dusty eating areas or eating areas along main transportation arteries with vehicular smoke pollution (c)
- Uncovered vendor prepared food or left-overs within the house (c/h)
- Evidence of children defecating around food vending area/cooking area within the home (c/h)
- Food sold in eating-places without running water (c)

- Use of unwashed or rotten vegetables for cooking/raw eating (c/h)
- Lack of medical certification of food vendors (from health inspectors) (c)
- Using (naked) hand as means of serving food. (c/h)
- Serving food in leaves/paper (c)

**I: Solid Waste**

- Mounds of uncollected garbage within community (c)
- Indiscriminate dumping of garbage in community (c)
- Evidence of uncovered solid waste within house compounds (c)
- Paper and plastic litter within community (c)
- Evidence of children playing around waste-dumps and/or scavenging in them (c)
- Evidence of animals scavenging on waste-dumps and spreading the litter (c)

**III: Health Indicators (Few of which can be implemented via rapid assessment)**

**A: Children's Diarrhoea Problems**

- Episodes of diarrhoea per child for past two weeks
- Number of children who had diarrhoea in the past two weeks
- Number of diarrhoea cases with fever
- Number of diarrhoea cases with measles rash
- Number of diarrhoea cases with blood in stool

**B: Children's Respiratory Problems**

- Cough episodes per child for two week period
- Running nose per child for two week period
- Difficulty in breathing per child for two week period
- Number of children with cough for two week period
- Number of children with running nose
- Number of children with difficulty in breathing

**C: Respiratory Problems of Principal Homemaker**

- Cough of short duration (less than three weeks)
- Cough of long duration (more than three weeks)
- Evidence of sore throat for the past three weeks
- Evidence of common colds for the past three weeks

**D: Malaria**

- Number of fever episodes per child for past two weeks
- Number of fever episodes per adult for past two weeks

(According to epidemiologists consulted, roughly 70% of all fevers can be categorised as malaria.)

**E: Skin Diseases**

- Evidence of skin rashes
- Evidence of scabies (Zongo Lachichi or Krokro)

**F. Other Diseases**

- Presence of blood in urine (Schistosomiasis); typhoid, cholera

### 3.2 Resulting Weights for Each Environmental Problem Area and Indicator

This review was followed by a discussion of the weighting technique as specified in section 2.2 and applying the approach to weight the environmental problem areas and the indicators listed beneath each problem area.

Table 1.3 below shows the mean weights and the ranking of the problem areas undertaken by ten experts (For details of scores from individual members see Annex 2).

**Table 1.3: Mean Weights and Rank Order of Environmental Problem Areas.**

Environmental Problem Area	Total	Weight	Rank
1. Water	185	18.5	1
2. Sanitation	150	15.0	2
3. Pests	123	12.3	3
4. Sullage /Drainage	117	11.7	4
5. Food Contamination	105	10.5	5
6. Hygiene	98	9.8	6
7. Solid Waste	95	9.5	7
8. Housing	68	6.8	8
9. Air Pollution	59	5.9	9
<b>Total</b>	<b>1000</b>	<b>100.0</b>	

Note: In this and following tables rounding errors are not reflected in totals.

Table 1.4 also presents the mean scores or weights for specific indicators in individual problem areas and their ranking based upon the individual scores provided by ten experts. To make the weighting easier, the expert scores for individual problem areas were assigned so that the total for all problem areas was 200 rather than 100. The value for each problem area was used for weighting for individual indicators within the problem areas, with the total equal to the score assigned to the problem area ( For details of individual scoring see Annex 3).

**Table 1.4: Mean Weights and Rank Order of Environmental Indicators for the Problem Areas**

Indicator	Total Score	Mean Score	Rank
<b>A. Water</b>			
1. Ponds/streams as principal source of water supply within community	67	6.7	1
2. Pipelines on ground surface and in drains (cross contamination)	48	4.8	2
3. Frequent water supply interruptions within community	40	4.0	3
4. Principal source of potable water supply outside house compound	36	3.6	4
5. Vendors as principal source of potable water supply with community	34	3.4	5
6. Potable water stored in open containers	31	3.1	6
7. Use of common dip cup for drinking water	28	2.8	7
*8. Distance above 200 metres from water collection points	27	2.7	8
*9. Queuing time of 20+ minutes at water collection points	24	2.4	9
*10. Pay as you use for water	24	2.4	9
*11. Community self-assessment of water quality using their own indicators	11	1.1	10
<b>Sub-Total for Water</b>	<b>370</b>	<b>37.0</b>	

Indicator	Total Score	Mean Score	Rank
<i>Table 1.4 continue...</i>			
<b>B. Sanitation</b>			
1. Open defaecation by neighbourhood children and /or adults	59	5.9	1
2. Littering of polythene/paper bags of faecal matter within community	41	4.1	2
3. Presence of overflowing septic tanks and aqua-privy systems in the community	33	3.3	3
4. Use of chamber pots for storing faecal matter/urine in-house	31	3.1	4
5. Communal toilets as principal toilet facility within community	31	3.1	4
*6. Queuing time above 10 minutes at selected toilets within community	27	2.7	5
7. Presence of public toilets in the midst of human dwellings	25	2.5	6
8. Toilet sharing between households within house compound	19	1.9	7
*9 Toilet user fee payment for toilet use	17	1.7	8
10. Odour nuisance around toilets/garbage dumps/drains etc.	17	1.7	9
<b>Sub-Total for Sanitation</b>	<b>300</b>	<b>30.0</b>	
<b>C. Pests</b>			
1. Presence of many flies within kitchen/chop bars (cooking area)	53	5.3	1
2. Presence of mosquito larvae in water storage containers	52	5.2	2
3. Presence of many flies within toilet	44	4.4	3
4. Presence of many cockroaches in cooking area and house compound	28	2.8	4
5. Presence of mice within house	27	2.7	5
6. Complaints about bed bugs in sleeping area	22	2.2	6
7. Evidence of lice in children's hair within community	20	2.0	7
<b>Sub-Total for Pests</b>	<b>246</b>	<b>24.6</b>	
<b>D. Sullage/Drainage</b>			
1. Evidence of mosquito and other larvae within stagnant water bodies	42	4.2	1
2. Pools of stagnant water (cesspools)	39	3.9	2
3. Drains choked with garbage, weeds and silt	37	3.7	3
4. Pools of stagnant water in drains	35	3.5	4
5. Evidence of children playing in and around stagnant water	30	3.0	5
6. Absence of/narrow drains in the community	29	2.9	6
7. Evidence of flood risks within community	21	2.1	7
<b>Sub-Total for Sullage/Drainage</b>	<b>234</b>	<b>23.4</b>	
<b>E. Food Contamination</b>			
1. Evidence of defecating children around food vending area/cooking area within the home	32	3.2	1
2. Uncovered vendor prepared food/uncovered prepared food or food left-overs within the house	26	2.6	2
3. Food sold near public toilets	25	2.5	3
4. Food sold near drains	21	2.1	4
5. Use of unwashed or rotten vegetables for cooking/ raw eating	18	1.8	5
6. Using (bare) hand as means of serving food	17	1.7	6
7. Food sold in eating places without running water	16	1.6	7
8. Dusty eating areas or eating areas along main transportation arteries with vehicular smoke pollution	16	1.6	8
9. Serving food in leaves/paper	15	1.5	9
10. Lack of medical certification of food vendors (from health inspectors)	15	1.5	10
11. Food cooked in the open for sale	10	1.0	11
<b>Sub-Total for Food Contamination</b>	<b>210</b>	<b>21.0</b>	



Indicator	Total Score	Mean Score	Rank
<i>Table 1.4 continue...</i>			
<b>F. Hygiene</b>			
1. Hands not washed after toilet	35	3.5	1
2. Hands not washed before food preparation/eating	33	3.3	2
3. Evidence of spitting around in community	22	2.2	3
4. Evidence of unwashed plates/dishes in house compound	18	1.8	4
5. No facility for hand washing attached to toilet	18	1.8	5
6. Presence of children/adults with open sores/running noses	16	1.6	5
7. Communal hand washing practices within home/chopbars etc.	15	1.5	6
8. Absence of household bath-house facility	13	1.3	7
9. Presence of barefooted children in community	13	1.3	8
10 Inadequate public bath-house facilities	13	1.3	9
<b>Sub-Total for Hygiene</b>	<b>196</b>	<b>19.6</b>	
<b>G. Solid Waste</b>			
1. Mounds of uncollected garbage within community	41	4.1	1
2. Indiscriminate dumping of garbage in community	40	4.0	2
3. Evidence of uncovered solid waste in house compounds	36	3.6	3
4. Evidence of children playing around waste-dumps and/or scavenging in them	34	3.4	4
5. Paper and plastic litter within community	22	2.2	5
6. Evidence of animals scavenging on waste-dumps and spreading the litter	20	2.0	6
<b>Sub-Total for Solid Waste</b>	<b>192</b>	<b>19.2</b>	
<b>H. Housing Problems</b>			
1. Evidence of crowding in sleeping places	24	2.4	1
2. Absence of mosquito/insect screens in building	20	2.0	2
3. Evidence of domestic animals sharing dwelling places with humans	18	1.8	3
4. Droppings of domestic animals in and around house compound	13	1.3	4
5. Evidence of crowding and unplanned layout of houses	11	1.1	5
6. Evidence of sleeping outside of rooms in community	11	1.1	6
7. Evidence of leaking roofs during rains	11	1.1	7
8. Evidence of damp walls	10	1.0	8
9. Presence of noise pollution from artisanal works/micro-enterprises etc.	7	0.7	9
10 Evidence of dirty floor of house compound	6	0.6	10
11. Evidence of cracks in walls	5	0.5	11
<b>Sub-Total for Housing Problems</b>	<b>136</b>	<b>13.6</b>	
<b>I. Indoor/Outdoor Air Pollution</b>			
1. Smoke pollution from corn mills and micro-enterprise/vehicle (e.g. garages, fish smoking, rubbish burning etc.) in community	19	1.9	1
2. Wood as principal cooking fuel in community	18	1.8	2
3. Evidence of wide-spread cigarette/pipe smoking within home	18	1.8	3
4. Evidence of cooking done indoors (in sleeping rooms	17	1.7	4
5. Evidence of cooking with wood/charcoal in kitchens	15	1.5	5
6. Charcoal as principal cooking fuel in community	15	1.5	6
7. Use of pump-spray insecticide	10	1.0	7
8. Use of mosquito coil/burning of leaves as repellent	7	0.7	8
<b>Sub-Total for Indoor/Outdoor Air Pollution</b>	<b>118</b>	<b>11.8</b>	
<b>Grand Total</b>	<b>2000</b>	<b>200.0</b>	

Notes for Table 1.4, see next page...

Notes for Table 1.4:

- \*A8. Accompanying notes should provide information on actual distance for specific residential areas as a supplement to the scoring.
  - \*A9. Accompanying notes should provide information on actual time for specific residential areas as a supplement to the scoring
  - \*A10. Accompanying notes should provide information on actual price for specific residential areas as a supplement to the scoring.
  - \*A11. These indicators include colour, taste, smell, particulates/turbidity, etc.
  - \*B6. Accompanying notes should provide information on actual time for specific residential areas in addition to scoring.
  - \*B9. Accompanying notes should provide information on actual amount paid for toilet use for specific residential areas in addition to the scoring
- 

### 3.3 Summary of Outputs of Consultations

The initial consultation that was undertaken between the Policy Study team members and an intersectoral network of experts in urban environmental health - epidemiologists, environmentalists, planners, nutritionists and statisticians achieved a number of outputs.

A. With respect to Environmental Indicators the following was provided:

1. A list of proxy indicators for the nine environmental problem areas (e.g. water, sanitation, pests, sullage/drainage, food contamination, hygiene, solid waste, housing and indoor/outdoor air pollution);
2. Weights for environmental problem areas according to their conjectured importance in determining health outcomes in the metropolis; and
3. Weights for environmental indicators within individual problem areas on the basis of the total score awarded to each problem area, such that the sum total of all scores for all variables within a problem area should not exceed the overall weight allocated to it.

The results of the work achieved in steps 1-3 provides a model for applications in the field in order to determine the environmental health status of residential areas for GAMA. It is envisaged that this methodology could easily be extended to other human settlements in Ghana with minimum adaptation.

B. In the area of Health Indicators, the meeting identified the list of health problems (and their symptoms) which are related to a number of the environmental indicators identified in “A” above.

#### 4. FIELD TESTING

Four sample residential areas were selected for field testing the model for rapid assessment developed above. These were:

- La - within the High Density Indigenous Sector (HDIS);
- Nima - within the High Density Low Class Sector (HDLCS);
- La Estate - within the Medium Density Middle Class Sector (MDMCS); and
- Airport Residential Area - within the Low Density High Class Sector (LDHCS).

The field testing was designed to determine whether the procedures could be made operational, and applied more generally. A description of how the procedure is applied follows.

##### 4.1 Operational Procedures for Field Testing of Environmental Indicators

The environmental indicators were adapted for collection through a rapid assessment procedure based upon field visits. For low class residential areas which are generally unplanned and vary considerably in quality from place to place, it was considered important to define blocks of housing units. The field researcher undertook reconnaissance trips to select the blocks. The field researcher identified the principal types of residential areas in the neighbourhood, based on quality of housing and environmental conditions, estimated roughly the share of households living in the different residential types, and apportioned the blocks to reflect these shares. These then became the primary units within each neighbourhood for data collection. The results from the different blocks were eventually to be combined to create community averages. The field researcher therefore also provided notes on relative quality from area to area within the residential area, justifying the choice of blocks.

The data collection itself within these residential areas/blocks is complicated by the fact that some of the indicators are to be collected at the community level, some at the household level and yet others at the individual level.

The rapid assessment methodology involved the following research instruments:

*For community level indicators:*

- Structured observation

*For household and personal indicators:*

- Structured observation;
- Discussion/interviews with opinion leaders/community health workers/environmental health inspectors. Examples of such groups include school teachers, nurses, environmental health inspectors, queen mothers, other women's group leaders living in the community;
- Focus group discussion with a sample of 5-10 women per women's group in the community.

If and when there was no clear consensus or majority opinion, or where differences of opinion could not be resolved, the field workers presented the problem at the field team meetings, and conducted additional visits as necessary. For the pre-test, the seasons were ignored, although the data collection should really be undertaken in both the wet season (June/July) and the dry season (December/January) in order to capture seasonal variations.

## **4.2 Operational Procedures for Field Testing of Health Indicators**

Most residential areas of GAMA have health centres located therein or nearby. The health status report was originally designed to be based on health data (morbidity) collected for the following:

1. Children under 5
2. Women (18 years +)
3. General population

In practice, as noted in later sections, problems were encountered in gathering comparable health data from the different communities selected. In particular, there were no equivalents to the community health centres to be found in the less affluent areas, and no alternative community-linked morbidity data readily available. Specialist facilities existed in wealthy areas and catered for the wealthy all over the city and not only the community where they are located. The following account should therefore be interpreted as reflecting the intentions rather than the actuality of the health data collection.

The health data were to be derived roughly from clinic or hospital-based data (hospital records) to determine an indicative morbidity profile of the population and the relative importance of problems suspected of being linked to environmental conditions. Outpatient records for a sample of one month or two in the wet season (June/July) and one or two months in the dry season (December/January) were to be selected for analysis depending on the volume of data. This was intended to allow for the analysis of seasonal variations and averages. The clinic staff were also to be asked to describe their patient catchment area, to verify the extent to which their records reflect the problems encountered within the study area.

## **4.3 Field Test Process and Results**

The four sample residential areas selected belong to four different socio-environmental zones or socio-ecological areas within the city ranging from poor, low class and degraded areas to the de-luxe and planned areas. For the details of this classification, see Ministry of Local Government (1990). As noted above, these sample areas include La Township, Nima, La Estate and Airport Residential area.

Nima lies within the High Density Low Class Sector (HDLCS). This area is characterised by high housing and population densities, low income with poor infrastructure facilities and environmental services. The population is ethnically diverse with a high percentage of migrants. There is hardly any planning. Homelessness is fast becoming a problem because of high population growth rates.

La Township falls within the High Density Indigenous Sector (HDIS) which consist of settlement nuclei along the coast. They are termed indigenous because the Ga ethnic group who occupied the Accra plains before the early period of European coastal trade founded them. These areas share common traits with other low class residential areas characterised by crowding and low amenity values.

La Estate is categorised under the Medium Density Middle Class Sector (MDMCS). Some of these areas started as low-density high class residential areas but have experienced some decay and increased density. The residential quality and services are good. Incomes are medium and the population typically literate.

Airport Residential Area belongs to the choice or deluxe Low Density High Class Sector (LDHCS). This area is inhabited by a population of high socio-economic status with high levels of education and wealth. It has low density, low

to zero population growth, the best infrastructure and highest amenity value in the metropolis.

This broad spectrum of residential categories was chosen to help assess the validity of the results. All of these areas were also covered in the baseline studies undertaken several years before, but still providing valuable information to help verify the rapid assessment (Benneh et al., 1993, Stephens et al., 1994).

#### 4.3.1 Environmental Indicators

The results derived from the pre-test do indicate that the methodology for rapid assessment provides a useful way of comparing the environmental health conditions of the four sample residential areas. Table 1.5 provides a comparison of the performance of the sample residential areas in relation to the maximum. The closer the score to the maximum, the more serious is the environmental health threat to residents. The smaller the score, the higher the environmental health status or the lower the risk factors or hazards facing the community.

In these and subsequent tables the figures were rounded after the tables were created, and the totals may not add precisely.

**Table 1.5: Environmental health indicators and total weighted environmental health index for sample residential areas in GAMA.**

Indicator	Residential Areas:				
	Max Score	Nima	La Town-Ship	La Estate	Airport Res.
<b>A. Water</b>					
1. Ponds/streams as principal source of water supply within community	6.7	-	--	-	-
2. Pipelines on ground surface and in drains (cross contamination)	4.8	4.8	4.8	-	-
3. Frequent water supply interruptions within community	4.0	4.0	4.0	-	4.0
4. Principal source of potable water supply outside house compound	3.6	3.6	2.4	-	-
5. Vendors as principal source of potable water supply within community	3.4	3.4	2.3	-	-
6. Potable water stored in open containers	3.1	3.1	3.1	-	-
7. Use of common dip cup for drinking water	2.8	2.8	1.9	-	-
8. Distance above 200 metres from water collection points	2.7	2.7	-	-	-
9. Queuing time of 20+ minutes at water collection points	2.4	2.4	1.6	-	-
10. Pay as you use for water	2.4	2.4	1.6	-	-
11. Community self-assessment of water quality using own indicators	1.1	1.1	1.1	1.1	1.1
<b>Sub-Total for Water</b>	<b>37.0</b>	<b>30.3</b>	<b>22.8</b>	<b>1.1</b>	<b>5.1</b>

Table 1.5 continue...

<b>B. Sanitation</b>					
1. Open defecation by neighbourhood children and/or adults	5.9	5.9	-	5.9	-
2. Littering of polythene/paper bags of	4.1	4.1	2.7	-	-

	<i>Residential Areas:</i>	<i>Nima</i>	<i>La Town-Ship</i>	<i>La Estate</i>	<i>Airport Res.</i>
<b>Indicator</b>	<b>Max Score</b>	<b>Mean Score</b>			
faecal matter within community					
3. Presence of overflowing septic tanks and aqua-privy systems in the community	3.3	3.3	2.2	-	-
4. Use of chamber pots for storing faecal matter/urine in-house	3.1	3.1	3.1	-	-
5. Communal toilets as principal toilet facility within community	3.1	3.1	3.1	-	-
6. Queuing time above 10 minutes at selected toilets within community	2.7	2.7	2.7	-	-
7. Presence of public toilets in the midst of human dwellings	2.5	2.5	2.5	-	-
8. Toilet sharing between households within house compound	1.9	1.9	1.9	-	-
9. Toilet user fee payment for toilet use	1.7	1.7	1.7	1.7	-
10. Odour nuisance around toilets/garbage dumps/drains etc.	1.7	1.7	1.1	-	-
<b>Sub-Total for Sanitation</b>	<b>29.9</b>	<b>29.9</b>	<b>21.0</b>	<b>7.6</b>	<b>0.0</b>
<b>C. Pests</b>					
1. Presence of many flies within kitchen/chop bar (cooking area)	5.3	5.3	3.6	-	-
2. Presence of mosquito larvae in water storage containers (Entomologists?)	5.2	-	5.2	-	-
3. Presence of many flies within toilet	4.4	4.4	-	-	-
4. Presence of many cockroaches in cooking area and house compound	2.8	2.8	0.8	-	-
5. Presence of mice within house	2.7	2.7	2.7	-	-
6. Complaints about bed bugs in sleeping area	2.2	2.2	-	-	-
7. Evidence of lice in children's hair within community	2.0	2.0	-	-	-
<b>Sub-Total for Pests</b>	<b>24.6</b>	<b>19.4</b>	<b>12.3</b>	<b>0.0</b>	<b>0.0</b>
<b>D. Sullage/Drainage</b>					
1. Evidence of mosquito and other larvae within stagnant water bodies	4.2	4.2	-	-	-
2. Pools of stagnant water (cesspools)	3.9	3.9	3.9	3.9	-
3. Drains choked with garbage, weeds and silt	3.7	3.7	3.7	3.7	3.7
4. Pools of stagnant water in drains	3.5	3.5	3.5	3.5	-
5. Evidence of children playing in and around stagnant water	3.0	3.0	-	-	-
6. Absence of/narrow drains in the community	2.9	2.9	2.9	2.9	-
7. Evidence of flood risks within community	2.1	2.1	2.1	2.1	-
<b>Sub-Total for Sullage/Drainage</b>	<b>23.4</b>	<b>23.4</b>	<b>16.2</b>	<b>16.2</b>	<b>3.7</b>
<i>Table 1.5 continue...</i>					
<b>E. Food Contamination</b>					
1. Evidence of defecating children around food vending area/ cooking area with the home	3.2	3.2	-	-	-
2. Uncovered vendor prepared food/uncovered prepared food left-	2.6	2.6	2.6	-	-

	<b>Residential Areas:</b>				
	<b>Nima</b>	<b>La Town-Ship</b>	<b>La Estate</b>	<b>Airport Res.</b>	
<b>Indicator</b>	<b>Max Score</b>	<b>Mean Score</b>			
overs within the house					
3. Food sold near public toilets	2.5	2.5	2.5	-	-
4. Food sold near drains	2.1	2.1	2.1	-	-
5. Use of unwashed or rotten vegetables for cooking/raw eating	1.8	-	-	-	-
6. Using (naked) hand as means of serving food.	1.7	1.7	1.1	-	-
7. Food sold in eating places without running water	1.6	1.6	1.6	-	-
8. Dusty eating areas or eating areas along main transportation arteries with vehicular smoke pollution	1.6	1.6	1.6	-	-
9. Serving food in leaves/paper	1.5	1.5	1.5	-	-
10. Lack of medical certification of food vendors (from health inspectors)	1.5	1.5	1.5	-	-
11. Food cooked in the open for sale	1.1	1.1	1.1	-	-
<b>Sub-Total for Food Contamination</b>	<b>21.0</b>	<b>19.2</b>	<b>15.43</b>	<b>0.0</b>	<b>0.0</b>
<b>F. Hygiene</b>					
1. Hands not washed after toilet	3.5	3.5	2.3	-	-
2. Hands not washed before food preparation/eating	3.3	3.3	2.2	-	-
3. Evidence of spitting around in community	2.2	2.2	2.2	2.2	-
4. Evidence of unwashed plates/dishes in house compound	1.8	1.8	1.2	-	-
5. No facility for hand washing attached to toilet, chopbars, etc.	1.8	1.8	1.8	-	-
6. Presence of children/adults with open sores/running noses	1.6	1.6	-	--	-
7. Communal handwashing practices within home	1.5	1.5	1.5	-	-
8. Absence of household bathhouse facility	1.3	-	1.3	-	-
9. Presence of barefooted children in community	1.3	1.3	1.3	-	--
10. Inadequate public bath-house facilities	1.3	1.3	1.3	1.3	-
<b>Sub-Total for Hygiene</b>	<b>19.6</b>	<b>18.3</b>	<b>15.2</b>	<b>3.5</b>	<b>0.0</b>
<b>G. Solid Waste</b>					
1. Mounds of uncollected garbage within community	4.1	4.1	4.1	-	-
2. Indiscriminate dumping of garbage in community	4.0	4.0	4.0	-	-
3. Evidence of uncovered solid waste within house compound	3.6	3.6	2.4	-	-
4. Evidence of children playing around waste dumps and/or scavenging in them	3.4	3.4	-	-	-
5. Paper and plastic litter within community	2.2	2.2	2.2	-	-
6. Evidence of animals scavenging on waste dumps and spreading the litter	2.0	2.0	-	-	-
<b>Sub-Total for Solid Waste</b>	<b>19.2</b>	<b>19.2</b>	<b>12.6</b>	<b>0.0</b>	<b>0.0</b>
<b>H. Housing Problems</b>					
1. Evidence of crowding in sleeping places	2.4	2.4	1.6	-	-
2. Absence of mosquito/insect screens in building	2.0	2.0	1.3	-	-
3. Evidence of domestic animals sharing dwelling places with humans	1.8	1.8	0.6	1.8	-
4. Droppings of domestic animals in and around house compound	1.3	1.3	1.3	1.3	-

Indicator	<i>Residential Areas:</i>				
	<i>Max Score</i>	<i>Nima</i>	<i>La Town-Ship</i>	<i>La Estate</i>	<i>Airport Res.</i>
5. Evidence of crowding and unplanned layout of houses	1.1	1.1	0.8	-	-
6. Evidence of people sleeping outside of rooms in community	1.1	1.1	0.7	-	-
7. Evidence of leaking roofs during rains	1.1	1.1	1.1	1.1	-
8. Evidence of damp walls	1.0	1.0	-	1.0	-
9. Presence of noise pollution from artisanal works/micro-enterprises etc.	0.7	-	-	-	-
10. Evidence of dirty floors	0.6	0.6	0.6	-	-
11. Evidence of cracks in walls	0.5	0.5	0.5	0.5	-
<b>Sub-Total for Housing Problems</b>	<b>13.6</b>	<b>13.0</b>	<b>8.5</b>	<b>5.7</b>	<b>0.0</b>
<b><i>I. Indoor/Outdoor Air Pollution</i></b>					
1. Smoke pollution from corn mills and micro-enterprise/vehicle (e.g. garages, fish smoking, rubbish burning etc.) in community	1.9	1.9	-	-	-
2. Wood as principal cooking fuel in community	1.8	1.8	-	-	-
3. Evidence of widespread cigarette/pipe smoking within home	1.8	-	-	-	-
4. Evidence of cooking done indoors (in sleeping rooms)	1.7	1.7	-	-	-
5. Evidence of cooking with wood/charcoal in kitchens	1.5	1.5	1.5	-	-
6. Charcoal as principal cooking fuel in community	1.5	1.5	1.5	-	-
7. Use of pump-spray insecticide	1.0	1.0	1.0	1.0	-
8. Use of mosquito coil/burning of leaves as repellent	0.7	0.7	0.7	0.7	-
<b>Sub-Total for Indoor/Outdoor Air Pollution</b>	<b>11.8</b>	<b>10.0</b>	<b>4.6</b>	<b>1.7</b>	<b>0.0</b>
<b>Grand Total</b>	<b>200.0</b>	<b>182.6</b>	<b>128.5</b>	<b>35.7</b>	<b>8.8</b>

Overall, Nima, a well-documented slum has a total weighted index of 183 that is very close to the maximum score of 200. La Township has an overall score of 128 presenting an environmental profile that is slightly better than Nima but nevertheless reaches 64% of the maximum score. These two low income communities stand in sharp contrast to La Estate which has an overall score of 36 which reaches only 18% of the maximum score. Airport Residential Area has a total weighted index of 9: a mere 4.4% of the maximum permissible score, suggesting a good local environmental quality. The range of values are consistent with expectations (For details of pre-test results see Annex 4).

#### **4.3.2 Health Indicators**

The pre-tested approach was premised on the understanding that all residential areas have health facilities located there and that these would provide relevant health information derived from hospital records. This would in turn provide a means for comparing community morbidity information with city-wide averages. These results were also intended to help identify the neighbourhoods where environment-related disease loads were high.

There were several problems associated with this approach:



- 1) The health facilities that are present in various communities offer different levels of care that will not provide similar data sets. For example, whilst Primary Health Care Centres are common in the low-income areas, it is more often specialist facilities that are located in wealthy areas.
- 2) Whereas the catchment areas of health facilities located in low-income areas almost invariably serve the poor in the community, this is not the case for private practitioners located in high class residential areas who offer specialised quality service. Nyaho Clinic in Airport Residential Area organised client information not by residence but by the company or corporation for whose staff it provides health-care. Health information collected from low-income areas may nevertheless be very useful as the communicable disease burden is most acute in these areas of the city (Benneh et. al., 1993, Songsore and McGranahan, 1993, Stephens et al., 1994).
- 3) It is estimated that about 50% of the population in Accra rely either on private practitioners or treatment by traditional healers and self-medication through the direct purchase of drugs at pharmacies and drug peddlers. Whereas data from most private hospitals can easily be obtained, not all of them employ the same system of record keeping as in the government hospitals. By contrast there are no records on self-medication at drug stores and traditional healers (Songsore and Goldstein, 1995).

There are a number of possible alternatives. For example, the list of environment related diseases provided by experts could serve as a basis for a community self-survey in a focus group discussion with principal female homemakers or health experts working in the community. They could be asked to rank these diseases, or the closest locally defined equivalents, in terms of their severity in the community. If this process were also applied to environmental problem areas and selected indicators, this would also provide a means of bringing local preferences into the assessment process.

However, as shown in Annex 4, the health information actually collected can be of interest, even if it does not provide a basis for systematic assessment.

#### **4.4 Revealed Strengths and Weaknesses**

##### ***4.4.1 Potential of the Approach in Urban Environmental Health Management***

This approach shares the advantages of other rapid assessment methodologies as it is rapid, costs a fraction of the cost of orthodox surveys and centralises diverse information (Leitman, 1994, Vol.1. p.22). It also requires neither highly trained enumerators, nor complex analytical procedures, and can therefore be relatively easily applied by both environmental specialists and non-specialists alike (Maxwell, 1995, p.12). It can easily be employed by a community based organisation in a community self-survey of environmental risk factors and the associated health problems. In addition because of its ease of application, it can be applied on a seasonal basis (i.e. wet and dry seasons) to capture aspects of seasonality in the occurrence of risk factors.

Some of the potential benefits of these “proxy” indicators, are shared with classical environmental and health monitoring data both for health policy formulation and urban management. Application of the approach should help realise the objectives outlined in Box 1.

**Box 1. Potential Benefits of Health and Environmental Monitoring Data and Environmental Health Indicators**

- i) It will fill gaps in our knowledge about intra-urban differentials health burdens.
- ii) It will help make decisions on priorities for improvements in health and human settlement.
- iii) It will help develop action plans for implementation.
- iv) The development of environmental health indicators within the metropolis based on environment and health data linkage will be of great value in monitoring progress in environmental health management and surveillance of communicable diseases.
- v) It will provide planners with updates on the human settlement and environmental health situation in the various ecological zones, thus functioning as an “early warning” system for urban environmental and health problems and thereby enhance disaster preparedness, etc.
- vi) It helps planners to incorporate any trends in environmental and health conditions into the strategic plan of the metropolis and to plan ongoing interventions.
- (vii) It provides planners, community members and other actors with necessary information which they can utilise in planning, implementing and managing strategic interventions aimed at improving housing and environmental conditions in human settlements.

(Source: Songsore and Goldstein, 1995)

**4.4.2 Proxy Indicators as Tools for Public Education and Participation**

Proxy environmental health indicators can also be useful tools in the education and sensitisation of a broad range of actors, community groups and NGOs. For example, few planners and engineers are fully aware of the health implications of their technical choices or the lack of basic housing infrastructure and services. Similarly, not all health officials are aware of the potential impact that shelter and settlement improvement interventions could make on community health. Besides, policy makers will be more inclined to support environmental health interventions once the links between environment and health can be demonstrated (Songsore, 1994, p.35-36; Ochola et al, 1994).

The potential audience for information on proxy indicators includes policy makers, planners and utilities from the public sphere, as well as educators, media, non-governmental, community-based and religious organisations, communities themselves, chiefs, other opinion leaders and private enterprises of the civil society.

**4.4.3 Potential Adaptation for Use in Other Human Settlements in Ghana**

This rapid assessment methodology can easily be applied in other large metropolitan areas with very little adaptation. Such towns include Kumasi, Sekondi-Takoradi, Tamale and most of the regional capitals in Ghana.

Since the range of utility services is far more restricted in scope for other towns, the methodology will require some adaptation for small towns in Ghana. It would however require some major modifications to the list of indicators if it is to be applied in rural settlements in Ghana as they lack most utility services that are available in most urban centres in Ghana. The relevance of the broad framework and the methodology for rural settlement appraisal rest on the understanding that rural settlements have similar disease profiles as urban settlements. In many respects the communicable, environment related disease burdens in rural settlements are of even more concern than in urban areas because of the lack of preventive and curative services.

#### **4.4.4 Identified Weaknesses of the Rapid Assessment Method.**

##### *Environmental Conditions Indicators*

There are several weaknesses associated with the application of the methodology:

- i) it generates purely descriptive information which needs to be complemented with some background knowledge of underlying causes;
- ii) it provides some guidance as to what might be priority problems without identifying possible solutions;
- iii) it indicates potential health hazards without linking these indicators to particular health outcomes;
- iv) it is simple to apply, but still requires careful training of field workers to ensure that they will make similar judgements in comparable circumstances;
- v) it relies on local knowledge of environmental conditions, but does not reveal local preferences or allow local residents to identify different problems;
- vi) it takes into account the presence or absence of a broad range of individual problems, but does not reflect how severe the individual problems are (thus a neighbourhood with a wide range of sub-standard conditions will appear far worse than one with a few very severe hazards).
- iv) it employs techniques, such as focus group discussions, which are not very appropriate to affluent neighbourhoods where a sense of community hardly exists (as evident in the absence of community organisations so common in other neighbourhoods).

##### *Health Outcome Indicators*

The problems associated with this aspect have already been alluded to in the results section.

## 5. CONCLUSIONS

Proxy indicators of the type developed here are justified by: 1) the need to target and monitor environmental health improvements; 2) the paucity of environmental health indicators at the local level, and; 3) the cost of collecting data through formal surveys. Such indicators allow for the analysis of intra-urban differentials. The methodology described is relatively simple and user friendly. As it stands, it already provides the basis for a potentially important decision-making tool. Ideally, an assessment procedure will be initiated along with an improvement programme, and be adapted to the needs and organisational form of that programme.

The scientific validity of the indicators can be questioned, but that does not invalidate their use. True, there is no incontrovertible evidence that the individual indicators are linked to health impacts in the neighbourhoods selected. On the other hand, the same holds of the more technical indicators, such as the presence of faecal coliform in the piped water, which are regularly used in the policy process. The purpose of the indicators presented here is not, and should not be, to identify what particular technical or behavioural interventions are needed. To attempt to use such indicators in this manner is almost inevitably misguided.

The broad range of indicators employed reflects the broad range of conditions that contribute to ill health. One of the dangers inherent in selecting a few key indicators, such as the share of households with piped water, is that the resulting policies tend to target these indicators, despite evidence of numerous confounding factors as well as other causes of ill health. Even if a narrow intervention such as extending the piped water system is envisaged, it remains important to monitor a range of conditions and behaviours. When more broad ranging and participatory programmes are envisaged, the need for a wide range of indicators is even more evident. The proxy indicators described above should be able to meet this need. Ideally, however, they should also include selected indicators identifying conditions far below the indicator thresholds, which could then be taken to indicate the need for more targeted action.

A more serious challenge is to ensure that the proxy indicator system is both operational and reproducible, while remaining inexpensive and rapid. The environmental indicators would appear to meet these criteria, though their reproducibility still remains to be demonstrated. The health indicators, as envisaged, were not operational. Hence, it is suggested that the assessment procedure adopt a more participatory approach to health monitoring.

But perhaps the most serious challenge of all is to integrate such an assessment procedure into the local policy process in a synergistic manner. Visits and discussion with local residents can provide more insights for those involved in improvement efforts than is displayed in the indicators alone. Developed effectively, the rapid assessment process could become an important component of a more comprehensive attempt to initiate a two-way flow of information between local residents and environmental health workers, create new partnerships, and address environmental health issues.

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**ANNEX 1: MEMBERS OF NETWORK WHO PARTICIPATED IN THE SCORING**

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### ANNEX 3: WEIGHTING OF ENVIRONMENTAL INDICATORS BY MEMBERS OF THE CONSULTATION

Indicator	Individual's Scoring										Total	Mean	Rank
	Amuzu	Songsore	Doe	Maxwell	Bugri	Aryee	Bawa	Antwi	Avle	Vere			
<i>A. Water</i>													
1. Ponds/streams as principal source of water supply within community	17	7	6	0	10	6	2	5	6	8	67	6.7	1
2. Pipelines on ground surface and in drains (cross contamination)	5	2	7	4	6	4	7	6	2	5	48	4.8	2
3. Frequent water supply interruptions within community	3	5	3	6	6	1	7	3	2	4	40	4.0	3
4. Principal source of potable water supply outside house compound	1	5	3	3	3	5	2	2	6	6	36	3.6	4
5. Vendors as principal source of potable water supply within community	2	3	4	3	2	2	5	3	6	4	34	3.4	5
6. Potable water stored in open containers	2	3	2	10	2	4	1	4	1	2	31	3.1	6
7. Use of common dip cup for drinking water	3	3	4	5	1	2	3	5	1	1	28	2.8	7
8. Distance above 200 metres from water collection points	0	3	3	2	2	5	5	2	5	0	27	2.7	8
9. Queuing time of 20 minutes + at water collection points	0	4	3	2	1	4	2	3	5	0	24	2.4	9
10. Pay as you use for water	2	2	2	2	3	4	1	3	2	3	24	2.4	9
11. Community self-assessment of water quality using their own indicators	2	0	0	0	1	0	2	1	1	4	11	1.1	11
<b>Sub-Total for Water</b>	<b>37</b>	<b>37</b>	<b>37</b>	<b>37</b>	<b>37</b>	<b>37</b>	<b>37</b>	<b>37</b>	<b>37</b>	<b>37</b>	<b>370</b>	<b>37.0</b>	
<i>B. Sanitation</i>													
1. Open defecation by neighbourhood children and/or adults	10	5	5	7	10	6	1	4	4	7	59	5.9	1
2. Littering of polythene/paper bags of faecal matter within community	6	5	5	2	5	1	3	6	3	5	41	4.1	2
3. Presence of overflowing septic tanks and aqua-privy systems in the community	2	2	4	3	5	5	4	1	4	3	33	3.3	3
4. Use of chamber pots for storing faecal matter/urine in-house	2	2	2	4	3	4	2	5	3	4	31	3.1	4
5. Communal toilets as principal toilet facility within community	1	5	3	5	2	2	4	3	4	2	31	3.1	4
6. Queuing time above 10 minutes at selected toilets within community	3	5	2	2	1	3	4	3	2	2	27	2.7	6

Indicator	Individual's Scoring											Total	Mean	Rank
	Amuzu	Songsore	Doe	Maxwell	Bugri	Aryee	Bawa	Antwi	Avle	Vere				
7. Presence of public toilets in the midst of human dwellings	2	1	2	2	1	4	4	3	4	2	25	2.5	7	
8. Toilet sharing between households within house compound	2	2	2	3	0.5	1	4	1	3	1	19.5	2.0	8	
9. Toilet user fee payment for toilet use	2	2	3	1	2	2	0	2	2	1	17	1.7	9	
10. Odour nuisance around toilets/garbage dumps/drains etc.	0	1	2	1	0.5	2	4	2	1	3	16.5	1.7	10	
<b>Sub-Total for Pests</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>300</b>	<b>30.0</b>		
<b>C. Pests</b>														
1. Presence of many flies with kitchen/chop bars (cooking area)	10	5	5	6	6	4.6	4	2	5	5.6	53.2	5.3	1	
2. Presence of mosquito larvae in water storage containers (Entomologists?)	4	5	3	6	4	4	4	10	6	6.3	52.3	5.2	2	
3. Presence of many flies within toilet	4	5	5	4	4	5	4	3	5	4.8	43.8	4.4	3	
4. Presence of many cockroaches in cooking area and house compound	2	3	5	2	1.6	3	4	2	3	2.7	28.3	2.8	4	
5. Presence of mice within house	2	3	3	2.6	3	3	4	3	2	1.5	27.1	2.7	5	
6. Complaints about bed bugs in sleeping area	2	3	2	2	2	3	2	2	2	1.7	21.7	2.2	6	
7. Evidence of lice in children's hair within community	0.6	0.6	1.6	2	4	2	2.6	2.6	1.6	2	19.6	2.0	7	
<b>Sub-Total for Pests</b>	<b>24.6</b>	<b>24.6</b>	<b>24.6</b>	<b>24.6</b>	<b>24.6</b>	<b>24.6</b>	<b>24.6</b>	<b>24.6</b>	<b>24.6</b>	<b>24.6</b>	<b>246</b>	<b>24.6</b>		
<b>D. Sullage/Drainage</b>														
1. Evidence of mosquito and other larvae within stagnant water bodies	2	3	4	4	6	3	4	7	5	3.7	41.7	4.2	1	
2. Pools of stagnant water (cesspools)	5	5	4	4	2	3	3	5	4	4.2	39.2	3.9	2	
3. Drains choked with garbage, weeds and silt	2	3	3	4	6	3	4	3	3	6	37	3.7	3	
4. Pools of stagnant water in drains	2	2.4	4	4.4	6	2.4	3.4	3.4	4	3.2	35.2	3.5	4	
5. Evidence of children playing in and around stagnant water	10	3	3	1	0.4	3	4	1	2	2.9	30.3	3.0	5	
6. Absence of/narrow drains in the community	0.4	5	2	4	2	5	4	2	3	1.8	29.2	2.9	6	
7. Evidence of flood risks within community	2	2	3.4	2	1	4	1	2	2	1.6	21	2.1	7	
<b>Sub-Total for Sullage/Drainage</b>	<b>23.4</b>	<b>23.4</b>	<b>23.4</b>	<b>23.4</b>	<b>23.4</b>	<b>23.4</b>	<b>23.4</b>	<b>23.4</b>	<b>23</b>	<b>23.4</b>	<b>233.6</b>	<b>23.4</b>		

Indicator	Individual's Scoring											Total	Mean	Rank
	Amuzu	Songsore	Doe	Maxwell	Bugri	Aryee	Bawa	Antwi	Avle	Vere				
<i>E. Food Contamination</i>														
1. Evidence of defaecating children around food vending area/cooking area with the home	2	2	3	4	5	3	3	2	3	5	32	3.2	1	
2. Uncovered vendor prepared food/uncovered prepared food or food left-overs within the house	2	3	2	2	6	2	3	1	1.5	3	25.5	2.6	2	
3. Food sold near public toilets	6	2	2	2	2	3	2	1	2	3	25	2.5	3	
4. Food sold near drains	5	2	2	2	0	3	2	1	2	2	21	2.1	4	
5. Use of unwashed or rotten vegetables for cooking/raw eating	1	2	3	3	0	3	2	2	1	1	18	1.8	5	
6. Using (naked) hand as means of serving food.	0	2	2	1.5	2	1	3	3	2.5	0	17	1.7	6	
7. Food sold in eating places without running water	1	2	1	1	0	2	1	5	1	2	16	1.6	7	
8. Dusty eating areas or eating areas along main transportation arteries with vehicular smoke pollution	1	2	2	2	1	2	1	1	1.5	2	15.5	1.6	8	
9. Serving food in leaves/paper	0	2	2	1.5	2	1	2	2	2.5	0	15	1.5	9	
10. Lack of medical certification of food vendors (from health inspectors)	1	1	1	1	3	1	1	2	2.5	1	14.5	1.5	10	
11. Food cooked in the open for sale	2	1	1	1	0	0	1	1	1.5	2	10.5	1.1	11	
<b>Sub-Total for Food Contamination</b>	<b>21</b>	<b>21</b>	<b>21</b>	<b>21</b>	<b>21</b>	<b>21</b>	<b>21</b>	<b>21</b>	<b>21</b>	<b>21</b>	<b>210</b>	<b>21.0</b>		
<i>F. Hygiene</i>														
1. Hands not washed after toilet	5	3	3	5	2	3	3	4	2.6	4	34.6	3.5	1	
2. Hands not washed before food preparation/eating	2	3	3	5	5	3	3	3	3	3.3	33.3	3.3	2	
3. Evidence of spitting around in community	5	2	3	0.6	3	2	1.6	1	0.5	3.2	21.9	2.2	3	
4. Evidence of unwashed plates/dishes in house compound	0.6	2	2	2	3	1.6	2	1	2	2.2	18.4	1.8	4	
5. No facility for hand washing attached to toilet	1	2	1.6	2	0.6	3	1	2	2	3.1	18.3	1.8	5	
6. Presence of children/adults with open sores/running noses	1	2	1	1	1	1	1	1	4	2.6	15.6	1.6	5	
7. Communal Hand-washing practices within home/chopbars etc.	0	2.6	2	0	0	1	3	4	2	0	14.6	1.5	7	
8. Absence of household bath-house facility	2	1	1	2	0	2	2	1.6	1.5	0.3	13.4	1.3	8	
9. Presence of barefooted children in	2	1	2	1	3	1	1	1	0.5	0.6	13.1	1.3	9	

Indicator	Individual's Scoring											Total	Mean	Rank
	Amuzu	Songsore	Doe	Maxwell	Bugri	Aryee	Bawa	Antwi	Avle	Vere				
<b>community</b>														
10. Inadequate public bath-house facilities	1	1	1	1	2	2	2	1	1.5	0.3	12.8	1.3	10	
<b>Sub-Total for Hygiene</b>	<b>19.6</b>	<b>19.6</b>	<b>19.6</b>	<b>19.6</b>	<b>19.6</b>	<b>19.6</b>	<b>19.6</b>	<b>19.6</b>	<b>25.3</b>	<b>19.6</b>	<b>196</b>	<b>19.6</b>		
<b>G. Solid Waste</b>														
1. Mounds of uncollected garbage within community	5	4	4	3	6	4	3	2	3.5	6	40.5	4.1	1	
2. Indiscriminate dumping of garbage in community	5	4	4	4	6	3	3	2	4	5	40	4.0	2	
3. Evidence of uncovered solid waste within house compounds	1	4	3	3	4	3	4	6	5	3	36	3.6	3	
4. Evidence of children playing around waste-dumps and/or scavenging in them	5	4	4	3	1	3	3	7	2	2	34	3.4	4	
5. Paper and plastic litter within community	2	2	3	3	2	2	3	1	2.5	1	21.5	2.2	5	
6. Evidence of animals scavenging on waste-dumps and spreading the litter	1	1	1	3	0	4	3	3	2	2	20	2.0	6	
<b>Sub-Total for Solid Waste</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>21</b>	<b>19</b>	<b>19</b>	<b>192</b>	<b>19.2</b>		
<b>H. Housing Problems</b>														
1. Evidence of crowding in sleeping places	3	2	2	2	5	3	2	1	2	2	24	2.4	1	
2. Absence of mosquito/insect screens in building	2	2	1	3.6	2	2	2	1	3	1.5	20.1	2.0	2	
3. Evidence of domestic animals sharing dwelling places with humans	1	1	2	2	3	2	1.6	2	1	1.9	17.5	1.8	3	
4. Droppings of domestic animals in and around house compound	0.6	1	1	2	0	4	0	2	1	1.6	13.2	1.3	4	
5. Evidence of crowding and unplanned layout of houses	2	0	1	2	0	0	2	1	2	1.4	11.4	1.1	5	
6. Evidence of sleep outside of rooms in community	0	2	1	1	0	1.6	1	1	2	1.2	10.8	1.1	6	
7. Evidence of leaking roofs during rains	0	2	1.6	1	0.6	1	2	1	0.5	0.9	10.6	1.1	7	
8. Evidence of damp walls	1	1	1	0	3	0	1	2	0.5	0.8	10.3	1.0	8	
9. Presence of noise pollution from artisanal works/micro-enterprises etc.	1	1	1	0	0	0	1	1	0.5	1	6.5	0.7	9	
10. Evidence of unkempt and uncemented floor of house compound	2	1	1	0	0	0	0	1	0.5	0.8	6.3	0.6	10	
11. Evidence of cracks in walls	1	0.6	1	0	0	0	1	0.6	0.6	0.5	5.3	0.5	11	

Indicator	Individual's Scoring											Total	Mean	Rank
	Amuzu	Songsore	Doe	Maxwell	Bugri	Aryee	Bawa	Antwi	Avle	Vere				
<b>Sub-Total for Housing Problems</b>	<b>13.6</b>	<b>13.6</b>	<b>13.6</b>	<b>13.6</b>	<b>13.6</b>	<b>13.6</b>	<b>13.6</b>	<b>13.6</b>	<b>13.6</b>	<b>13.6</b>	<b>13.6</b>	<b>136</b>	<b>13.6</b>	
<b><i>I. Indoor/Outdoor Air Pollution</i></b>														
1 Smoke pollution from corn mills and micro-enterprise/vehicle (e.g garages, fish smoking, rubbish burning etc.) in community	2	1	3	1.5	3	2	1.8	1	1.2	2.6	19.1	1.9	1	
2. Wood as principal cooking fuel in community	5	2	2	1.5	0	2	2	1	1.6	1	18.1	1.8	2	
3. Evidence of wide-spread cigarette/pipe smoking within home	0	2	1	1.5	3	2.8	1	1.8	3	2	18.1	1.8	2	
4. Evidence of cooking done indoors (in sleeping rooms)	1	1	2	1.5	2	2	2	3	1.5	1	17	1.7	4	
5. Evidence of cooking with wood/charcoal in kitchens	1	0.8	1.8	1.5	2	1	2	2	1.5	1	14.6	1.5	5	
6. Charcoal as principal cooking fuel in community	2	2	1	1.5	1	2	2	1	1	1	14.5	1.4	6	
7. Use of pump-spray insecticide	0.8	2	1	1.5	0	0	0	1	1	2.2	9.5	1.0	7	
8. Use of mosquito coil/burning of leaves as repellent	0	1	0	1.3	0.8	0	1	1	1	1	7.1	0.7	8	
<b>Sub-Total for Indoor/Outdoor Air Pollution</b>	<b>11.8</b>	<b>11.8</b>	<b>11.8</b>	<b>11.8</b>	<b>11.8</b>	<b>11.8</b>	<b>11.8</b>	<b>11.8</b>	<b>11.8</b>	<b>11.8</b>	<b>118</b>	<b>11.8</b>		
<b>Grand Total</b>												<b>2000</b>	<b>200.0</b>	

## **ANNEX 4: PRETEST RESULTS FOR 4 RESIDENTIAL AREAS**

### **ANNEX 4.1: Pretest of Proxy Indicators For Rapid Assessment of Environmental Health Status of Residential Areas in Accra: Nima Survey**

**By Osman Alhassan and Lawrencina Pokua-Nimo (Research Assistants)**

#### **1. Pretest**

The pretest of environmental and health status of the Nima Residential Area was preceded by a field reconnaissance covering the whole of Nima. This was designed to facilitate the demarcation of blocks/areas of relatively similar characteristics with respect to housing, sanitation, water, access roads, air quality, etc.

The major difference was that of access roads - where Nima East has seen the construction of roads to facilitate movement of people and goods. Some renewal of houses has taken place along constructed streets - mostly rehabilitation or new buildings for purposes related to shops, warehouses, and communication centres. The advantages to be derived from these roads are reduced as cars park on one side of the very narrow streets. Pedestrians and hawkers displaying their wares compete for the rest of the space. Further, the conversion of residential places into stores and shops (and this was confirmed by some people interviewed) seems likely to cause further pressure on dwelling places. This problem is minimised as many people in the Nima area sleep in stores at night.

On the whole, however, not many differences existed among sections of Nima. For convenience sake as well as for comparative purposes, the area was divided into two - "Nima East" including 441, and Nima West. Nima East is the area bordered on the east by the Kanda Highway; north by the Maamobi Gutter; west by the Nima Highway; and south by Odaw Kwao street stretching from Pan African Hotel to Odaw Kwao Unit Area around Kanda Highway. "Nima West" is bounded on the east by the Nima Highway, north by Maamobi Gutter; west by Accra Newtown; and south by Kokomlemle.

The Proxy Environmental Health Indicators were assessed in each area and appropriate scores assigned. Field observations were conducted; interviews with individuals and groups such as water vendors, food sellers, and health and social workers in each blocked area. A focus group discussion involving women from Nima West was also carried out and views of residential quality of Nima in general and information at household level was sought before the scoring was made. Average scores of the two sections were derived to represent the whole of the Nima Residential Area.

Medical records of the residential area were thought to provide important clues as regards the disease profile and health status of the community. Records from the Nima 441 Welfare Association Primary Health Care Centre for June and December 1995 were extracted and a summary is included in the tables below.

#### **2. Weighted Scoring of "Proxy" Indicators**

The combination of field observations, personal and group interviews as well as a Focus Group Discussion involving women from Nima West led to the weighted scores as presented in the table below.

Indicator		Nima East	Nima West	All of Nima
	Maximum Score		Mean Score	
<b>A. Water</b>				
1. Ponds/streams as principal source of water supply within community	6.7	-	-	-
2. Pipelines on ground surface and in drains (cross contamination)	4.8	4.8	4.8	4.8
3. Frequent water supply interruptions within community	4.0	4.0	4.0	4.0
4. Principal source of potable water supply outside house compound	3.6	3.6	3.6	3.6
5. Vendors as principal source of potable water supply within community	3.4	3.4	3.4	3.4
6. Potable water stored in open containers	3.1	3.1	3.1	3.1
7. Use of common dip cup for drinking water	2.8	2.8	2.8	2.8
*8. Distance above 200 metres from water collection points	2.7	2.7	2.7	2.7
*9. Queuing time of 20+ minutes at water collection points	2.4	2.4	2.4	2.4
*10. Pay as you use for water	2.4	2.4	2.4	2.4
*11. Community self-assessment of water quality using own indicators	1.1	1.1	1.1	1.1
<b>Sub-total for Water</b>	<b>37.0</b>	<b>30.3</b>	<b>30.3</b>	<b>30.3</b>
<b>B. Sanitation</b>				
1. Open defecation by neighbourhood children and/or adults	5.9	5.9	5.9	5.9
2. Littering of polythene/paper bags of faecal matter within community	4.1	4.1	4.1	4.1
3. Presence of overflowing septic tanks and aqua privy systems in the community	3.3	3.3	3.3	3.3
4. Use of chamber pots for storing faecal matter/urine in-house	3.1	3.1	3.1	3.1
5. Communal toilets as principal toilet facility within community	3.1	3.1	3.1	3.1
*6. Queuing time above 10 minutes at selected toilets within community	2.7	2.7	2.7	2.7
7. Presence of public toilets in the midst of human dwellings	2.5	2.5	2.5	2.5
8. Toilet sharing between households within house compound	1.9	1.9	1.9	1.9
*9. Toilet user fee payment for toilet use	1.7	1.7	1.7	1.7
10. Odour nuisance around toilets/garbage dumps/drains etc.	1.7	1.7	1.7	1.7
<b>Sub total for Sanitation</b>	<b>29.9</b>	<b>29.9</b>	<b>29.9</b>	<b>29.9</b>
<b>C. Pests</b>				
1. Presence of many flies within kitchen/chop bars (cooking area)	5.3	5.3	5.3	5.3
2. Presence of mosquito larvae in water storage containers (Entomologists?)	5.2	-	-	-
3. Presence of many flies within toilet	4.4	4.4	4.4	4.4
4. Presence of many cockroaches in cooking area and house compound	2.8	2.8	2.8	2.8
5. Presence of mice within house	2.7	2.7	2.7	2.7
6. Complaints about bed bugs in sleeping area	2.2	2.2	2.2	2.2
7. Evidence of lice in children's hair within community	2.0	2.0	2.0	2.0
<b>Sub-total for Pests</b>	<b>24.6</b>	<b>19.4</b>	<b>19.4</b>	<b>19.4</b>
<b>D. Sullage/Drainage</b>				



Indicator		Nima East	Nima West	All of Nima
	Maximum Score		Mean Score	
1. Evidence of mosquito and other larvae within stagnant water bodies	4.2	4.2	4.2	4.2
2. Pools of stagnant water (cesspools)	3.9	3.9	3.9	3.9
3. Drains choked with garbage, weeds and silt	3.7	3.7	3.7	3.7
4. Pools of stagnant water in drains	3.5	3.5	3.5	3.5
5. Evidence of children playing in and around stagnant water	3.0	3.0	3.0	3.0
6. Absence of/narrow drains in the community	2.9	2.9	2.9	2.9
7. Evidence of flood risks within community	2.1	2.1	2.1	2.1
<b>Sub-total for Sullage/Drainage</b>	<b>23.4</b>	<b>23.4</b>	<b>23.4</b>	<b>23.4</b>
<b>E. Food Contamination</b>				
1. Evidence of defecating children around food vending area/cooking area with the home	3.2	3.2	3.2	3.2
2. Uncovered vendor prepared food/uncovered prepared food left-overs within the house	2.6	2.6	2.6	2.6
3. Food sold near public toilets	2.5	2.5	2.5	2.5
4. Food sold near drains	2.1	2.1	2.1	2.1
5. Use of unwashed or rotten vegetables for cooking/raw eating	1.8	-	-	-
6. Using (naked) hand as means of serving food.	1.7	1.7	1.7	1.7
7. Food sold in eating places without running water	1.6	1.6	1.6	1.6
8. Dusty eating areas or eating areas along main transportation arteries with vehicular smoke pollution	1.6	1.6	1.6	1.6
9. Serving food in leaves/paper	1.5	1.5	1.5	1.5
10. Lack of medical certification of food vendors (from health inspectors)	1.5	1.5	1.5	1.5
11. Food cooked in the open for sale	1.1	1.1	1.1	1.1
<b>Sub-total for Food Contamination</b>	<b>21.0</b>	<b>19.2</b>	<b>19.2</b>	<b>19.2</b>
<b>F. Hygiene</b>				
1. Hands not washed after toilet	3.46	3.46	3.46	3.5
2. Hands not washed before food preparation/eating	3.33	3.33	3.33	3.3
3. Evidence of spitting around in community	2.19	2.19	2.19	2.2
4. Evidence of unwashed plates/dishes in house compound	1.84	1.84	1.84	1.8
5. No facility for hand washing attached to toilet	1.83	1.83	1.83	1.8
6. Presence of children/adults with open sores/running noses	1.56	1.56	1.56	1.6
7. Communal handwashing practices within home/chopbars etc.	1.46	1.46	1.46	1.5
8. Absence of household bathhouse facility	1.34	-	-	-
9. Presence of barefooted children in community	1.31	1.31	1.31	1.3
10. Inadequate public bath-house facilities	1.28	1.28	1.28	1.3
<b>Sub-total for Hygiene</b>	<b>19.6</b>	<b>18.26</b>	<b>18.26</b>	<b>18.3</b>
<b>G. Solid Waste</b>				
1. Mounds of uncollected garbage within	4.1	4.1	4.1	4.1

Indicator		Nima East	Nima West	All of Nima
	Maximum Score		Mean Score	
community				
2. Indiscriminate dumping of garbage in community	4.0	4.0	4.0	4.0
3. Evidence of uncovered solid waste within house compound	3.6	3.6	3.6	3.6
4. Evidence of children playing around waste dumps and/or scavenging in them	3.4	3.4	3.4	3.4
5. Paper and plastic litter within community	2.2	2.2	2.2	2.2
6. Evidence of animals scavenging on waste dumps and spreading the litter	2.0	2.0	2.0	2.0
<b>Sub-total for Solid Waste</b>	<b>19.2</b>	<b>19.2</b>	<b>19.2</b>	<b>19.2</b>
<b>H. Housing Problems</b>				
1. Evidence of crowding in sleeping places	2.4	2.4	2.4	2.4
2. Absence of mosquito/insect screens in building	2.01	2.01	2.01	2.0
3. Evidence of domestic animals sharing dwelling places with humans	1.75	1.75	1.75	1.7
4. Droppings of domestic animals in and around house compound	1.32	1.32	1.32	1.3
5. Evidence of crowding and unplanned layout of houses	1.14	1.14	1.14	1.1
6. Evidence of people sleeping outside of rooms in community	1.08	1.08	1.08	1.1
7. Evidence of leaking roofs during rains	1.06	1.06	1.06	1.1
8. Evidence of damp walls	1.03	1.03	1.03	1.0
9. Presence of noise pollution from artisanal works/micro-enterprises etc.	0.65	-	-	-
10. Evidence of dirty floor of house compound	0.63	0.63	0.63	0.6
11. Evidence of cracks in walls	0.53	0.53	0.53	0.5
<b>Sub-total for Housing Problems</b>	<b>13.6</b>	<b>12.95</b>	<b>12.95</b>	<b>12.9</b>
<b>I. Indoor/Outdoor Air Pollution</b>				
1. Smoke pollution from corn mills and micro-enterprise/vehicle (e.g. garages, fish smoking, rubbish burning etc.) in community	1.91	1.91	1.91	1.9
2. Wood as principal cooking fuel in community	1.81	1.81	1.81	1.8
3. Evidence of widespread cigarette/pipe smoking within home	1.81	-	-	-
4. Evidence of cooking done indoors (in sleeping rooms)	1.70	1.70	1.70	1.7
5. Evidence of cooking with wood/charcoal in kitchens	1.46	1.46	1.46	1.5
6. Charcoal as principal cooking fuel in community	1.45	1.45	1.45	1.4
7. Use of pump-spray insecticide	0.95	0.95	0.95	0.9
8. Use of mosquito coil/burning of leaves as repellent	0.71	0.71	0.71	0.7
<b>Sub-total for Indoor/Outdoor Air Pollution</b>	<b>11.79</b>	<b>9.98</b>	<b>9.98</b>	<b>9.9</b>
<b>GRAND TOTAL</b>	<b>200.0</b>			<b>182.6</b>

Except for few indicators, all the indicators were scored as all the conditions existed in all sections of Nima.

### 3. Disease Profile of Nima as Reflected in Clinical Records

As can be inferred from table 1 and 2 below, Out-Patient records of the Nima 441 Clinic show that children up to 4 years of age are highly vulnerable in the Nima residential Area. The fact that there are so many old cases suggest that some diseases such as malaria are endemic and attack people more than once in a season. There is no clear disease pattern suggesting that either males or females are the most vulnerable group as their statistics are almost the same.

**TABLE 1: Outpatient Visits to Nima 441 Clinic for June 1995 – by age and gender**

Age Groups	MALE		FEMALE		COMBINED	
	Number	Percent	Number	Percent	Number	Percent
Under 1 Year	34	21	35	22	69	22
1-4 Years	27	17	30	19	57	18
5-14 Years	27	17	24	15	51	16
15-44 years	40	25	39	25	79	25
45-59 years	21	13	17	13	38	12
60 years and above	13	8	13	8	26	8
<b>All ages</b>	<b>162</b>	<b>100</b>	<b>158</b>	<b>100</b>	<b>320</b>	<b>100</b>

**TABLE 2: Outpatient Visits to Nima 441 Clinic for December 1995 – by age and gender**

Age Groups	MALE		FEMALE		COMBINED	
	Number	Percent	Number	Percent	Number	Percent
Under 1 Year	31	31	33	29	64	30
1-4 Years	18	18	22	19	40	19
5-14 Years	16	16	16	14	32	15
15-44 Years	20	20	27	24	47	22
45-59 Years	9	9	8	7	17	8
60 Years and above	6	6	8	7	14	7
<b>All Ages</b>	<b>100</b>	<b>100</b>	<b>114</b>	<b>100</b>	<b>214</b>	<b>100</b>

Malaria is the most common disease with very high prevalence rates, as shown in tables 3 and 4 below that depict the ten top diseases in Nima. Except for malaria, all other diseases recorded rather low figures. In general, females tend to seek assistance for malaria attacks more often than males (tables 3 and 4). Several factors can be behind this, but a likely reason is that many lactating and nursing mothers are physiologically more vulnerable to disease attacks. Women are also engaged, more than their menfolk, in selling or working around choked gutters, stagnant pools of water, and in less lit places where mosquito prevalence is rather high.

**TABLE 3: Selected Disease Reports at Nima 441 clinic for June 1995 – by Gender**

	MALE	FEMALE	COMBINED
DISEASE	#CASES	#CASES	#CASES
1. Malaria	112	147	259
2. Sores	5	4	9
3. Skin Rashes	4	4	8
4. Chicken Pox	5	1	6
5. Measles	2	0	2
6. Upper Respiratory Tract Infection (URTI)	0	2	2
7. Abdominal Pains	2	0	2
8. Ring Worm	0	2	2
9. Burns	0	2	2
10. Hypertension	2	2	4
<b>TOTAL</b>	<b>132</b>	<b>164</b>	<b>296</b>

**TABLE 4: Selected Disease Reports at Nima 441 Clinic for December 1995 – by Gender**

	MALE	FEMALE	COMBINED
DISEASE	#CASES	#CASES	#CASES
1. Malaria	66	84	150
2. Abdominal Pains	6	2	8
3. Upper Respiratory Tract Infection (URTI)	4	2	6
4. Skin Rashes	2	4	6
5. Gastro- Enteritis	2	3	5
6 Laceration	1	3	4
7. Swollen Feet	2	2	4
8. Hypertension	0	3	3
9. Burns	0	2	2
10. Rheumatic Pains	0	2	2
<b>TOTAL</b>	<b>83</b>	<b>107</b>	<b>190</b>

**NB.** Other diseases recorded in December were measles, depression, chicken pox, ringworm, scabies, anaemia, abrasion, and punctured toes/sores/wounds.

#### **4. Other Observations**

##### **A: WATER**

**A8** Distances vary from household to household. Generally, short distances of between 30 to 100 metres are travelled for water collection. Water vending has become a very lucrative business in Nima and many landlords/ladies have installed taps and sell water in their homes. With the lure of water selling, many more households than before have water, and this reduces the distances people travel to draw water.

**A9** Queuing time at water collection points range between 15 to 20 minutes in the mornings when many people draw water. This is also true for instances where the taps are shut and storage containers provide the main source of water. People prefer drawing water for drinking direct from flowing taps, but are not choosy when water is meant for general use cooking, washing, and cleaning.

**A10** A typical bucket of water costs around ¢20, while larger buckets may cost ¢30. A headpan cost around ¢50, and a drum (52-55 gallons) cost between ¢300 and 350. These generally prevailing rates may be increased arbitrarily depending on the length of water interruptions. The community thinks the prevailing prices are exorbitant as water is a necessity and cannot be easily sacrificed.

The community's assessment of the water quality is that it is generally clean. During long interruptions, many storage containers are emptied and the last bits of such water may exhibit some colour, taste, smell, and some particles. Most storage tanks, especially underground tanks have cracks and very likely to let in dirty water from underground drains and waterways. Also many leaking pipelines along drains could be the cause of water contamination although it was not indicated in the community self-assessment.

**B: SANITATION**

**B1** Open defecation by children observed, not by sane adults.

**B9** Toilet usage fee is ₺20. An “A4 sized” newspaper /brown paper is provided by the toilet attendant to be used as toilet paper.

**B6** Normal queuing time at public toilets is between 10 to 25 minutes. Very long queues develop as early as 4 am. Queuing time may be up to one hour around this time and around 25 to 45 minutes in the evenings (around 5-7 PM).

**D: SULLAGE**

**D2** This is more pronounced during the rainy season

**D7** Flooding risks are higher around East and West Nima near the Odaw drain (popularly known as "Gutter").

**E: FOOD CONTAMINATION**

**E9** Use of polythene is becoming more common. The use of leaves is gradually being phased out. A food seller remarked that the mostly used “Cola Tree Leaves” are expensive and not economical to use (they dry quickly).

**4.2 Problems Encountered During Pretest in Nima**

Some people not readily willing to tell the truth. Others do not respond at all to any question being asked. As pretest took place during the peak of the rains and it was difficult getting around Nima. Furthermore, scoring for presence or absence of environmental conditions does not allow for the variability in conditions within a neighbourhood such as Nima.

## ANNEX 4.2: PRETEST OF “PROXY” INDICATORS FOR RAPID ASSESSMENT OF ENVIRONMENTAL HEALTH STATUS OF RESIDENTIAL AREAS IN ACCRA: AIRPORT RESIDENTIAL AREA

By Osman Alhassan and Lawrencina Pokuaa Nimo (Research Assistants)

### 1. Method of Pretest

A field survey of the Airport Residential Area revealed that differences did not exist in sections of the area in terms of the environmental and health indicators the pretest sought to find out. The residential area was therefore treated as one and observations proceeded with this basic understanding. Some houses were visited and the residents were interviewed about their perception of environmental and health indicators of the area. This is a zoned and planned high class residential area. Two clinics were visited and observations made. Some clinical records were extracted from Nyaho Clinic. The field observers could not have medical records from the St. Lukes children’s clinic.

### 2. Weighted Scores of the Airport Residential Area

The views of residents together with the field observation enabled a fair scoring of the area. Below are the weighted scores of the Airport Residential Area

Indicator	<i>Max. Score</i>	Airport Residential Area Score
<i>A. Water</i>		
1. Ponds/streams as principal source of water supply within community	6.7	-
2. Pipelines on ground surface and in drains (cross contamination)	4.8	-
3. Frequent water supply interruptions within community	4.0	4
4. Principal source of potable water supply outside house compound	3.6	-
5. Vendors as principal source of potable water supply within community	3.4	-
6. Potable water stored in open containers	3.1	-
7. Use of common dip cup for drinking water	2.8	-
8. Distance above 200 metres from water collection points	2.7	-
9. Queuing time of 20+ minutes at water collection points	2.4	-
10. Pay as you use for water	2.4	-
11. Community self-assessment of water quality using their own indicators	1.1	1.1
<i>Sub-total for Water</i>	<b>37.0</b>	<b>5.1</b>
<i>B. Sanitation</i>		
1. Open defecation by neighbourhood children and/or adults	5.9	-
2. Littering of polythene/paper bags of faecal matter within community	4.1	-
3. Presence of over flowing septic tanks and aqua-privy systems in the community	3.3	-
4. Use of chamber pots for storing faecal matter/urine in-house	3.1	-
5. Communal toilets as principal toilet facility within community	3.1	-
6. Queuing time above 10 minutes at selected toilets within community	2.7	-
7. Presence of public toilets in the midst of human dwellings.	2.5	-
8. Toilet sharing between households within house compound	1.9	-
9. Toilet user fee payment for toilet use	1.7	-
10. Odour nuisance around toilets/garbage dumps/drains etc.	1.7	-

Indicator	Max. Score	Airport Residential Area Score
<b>Sub-total for Sanitation</b>	<b>30.0</b>	<b>0</b>
<b>C Pests</b>		
1. Presence of many flies within kitchen/chopbars (cooking areas)	5.3	-
2. Presence of mosquito larvae in water storage containers (Entomologist?)	5.2	-
3. Presence of many flies within toilet	4.4	-
4. Presence of many cockroaches in cooking area and house compound	2.8	-
5. Presence of mice within house	2.7	-
6. Complaints about bed bugs in sleeping area	2.2	-
7. Evidence of lice in children's hair	2.0	-
<b>Sub-total for Pests</b>	<b>24.6</b>	<b>0</b>
<b>D. Sullage/Drainage</b>		
1. Evidence of mosquito and other larvae within stagnant water bodies	4.1	-
2. Pools of stagnant water (cesspools)	3.9	-
3. Drains choked with garbage, weeds and silt	3.7	3.7
4. Pools of stagnant water in drains	3.5	-
5. Evidence of children playing in and around stagnant water	3.0	-
6. Absence of/narrow drains in the community	2.9	-
7. Evidence of flood risk within community	2.1	-
<b>Sub-toal for Sullage/Drainage</b>	<b>23.4</b>	<b>3.7</b>
<b>E. Food Contamination</b>		
1 Evidence of defecating children around food vending area/cooking area within the home	3.2	-
2. Uncovered vendor prepared food/uncovered prepared food or left overs within the house	2.5	-
3. Food sold near public toilets	2.5	-
4. Food sold near public drains	2.1	-
5. Use of unwashed or rotten vegetables for cooking/raw eating	1.8	-
6. Using (naked) hand as means of serving food	1.7	-
7 .Food sold in eating places without running water	1.6	-
8. Dusty eating areas or eating areas along main transportation arteries with vehicular smoke pollution	1.5	-
9. Serving food in leaves/paper	1.5	-
10. Lack of medical certification of food vendors (from health inspectors)	1.4	-
11. Food cooked in the open for sale	1.0	-
<b>Sub-total for Food Contamination</b>	<b>21.0</b>	<b>0</b>
<b>F. Hygiene</b>		
1. Hands not washed after toilet	3.5	-
2. Hands not washed before food preparation/eating	3.3	-
3. Evidence of spitting around in community	2.2	-
4. Evidence of unwashed plates/dishes in house compound	1.8	-
5. No facility for hand washing attached to toilet	1.8	-
6. Presence of children/adults with open sores/running noses	1.6	-
7. Communal hand washing within home/chop bars etc.	1.5	-
8. Absence of household bath-house facility	1.3	-
9. Presence of barefooted children in community	1.3	-
10. Inadequate public bath-house facilities	1.3	-
<b>Sub-total for Hygiene</b>	<b>19.6</b>	<b>0</b>
<b>G. Solid Waste</b>		
1. Mounds of uncollected garbage within community	4.0	-
2. Indiscriminate dumping of garbage in community	4.0	-
3. Evidence of uncovered solid waste within house compounds	3.6	-

Indicator	Max. Score	Airport Residential Area Score
4. Evidence of children playing around waste-dumps and/or scavenging in them	3.4	-
5. Paper and plastic litter within community	2.1	-
6. Evidence of animals scavenging on waste-dumps and spreading the litter	2.0	-
<b>Sub-total for Solid Waste</b>	<b>19.2</b>	<b>0</b>
<b>H. Housing Problems</b>		
1. Evidence of crowding in sleeping places	2.4	-
2. Absence of mosquito/insect screens in building	2.0	-
3. Evidence of domestic animals sharing dwelling places with humans	1.7	-
4. Droppings of domestic animals in and around house compounds	1.3	-
5. Evidence of crowding and unplanned layout of houses	1.1	-
6. Evidence of sleeping outside of rooms in community	1.1	-
7. Evidence of leaking rooms during rains	1.1	-
8. Evidence of damp walls	1.0	-
9. Presence of noise pollution from artisanal works/micro-enterprises etc.	0.6	-
10. Evidence of dirty floor of house compound	0.6	-
11. Evidence of cracks in walls	0.5	-
<b>Sub-total for Housing Problems</b>	<b>13.6</b>	<b>0</b>
<b>I. Indoor/Outdoor Air Pollution</b>		
1. Smoke pollution from corn mills and micro-enterprises/vehicle (eg. garages, fish smoking, rubbish burning etc) in community	1.9	-
2. Wood as principal cooking fuel	1.8	-
3. Evidence of wide-speed cigarette/pipe smoking within community	1.8	-
4. Evidence of cooking done indoors (in sleeping rooms)	1.7	-
5. Evidence of cooking with wood/charcoal in kitchens	1.5	-
6. Charcoal as principal cooking fuel in community	1.4	-
7. Use of pump - spray insecticide	0.9	0.9
8. Use of mosquito coil/burning of leaves as repellent.	0.7	0.7
<b>Sub-total for Indoor/Outdoor Air Pollution</b>	<b>11.8</b>	<b>1.7</b>
<b>Grand Total</b>	<b>200.0</b>	<b>8.8</b>

### 3. Disease Profile of the Airport Residential Area

The disease profile for June and December 1995 were extracted from Nyaho Clinic. These records did not however serve the purposes of the pretest for the following reasons:

- i) Records of patients who underwent admission were available. Records of outpatients are normally kept according to institutions/organisations from which patients come eg. Merchant Bank, Elf Oil, Bilington Bogoso, Goldfields, etc - and not by diseases, geography or sex. It was therefore very difficult to get data on outpatients.
- ii) Out of 86 and 67 patients attending the clinic for June and December respectively, only 5 and 3 patients in June and December respectively indicated that they lived in the Airport Residential Area. All others came from other areas of Accra and Ghana.
- iii) Disease profile of patients were mostly those requiring professional attention. Malaria, diarrhoea, URTI and skin diseases were very minimally represented. These diseases do not need admission and so those patients who might have attended the clinic could not be captured by the available records.



iv) It was difficult to make any extractions as it was not possible to read the writing on the files.

#### **4. Other Observations**

Though a first class residential area, residents of Airport Residential Area enumerated a number of problems facing the area.

These include the following:

1. Frequent water supply interruptions that last up to 30 hours. The use of storage containers/tanks has become necessary. Water quality is affected when storage containers are used as particles collect under containers and can be harmful when used.
2. There are frequent power interruptions and because many embassies, businesses and individuals have power generators in their houses, the Electricity Corporation of Ghana seems to pay less attention to the problem. This is particularly serious during the rainy season.
3. Garbage disposal is becoming a problem. Most of the residents have cancelled their contracts with the Accra Metropolitan Assembly. Thus, burning of rubbish is more common than before and makes the environment less clean.
4. Choking of drains along the streets is becoming particularly serious, especially following the road construction by Construction Pioneers. Portions of drains with collected water where mosquitoes breed.
5. Some dualism exists between the main residence (bungalows) and “quarters” meant for househelps. The quarters were heavily populated and their sanitation was not as good as in the main bungalows.

### **ANNEX 4.3: A PROFILE OF LA TOWNSHIP AND ESTATE**

**By Francis Boakye and Cynthia Engman (Research Assistants)**

La Township exhibits significant spatial variation in terms of environmental conditions. This, coupled with the fact that it is a very large township, makes inadequate any approach that treats the area as a homogeneous whole without any attempt at categorisation. To appreciate the true intra-community variations therefore, a thorough reconnaissance survey was done to provide researchers with relevant parameters for categorisation of the area.

Upon critical study, the township was divided into three sectors using parameters like population density, environmental quality, and the absence or presence of well planned lay-outs.

The first category is *La Estate* that has low to moderate population density, well-planned lay-outs, generally good housing conditions and relatively good neighbourhood sanitation. La Estate shares borders with Osu to the West and also fringes Labadi By-Pass to the South. On all counts of variables that show the status of environmental quality, the Estate has the best environmental quality relative to the other areas. After further investigations, La Estate was recognised as a separate residential category, that is, middle class area. It was therefore treated separately. This area is designated as A in the work.

The second category, within the La Township, ranks lower than La Estate but higher than the third category in terms of environmental quality, is the area designated as '*mixed densely populated sector*'. This area is bounded by the Labadi Road to the East and Labone Estate to the West. It is inhabited by almost equal numbers of indigenous and non-indigenous people. It also has a mix of residence and industries. This area is designated as B in the work.

The last category (also within the La Township), which represents the area with the most severe environmental problems, is the *core indigenous* area. It is demarcated by the Labadi Road to the west, Labadi By-Pass to the south and the Trade Fair - 37 Road to the east. This area is designated as C in the work.

#### **Methods**

After sectoring the township into three areas, scores were given to identifiable environmental indicators (as provided by a scheme for scoring) on the basis of presence or absence of indicators. Environmental indicators present in a sector attracted a score not lower nor higher than those provided by the scheme. Absence of an indicator attracts zero. Basic research instruments were personal observations at community level, focus group discussions, and personal interviews with some individuals.

As mentioned above, the *core indigenous* area and *mixed densely populated* area were considered as two sub-categories of La Township. Since the core indigenous area has a far larger population and also more of the environmental problems, it was sub-divided into two blocks for purposes of scoring in order to have results that are representative of the area.

Thus, the averages in the tables below are based on one block from area B and two blocks from area C. This was done by adding the three blocks and dividing by three. This then serves as the average score (condition) for the two sectors which together constitute the La Township, as opposed to the La Estate, which is treated separately.

## Problems

Problems associated with the application of the research instruments were very few. There was no problem with the application of community level observation as a research instrument.

However, there were some problems during the focus group discussions, albeit very few. A reflection over some opinions revealed that there were attempts to hush the truth concerning certain issues. For instance during one of such discussions, there was one person who dominated the discussion and more often than not said positive things about issues that were apparently bad. Researchers therefore had to be more critical, reformulate questions in ways that can force the truth out and also observe for themselves things in the compounds and households where possible.

The scoring as seen from the tables to some extent does not lend itself to a quick appreciation of the intra-community environmental status differential. For instance, in many instances, actual scores for both the 'mixed' densely populated area and core indigenous area are the same. This suggests to some extent equal magnitude of problems. This is quite erroneous as the core-indigenous area has far greater population density than the 'mixed' densely populated area. It also has more of the waste, household problems etc.

## Profile of La Estate

TABLE A1:

Indicator	Max. Score	La Estate Score
<i>A. Water</i>		
1. Ponds/streams as principal source of water supply within community	6.7	–
2. Pipelines on ground surface and in drains (cross contamination)	4.8	–
3. Frequent water supply interruptions within community	4.0	–
4. Principal source of potable water supply outside house compound	3.6	–
5. Vendors as principal source of potable water supply within community	3.4	–
6. Potable water stored in open containers	3.1	–
7. Use of common dip cup for drinking water	2.8	–
8. Distance above 200 metres from water collection points	2.7	–
9. Queuing time of 20+ minutes at water collection points	2.4	–
10. Pay as you use for water	2.4	–
11. Community self-assessment of water quality using their own indicators	1.1	1.1
<b>Sub-total for Water</b>	<b>37.0</b>	<b>1.1</b>
<i>B. Sanitation</i>		
1. Open defecation by neighbourhood children and/or adults	5.9	5.9
2. Littering of polythene/paper bags of faecal matter within community	4.1	–
3. Presence of over flowing septic tanks and aqua-privy systems in the community	3.3	–
4. Use of chamber pots for storing faecal matter/urine in-house	3.1	–
5. Communal toilets as principal toilet facility within community	3.1	–
6. Queuing time above 10 minutes at selected toilets within community	2.7	–
7. Presence of public toilets in the midst of human	2.5	–

Indicator	Max. Score	La Estate Score
dwelling.		
8. Toilet sharing between households within house compound	1.8	–
9. Toilet user fee payment for toilet use	1.7	1.7
10. Odour nuisance around toilets/garbage dumps/drains etc.	1.6	–
<b>Sub-total for Sanitation</b>	<b>29.9</b>	<b>7.6</b>
<b>C. Pests</b>		
1. Presence of many flies within kitchen/chopbars (cooking areas)	5.3	–
2. Presence of mosquito larvae in water storage containers (Entomologist?)	5.2	–
3. Presence of many flies within toilet	4.4	–
4. Presence of many cockroaches in cooking area and house compound	2.8	–
5. Presence of mice within house	2.7	–
6. Complaints about bed bugs in sleeping area	2.2	–
7. Evidence of lice in children's hair	2.0	–
<b>Sub-total for Pests</b>	<b>24.6</b>	<b>0.0</b>
<b>D. Sullage/Drainage</b>		
1. Evidence of mosquito and other larvae within stagnant water bodies	4.2	–
2. Pools of stagnant water (cesspools)	3.9	3.9
3. Drains choked with garbage, weeds and silt	3.7	3.7
4. Pools of stagnant water in drains	3.5	3.5
5. Evidence of children playing in and around stagnant water	3.0	–
6. Absence of/narrow drains in the community	2.9	2.9
7. Evidence of flood risk within community	2.1	2.1
<b>Sub-total for Sullage/Drainage</b>	<b>23.4</b>	<b>16.2</b>
<b>E Food Contamination</b>		
1. Evidence of defecating children around food vending area/cooking area within the home	3.2	–
2. Uncovered vendor prepared food/ uncovered prepared food or left overs within the house	2.5	–
3. Food sold near public toilets	2.5	–
4. Food sold near public drains	2.1	–
5. Use of unwashed or rotten vegetables for cooking/raw eating	1.8	–
6. Using (naked) hand as means of serving food	1.7	–
7. Food sold in eating places without running water	1.6	–
8. Dusty eating areas or eating areas along main transportation arteries with vehicular smoke pollution	1.5	–
9. Serving food in leaves/paper	1.5	–
10. Lack of medical certification of food vendors (from health inspectors)	1.4	–
11. Food cooked in the open for sale	1.05	–
<b>Sub-total for Food Contamination</b>	<b>21.0</b>	<b>0.0</b>
<b>F. Hygiene</b>		
1. Hands not washed after toilet	3.5	–
2. Hands not washed before food preparation/eating	3.3	–
3. Evidence of spitting around in community	2.2	2.2
4. Evidence of unwashed plates/dishes in house compound	1.8	–
5. No facility for hand washing attached to toilet	1.8	–
6. Presence of children/adults with open sores/running noses	1.6	–
7. Communal hand washing within home/chop bars etc.	1.5	–
8. Absence of household bath-house facility	1.3	–
9. Presence of barefooted children in community	1.3	–
10. Inadequate public bath-house facilities	1.3	1.3
<b>Sub-total for Hygiene</b>	<b>19.6</b>	<b>3.47</b>

Indicator	Max. Score	La Estate Score
<b>G. Solid Waste</b>		
1. Mounds of uncollected garbage within community	4.0	–
2. Indiscriminate dumping of garbage in community	4.0	–
3. Evidence of uncovered solid waste within house compounds	3.6	–
4. Evidence of children playing around waste-dumps and/or scavenging in them	3.4	–
5. Paper and plastic litter within community	2.1	2.1
6. Evidence of animals scavenging on waste-dumps and spreading the litter	2.0	–
<b>Sub-total for Solid Waste</b>	<b>19.0</b>	<b>2.1</b>
<b>H. Housing Problems</b>		
1. Evidence of crowding in sleeping places	2.4	–
2. Absence of mosquito/insect screens in building	2.0	–
3. Evidence of domestic animals sharing dwelling places with humans	1.7	1.7
4. Droppings of domestic animals in and around house compounds	1.3	1.3
5. Evidence of crowding and unplanned layout of houses	1.1	–
6. Evidence of sleeping outside of rooms in community	1.1	–
7. Evidence of leaking rooms during rains	1.1	1.1
8. Evidence of damp walls	1.0	1.0
9. Presence of noise pollution from artisanal works/micro-enterprises etc.	0.6	–
10. Evidence of dirty floor of house compound	0.6	–
11. Evidence of cracks in walls	0.5	0.5
<b>Sub-total for Housing Problems</b>	<b>13.6</b>	<b>5.7</b>
<b>I. Indoor/ Outdoor Air Pollution</b>		
1. Smoke pollution from corn mills and micro-enterprises/vehicle (eg. garages, fish smoking, rubbish burning etc) in community	1.9	–
2. Wood as principal cooking fuel	1.8	–
3. Evidence of wide-speed cigarette/pipe smoking within community	1.8	–
4. Evidence of cooking done indoors (in sleeping rooms)	1.7	–
5. Evidence of cooking with wood/charcoal in kitchens	1.5	–
6. Charcoal as principal cooking fuel in community	1.4	–
7. Use of pump - spray insecticide	0.9	0.9
8. Use of mosquito coil/burning of leaves as repellent.	0.7	0.7
<b>Sub-total for Indoor/Outdoor Air Pollution</b>	<b>11.8</b>	<b>1.7</b>
<b>Grand Total</b>	<b>200.0</b>	<b>35.7</b>

## Methodology

For details on the methodology, see the section on methodology for main La township. South La Estate unlike the indigenous area is well planned area. It was therefore treated as a single block.

La Estate is considered as a Middle Class Area.

## Disease profile of La Estate

Disease profile of La Estate was acquired from La Polyclinic. Its shows top diseases like malaria, URTI, and Chicken pox reported a in June and December, 1995 (see La Polyclinic June and December, 1995).

The profile is more of an inference than of absolute knowledge since records do not show where patients live. It is assumed that because of proximity residents will patronise La Polyclinic than those located at far distances.

**ANNEX 4.4: LA TOWNSHIP (WEIGHTED SCORES OF CORE INDIGENOUS AREA AND MIXED DENSELY POPULATED AREA)**

TABLE B1:

Indicator		La Town- B	La Town- C	All Of La Town.
	Max. Score	Mean Score		
<b>A. Water</b>				
1. Ponds/streams as principal source of water supply within community	6.7	-	-	-
2. Pipelines on ground surface and in drains (cross contamination)	4.8	4.8	4.8	4.8
3. Frequent water supply interruptions within community	4.0	4.0	4.0	4.0
4. Principal source of potable water supply outside house compound	3.6	-	3.6	2.4
5. Vendors as principal source of potable water supply within community	3.4	-	3.4	2.3
6. Potable water stored in open containers	3.1	3.1	3.1	3.1
7. Use of common dip cup for drinking water	2.8	-	2.8	1.9
8. Distance above 200 metres from water collection points	2.7	-	-	--
9. Queuing time of 20 + minutes at water collection points	2.4	-	2.4	1.6
10. Pay as you used for water	2.4	-	2.4	1.6
11. Community self-assessment of water quality using their own indicators	1.1	1.1	1.1	1.1
<b>Sub-total for Water</b>	<b>37</b>	<b>15.8</b>	<b>24.8</b>	<b>21.8</b>
<b>B. Sanitation</b>				
1. Open defecation by neighbourhood children and/or adults	5.9	-	-	-
2. Littering of polythene/paper bags of faecal matter within community	4.1	-	4.1	2.7
3. Presence of over flowing septic tanks and aqua-privy systems in the community	3.3	-	3.3	2.2
4. Use of chamber pots for storing faecal mater/urine in-house	3.1	3.1	3.1	3.1
Communal toilets as principal toilet facility within community	3.1	3.1	3.1	3.1
6. Queuing time above 10 minutes at selected toilets within community	2.7	2.7	2.7	2.7
7. Presence of public toilets in the midst of human dwellings.	2.5	2.5	2.5	2.5
8. Toilet sharing between households within house compound	1.8	1.85	1.8	1.8
9. Toilet user fee payment for toilet use	1.7	1.7	1.7	1.7
10. Odour nuisance around toilets/garbage dumps/drains etc.	1.6	-	1.6	1.1
<b>Sub-total for Sanitation</b>	<b>29.9</b>	<b>14.8</b>	<b>24</b>	<b>21.0</b>
<b>C. Pests</b>				
1 Presence of many flies within kitchen/chopbars (cooking areas)	5.3	-	5.3	3.5
2. Presence of mosquito larvae in water storage containers	5.2	5.2	5.2	5.2
3. Presence of many flies within toilet	4.4	-	-	-
4. Presence of many cockroaches in cooking area and house compound	2.8	2.8	-	0.8

Indicator		La Town- B	La Town- C	All Of La Town.
	Max. Score	Mean Score		
5. Presence of mice within house	2.7	2.7	2.7	2.7
6. Complaints about bed bugs in sleeping area	2.2	-	-	-
7. Evidence of lice in children's hair	2.0	-	-	-
<b>Sub-total for Pests</b>	<b>24.6</b>	<b>10.8</b>	<b>13.3</b>	<b>12.3</b>
<b>D. Sullage/Drainage</b>				
1 Evidence of mosquito and other larvae within stagnant water bodies	4.2	-	-	-
2 Pools of stagnant water (cesspools)	3.9	3.9	3.9	3.9
3. Drains choked with garbage, weeds and silt	3.7	3.7	3.7	3.7
4 Pools of stagnant water in drains	3.5	3.5	3.5	3.5
5 Evidence of children playing in and around stagnant water	3.0	-	-	-
6. Absence of/narrow drains in the community	2.9	2.9	2.9	2.9
7. Evidence of flood risk within community	2.1	2.1	2.1	2.1
<b>Sub-total for Sullage/Drainage</b>	<b>23.4</b>	<b>16.16</b>	<b>16.16</b>	<b>16.16</b>
<b>E. Food Contamination</b>				
1. Evidence of defecating children around food vending area/cooking area within the home	3.2	-	-	-
2. Uncovered vendor prepared food/uncovered prepared food or left overs within the house	2.5	2.5	2.5	2.5
3. Food sold near public toilets	2.5	2.5	2.5	2.5
4. Food sold near public drains	2.1	2.1	2.1	2.1
5. Use of unwashed or rotten vegetables for cooking/raw eating	1.8	-	-	-
6 Using (naked) hand as means of serving food	1.7	-	1.7	1.3
7. Food sold in eating places without running water	1.6	1.6	1.6	1.6
8. Dusty eating areas or eating areas along main transportation arteries with vehicular smoke pollution	1.5	1.5	1.5	1.5
9 Serving food in leaves/paper	1.5	1.5	1.5	1.5
10.Lack of medical certification of food vendors (from health inspectors)	1.4	1.4	1.4	1.4
11 Food cooked in the open for sale	1.05	1.05	1.0	1.0
<b>Sub-total for Food Contamination</b>	<b>21</b>	<b>14.3</b>	<b>16</b>	<b>15.4</b>
<b>F. Hygiene</b>				
1. Hands not washed after toilet	3.5	-	3.5	2.3
2. Hands not washed before food preparation/eating	3.3	-	3.3	2.2
3. Evidence of spitting around in community	2.2	2.2	2.2	2.2
4. Evidence of unwashed plates/dishes in house compound	1.8		1.8	1.2
5. No facility for hand washing attached to toilet	1.8	1.8	1.8	1.8
6 Presence of children/adults with open sores/running noses	1.6	-	-	-
7. Communal hand washing within home/chop bars etc.	1.5	1.5	1.5	1.5
8. Absence of household bath-house facility	1.3	1.3	1.3	1.3
9 Presence of barefooted children in	1.3	1.3	1.3	1.3

Indicator		La Town- B	La Town- C	All Of La Town.
	Max. Score	Mean Score		
community				
10 Inadequate public bath-house facilities	1.3	1.3	1.3	1.3
<b>Sub-total for Hygiene</b>	<b>19.6</b>	<b>9.4</b>	<b>18.0</b>	<b>15.2</b>
<b>G. Solid Waste</b>				
1. Mounds of uncollected garbage within community	4.0	4.0	4.0	4.0
2. Indiscriminate dumping of garbage in community	4.0	4.0	4.0	4.0
3. Evidence of uncovered solid waste within house compounds	3.6	-	3.6	2.4
4. Evidence of children playing around waste-dumps and/or scavenging in them	3.4	-	-	-
5. Paper and plastic litter within community	2.1	2.15	2.1	2.1
6 Evidence of animals scavenging on waste-dumps and spreading the litter	2.0	-	-	-
<b>Sub-total for Solid Waste</b>	<b>19.2</b>	<b>10.2</b>	<b>13.8</b>	<b>12.6</b>
<b>H. Housing Problems</b>				
1. Evidence of crowding in sleeping places	2.4	-	2.4	1.6
2. Absence of mosquito/insect screens in building	2.0	-	2.0	1.3
3. Evidence of domestic animals sharing dwelling places with humans	1.7	1.7	-	0.6
4. Droppings of domestic animals in and around house compounds	1.3	1.3	1.3	1.3
5. Evidence of crowding and unplanned layout of houses	1.1	-	1.1	0.8
6 Evidence of sleeping outside of rooms in community	1.1	-	1.1	0.7
7. Evidence of leaking rooms during rains	1.1	1.1	1.1	1.1
8. Evidence of damp walls	1.0	-	-	-
9. Presence of noise pollution from artisanal works	0.6	-	-	-
10 Evidence of dirty floor of house compound	0.6	0.6	0.6	0.6
11 Evidence of cracks in walls	0.5	0.5	0.5	0.5
<b>Sub-total for Housing Problems</b>	<b>13.6</b>	<b>5.3</b>	<b>10.2</b>	<b>8.54</b>
<b>I. Indoor/Outdoor Air Pollution</b>				
1. Smoke pollution from corn mills and micro-enterprises/vehicle (e.g. garages, fish smoking, rubbish burning etc) in community	1.9	-	-	-
2. Wood as principal cooking fuel	1.8	-	-	-
3. Evidence of wide-spread cigarette/pipe smoking within community	1.8	-	-	-
4. Evidence of cooking done indoors (in sleeping rooms)	1.7	-	-	-
5. Evidence of cooking with wood/charcoal in kitchens	1.5	1.5	1.5	1.5
6 Charcoal as principal cooking fuel in community	1.4	1.4	1.4	1.4
7. Use of pump-spray insecticide	0.9	0.9	0.9	0.9
8. Use of mosquito coil/burning of leaves as repellent.	0.7	0.7	0.7	0.7
<b>Sub-total for Indoor/Outdoor Air Pollution</b>	<b>11.8</b>	<b>4.6</b>	<b>4.6</b>	<b>4.6</b>
<b>Grand Total</b>	<b>200.0</b>			<b>128.5</b>



### Disease Profile of La Township

Disease profile of the core indigenous area and the mixed densely populated area was acquired from La Polyclinic. It shows the top eight diseases like malaria, fever of unknown origin (PUO), upper respiratory tract infection (URTI) and chicken pox that were reported in June and December 1995.

### Selected Disease Reports at La Polyclinic For June 1995 – By Gender

DISEASE	MALE	FEMALE	TOTAL
	NO	NO	NO
Malaria	457	655	1112
Skin Diseases (excluding Measles, Chicken Pox And Boils)	95	80	175
Respiratory Infection	74	92	166
PUO*	49	44	93
Enteric Fever	39	57	96
Chicken Pox	15	19	34
Measles	10	10	20
Diarrhoea	7	8	15
<b>TOTAL</b>	<b>746</b>	<b>965</b>	<b>1711</b>

### Selected Disease Reports at La Polyclinic For December, 1995 – By Gender

DISEASE	MALE	FEMALE	TOTAL
	NO	NO	NO
Malaria	83	150	223
Respiratory Track Infections	11	25	36
Diarrhoea	12	20	32
Skin Diseases (excluding Chicken Pox, Measles, Boils)	8	20	28
Enteric Fever	2	4	6
Chicken Pox	1	2	3
PUO*	0	0	0
Measles	0	0	0
<b>TOTAL</b>	<b>117</b>	<b>221</b>	<b>100</b>

\*Pyrexia (=fever) of unknown origin

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## SEI MISSION STATEMENT

*The Stockholm Environment Institute (SEI) is an independent, international research organisation committed to the implementation of practices supportive of global sustainable development. SEI conducts a comprehensive research, consulting and training programme that focuses on the links between ecological, social and economic systems at global, regional, national and local levels. In its commitment to bridge the gap between science and policy-making, SEI employs innovative methods to communicate its work to governments, the private sector and society-as-a-whole. To meet these challenges, SEI has created an international network of centres and has established partnerships with sustainable development organisations throughout the world.*

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# THE STOCKHOLM ENVIRONMENT INSTITUTE

SEI is an independent, international research institute specializing in sustainable development and environment issues. It works at local, national, regional and global policy levels. The SEI research programme aims to clarify the requirements, strategies and policies for a transition to sustainability. These goals are linked to the principles advocated in Agenda 21 and the Conventions such as Climate Change, Ozone Layer Protection and Biological Diversity.

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The SEI mission developed from the insights gained at the 1972 UN Conference on the Human Environment in Stockholm (after which the Institute derives its name), the work of the (Brundtland) World Commission for Environment and Development and the 1992 UN Conference on Environment and Development (UNCED). The Institute was established in 1989 following an initiative by the Swedish Government to develop an international environment/development research organisation.

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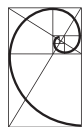
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- *Sustainable Development*
- *Sustainable Energy*
- *Atmospheric Environment*
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- *Environmental Assessment*
- *Institutional Development*
- *Disseminating Global Knowledge*



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