

Gap Analysis of Research Needs in Environmental Health, Malawi

Report to the National Commission of Science
and Technology

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List of Abbreviations

ADB	African Development Bank
AAEH	Africa Academy for Environmental Health
Anon	Anonymous
AU	African Union
BTB	Bovine Tuberculosis
CHORDS	Connecting Health Organisations for Regional Health Surveillance
CLTS	Community Led Total Sanitation
CoM	College of Medicine, University of Malawi
CONGOMA	Council of Non Governmental Organisations of Malawi
DAHI	Department of Animal Health and Industry
DfID	Department for International Development (UK)
DIP	District Implementation Plan
DPC	Disease Prevention and Control
DSS	Demographic Surveillance Systems
EcoSan	Ecological Sanitation
EH	Environmental Health
EHO	Environmental Health Officer
EHP	Environmental Health Professional
FAO	Food and Agricultural Organisation of the United Nations
FGD	Focus Group Discussion
GoM	Government of Malawi
HACCP	Hazard Analysis Critical Control Points
HDR	Human Development Report
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information Systems
HP	Health Promotion
HRCSI	Health Research Capacity Strengthening Initiative
HFH	Habitat for Humanity
IDRC	International Development Research Centre (Canada)
IDS	Integrated Disease surveillance
IDSR	Integrated Disease Surveillance and Response
IEC	Information, Education and Communication
IFEH	International Federation of Environmental Health
ILO	International Labour Organisation
JICA	Japan International Cooperation
JMP	Joint Monitoring Programme
KCN	Kamuzu College of Nursing, University of Malawi
MDG	Millennium Development Goal
MIWD	Ministry of Irrigation and Water Development (Malawi)
MoEPD	Ministry of Economic Planning and Development
MoH	Ministry of Health (Malawi)
MoIWD	Ministry of Irrigation and Water Development
MoLG&RD	Ministry of Local Government and Rural Development
MP	Member of Parliament
NCD	Non communicable diseases
NCST	National Commission for Science and Technology
NGO	Non Governmental Organisation
NHRA	National Health Research Agenda
NNP	National Nutrition Policy
NSO	National Statistics Office
NTF	National Task Force
NWP	National Water Policy
OHS	Occupational Health and Safety
OPC	Office of President and Cabinet

PHAST	Participatory Hygiene and Sanitation Transformation
POP	Persistent Organic Pollutants
PSI	Population Services International
PSI	Population Services International
SACIDS	Southern Africa Centre for Infectious Disease Surveillance
SADC	Southern African Development Community
SD	Standard Deviation
SNOWS	Strengthening Research Capacity in Environmental Health
SSA	Sub Saharan Africa
SWAp	Sector Wide Approach
TB	Tuberculosis
TFCA	Transfrontier conservation area
UN	United Nations
UNICEF	United Nations Children's Fund
UNDP	United Nations Development Programme
USA	United States of America
UK	United Kingdom
VLOM	Village Level Operation and Maintenance
WASH	Water Sanitation and Hygiene
WASH	Water, Sanitation and Hygiene
WASHTED	Centre for Water, Sanitation, Health and Appropriate Technology Development
WFP	Water for People
WHO	World Health Organisation
WTO	World Trade Organisation

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- Lilongwe City Assembly
- Blantyre District Health Office
- Chitipa District Health Office
- Rumphi District Health Office
- Ntcheu District Health Office
- Salima District Health Office
- Nsanje District Health Office
- Malawi Environmental Health Association
- Southern Regional Veterinary Health Office
- Mikolongwe Veterinary College
- Malawi College of Health Sciences
- Polytechnic, University of Malawi
- College of Medicine, University of Malawi
- Kamuzu College of Nursing, University of Malawi
- Bunda College of Agriculture, University of Malawi
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- UNICEF, Malawi
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1.0 Executive Summary

1.1 Introduction

Environmental health is the branch of public health concerned with all aspects of the natural and built environment that may affect human health. In simple terms it is often referred to as preventative health and if managed and implemented effectively, can reduce disease burden, increase productivity and reduce the demand on the already encumbered health services.

Nevertheless, at the dawn of the 21st century, Malawi is facing a gap in the training, implementation and management of environmental health issues, and in order to inform and develop effective policy and strategies on a national basis, we need relevant research and data to be available. This is a gap in critical knowledge that hinders our national efforts to reduce or eliminate diseases that might be prevented by better managing environmental factors. This is especially true for emerging and re-emerging diseases and conditions such as diarrhoea (including cholera), HIV/AIDS, malnutrition, neglected tropical diseases, malaria, tuberculosis, cancer, birth defects and asthma and which strike hundreds of thousands of Malawian families every year.

To this regard, Malawi has received support from Wellcome Trust, the Department for International Development (DFID) UK and the International Development Research Centre, Canada (IDRC) to implement a five year Health Research Capacity Strengthening Initiative (HRCSI) programme. The HRCSI seeks to expand and promote multidisciplinary health research in Malawi. In collaboration with national stakeholders, the programme aims to enhance institutional capacity for multi-disciplinary health research; promote the use of research in the formulation of national health policies and programmes; enhance dissemination of scientific knowledge in Malawi; and strengthen the regulation and coordination of the national research component. The lifespan of the HRCSI is for five years and the Initiative is coordinated by the National Commission for Science and Technology (NCST).

1.2 Purpose of the work

The aim of this consultancy was to assess the current gaps in research for the environmental health sector in Malawi, and to recommend research priorities and an effective action plan to address these gaps.

1.3 Expected outcomes

- To provide a prioritised list of research themes and topics for Environmental Health which can be developed for funding consideration.
- To provide a broader view of perceived needs for Environmental Health research from relevant stakeholders in Malawi.
- To indicate the most appropriate modalities for carrying out the suggested research and improving environmental health research in Malawi.

1.4 Methodology

In order to carry out this work, a three- member Environmental Health team, hereafter known as EH Working Group was selected to carry out the environmental health gap analysis and set out research priorities thereof. The consultant applied the methodology proposed by a multi-disciplinary National Task Force (NTF) comprising of thirty members. The EH consultancy team worked for 30

days conducting focus group discussions (FGDs) and individual interviews with key informants using semi structured questionnaires. Key informants were identified from government, non governmental, private sector and academia to ensure a wide coverage of opinions and information. Grey and published literature as well as reports for current and completed programmes were reviewed and collated, and outcomes detailed according to findings from literature and key informants.

The EH Working Group identified the following nine sub-themes of Environmental health for the purposes of this gap analysis exercises; communicable diseases, disease surveillance and epidemiology, food safety and hygiene, health promotion and education, nutrition and health, occupational Health, pollution, water and sanitation animal health, built environment.

1.5 Summary of Key findings

The Gap analysis undertaken by the environmental health working group has attempted to assess the main areas of environmental health in terms of current research, policy and programmes to identify the gaps within current knowledge which could help improve environmental health practice in Malawi.

The key findings are broken down into four areas, namely:

1. Recommended research priorities for environmental health
2. Cross cutting issues which relate to all subthemes
3. Opportunities for environmental health research and development
4. Information and dissemination
5. Proposed way forward and action plan

1.5.1 Research Priority Areas for Environmental Health

Research priority areas were identified through a thorough assessment of existing literature and interviews with key informants for both environmental health and specific sub themes therein. The Environmental health working group used a three stepped approach to identify priority areas.

1. Review of literature pertaining to all areas of environmental health
2. Identification of priority sub themes from environmental health experts
3. Identification of priority research areas within sub themes from environmental health and sub theme experts.

This approach identified specific research priorities which were then consolidated by the environmental health working group for form a comprehensive list of priority research areas for environmental health in Malawi. These are detailed in Figure 1 as a summary. Full details of each priority area can be found within the relevant subtheme.

Figure 1 Summary of research priority areas for environmental health in ,Malawi

Research Priority	Sub themes for Research in Environmental Health					
	Disease Surveillance and Response	Water and Sanitation	Food Safety and Hygiene	Health Promotion and Education	Pollution Control	Occupational Health and Safety
1	Assess and evaluate reporting systems in terms of accuracy, neglected tropical diseases, new technologies and SWAp	Analyse reasons for lack of stakeholder coordination	Assess microbiological contamination of specific food groups	Develop and evaluate behaviour interventions for reducing harmful cultural practices related to reproductive health	Determine the impact of the following on water, soil, air and therefore human health: <ul style="list-style-type: none"> • Agricultural chemicals 	Establish a baseline for accidents and injuries in the workplace
2	Assess and evaluate quality of data from community, facilities and alternative systems	Assess availability of sustainable water and sanitation facilities	Assess chemical contamination of specific food groups	Develop and evaluate behaviour interventions reducing endemicity of cholera	<ul style="list-style-type: none"> • POPs • Solid waste • Clinical waste • Industrial waste 	Assess occupational health and safety standards in the following sectors: <ul style="list-style-type: none"> • Agricultural • Industrial • Health • Informal
3	Assess and evaluate quality of data in terms of 15 priority diseases and attitudes of data collectors	Assess sustainability and operation of sanitation technologies	Assess hygiene practices in commercial food premises	Develop and evaluate behaviour interventions for promoting improved sanitation and hygiene practices	Assess the levels of particulate pollutants in domestic, commercial and industrial settings	
4	Assess and evaluate use of data at facility, district, zonal and national level	Assess efficacy of point of use treatment for household water	Determine applicability of food safety management systems in commercial businesses in Malawi	Evaluate effectiveness of health promotion and education programmes		
5	Monitor and evaluate existing intervention programmes to inform planning and policy development	Assess impact of climate change on water resources				

1.5.2 Cross Cutting Issues

One of the main outcomes to this consultancy is the lack of current research priorities in environmental health and the subthemes. The majority of research in Malawi is conducted by academic institutions specifically for academic development (promotion) rather than solving problems. As such the following were identified as the major barriers to EH research at present:

- Lack of infrastructural and human resources to conduct effective research
- Lack or inadequate published research work,
- Lack of coordination and collaboration between different researchers, and agencies in Malawi,
- Uncoordinated or non-existence of set research dissemination procedures,
- Lack of effective interface to allow research to inform and influence policy development
- Lack of understanding of non academics that intervention projects and development programmes at District level are also research and can inform policy and strategy development,
- Lack of expertise within the profession to develop and execute research proposals to a good standard.
- Lack of expertise within the profession to interpret, analyse and report data effectively

All in all these lead to an inconsistent and haphazard approach in terms of research and dissemination, which is currently reliant on the motivation of individuals rather than cooperation with policies and procedures.

1.5.3 Anticipated Opportunities for Environmental Health

Despite the various challenges facing environmental health research in Malawi, many opportunities lie within the sector which must be developed.

1.5.3.1 Development and involvement in national regional and international networks

As detailed within the specific sub theme sections, there are numerous effective networks into which environmental health and allied health professionals can access capacity building, networking and research opportunities. An example with reference to environmental health is the Africa Academy for Environmental Health (www.ifeh.org/afa). This is a continental network of academic institutions, organisations representing environmental health professionals and expert practitioners for the advancement of the science and practice of environmental health. University of Malawi is already a member of this network. Regional partnerships such as these strengthen the opportunity for funding and regional based collaboration and coordination to move environmental health forward in Malawi, SADC and Africa.

Nevertheless, emphasis must also be placed on the importance of national networking and collaboration which is currently very poor in environmental health in Malawi. Electronic networks, national research centres and technical working groups with effective stakeholder representation could successfully overcome this problem if implemented in a structured and coordinated manner. The funding of these developments must be considered as a matter of priority for both the HRCSI programme and SWAp for health.

1.5.3.2 Capacity building and research development

Environmental health in Malawi has a number of strong stakeholders. The environmental health department at the University of Malawi Polytechnic has a research active department with experienced and skilled staff. Recently the University with the Ministry of Health hosted the 2nd All Africa Environmental Health Congress (May 2010) which hosted over fifteen countries and offered an opportunity to share research and experience in all nine sub theme areas. The recent re-launch of the Malawi Environmental Health Association has already borne fruit in the form of a grant for the

development of continuing professional development scheme for EHPs, and they are seeking further funding for the development of practical training schemes for graduates. It is essential that these active National groups coordinate and facilitate the development of the environmental health profession and research active professionals therein. With this in mind, the necessity for infrastructural capacity and development must be supported. It is recommended that a centre for environmental health be considered that will consolidate all areas of research and development for the profession to ensure a successful coordinated approach in the future.

1.5.4 Information Dissemination

At all levels the efficacy of information dissemination and the effective use of research data was found to be poor. While this remains the status quo there will be little room for research to inform and support policy and strategy development in Malawi.

With this in mind the EH working group gives the following recommendations:

- Advocacy for environmental health must improve to increase the understanding within allied health professionals and general public of the role of EH in preventive health services
- As a cross cutting profession, it must be ensured that environmental health researchers from all backgrounds are invited and are aware of dissemination seminars and conferences taking place in Malawi.
- The initiation of an African Journal for Environmental Health should be considered as a route to disseminate research on a regional basis. Such a journal could be based in Malawi and the possibility of an e journal format should be considered as an effective means of circulating the periodical.
- National networks should be developed to allow environmental health practitioners to collaborate and share experiences in environmental health research.
- Environmental health researchers should be encouraged to join appropriate regional and international networks to facilitate collaboration, share experiences and access funding opportunities.
- The mass media must also be utilised to contribute to the knowledge base on which the public may make informed decision. Behaviour change is integral to policy and strategy implementation in environmental health.

1.5.5 Action Plan

To ensure the above gaps and recommendations are addressed in a coordinated and collaborative manner, the EH working group recommends the action plan outlined in Figure 2.

1.6 Conclusion

This is an exciting time for the environmental health research. As Africa is leading the world in the development of environmental health training through the Africa Academy for Environmental Health, we also have the opportunity to raise the profile of research in this area by placing it at the top of the National Health Research Agenda. The significance and impact of environmental interventions cannot be underestimated in terms of disease prevention and the subsequent impact on all areas of the Millennium Development Goals.

Figure 2 Proposed Action Plan for Research Development in Environmental Health in Malawi



2.0 Introduction

2.1 Aim of the Project

In the process of developing a National Health Research Agenda (NHRA), the Ministry of Health in conjunction with the National Commission for Science and Technology (NCST), and National Task Force therein identified nine thematic areas. These areas are to be established as priorities for the NHRA and as such, each specific area requires to have a gap analysis undertaken with relevant stakeholders to identify the research priorities for each theme.

The nine themes were given as follows:

1. Infectious diseases
2. Health systems
3. Reproductive health
4. Environmental health
5. Nutrition
6. Non-communicable diseases
7. Social and behavioural research
8. Trauma and rehabilitation
9. Mental health

Environmental health was identified as one of the nine key thematic areas, due to its important role in the public and preventative health sector. As such, this report represents the findings of the gap analysis conducted for the field of environmental health in Malawi.

WHO recognised in their 2009 annual report for Malawi that there is limited capacity to deliver equitable and efficient health services and utilization of information for evidence based decision making. It is important to strengthen the scientific basis for decision making about environmental health effects in both the public and industrial sectors. More than many other fields, environmental health is plagued by alarming reports on actual and perceived risks and these have complicated rational priority setting (Perschagen, 1999).

This report attempts to address this gap in capacity to allow informed decision to be made in terms of health services.

Due to the wide ranging nature of environmental health, a number of the thematic areas being assess relate to research in this area. As such, reference to the cross cutting areas will be made where appropriate.

2.2 Consultancy Team

The contract was undertaken by a group of consultants from the University of Malawi – Polytechnic, Department of Environmental Health, namely

- Dr Tracy Morse
- Dr Steven Taulo
- Mr Kingsley Lungu

The consultant group will hereafter be referred to as the Environmental Health Working Group.

2.3 Expected outcomes

The funding of a gap analysis for health research in Malawi is a welcome development. This is particularly the case in the environmental health profession, where so many areas of health are addressed and cross different fields leading to an uncoordinated approach with minimal

collaboration and regular duplication. As such, the development of a coordinated approach to research, and the introduction of multidisciplinary research will be of particular benefit to the development of the environmental health sector in Malawi.

The specific objectives of the assignment were given as:

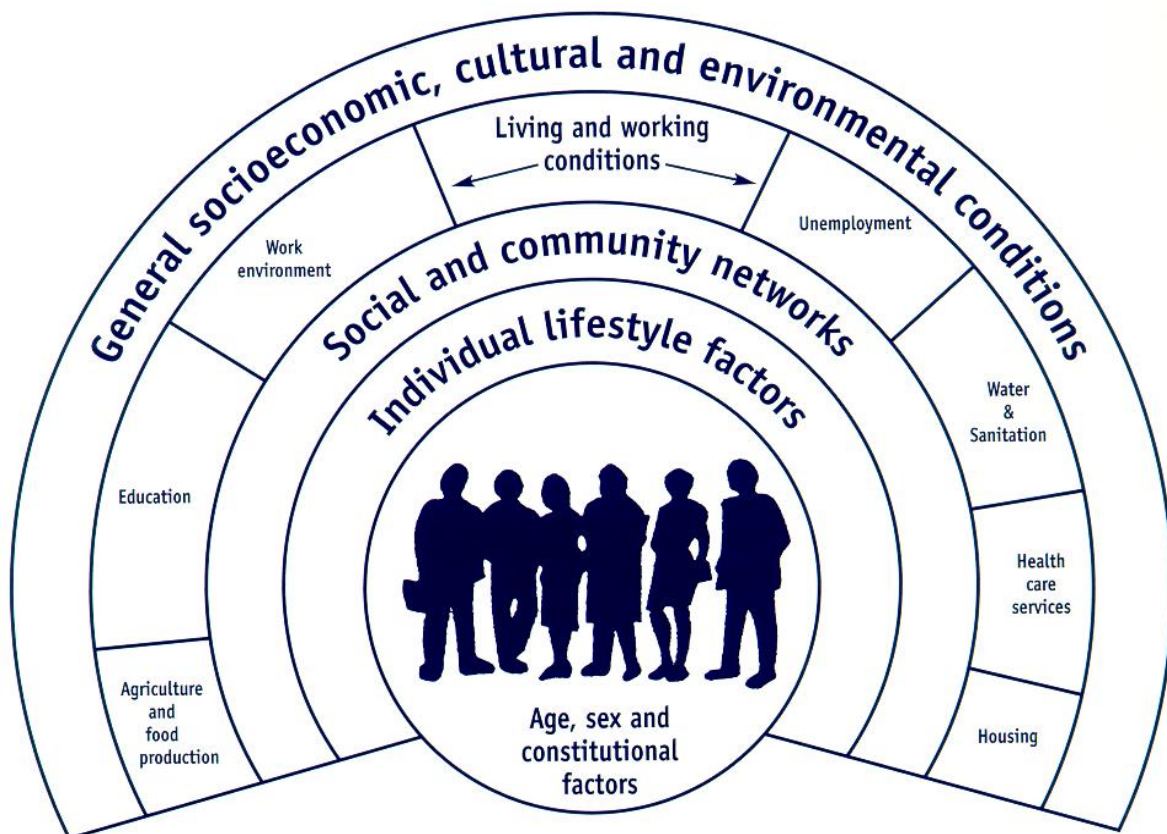
- 1) To identify research priorities under each theme where an increase in research effort – including collaboration and coordination – would make a significant contribution to national wealth and/or wellbeing. The identified research priorities should be those of key stakeholders such as policy makers, researchers, donors and the civil society.
- 2) To determine what shift in research effort is needed, what new or improved research activities are required, and how the targeting of research effort can best be achieved.
- 3) To assess the quality of existing research works: methodology was adequately described, the sample size was appropriate and design was suited to the research question.
- 4) To identify existing opportunities and challenges for research under each thematic areas. In light of the opportunities and challenges, advise on the mechanisms for enhancing research in terms of developing a focus on targeted priorities.
- 5) To develop an action plan for the identified priorities under each theme. The action plan should include strategies for publicising, monitoring and evaluating the national research agenda.

3.0 Methodology

3.1 Background

Environmental Health (EH) is the assessment and management of environmental influences (e.g. chemical, physical, biological, social and psychosocial factors) on human health (Figure 1). This entails the study of food safety and hygiene (including production, distribution and fitness for human consumption), occupational health and safety (including investigation and control of work-related ill health), community health (communicable and non-communicable disease control and prevention, disaster management, health promotion and education), the built environment (including homes, workplaces and public spaces) and pollution control (including the control of the air, land and water). EH is about taking a preventative approach to tackling disease and ill-health rather than a curative approach (AAEH, 2010).

Figure 1. The Main Determinants of Health (Adapted from Dahlgren & Whitehead, 1991)



Within these areas are a number of sub themes, particularly with regard to community health. Unlike other thematic areas which could allow a concentrated effort on a specific subject, the environmental health gap analysis undertook the study as follows:

- Development of key informant questionnaire (Appendix 2 & 3)
- Division of environmental health into subthemes
- Identification of relevant stakeholders and key informants
- Interviews with key informants
- Literature review of environmental health related research in Malawi
- Triangulation of information from literature and key informants

- Development of research priorities
- Assessment of challenges and opportunities
- Development of an action plan for implementation.

Collaboration with teams of consultants working on the other thematic areas will be necessary for the production of the final report, and to ensure best use of funds and avoid duplication in stakeholder meetings.

3.2 Questionnaire development

The main thrust of data collection for the gap analysis was concentrated on key informant interviews. Much of the data held on environmental health based research and interventions are in government, academic institutions, and nongovernmental organisations. Due to the lack of coordination and central database for research conducted in Malawi, for a number of areas of environmental health the identification and assessment of literature and current intervention programmes was hindered and as such key informants were a vital source of information on current and recent programmes which should be assessed.

The questionnaire was devised by the EH working group taking into consideration the need to capture both information related to possible literature and to gather views and perceptions of interviewees. A simplified version was used for EHPs to allow them to give an overview of all EH subthemes (Appendix 3), whereas key informants for sub theme areas were interviewed using a more specialised questionnaire (Appendix 2)

In order to allow key priorities to be identified from the data collected within questionnaires, a system of five criteria was employed as recommended by the NCST Research Coordinator. These criteria were:

1. Current and potential burden of disease
2. Feasibility and deliverability of the research taking into consideration human, financial and infrastructural resources and the acceptability of the research.
3. Expected impact of the research on:
 - a. Policy/decision making/system changes
 - b. Disease burden reduction
 - c. Health care delivery services
 - d. Knowledge for further research and design of interventions
 - e. Direct and indirect effects
 - f. Short and long term benefits
4. Effects on equity and social justice to ensure the concerns of vulnerable groups and disadvantaged are considered.
5. Contribution to research capacity strengthening in Malawi

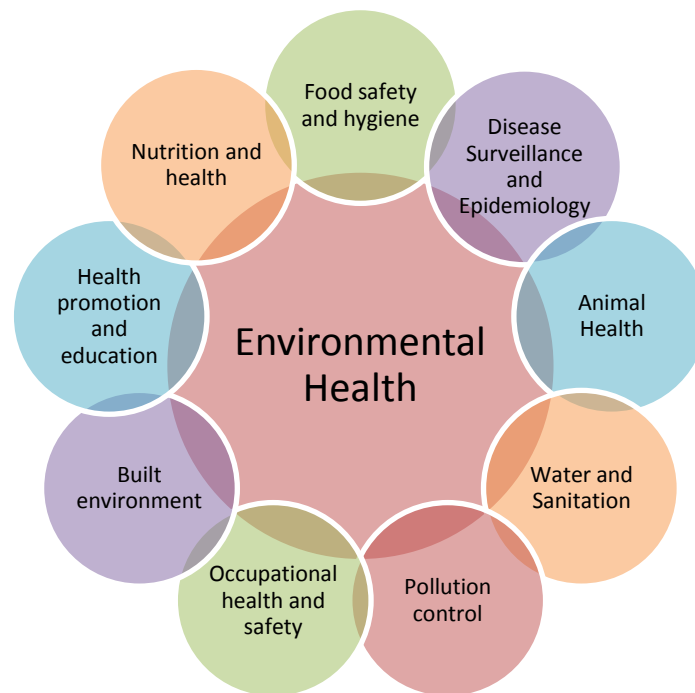
The questionnaire was designed to establish the thoughts and recommendations of each key informant on these criteria for each of their recommended research priorities.

Questionnaires were sent to NCST for comment before use.

3.3 Subthemes

For the purpose of the gap analysis, environmental health was sub divided into a higher number of subthemes as outlined in Figure 3.

Figure 3 Sub themes explored for environmental health gap analysis



In order to maximise use of funds and time, the EH working group cross analysed the sub themes with the other thematic areas of the National Health Research Agenda. The outcome of this was to remove the need to conduct a gap analysis on communicable disease as it was felt that this would be adequately covered in the infectious disease theme and could also be commented upon at consultation stage should the needs of EH not have been addressed.

3.4 Key Informants

For each of the subthemes relevant stakeholders were established to be approached for interview. An exhaustive list was first established which was then reduced to a manageable list of key informants to be approached for interview. Identification of these key informants were based on the following criteria:

- Relevant experience in the subtheme
- Representation of government, NGO, private, academia and consumer sectors
- Representation of all geographical regions within Malawi
- Experience of the consultancy team
- Information databases, e.g. CONGOMA list of registered NGOs

Informants were categorised into two groups:

- Informants with a full understanding of environmental health who were interviewed on the thematic area as a whole to achieve a holistic view
- Informants who have specific expertise in a sub theme area and could further elucidate and consolidate information from environmental health specialists.

Overall 40 key informants were identified for interview. A number of additional key informants were identified which would have informed the gap analysis. Further however due resources, logistics and time constraints these were not accessed. Nevertheless the EH working group feel that the key informants included offered as well balanced in informed view of all sub thematic areas.

Data collated from key informants was triangulated with findings of previous research to identify and outline recommended areas of research for the National Health Research Agenda.

The final informants are detailed in Figure 4. Full contact details of all informants involved in final interviews are included in Appendix 1.

Figure 4 Key informants Interviewed for Environmental Health Gap Analysis



3.4.1 Interview with Key Informants

Interviews were conducted over a period of three months by all three consultants.

All interviews were conducted by consultants to ensure questionnaires were completed accurately and that all responses were followed up adequately in each area.

In total 15 interviews were conducted on a one to one basis. The remaining 25 key informants interviewed were done so as part of focus groups discussions (FGDs) which involved more than one member of a department or organisation during the administration of the questionnaire to gain a wider perspective on responses. These are detailed below:

- Lilongwe City Assembly (n = 8)
- Nutrition Department, Ministry of Health (n = 3)
- Food Safety Section, Ministry of Health (n = 3)
- Malawi Bureau of Standards (n = 3)
- Occupational Health and Safety Directorate, Ministry of Labour (n = 2)
- UNICEF (n = 2)
- Health Education Unit, Ministry of Health (n = 4)

3.5 Literature Review

The literature review used the following resources to identify existing research information for Malawi in the areas of environmental health including:

- Follow up on reports and research projects referred to by key informants (particularly the presence of grey literature)
- Reference to publications produced from Malawi based research
- Internet searches for current relevant programmes and research in Malawi

Details of literature reviews are contained within each subtheme section below. It is important to note that the collation of literature and reports was limited by time and resources allocated to the gap analysis. In addition, the lack of coordination and collaboration within the sector makes it very difficult to establish what has been done and what is currently being undertaken. With this in mind, each section gives an overview of literature and how these problems can be overcome is addressed within the Gap Analysis summary and recommendations (Section 15).

In addition, in some thematic areas it was determined that a dearth of literature or research had been conducted in the area of interest and therefore reference is made to African wide research where this may assist to identify key gaps and maximise the effective use of funds.

3.6 Priority Setting Methodology

The EH working group utilised the priority setting methodology agreed by the HRCSI NTF, and as such the questionnaire was designed to reflect this methodology.

Prioritisation criteria were given as:

1. Current and potential burden of disease
2. Feasibility and deliverability of the research
3. Expected impact of the research

4. Effects on equity and social justice
5. Contribution to research capacity strengthening in Malawi

Each recommended areas of research outlined by key informants was ranked according to these criteria, and the criteria themselves were ranked in order of importance (refer to questionnaire detailed in Appendix 2)

Prioritisation of criteria was averaged for respondents in each subtheme, the details of which are contained within each subtheme section. Based on the prioritisation of the five criteria, and the assessment of the recommended research, the research areas were prioritised as outlined in each subtheme area.

Subthemes were prioritised based on the responses of the key informants giving a holistic view of environmental health as detailed in Section 4.0. Subsequently, subthemes are contained in the report in the order of prioritisation.

On this basis, the summary (Section 15) outlines the recommended research priorities based on prioritisation of subthemes and subsequent prioritisation of recommended research areas therein.

4.0 Environmental health

4.1 Introduction

Environmental Health (EH) is the assessment and management of environmental influences (e.g. chemical, physical, biological, social and psychosocial factors) on human health. This entails the study of water and food safety and hygiene (including production, distribution and fitness for human consumption), occupational health and safety (including investigation and control of work-related ill health), communicable disease (including investigation, control and prevention), the built environment (including homes, workplaces and public spaces) and environmental protection (including the control of the air, land and water pollution). EH is about taking a preventative approach to tackling disease and ill-health rather than a curative approach (AAEH, 2010).

4.2 Literature Review

4.2.1 African Context

The average life expectancy of someone living in sub-Saharan Africa (SSA) is half of that (Human Development Report (HDR), 2007). For the region as a whole life expectancy today is lower than it was three-decades ago. Several countries in SSA have suffered catastrophic reversals: 20 years in Botswana, 16 in Swaziland and 13 years in Lesotho and Zambia (HDR, 2007). A report on children's environmental health conducted by the WHO Regional Office for Africa of 6 African countries (WHO 2005) concluded that the main environmental health factors causing morbidity and mortality are related to inadequate access to safe water supplies, inadequate sanitation, inadequate solid and hazardous waste management and disposal, inadequate vector control, inadequate housing/overcrowding, poor personal hygiene, air pollution, exposure to various non-communicable diseases etc. Today 28 of the 31 low human development countries are in SSA (HDR, 2007)(AAEH, 2010).

Progress towards the key Millennium Development Goals (MDGs) can be accelerated through improved environmental health conditions, in particular the MDGs for child health, access to water and sanitation and environmental sustainability. While many other interventions may also accelerate progress, the multi-sectoral approach to environmental health offers cost effective and sustainable improvements. Environmental risk factors account for 21% of the overall burden of disease worldwide, and more in developing countries. Some 1.7 million young children die each year from diarrhoeal disease associated with inadequate water supplies, sanitation and hygiene and a further 1.4 million child deaths from respiratory infections are attributable to indoor pollution. Environmental improvements are often more cost-effective as health measures than curative health services (Cairncross *et al.*, 2003)(AAEH, 2010).

Addressing these factors and therefore achieving the MDGs and other internationally agreed development goals in Africa holds the promise of saving millions of lives. Improving the environment – provision of safe water, safe sanitation, management of vectors of public health interest - remains one of the most key interventions in pursuit of improved health outcomes for the populations in the African Region. More than 44% have no access to safe drinking water while less than 37% have access to safe sanitation. Air pollution remain one of the leading causes of child morbidity, traffic accidents claim millions of lives and occupational injuries and illness are a factor in contributing towards poverty and reduced life expectancy. Vector borne diseases such as malaria and schistosomiasis are still among the major health problems due to proliferation of vectors as a result of, among others, ill-planned development and climate change. The Africa Region is forecast to fall short of meeting most of the MDGs in particular those related to health. (WHO, 2002)

Over the past two decades policy, legislative and regulatory frameworks that address environment–health linkages have been developed. Their effective implementation however, has been extremely limited, if at all. Today Africa continues to face environmental challenges of the pre-industrial era, industrialization and of the twenty-first century, all in the context of strained public health systems

Key challenges faced African countries include:

- Understanding and communicating the contribution and benefits of the environment to other determinants of health which are not well understood by policy makers and planners;
- Increasing awareness amongst health sector personnel on the mounting burden of disease from environmental health risks;
- Prioritising health and highlighting the health costs and benefits of the actions of key decision-makers within economic sectors at the centre of decision-making processes;
- Engaging of stakeholders to ensure translation of environment and health related policy, legislative and regulatory frameworks to practice;
- Bringing recognition to the contribution of reduced environmental hazards to the achievement of the relevant MDGs as well as socio-economic development to the attention of development partners

(WHO 2002)

The importance of environment and health was highlighted in the Libreville Declaration 2008 which indicated that more than 23% of all deaths in Africa are attributable to avoidable environmental risk factors particularly in the poorest and most vulnerable groups. The countries signed up to this declaration (including Malawi) agreed that there was a need to undertake further research to increase understanding of the vulnerability of humans to environmental risks, and address the constraints to the implementation of appropriate interventions, particularly in the following areas:

- Poor access to water
- Poor sanitation
- Poor air quality
- Vector borne diseases
- Exposure to chemicals and toxic substances
- Poor waste management
- Desertification and natural disasters
- Exposure to industrial and household risk factors

Ultimately, it was recognised that health security can only be achieved through a healthy environment.

With particular relevance to environmental health research, the Libreville Declaration (2008) committed nations to:

- Building national, sub regional and regional capacities to better prevent environmental related health problems through establishment or strengthening of health and environment institutions
- Support knowledge acquisition and management in the area of health and the environment through applied research at national, sub regional and regional level while ensuring coordinated of scientific and technical publications so as to identify knowledge gaps and research priorities.
- Setting up national monitoring and evaluation mechanisms to assess performance in implementing priority programmes and peer review mechanisms to learn from experience
- Developing partnerships for targeted and specific advocacy on health and environmental issues aimed at institutions and communities including youth, parliament, local government, educational institutions, civil society and private sector.

The African Union also highlighted environmental health as a key area within their African Health Strategy 2007 – 2015, documenting that prevention is the most cost effective way to reduce the burden of disease. In particular they emphasised the need for environmental health promotion,

rural development in communities and urban strategies to address informal settlements. The Strategy also emphasised the importance of effective monitoring and evaluation of programmes and the need for evidence as a basis for sound public health policy and practice (AU, 2007).

4.2.2 Malawi Context

The work of the environmental health practitioner in Malawi is primarily based in either government or the various nongovernmental organisations operating in the country. The profession is prolific and includes a wide range of areas including:

- Food hygiene and safety
- Occupational health and safety
- Built environment
- Pollution control
- Community health (including infectious diseases, child health, nutrition, non communicable diseases, animal health and health systems)

EHPs may work in all or one of these areas depending on their roles and responsibilities.

At present, environmental health based research and work is located in four main sectors:

- Government
- Nongovernmental
- Academia
- Private Sector

At Government level, environmental health related work is conducted within the Ministries of Health, Irrigation and Water Development, Labour, Agriculture and Department of Environmental Affairs. However, the core of environmental health duties are coordinated from the Ministry of Health under the Directorate for Preventive Health Services and the Chief Environmental Health Officer therein. In addition a wide range of community based and industry based work is conducted by environmental health practitioners in nongovernmental organisations and the private sector. Environmental health related training and research are conducted at the University of Malawi and Malawi College of Health Sciences.

With this in mind, the wealth of research and data within the various sectors of environmental health are far spread and a lack of consolidation between government ministries, academic institutions and nongovernmental organisations means that accessing up to date research and data is extremely difficult. In addition, the majority of research projects relate directly to intervention programmes and specific geographical areas which means the information is not always shared on a national basis, and organisations or government workers do not realise their work can be categorised as research. This problem is perpetuated by the lack of a current environmental health policy. An example of the lack of coordination was the recent 2nd IFEH Africa Group All Africa Environmental Health Congress which took place in Lilongwe from 24th – 27th May 2010. There were a large number of papers presented from within Malawi on research in food safety, occupational health and safety, waste management, water and sanitation, community health, policy development, climate change, disaster risk management and training and development. Nevertheless the majority of this research had not been previously disseminated in Malawi.

Literature on the specific areas of environmental health are detailed within the appropriate sub themes. However in terms of holistic environmental health literature, much of this pertains to policy development as detailed above.

4.3 Interviews and Respondents

Key informants were interviewed as detailed in Figure 5. Examination of existing reports and key informants, indicated that environmental health is a wide subject area where emphasis on research priorities is dependent role of individuals approached. The key informants included in this section were deemed to be individuals with an understanding of environmental health as a whole. The questionnaire used for the Chief and District Environmental Health Officers was adapted to allow them to answer on all areas of the profession (Appendix 3). The details of the specific sections are detailed under sub themes, where the comments received from both key informants who specialise in the subtheme and EH specialists are combined.

In academia it was ensured that all training colleges for environmental health practitioners were included and that practitioners were represented from both Ministry and District level (South, Central and North). Appropriate representation was also sought from nongovernmental organisations with an interest in environmental health.

Figure 5 Key Informants for Environmental Health Gap Analysis



4.4 Current priorities in Environmental Health in Malawi

As detailed above there is currently no formalised environmental health policy in Malawi, to inform research although a working group is currently developing such a document for approval. The impact of this lack of direction was well outlined by one informant with the quote *“Research in environmental health in Malawi is quiet so it is not easy to establish the priorities”*

Although no specific research priorities were indicated by key informants or Government documentation, a number of sub themes were indicated as priority areas for the profession to undertake. In particular, respondents indicated the following areas as priorities for the sector:

- Water and sanitation
- Food safety and hygiene
- Waste management
- Control of epidemics and disease
- Emergency and disaster management
- Health education and promotion
- Climate change and health
- Environmental health impact assessment
- Port health
- Health and safety

Specific details of each of these sectors are given within the appropriate sub headings and sub themes.

4.5 Recommended research priorities for Environmental Health

Examination of existing reports and key informant questionnaires indicated environmental health is often neglected to the benefit of more high profile curative health research. As such there is a low level of research currently ongoing in Malawi. Nevertheless, EHPs working in the professional are well versed in the areas which need to be addressed and the current barriers to achieving this.

Priority Setting

Prioritisation of key research priorities in terms of the five criteria was determined by key informants as follows:

1. Potential for disease burden reduction
2. Expected impact of the research
3. Feasibility of the research
4. Contribution to capacity strengthening for research in Malawi
5. Effect on equity and social justice

Taking these factors and priorities into consideration, the subthemes for environmental health were prioritised as detailed in Figure 6.

Figure 6 Priority Subthemes for Environmental Health with specific recommended areas of research

Priority subtheme	Recommended areas of research within sub themes				
Communicable disease surveillance	Assessment of data collection and reporting systems	Assessment of recording systems and data analysis	Assessment of effective use of data for planning		
Water and Sanitation	Improvement of drinking water supply	Assessment of household water storage and treatment	Sanitation promotion (including EcoSAN)	Monitoring and evaluation of rural sanitation programmes	
Food Safety and Hygiene	Training and development of enforcement staff and food handlers	Development, monitoring and evaluation of risk assessment in food	Microbiological standards of food in commercial premises	Assessing current levels of food poisoning	Development of effective legislation and policy
Health Promotion and Education	Training and development for IEC officers	Monitoring and evaluation of health promotion materials	Effective use of mass media	Implementation, monitoring and evaluation of health city and healthy village initiatives	Testing and assessment of alternative health education methods
Pollution Control	Climate change and its effects on health	Assessment of indoor and outdoor air pollution	Assessment of hazardous and non hazardous waste disposal	Assessment of water course pollution	Use and efficacy of environmental impact assessments
Occupational health and safety	Working conditions and their impact on health	Machinery safety and impact on work related accidents	Exposure of workers to hazardous chemicals and substances	Effects or uranium mining and levels of radioactivity in Northern Malawi	Assessment of ergonomic standards in working environments

It must be borne in mind that these priorities are very generalised due to the key informants responding on all areas of EH and not just one specific area. As such more detailed outlines of research needs under these subthemes are given below and are combined with these to identify final research priorities for EH.

4.6 Anticipated Challenges and Opportunities in Environmental Health

Environmental health is the key to prevention rather than cure in the health sector. Effective management and implementation of the various sectors within the profession have the potential to reduce disease burden and thereby reduce the impact on health services and facilities as well as impact on poverty reduction. With this in mind it is essential to environmental health is given adequate priority within the national health research agenda to allow effective policies and frameworks to be developed and implemented to make theory a reality. Nevertheless, there are four main barriers to this research being conducted in Malawi at the current time.

1. Research capacity and motivation in terms of human resources

There is currently a lack of effective research in the sector and this is compounded by a general lack of understanding of the role of environmental health within the health sector and civil society. This has led to a lack of motivation and prioritisation for the profession and as such research has not received a high level of interest. There is also the misconception that research is purely based at academic institutes and cannot be managed and undertaken by professional staff at national and district level. In fact a large proportion of the intervention projects and research is undertaken by these groups in conjunction with institutions and non-governmental organisations, and we must change the mindset of professionals to also see these as research programmes which can inform and influence future policy and development. This was encapsulated in recent feedback from the 2nd All Africa Environmental Health Congress (Malawi 2010) which indicated that *“there should have been more presentations from practising EHOs and not just research from academics”*

2. Research capacity in terms of infrastructure

A number of areas of research can be effectively conducted with minimal need for equipment and laboratory facilities. However, there are some areas of research recommended which will require adequate resources in terms of specific equipment, skills sets and facilities if they are to be undertaken and provision must be made for these.

3. No current priorities or awareness of ongoing research

Throughout the general and sub theme interview with key informants it is consistently clear that at all levels people are not aware of the research that is going on within Malawi. Responses varied from *“no research being conducted in environmental health”* to district or organisation specific research. The development of the NHRA and the EH policy should help to alleviate some of these issues.

4. Financial constraints

One respondent indicated that *“funding arrangements are not always clear”* and this tone was perpetuated with all informants. Lack of awareness of where to identify funding and how to approach donors or government for specific funding was seen as a major constraint.

To overcome some of these challenges, an improved level of advocacy needs to be launched regarding environmental health and Malawi needs to integrate with the current regional developments within the sector. For example, the Africa Academy for Environmental Health (www.ifeh.org/afa) is a continental network of universities offering courses in environmental health. The Academy is a body of academic institutions, organisations representing environmental health professionals and expert practitioners for the advancement of the science and practice of environmental health in Africa to represent academic institutions and the Africa Group of IFEH and to promote the interest and uphold the status of environmental health training in Africa. This network also offers opportunities for collaborative research on a regional basis and to learn lessons from other countries on similar areas of work.

Another example is the recently launched The African SNOWS (Strengthening Research Capacity in Environmental Health), a collaboration between African and European countries through the Wellcome Trust. Once again this group offers the opportunity for Malawi to become involved in continental and regional research which can influence policy at a local and international level.

4.7 Information and Dissemination

Overall, it is clear from informant responses and literature reviews that within Malawi there is currently little scope for regular and effective dissemination of environmental health research. A number of forums were mentioned by informants which were utilised for information dissemination including:

- Annual environmental health review meeting (Government)
- College of Medicine research dissemination conference
- National AIDS Commission conference
- Publications in professional magazines and journals
- Moyo Magazine (Government)

Nevertheless, there are no specific areas for the profession to link academic, developmental and governmental research experience and information. Such a forum would offer a platform for EHPs to share practical research and intervention experiences, increase motivation and improve collaboration and the interface between researchers, government and the implementers. As internet access improves across the country, these networks can be in the form of electronic groups or newsletters and may be coordinated through the Malawi Environmental Health Association, University of Malawi or Ministry of Health. An example of such a group is the <http://aaeh-network.ning.com> which is used by the Africa Academy for Environmental Health for networking purposes. Websites have also been created in other countries for networking and information sharing such as the environmental health research network for South Africa (www.ehrn.co.za) which offer other forums for information sharing and are more widely accessible to people from outside the country and networking group.

The possibilities for a journal or professional magazine specifically for environmental health issues should also be considered. At present environmental health papers may be published in journals related to the specific sub theme, or to the International Journal of Environmental Health Research. Nevertheless there is no specific continental journal at this time. It is recommended that the launch of an African Journal of Environmental Health could be explored to be based in Malawi in partnership with the Africa Academy for Environmental Health.

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5.0 Disease surveillance and Epidemiology

5.1 Introduction

Communicable diseases remain the most common health condition the prevalence of which results in huge social, economic and quality of life losses in the African continent. Malaria, Diarrhoea Tuberculosis, AIDS and Meningitis are still killing millions of people each year. Cholera has become endemic in most countries in the continent. Wild polio virus is being reintroduced in countries where polio had disappeared for more than 3 years. Despite success against measles mortality, this disease continues to kill in many countries, and we are still address many of the issues pertaining to neglected tropical diseases (Bowie, 2006).

In terms of the Gap Analysis being undertaken, it was felt that the issue of communicable disease status in Malawi was being addressed under the infectious disease theme. Therefore, to minimise duplication, this analysis addressed primarily the issue of disease surveillance and it's relevance to the field of environmental health.

5.2 Literature Review

5.2.2 African Perspective

Strengthening disease surveillance capacity allows countries to more effectively identify disease prevention priorities, plan for the best possible health of their populations, sensitise beneficiaries, focus on evidence based interventions that work and monitor the trends to show impact as well as to detect issues to address. Since 1998 countries in the WHO African Region have adopted the integrated disease surveillance (IDS) strategy, one of which is Malawi. (www.afro.who.int)

In order for disease surveillance systems to work effectively, people at different levels of surveillance need to report accurate, timely and reliable data to national authorities, to ensure timely and effective responses to contain communicable disease outbreaks. In addition donor support may be needed to secure funding to strengthen surveillance and response activities to communicable diseases. Most importantly, all surveillance levels in countries should be able to utilize the surveillance information locally to address and resolve problems related to control of communicable diseases. (WHO 2004).

Nevertheless barriers continue to be met in the implementation of the IDS, the majority of which are affected by a lack of human and infrastructural capacity.

In addition to the WHO implementation, support and development, there are a number of coordinating groups such as Southern Africa Centre for Infectious Disease Surveillance (SACIDS) (www.sacids.org), East African Centre for Infectious Disease Surveillance (www.eac.int/eaidnet/) and Connecting Health Organizations for Regional Disease Surveillance (CHORDS) (<http://www.ghsi.org/projects/chords.html>), however Malawi is not currently a member of any of these. All funded through the Rockefeller Foundation and other donors, the centres are currently focussed on research in the following areas:

- Disease including plague, rift valley fever, tuberculosis and foot and mouth disease
- Use of data and collection in terms of epidemiological skills, use of mobile technologies, resource mapping, one health geospatial analysis.

They are focussed on capacity building, increased collaboration and networking between countries and regions and support for the implementation of the International Health Regulations 2005.

5.2.2 Malawi Perspective

Of the top 10 leading causes of mortality in Malawi, six are infectious diseases and account for over 60% of deaths and disability in the population (Bowie, 2006). Risk factors associated with these diseases are primarily controlled through effective environmental health practices, for example, improved water, sanitation and hygiene, reduction of smoke inhalation from solid fuels, effective immunisation programmes at community level, etc. Nevertheless, we are still ignorant of the epidemiology and prevalence of these diseases in Malawi.

A number of studies have been conducted on the prevalence and epidemiology of specific diseases within Malawi which are expected to be reported in terms of the infectious disease thematic area. As such this section pertains only to the disease surveillance mechanisms currently used in Malawi and their efficacy in monitoring disease, facilitating effective planning and informing policy.

As in many developing countries, lack of reliable data and grossly inadequate appreciation and use of available information in planning and management of health services were two main weaknesses of the health information systems in Malawi. However, as outlined by Chaulagai et al (2005) no matter how good the design of an information system, it will not be effective unless there is internal desire, dedication and commitment of leadership to have an effective and efficient health service management system. There continues to be limited capacity to utilise information for evidence based decision making despite there being a comprehensive policy on health management information systems (HMIS)(WHO, 2009). To date, HMIS data collection tools have not been adequately adapted to ensure they inform the Sector Wide Approaches (SWAp) programme of work.

Data at the Ministry of Health is collated in line with the IDS by both the Department of HMIS and the Epidemiology Unit and District level throughout the country. The data collated includes:

- Integrated disease surveillance and response
- Health statistics (reported quarterly)
- Logistics for drugs and supplies
- Integrated financial management
- Human resources
- Infrastructure and physical systems

The Epidemiology Unit was set up under the Ministry of Health in 2000 but was not fully functional until 2003. Based at the Clinical Health Services Unit, the role of the department is to monitor fifteen priority diseases although they are not specifically coordinated with the HMIS section. Weekly and monthly reports should be produced for distribution to stakeholders in Malawi, however this system is not currently working effectively.

At a national level, data is also collected every four years for the national household and demographic survey by the National Statistics Office in Malawi. The outcomes of these surveys are fully published for national and international distribution. However, there is often a significant delay between data collection and publication. Further analysis of data from NSO surveys has also shown distinct geographical differences in the distribution of disease which could influence the effective delivery of health services if used in planning and development (Kandala et al 2006).

The World Health Organisation continue to support and play a key role in IDS in Malawi and are currently prioritising disease monitoring, control and treatment of leprosy and schistosomiasis.

In addition to the government surveillance systems, other research groups have been conducting surveillance in Malawi using alternative methodologies.

Karonga Prevention Study

The Karonga Demographic Surveillance System (DSS) which was implemented in 2002 as part of the Karonga Prevention Study (www.lshtm.ac.uk/ideu/kps/). This data is collected at household level and includes health data with reference to health passports and is also recorded on a GIS system. Data is updated on a monthly basis using a key informant system. An evaluation of this system and the potential for rolling it out to other geographical areas is currently under the HRCSI workplan to strengthen the platform for multidisciplinary research in Malawi.

Other projects

It is also important to note that other programmes and projects throughout Malawi have utilised government data and government employees to collect data for monitoring and evaluation. As detailed in the water and sanitation subtheme, this data is often not effectively used in project management and planning or to inform others. In addition, organisations often find that despite training and careful development of reporting forms, the low level of education and literacy in health cadres such as health surveillance assistants leads to poor quality data being produced which cannot add value or allow effective planning (Morse 2006)

More recently, new technologies are also be utilised to improve the efficacy and accuracy of data reporting for planning purposes. Examples of these include mobile technologies, which are currently being tested in Malawi through partnerships between SMSFrontline (www.frontlinesms.com) and Christian Hospitals Association of Malawi (St Gabriels, Namitete)and Management Sciences for Health (<http://www.msh.org/global-presence/the-malawi-program.cfm>), and digital pen technologies being tested by the Food and Agriculture Association of the United Nations (FAO) (<http://www.unmalawi.org/agencies/fao.html>) for monitoring animal health which can be easily translated for use in the health system. These systems are still relatively new to Malawi but appear to have potential to increase the speed with which data can be collated and accuracy of that data.

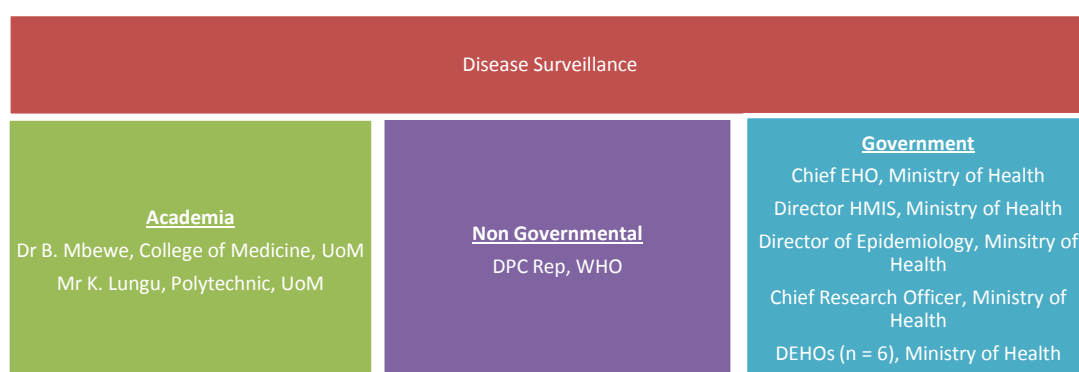
5.3 Interviews and Respondents

Key informants were interviewed from Government, academia, and donor sector as detailed in Figure 7

Interviews were all conducted using the semi structured questionnaire and were used to determine:

- Current policies, priorities and research in disease surveillance
- Perceived research priorities for the informant for disease surveillance in Malawi
- Anticipated Challenges and opportunities for research in disease surveillance in Malawi
- Role if information dissemination in the field of disease surveillance in Malawi

Figure 7 Key Informants interviewed for gap analysis in Disease Surveillance and Response sub theme



5.4 Current Priorities for Disease Surveillance and Response in Malawi

In terms of current priorities, disease surveillance is being conducted in accordance with the Health Information Systems Policy and Strategy (2003) which is in line with the IDSR to collate data on over 110 indicators on a quarterly basis. The emphasis is on routine facility data and population data in terms of the National Demographic Survey. Many of the activities conducted in terms of epidemiology are action orientated to respond to identified outbreaks such as measles, cholera etc, and other structured activities are related to donor priorities although are conducted through Ministry of Health structures. Despite outlined uses of data and methods for conversion of information to knowledge, key informants indicated in all cases that these systems are not currently working effectively.

5.5 Recommended research priorities for Disease Surveillance and Response

Examination of existing reports and key informants, indicated disease surveillance and response is widely recognised as an essential factor in the health sector and the need for evidence based policy development and implementation. Nevertheless despite a high number of inputs to the sector there still remains an uncoordinated approach which is restricting the value of the data collected. This is for a number of reasons:

- Lack of skilled human resources in the collection, recording, analysis, interpretation and use of data
- Lack of coordination between government departments and other related organisations to maximise the use of data
- Lack of cohesion between the current IDSR and the SWAp indicators

This is reflected both through key informants and literature which indicated a need to consolidate and coordinate the current systems to become more effective, and therefore research and development is needed in this area to identify the most effective way forward.

In summary areas for recommended areas of research in Malawi were as follows:

- Evaluation of the quality of data coming from health facilities
- Triangulation of the Karonga Prevention Study DSS data with facility data to assess the quality and differences between the two.
- Analysis of how data is being utilised to facility, district, zonal and national levels in planning of health services and fund allocation.
- Analysis of whether data collectors know why current data is being collected and how this is affected in terms of technical, behavioural and organisational issues.
- Identification of how the burden of disease can be accurately monitored for the 15 priority diseases.
- Evaluate the outcomes for cases of the 15 priority diseases
- Identify effective interventions to reduce the burden of disease
- Assess the current prevalence and epidemiology of neglected tropical diseases in Malawi
- Effective monitoring and evaluation of existing intervention programmes to inform planning and policy development
- Studies to determine drug resistance to specific priority and neglected tropical diseases.

The strong role played by environmental health practitioners and their role in the supervision of health surveillance assistants in data collection was reflected in the responses of those covering environmental health as a whole. As detailed in the environmental health overview (Section 4) disease surveillance was the top priority for environmental health practitioners. Once again issues

pertaining to data collection and reporting/recording systems, use and management of data were raised as areas requiring further research. This was particularly emphasised for the diseases including; diarrhoea, malaria, tuberculosis, HIV/AIDS, schistosomiasis, and emerging infectious diseases.

Prioritisation of key research priorities in terms of the five criteria were established from key informants as follows:

1. Potential for disease burden reduction
2. Feasibility of the research
3. Contribution to strengthening research capacity in Malawi
4. Expected impact of the research
5. Effect on equity and social justice

All respondents indicated the importance of informing policy and allow effective strategies to be developed and implemented on a national basis. However, feasibility was ranked as an important factor when taking into consideration the current lack of human capacity to fulfil some of these research areas. The emphasis of the HRCSI on the need for training in biostatistics, epidemiology, health economics, health systems and demographics should provide increased capacity within the country to facilitate some of these areas of research. However the value of collaboration with other organisations and countries to gain objective analysis cannot be underestimated.

In terms of feasibility, impact and equity, the majority of these research areas are currently achievable in Malawi given adequate human and financial resources as they are primarily aimed at assessing the current systems for efficacy and necessary changes (Figure 8).

Figure 8 **Priority Research Areas for Disease Surveillance and Response**

- 
1. Assessment and evaluation of reporting systems in terms of:
 - Improving the accuracy of how the burden of the 15 priority diseases can be monitored and recorded.
 - Current prevalence and epidemiology of neglected tropical diseases
 - Efficacy of new technologies in reporting accurate data.
 - Coordination between recording systems and indicators required to be reporting through the SWAp.
 2. Assessment and evaluation of the quality of data collected in terms of:
 - Community based data
 - Facility based data
 - Alternative data collection systems, e.g. Karonga Demographic Surveillance System
 - Comparison of community based data and facility based data systems
 - Knowledge attitudes and practices of data collectors and the affects of technical, behavioural and organisational factors
 - Burden of disease and outcome of cases for the 15 priority diseases
 3. Assessment and evaluation of how data is utilised in terms of:
 - Facility, district, zonal and national planning
 - Policy development and implementation

5.6 Anticipated Challenges and Opportunities

Despite significant progress in the development of disease surveillance systems over the last decade there still remain a number of areas which require to be research and developed further to have an effective and efficient disease surveillance and response system in Malawi. All respondents and available literature in terms disease surveillance and response referred to the lack of collaboration and effective use of data in planning and policy development. However important to note was the awareness of key informants of the weaknesses in the current system and the clear identification of the research needs within the subtheme to overcome these.

Research in these areas has the potential to allow the Government of Malawi to find tangible ways to overcome the current obstacles in disease surveillance and response in Malawi. Nevertheless this must be combined with the political and technical will to increase collaboration and coordination between the relevant stakeholders in this sector. It is also important to ensure that Malawi is participating in available collaborative groups and research networks on a regional, continental and international scale to help overcome gaps in expertise and resources and to build capacity within the country for future research and intervention programmes.

The current work plan for the National Commission for Science and Technology through the HRCSI programme has already identified gaps in Malawi based expertise in terms of surveillance and response related skills and is providing funds for training to build capacity within the country. This will support research in the priority areas identified above and will consequently inform policy and system developers on how these systems can become more effective.

5.7 Information and Dissemination

Regular reports and updates should be produced by all relevant government departments to outline epidemiological and disease surveillance data. Although collated on a monthly basis these data are not always available in a timely manner and therefore may not inform needs in health services as quickly as possible. Districts must also learn the value of the data they are collecting to accurately inform overall management and service delivery at their facilities

Future research in this area should include academic institutions to maximise the use of the data during analysis and gain objective views on outcomes.

Members of the relevant government departments should be invited and present at all review meetings and technical working groups to ensure health professionals from all sectors are well versed in current data

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6.0 Water and Sanitation

6.1 Introduction

Water and sanitation are environmental and health issues to their very core, and together constitute one of the top drivers of development. Managing water supplies so they become neither depleted nor polluted, and providing good sanitation, are central to the health of communities and the environment on which they depend (www.irishaid.gov.ie).

Poor water and sanitation provision can affect entire communities: one person's bad sanitation is another's contaminated food or water. Even piped systems, if poorly managed, can concentrate any "downstream" problems — such as pollution in rivers, lakes and seas — and further degrade wildlife habitats and contribute to human health problems. Where water and sanitation deficiencies are severe, there are likely to be a range of serious public health hazards (www.irishaid.gov.ie).

Infants, children and women are affected most profoundly by inadequate water supply or sanitation. Water and sanitation-related diseases hit infants and children hardest, while women bear the brunt of responsibilities, as it is usually they who nurse the ill. The horrendous health statistics typically linked to inadequate water and sanitation are merely the most easily quantified aspect of a more far-reaching burden. (www.irishaid.gov.ie).

Health is rarely the only motive for people wanting better water and sanitation. Collecting and carrying water (Robson et. al., 2010), and dealing with the consequences of sanitary deficiencies, can be both gruelling and demeaning. As these tasks fall mainly to women and children they constitute a serious social and economic problem. Water and sanitation are recognized as human right issues (Figure 9).

Figure 9: The human right to water

In 2002 the Committee on Economic, Social and Cultural Rights — which operates under the Office of the UN High Commissioner on Human Rights — made the unprecedented move of declaring water a human right.

In a "General Comment" interpreting the provisions of the International Covenant on Economic, Social and Cultural Rights, it said:

Water is fundamental for life and health. The human right to water is indispensable for leading a healthy life in human dignity. It is a pre-requisite to the realisation of all other human rights.

The Committee further defined five core aspects of the water we are all entitled to:

The human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses.

What this means is that the 145 countries that have ratified the Covenant must now work to ensure access to safe, secure water and sanitation for their people.

Source: www.irishaid.gov.ie

6.2 Literature Review

6.2.1 African Perspective

In 2008, 884 million people worldwide – 37% of whom live in Sub-Saharan Africa – lacked access to improved sources for drinking-water (WHO/UNICEF, JMP 2010). Furthermore, 2.6 billion people – representing half the developing world - lack access to improved sanitation. Of these, 69% are in sub-Saharan Africa (WHO/UNICEF, JMP 2010). As a result of these appalling figures, infants and young children are innocent victims of the worldwide failure to make safe drinking water and improved

sanitation services to impoverished people. In sub-Saharan Africa alone, some 769,000 children under 5 years of age died annually from diarrhoeal diseases in 2000 – 2003 (WHO/UNICEF JMP 2005). This means that more than 2000 children’s lives lost every day, in a region where just 36 percent of the population has access to hygienic means of sanitation. Compared to developed countries, a baby in sub-Saharan Africa has almost 520 times the chance of dying from diarrhoea compared with a baby born in Europe or the United States of America (UN, 2005).

6.2.2 Water and Sanitation in Malawi

6.2.2.1 Drinking Water

Poor access to water, inadequate sanitation facilities, and ineffective hygiene practices are problems affecting many Malawian homes. While 80% of Malawians obtain drinking water from an improved water source (such as a public tap), maintaining those sources is a challenge: breakdowns are frequent, spare parts hard to obtain, and repairs consequently slow and difficult to make (NSO and UNICEF, 2008). Distance frequently makes collecting clean drinking water burdensome: nearly 45% of households require more than 30 minutes to reach the nearest improved source (NSO and UNICEF, 2008).

Access to safe water is higher in urban areas than in rural areas. In 2008, 95% of urban population had access to safe water compared to 77% for rural areas (WHO/UNICEF JMP, 2010). The official government statistics on the website indicate that the overall provision of water supply and sanitation services in the country has improved significantly. Access to improved water supply increased by about 3% (from 73% in 2004 to 76% in 2008) [http://www.commonwealth-of-nations.org/Malawi/Water/Ministry_of_Irrigation_And_Water_Development/welcome]. However, these official statistics are misleading and hiding the scale of the problem.

The Government of Malawi (GoM) recognizes the problems and challenges in water resource management and considers this one of the priorities of its national development agenda. The National Water Policy (NWP) of 2005 addresses resource management and development; water quality and pollution control; water utilization; disaster management; and institutional roles and linkages. The vision statement—“Water and Sanitation for All, Always”—embraces and reflects GoM’s overall development objectives of poverty reduction and economic prosperity (GoM, 2005).

Nevertheless in a presentation in 2010, Gondwe and Mamba highlighted the continuing problems being faced in rural and urban water supply, namely:

1. Challenges for Rural Water Supply
 - General lack of capacity at the district and community levels to manage water supply systems
 - Increasing rate of water resources degradation requiring change of design to incorporate installation of water treatment plants
 - Scarcity of spare parts
 - Ineffective management information systems
2. Challenges for Towns and Cities
 - Low level of investments in infrastructure development (i.e. dams) and ageing infrastructure
 - Rapid population increases and unplanned settlements
 - Proliferation of point water sources mainly due to unreliability of supply
 - Inadequate and unreliable water sources due to the degradation of catchment areas resulting in increased levels of pollution

6.2.2.2 Sanitation

Sanitation has long been a poor cousin of water. According to the UNICEF/WHO 2010 Joint Monitoring Programme (JMP), in 2008, overall only 56% of Malawi population had access to improved sanitation, 27% shared unimproved sanitation facilities, 8% use unimproved sanitation facilities and 9% practice open defecation. However, according to the National Sanitation policy document access to improved sanitation is estimated to be between 25% and 33%, dropping to less than 7% in some rural communities (MoIWD, 2008). With respect to access to sanitation, 51% of urban population compared to 57% of rural population had access to improved sanitation in the same year (WHO/UNICEF JMP, 2010)

The use of these figures can often be misleading and Water for People (*info@waterforpeople.org*), maintains that the usefulness of the figures depends on the definition of “safe” or “adequate” sanitation, as almost all the facilities in Malawi are traditional pit latrines that do not prevent faecal–oral disease transmission. Furthermore, Water for People claim that statistics for urban water coverage mask the situation in the unplanned settlements, which are excluded from official statistics, or do not account for the significant percentage of non-functioning facilities, currently estimated at about 33% countrywide (*info@waterforpeople.org*),

The WHO/UNICEF Joint Monitoring Programme (JMP) has defined a set of categories for “improved” and “unimproved” sanitation facilities and drinking-water sources that are used to analyse the national data on which the MDG trends and estimates are based.

An improved sanitation facility is one that hygienically separates human excreta from human contact. An improved drinking-water source is one that by the nature of its construction adequately protects the source from outside contamination, in particular with faecal matter.

Figure 10 Comparison of improved sanitation and water supply

IMPROVED SANITATION	<p>Use of the following facilities:</p> <ul style="list-style-type: none"> • Flush or pour-flush to: <ul style="list-style-type: none"> • piped sewer system • septic tank • pit latrine • Ventilated improved pit (VIP) latrine • Pit latrine with slab • Composting toilet 	<p>Use of the following facilities:</p> <ul style="list-style-type: none"> • Flush or pour-flush to elsewhere (that is, not to piped sewer system, septic tank or pit latrine) • Pit latrine without slab/open pit • Bucket • Hanging toilet or hanging latrine <p>Shared facilities of any type</p> <p>No facilities, bush or field</p>	UNIMPROVED SANITATION
IMPROVED DRINKING-WATER	<p>Use of the following sources:</p> <ul style="list-style-type: none"> • Piped water into dwelling, yard or plot • Public tap or standpipe • Tubewell or borehole • Protected dug well • Protected spring • Rainwater collection 	<p>Use of the following sources:</p> <ul style="list-style-type: none"> • Unprotected dug well • Unprotected spring • Cart with small tank or drum • Tanker truck • Surface water (river, dam, lake, pond, stream, canal, irrigation channel) • Bottled water⁷ 	UNIMPROVED DRINKING-WATER

Source: WHO/UNICEF, 2010

6.2.2.3 Water, Sanitation and Hygiene

Most important to the impact in human health in this subtheme is the combination of water, sanitation and hygiene and the synergistic effect these elements have in the reduction of diarrhoeal

disease at household level. The importance of combined research and development in this area has been consistently highlighted in project reports and is now being effectively implemented in a primary school programme developed by UNICEF/Malawi.

6.2.2.4 Water and sanitation research in Malawi

Regarding water and sanitation research in Malawi, work has been done in water and human health, to assess water quantity and quality (Vazquez, 2008; Gutierrez, 2007; Lockwood et.al, 2006), low cost water treatment technologies (Madhlopa and Jonstone , 2008, Kumwenda et al. 2010), assessment of water and sanitation vis-à-vis meeting MDG targets (Manda, 2009; Misunje, 2008; Mtungila, et.al. 2008; Millennium Project,2004), poor environmental sanitation and water pollution (Palamuleni, 2002), detection methods and situation analyses to assess pathogen presence in water for drinking, human health risk assessments for microbes and chemicals, water sanitation and hygiene (WASH) (Save the Children; 2008), management and sustainability of communal water kiosks (WaterAid Malawi,2007), and water distribution networks/systems (Tanyimboh et. al, 2008, UNICEF 2010). Also, studies have looked at groundwater chemistry, characteristics of aquifers and development (Bath, 1980; Chilton and Smith-Carington, 1984; Lewis, W.J. and Chilton, P.J. (1989).), ecological sanitation - general awareness (Semu-Banda, 2007; World Bank, 2007; Sugden, 2003), feasibility of compost latrines in urban primary schools and the current state of WASH in primary schools (Chunga, 2009, MEST, 2009), cost of ecosan compost vis-à-vis synthetic fertilizers (Gremu, 2005), social cultural aspects of ecosan in rural Malawi (Lungu et.al. 2010), opportunities and challenges of ecosan implementation (Lungu et. Al. 2008), and effectiveness of ecosan in human waste management (Tsirizeni, 2004), availability and use of household latrines (Grimason et. al. 2000; Lungu et. al 2010) and impact of school sanitation on attendance (McPhedran et. al., 2010).

6.2.2.4 Policy development and implementation

One of the main hurdles in the development of the water and sanitation sector is the number of stakeholder and policies which affect it. In general the sector includes Government, Non-governmental organizations, UN agencies, consultancy firms, hydrogeologists and the academia. In terms of policies, the water and sanitation sector is governed and regulated by policies and statutes which are often within different ministries and government departments and include:

- National Water Policy (2005),
- National Sanitation Policy (2008),
- National Environmental Policy (2004),
- National Gender Policy (2000),
- National Decentralization Policy (1998),
- Waterworks Act (1995),
- Water Resources Act (1969)
- Environmental Management Act (1996).
- Local Government Act (1998)

Compounding this is the large number of NGOs working in water and sanitation in different areas of the country (Appendix 4), each with their specific agenda, and a lack of collaboration with other organisations and government to ensure lessons are learned and use of funds is maximised.

6.3 Interviews and Respondents

Interviews were held with stakeholders in government (central and local), donor/development partners, academia and non-governmental organizations (Figure 11). Due to time constraints, stakeholders in water boards were not reached. However, these deal more with operational problems (supply and demand issues) than environmental health research.

Figure 11: Key informants interviewed for gap analysis in water and sanitation sub-theme



6.4 Current priorities for water and sanitation in Malawi

According to the Joint Sector Review 2009 (Anon, 2010), the following were adopted as priorities for water and sanitation in Malawi:

- Increased supply to meet demand of growing urban population
- Operation and maintenance framework for rural water supply
- Capacity building in the sector – e.g. training in all areas
- Identification of catchment areas that need protection
- Identification of locations for multi-purpose dams
- Conduct survey for access to safe water
- Establish water supply systems in growing market centres
- Review the water resources monitoring system
- Enactment of water resources bill
- Management of water-related disasters
- Development of guidelines for effective water allocation
- Lobby government to fill existing vacancies in MoIWD

In general, those interviewed were not aware of the current priorities for water and sanitation in Malawi other than what their institution's priorities were. The following were reported to be the current priorities in Malawi:

- Increasing access to safe drinking water and improved sanitation facilities in both urban and rural areas
- Use of participatory approaches (e.g. CLTS and PHAST) in sanitation promotion
- Promotion of ecological sanitation and other low cost sanitation technologies
- Operation and maintenance of water points
- Water quality treatment and monitoring at household level
- Promotion and use of hand washing facilities

6.5 Recommended research priorities for water and sanitation

Prioritisation of key research priorities in terms of the five criteria was determined by key informants as follows:

1. Potential for disease burden reduction
2. Feasibility of the research
3. Expected impact of the research
4. Contribution to strengthening research capacity in Malawi
5. Effect on equity and social justice

Taking these factors and priorities into consideration, the research priorities for the water and sanitation sub theme detailed in Figure 12.

Figure 12 Priority Research Areas for Water and Sanitation

1. Assess access to sustainable safe water and improved sanitation facilities in Malawi
2. Determine the impact of climate change on water resources
3. Evaluate the impact of Community Led Total Sanitation (CLTS) on latrine coverage
4. Determine the sustainability of operation and maintenance of water sources
5. Assess the effectiveness water treatment options at household level
6. Assess the safety of EcoSan products (compost) from eco-toilets for agricultural re-use
7. Determine appropriate sanitation technologies for congested and informal settlements in urban areas.

6.6 Challenges and Opportunities for research in water and sanitation

Opportunities	Challenges
<ul style="list-style-type: none"> • Available qualified personnel • Access to international collaboration • Higher research feasibility • High potential to influencing policy, reducing disease burden and improving service delivery 	<ul style="list-style-type: none"> • Inadequate water and sanitation facilities • Inadequate financial resources • Limited laboratory infrastructure • Poor coordination • Lack of systematic way of information sharing • Lack of essential tools and equipment for research • Lack of commitment and interest from potential researchers

6.7 Information and Dissemination

Currently, under the collaboration of the Ministry of Irrigation and Water Development, the water and sanitation sector, holds annual joint sector reviews. The last joint sector review took place from 3 -4 December 2009. Participants to the joint sector reviews are government institutions (OPC, MPs, MoEPD, MoIWD, MoH, MoLG&RD) , development partners: ADB, JICA, Plan International, UNICEF, WHO, World Bank, and NGOs: Concern Universal, WaterAid, Water for People . Stakeholders in the private sector and consultants also participate in these reviews.

A number of stakeholders release regular newsletters and bulletins which highlight some of their activities. These tend to be nongovernmental organisations.

There are a number of annual regional conferences and workshops within the water and sanitation sector, such as the Waternet symposium (www.waternetonline.org) which is held in Southern/Eastern Africa and targets academics, policy makers and practitioners. Nevertheless it is imperative that should individuals be sponsored to attend such meetings there must be an effective means to disseminate the information gained once their return to their positions within the WATSAN sector.

Within Malawi there are also two networks for organisations working in the WATSAN sector. One of these is aimed at nongovernmental organisations, and the other by donors for the sector. If used effectively these can be an excellent interface for stakeholders to inform government of programmes and research and it must be ensured that academic institutions are also invited to these forums to provide full representation of stakeholders in the sector.

It is recommended that the following forums be considered as a means of improving information dissemination in the water and sanitation field:

- Institutional research dissemination meetings
- Newsletters and bulletins
- Joint sector reviews
- Annual water and sanitation research dissemination seminars

6.8 References and Research conducted in Malawi

The majority of interviewees were unaware of what research had been or was being done. However, from literature review, peer reviewed publications and grey literature, e.g. government policy documents and reports, the following researches have been conducted (list not exhaustive) in Malawi. Whilst some of the research work have been published, some are not and some were for postgraduate Masters/PhD Thesis and for newspaper articles.

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7.0 Food safety and hygiene

7.1 Introduction

Food safety is a public health priority; millions of people fall ill every year and many die as a result of eating unsafe food. Serious outbreaks of food borne disease have been documented on every continent in the past decade, and in many countries rates of illness are increasing significantly. The availability of safe food improves the health of people and is a basic human right. Safe food contributes to health and productivity and provides an effective platform for development and poverty alleviation (WHO, 2002)

7.2 Literature Review

7.2.1 African perspective

People are becoming increasingly concerned about the health risks posed by microbial pathogens and potentially hazardous chemicals in food. Up to one-third of the populations of developed countries are affected by food-borne illness each year, and the problem is likely to be even more widespread in developing countries. The poor are the most susceptible to ill-health. Food and waterborne diarrhoeal diseases, for example, are leading causes of illness and death in less developed countries, killing an estimated 2.2 million people annually, most of whom are children.

Diarrhoea is the most common symptom of food borne illness, but other serious consequences include kidney and liver failure, brain and neural disorders, and death. The debilitating long-term complications of food borne disease include reactive arthritis and paralysis (WHO, 2002).

Many countries, especially in Africa, still lack the necessary surveillance capacity for outbreak detection and response. In addition, food borne disease outbreaks go undetected in part, due to lack of communication between the human, veterinary, and food sectors (WHO, 2002)

Food borne illness caused by microorganisms is a large and growing public health problem. Most countries with systems for reporting cases of food borne illness have documented significant increases over the past few decades in the incidence of diseases caused by microorganisms in food, including pathogens such as *Salmonella*, *Campylobacter jejuna* and enterohaemorrhagic *Escherichia coli*, and parasites such as *cryptosporidium*, *Cyclospora*, trematodes. Approximately 1.8 million children in developing countries (excluding China) died from diarrhoea. The increased incidence of food borne disease due to microbiological hazards is the result of a multiplicity of factors, all associated with our fast-changing world. Demographic profiles are being altered, with increasing proportions of people who are more susceptible to microorganisms in food (Wong, 2010).

Changes in eating patterns, such as a preference for fresh and minimally processed foods, the increasingly longer interval between processing and consumption of foods and the increasing prevalence of eating food prepared outside the home all contribute to the increased incidences of food borne illness ascribed to microbiological organisms (WHO, 2005).

Chemicals are a significant source of food borne illness, although effects are often difficult to link with a particular food. Chemical contaminants in food include natural toxicants such as mycotoxins and marine toxins, environmental contaminants such as mercury, lead, radionuclides and dioxins, and naturally occurring chemicals in plants, such as glycoalkaloids in potatoes. Food additives and nutrients such as vitamins and essential minerals, pesticide and veterinary drug residues are deliberately used to increase or improve the food supply, but assurance must first be obtained that all such uses are safe (WHO, 2002).

Outbreaks of food borne disease attract media attention and raise consumer concern. However, cases of food borne illness occur daily in all countries, from the most to the least developed. As most of these cases are not reported, the true dimension of the problem is unknown, and efforts to secure the resources and support necessary for the identification and implementation of effective solutions often fail. However, there is no proper food -borne disease surveillance system (WHO, 2002)

7.2.2 Malawi perspective

The food safety and quality control systems in Malawi is aimed at protecting the consumer against unsafe, impure and fraudulently presented food that may be injurious to the health of the consumer and also ensure fair food trade. This is achieved through the enforcement of food laws, regulations and standards and also the implementation of programmes and projects aimed risk reduction throughout the food chain. The responsibility for food safety and quality control in the country is shared among different ministries and agencies and there are wide variations in the expertise and resources available between the key stakeholders (FAO/WHO, 2005).

Various ministries and sectors involved in food safety and quality control have their own pieces of legislation that govern their operations according to their area of focus and these include. There are no proper food safety surveillance systems (Taulo, et al, 2008). Laws at and regulations aimed at regulating and enhancing food safety have been enacted but there is no unifying policy and a single food law that regulates the issue (FAO/WHO, 2005)

There is no surveillance system that is put in place to monitor the incidence of food-borne diseases *per se* in Malawi. The Ministry of Health through the Epidemiology Unit introduced an Integrated Disease Surveillance System (IDSR) to monitor incidence disease conditions (FAO/WHO,2005). However, there is some capacity to analyze biological, chemical, heavy metals and physical food hazards at national level. There are four laboratories that are capable of analyzing food hazards (contaminants), namely Malawi Bureau of Standards laboratory, Community Health Sciences Laboratory of Ministry of Health, Central Veterinary Laboratory and Agricultural Research Laboratories of Ministry of Agriculture. Apart from the Malawi Bureau of Standards, the rest of the laboratories do not conduct analysis of food for hazards regularly largely due to lack of comprehensive national food safety programme, and inadequate skilled manpower, testing equipment and facilities. There is also generally lack of modern laboratory equipment. The Malawi Bureau of Standards, Community Health Sciences and Central Veterinary laboratories are also used as reference laboratories. (FAO/WHO, 2005)

The Malawi Bureau of Standards has the mandate to develop Malawi Standards, which include food standards. The food standards developed based on the joint FAO/WHO Codex Alimentarius Commission contain provisions of food safety. The standards cover food safety issues such as microbiological quality, food additive requirements, and levels of contaminants such as heavy metal and hygiene and sanitation standards. Other sectoral ministries and departments have also the responsibility and the mandate to develop technical guidelines to guide their operations and to ensure that food safety and quality requirements are satisfied. Ministries of Agriculture, Health, Tourism and Commerce and Private Sector Development are some of the institutions that are responsible for developing and enforcing food standards and regulations (FAO/WHO, 2005, Taulo et al., 2008).

Food safety and hygiene: Current research done in Malawi

In order to establish research work conducted in Malawi, information was obtained through comprehensive internet searches. Few published works were identified for Malawi demonstrating the low level of research work has been done in the food sector. The only published literature

retrieved was from published research work conducted by the consultant. Much of the work was on microbiological contamination, demonstrating a food safety research gap in chemical and physical contamination.

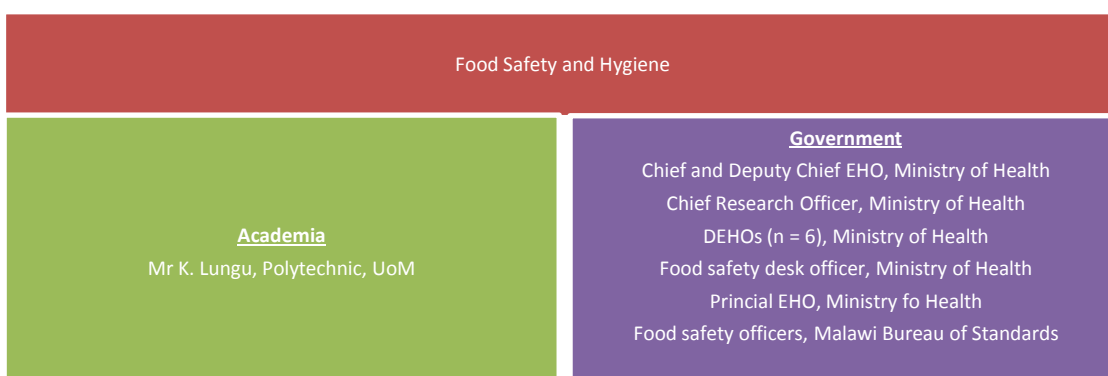
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Looking at the literature reviewed under Africa and Malawi perspectives, current priorities in food safety hinges not only on microbiological quality but also chemical and physical contamination of the food. Current literature in Malawi only reveals that research has only been conducted on microbiological contamination as shown by research work conducted by Taulo et al. (2008). Although this area of microbiological contamination has been addressed in Malawi research work, the existing literature cannot be considered to be adequate enough, demonstrating a gap in food safety research

7.3 Interview and Respondents

Interviews were undertaken with stakeholders in government and academia (Figure 13). Due to time constraints the private sector was not interviewed as a key informant but will be asked to comment on the draft report to ensure wide consultation.

Figure 13: Key informants interviewed for gap analysis in food safety and hygiene sub-theme



7.4 Current Priorities in Food Safety In Malawi

Because of lack of single coordinating Ministry or agency to enforce laws and regulations, there seems to be lack of prioritizing food safety issues. The Malawi Bureau of Standards only enforces laws pertaining to international foods. During the FDG discussion, it transpired that Officers assigned to food safety were not carrying out duties pertaining to food safety but were usually deployed to various sections, most of which are not related to food safety. The priority list presented below was obtained from reports and documents that were retrieved from the library of the Malawi Bureau of Standards as none of the officers was able to list the food safety priorities. Their only priority was microbiological testing of food samples whenever they have been requested by industries. Similarly, the Food safety desk officer for Ministry of health only mentioned capacity building as the Ministry's priority.

- Formulation of a comprehensive Food Act that will regularise the one government Ministry (Ministry of Health) to be the focal point for food safety and also encompass emerging issues in food safety and control.
- Regularization of street food vending through an Act of parliament since street food vending is recognized as an important sector in Malawi.
- Development of comprehensive guidelines for monitoring food safety and quality control.
- Development of a plan of action for consumer education and capacity building for street food vendors.
- Promotion of effective collaboration and coordination between all sectors/agencies involved in the management and control of food safety and quality through establishment of national food safety assurance steering committee to oversee the activities of foods safety. Under it a technical committee made up of members from the government ministries, regulatory bodies and other agencies involved in food safety and quality control need to be formed to perform technical tasks and report to the national steering committee.
- Training some staff in specialized areas of food safety and quality control.

The urge to identify current food safety priorities has been born out of curiosity following the visit of the consultant. Three other potential constraints in the failure to identification of current food safety priorities was sited to be "lack of flair" on the part of Food safety desk Officer at the Ministry of Health, reluctance of industry (Malawi Bureau of standard) to generate or clearly identify food safety research questions, and the absence of a national comprehensive early detection system for food safety health problems

7.5 Recommended Research Priorities for Food Safety and Hygiene in Malawi

After conducting a FGD with the Ministry of Health Environmental health officers, the following research priority list was established after a lengthy discussion. The Deputy Chief Environmental Health officer was able to articulate the discussion because she had just come back from an international conference on food safety. None of the Officers interviewed at both Ministry of Health food safety section Division and Malawi Bureau of Standards had ever done research in food safety. The list of priorities takes into consideration the priority criteria and available literature.

Figure 14 Priority Research Areas for Food Safety and Hygiene

- Assess the safety of food in terms of microbiological and chemical contamination for the following:
 - Street vended food
 - High risk and ready to eat foods
 - Foods at point of harvest
 - Foods exposed to antibiotics
 - Foods vulnerable to aflatoxin production
 - Foods at point of slaughter
- Assess hygiene practices in commercial food premises
- Applicability and use of food safety management systems in commercial businesses

7.6 Anticipated challenges and opportunities

Challenges	Opportunities
<ul style="list-style-type: none"> • There is critical shortage of food inspectors, food analysts /technicians, specialists. • Lack of comprehensive Food Act that harmonizes food safety and health issues performed by different sectors. • Weak enforcement of available Sectoral Food laws, and Local Assembly (Authority) Food By-laws • Inadequate laboratory capacity and equipment for analysis of food samples • Rapidly changing technologies in food production, processing and marketing which do not much with the current capacity of the country to keep pace. • Inadequate collaboration and coordination between different stakeholders involved in food safety and quality control. Most agencies involved in food safety issues work in parallel and there is no clear strategic plan for implementing food safety programs. • Proliferation Street Food Vending, which is not regulated at the moment. Street Food Vending has become one of the major sources of income generation for the urban and peri-urban settlers in Malawi • Inadequate awareness among the general public on the dangers of food hazards and unsafe foods to human health. Because stakeholders involved in food safety programmes work in a disintegrated, the public does not get standardized messages and information. • Malawi has no capacity at the moment to develop, test and regulate the imports as well as utilization of genetically modified foods (GM foods). This is a big challenge in light of the persistent food shortages in the country whereby food has to be imported or donated 	<ul style="list-style-type: none"> • There is some capacity to analyze biological, chemical, heavy metals and physical food hazards at national level. There are four laboratories that are capable of analyzing food hazards (contaminants), namely Malawi Bureau of Standards laboratory, Community Health Sciences Laboratory of Ministry of Health, Central Veterinary Laboratory and Agricultural Research Laboratories of Ministry of Agriculture. The Malawi bureau of Standard, Community Health Sciences and Central Veterinary laboratories are also used as reference laboratories. • There are wide variations in the expertise for food safety activities carried out by different agencies in Malawi.

Challenges	Opportunities
<p>to the country some of which could be genetically modified food.</p> <ul style="list-style-type: none"> • Limited human capacity to implement Food Safety programmes. The country does not have adequate staff to carry out food inspections, sampling and analysis. The problem is more acute in the rural areas where the majority of the people live. Most Malawians process food at household level and the safety of such locally processed foods cannot be guaranteed all the time. • Inadequate financial resources • A lot of problems are being faced in trying to enforce the above pieces of legislation because of their fragmentation and lack of coordination mechanisms between food authority agencies. • There is inadequate capacity to enforce the available Acts and Regulations. In addition, some legislation is outdated and cannot be used to address contemporary and emerging issues in food safety and quality control. 	

2.7 Information dissemination

Information dissemination and sharing on food safety remains a challenge in Malawi. It has been revealed from above that there has never been any information worth being disseminated and shared in Malawi. Studies conducted by Taulo et al. (2008) have even not been disseminated to stakeholders or the community at large. None of the stakeholders interviewed demonstrated that he/she attended any research dissemination forums regarding food safety in Malawi. During FGD forums with the stakeholders, it was strongly felt that the NCST should revitalize annual research conferences at least twice a year. Members also expressed the need to have local journals that can be used as conduits to research information sharing

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8.0 Health education and health promotion

8.1 Introduction

Health education can be defined as “any combination of learning experiences designed to facilitate voluntary actions conducive to health” (Green and Kreuter, 1991). Bandawe (2009) argues that health education is a planned activity, it is not haphazardly done. Health education is often considered under the broader term “health promotion”. The WHO have defined health promotion as “the process of enabling people and populations as a whole to increase control over their health and and those things that determine health” (WHO,2005). This definition is broader and encompasses social, economic, political and environmental factors that come into play in influencing health behaviour.

8.2 Literature Review

8.2.1 African Perspective

Health Promotion in sub-Saharan Africa (SSA) is currently facing many difficult challenges. Health status is worse than in any other region, with the midpoint data (July 2007) indicating that not a single sub-Saharan African country is on track to achieving all the Millennium Development Goals in 2015 (UN, 2007).

Lack of indicators for measuring health promotion effectiveness is another challenge in the development of health promotion in Africa. It must be stated, however, that this challenge is not limited to the continent alone; lack of such indicators is also a problem globally. Closely related to the lack of indicators is the limited research and documentation on health promotion best practice. There is still little evidence to justify specific strategy choices in health promotion programmes (Nyamwaya, 2003).

8.2.2 Malawi Perspective

According to the WHO - Malawi, (WHO annual report, 2009):

- Malawi has no Health Promotion (HP) policy which is an instrument to build the capacity of the ministry to deliver health services using the health promotion approaches.
- The districts have not fully integrated HP approaches in the District Implementation Plans (DIP).
- Various development partners use Health Promotion approaches without sharing the challenges, experiences and the best practices of HP settings approaches.
- There is weak stakeholder collaboration on School Health and Nutrition services even though it is generally accepted that the school is an essential institution of primary human resource development.
- There is lack of policies and legislation against promotion and use of tobacco products and alcohol. There is an absence of a surveillance system of major risk factors for Non Communicable Diseases (NCD) and the low knowledge of the NCD and their associated risk factors among the population in general.

The origins of health education in Malawi are grounded in efforts to address the practical problem of sanitation (Bomba, 1981). In 1933, the colonial government passed a Native Authorities Ordinance giving the traditional chiefs the mandate to order hygiene and sanitary measures on their people. The chiefs imposed the construction of pit latrines on the people who dug without using them and in some cases only built the superstructure without the no actual pit. Since people were not consulted, the latrines were associated with colonial oppression and not seen as a means of improving health.

After independence in 1964, the Malawi government removed the legislative approach to promoting sanitation and instead introduced an educational approach with maximum community participation. Three education strategies were adopted, the first being education on germ theory, the second, promotion of pit latrine usage as a status symbol and the third, bush clearance. Today, health education is recognized as “a support service which catalyses other components so that action is taken by individuals, families and communities and behaviour change is the end product” (Bomba, 1990).

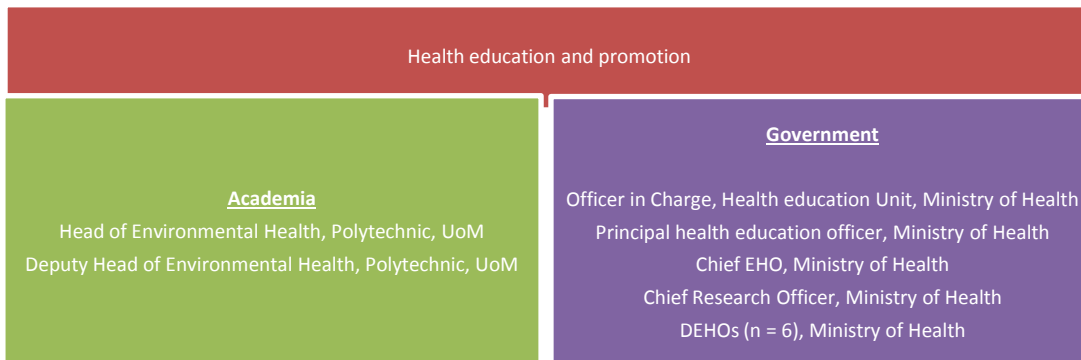
Health education in Malawi is co-ordinated by the Ministry of Health, through its health education unit which is headed by a Deputy Director of Preventive Health – Health Promotion. The main focus of health promotion is at the community level as all health care delivery programmes are aimed at the community. The function of health education activities in Malawi is the synthesis and translation of the various health messages “into meaningful packages” in the areas of health targeting the vulnerable groups.

Drama is one of the media for disseminate health information in Malawi but their effectiveness is not known (Daniel et.al 2007). The Story Workshop, PSI, Nanzikambe are some of the firms which are involved in health promotion in Malawi through drama groups by various drama groups and theatres. However, in the absence of health promotion policy (WHO, 2009), there is a general lack of integration and coordination of health promotion activities.

8.3 Interviews and Respondents

Interviews were held with stakeholders in government and academia (Figure 15). Due to time constraints, stakeholders in Non-governmental organizations and private sector were not reached.

Figure 15: Key informants interviewed for gap analysis in health education and promotion sub-theme



8.4 Current priorities for health education and promotion in Malawi

In general, those interviewed were not aware of the current priorities for health education and promotion in Malawi other than what their institution’s priorities were. This could be due to lack of health promotion policy for Malawi (WHO, 2009). However, the following were reported to be the current priorities in Malawi:

- Behavioural change on various health issues affecting Malawian population
- Health education on emerging diseases

8.5 Recommended research priorities for health education and promotion

One of the biggest problems in setting priorities for health education and promotion is uncertainty about the relationship between interventions and outcomes. This problem has two major components. One is the effect of education promotion efforts on behaviour. For instance, if an antismoking campaign is run on television, how many people will stop smoking, reduce their use of cigarettes, or refrain from starting? The other is the effect of changes in behaviour on various measures of health. If people smoke less, will the incidence of lung cancer, heart disease, or emphysema also decrease? As such this was a focus for the key informants when determining future research priorities.

Priority setting

Prioritisation of key research priorities in terms of the five criteria were established from key informants as follows:

1. Potential for disease burden reduction
2. Expected impact of the research
3. Effect on equity and social justice
4. Contribution to strengthening research capacity in Malawi
5. Feasibility of the research

Taking these factors into consideration, the research priorities for health education and health promotion sub theme were identified as outlined in Figure 16.

Figure 16 Priority Research Areas for Health Education and Promotion

1. Develop and evaluate behaviour change interventions for:
 - Reducing harmful cultural practices in reproductive health, HIV and AIDS
 - Reducing the endemicity of cholera outbreaks
 - Promoting/Adopting improved sanitation and hygiene practices
2. Evaluate the effectiveness of health education and promotion programmes at district and national levels

8.6 Opportunities and challenges

Opportunities	Challenges
<ul style="list-style-type: none"> • Directorate of health education and promotion created in MoH • High potential to reducing disease burden ; expected impact of research and effect on equity and social justice 	<ul style="list-style-type: none"> • Inadequate health promotion specialists (Currently, only EHOs and Nurses) • Inadequate equipment for IEC activities • Lack of indicators for measuring effectiveness of health promotion • Lack of commitment to research • Low priority funding for health education and promotion

8.7 Information and dissemination

Currently, no formal way of disseminating health promotion information exists in the country. As such, each stakeholder involved in health promotion disseminates her own information be it in electronic or print media. As a way forward, interviewed stakeholder proposed that there should be annual national health promotion review conferences/seminars to offer stakeholders a platform to share information and best practices (effective health promotion strategies that have worked). The Ministry of Health's Health Education Unit to coordinate this activity. At individual level, institutions need to initiate Research Dissemination Meetings, Newsletters and Bulletins.

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8.8.1 Current Research

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9.0 Pollution

9.1 Introduction

Pollution is the introduction of a contaminant into the environment. It is created mostly by human actions, but can also be a result of natural disasters. Pollution has a detrimental effect on any living organism in an environment, making it virtually impossible to sustain life. Pollution harms the Earth's environment and its inhabitants in many ways. Three main types of pollution are considered; land, air and water.

Land pollution is pollution of the Earth's natural land surface by industrial, commercial, domestic and agricultural activities. Some of the main contributors to land pollution are: chemical and nuclear plants, industrial factories, oil refineries, human sewage, oil and antifreeze leaking from cars, mining, littering, overcrowded landfills, deforestation and construction debris.

Air pollution is the accumulation of hazardous substances into the atmosphere that danger human life and other living matter. Air pollution may be caused by: automobile emissions, tobacco smoke, combustion of coal, acid rain, noise from cars and construction, power plants, manufacturing buildings and paint fumes.

Water pollution involves the introduction of chemical, biological and physical matter into large bodies of water that degrade the quality of life that lives in it and consumes it. Some of the main contributors to water pollution are: factories, refineries, waste treatment facilities, mining, pesticides, herbicides and fertilizers, human sewage, oil spills, failing septic systems, soap from washing your car, oil and antifreeze leaking from cars, household chemicals and animal waste (www.greenstudentu.com).

Environmental tracking for pollutants is crucial, because often the hazards can be removed or abated before they cause harm. Tracking actual human exposures to hazards in the environment is frequently the missing link between public health efforts to evaluate a risk nationally and the ability to respond to a health threat in a specific community. Without comprehensive environmental health research and tracking, policymakers and public health practitioners lack information that is critical to establishing sound environmental health priorities. In addition, the public is denied the right to know about environmental hazards, exposure levels and health outcomes in their communities—information they want and have every reason to expect. (National Science and Technology Council Committee on Technology (NSTCCT, 2007))

9.2 Literature Review

9.2.1 African perspectives

The pollution of rivers, lakes and aquifers from domestic and industrial wastewater discharges, mining runoff, agro-chemicals and other sources is now a growing threat to water resources in most countries in Southern Africa. According to a new report titled: 'Water Quality Management and Pollution Control' in southern Africa, written by Prof Ngonidzashe Moyo, a freshwater biologist at the University of Limpopo in South Africa and Sibekhile Mtetwa and other water resources development experts, the quality of water supplies in the SADC region, once taken for granted, is becoming the focus of increasing concern (Tsiho, 2007).

The water experts say the solid, liquid and particulate waste by-products of urbanization and economic activities are contaminating air, soil and water quality. The report suggests that the main sources of water pollution are untreated or partially treated effluents from municipal, industrial and mining wastewater discharges. In Zimbabwe, the discharge of industrial and municipal effluent has

heavily polluted Lake Chivero, Harare's principal water supply dam leading to massive fish deaths in the lake. Tanzania, for example, still has temporary drinking water standards because they envisage that adopting permanent standards, say for fluoride, would present difficult economic choices and compliance problems for a large segment of the population," the water experts noted. Industrial pollution in Swaziland is impacting on poor communities residing near waterways used as receiving waters. The polluted water poses a severe health risk to communities located near the river who use it for domestic activities, such as cooking, washing and bathing (Tsiho, 2007)

In terms of air pollution, there is an alarming exposure levels of particulate matter even compared to many metropolitan areas (10-100x compared e.g. to European cities). Children <5 years, and their mothers especially are at risk and air pollution is a major contributor to premature deaths <5, which is really what matters (in terms of DALYs). Awareness is rising in South Asia, but remains low in Sub-Saharan Africa. Every year in developing countries, an estimate 1.6 million people die from exposure to stove smoke inside their homes; 2.7% of the global burden of disease. Of this, there were an estimated 396,000 deaths in Sub-Saharan Africa due to indoor smoke. Cooking with wood, dung, coal and other solid fuels is a major risk factor for pneumonia among children, and chronic respiratory disease among adults (WHO, 2006)

9.2.2 Malawi perspective

Water pollution

A summary of the water quality criteria in Malawi by Kempster and Hatling (1980; Tauro, Wetlesen, Abrahamsen & Mkakosya) revealed that there is scarcity of data on pollution in Malawi. Mvuma (1997) carried out a study and compiled baseline data that showed that pollution of major rivers was significantly higher than those advocated by the WHO guidelines (Hadden, 2000, Tauro & Engelbrecht, 2001). In 1998, state of Environment in Malawi showed a deterioration of water bodies especially in rivers (Tauro, Faye, Phuka & Mazick, 2003; Kabwazi, 2000; Chinyama & Madhlopa, 1999; Materechera, 1998). A consultancy work for the City of Blantyre conducted by Carlo Bro International in 1998 revealed that rivers in the city are polluted with chemicals and microorganisms due to dumping of solid and liquid wastes (Matope, 1999). The 1999 and 2001 study by Tauro et al. also showed high levels of phosphate and nitrogen due to discharges of industrial wastes

Air pollution

Studies conducted on air pollution by Fullerton et al. (2006) showed that indoor air pollution levels in Malawian homes are high. Respirable dust levels in both the urban and rural environment were high with the mean (SD) 24 h average levels being 226 mg/m³ (206 mg/m³). Data from real-time instruments indicated respirable dust concentrations were .250 mg/m³ for .1 h per day in 52% of rural homes and 17% of urban homes. Average carbon monoxide levels were significantly higher in urban compared with rural homes (6.14 ppm vs. 1.87 ppm; p, 0.001). The transition metal content of the smoke was low, with no significant difference found between urban and rural homes.

Current research in Malawi

This information was gathered through published literature, grey literature and reports accessed from stakeholders. Grey literature selection criteria were based on consultancy reports and surveys commissioned by donors and governments. Literature for ongoing research and research being conducted by undergraduate students was excluded except those that had received funding from National Research Council and other funding agencies and is presented below;

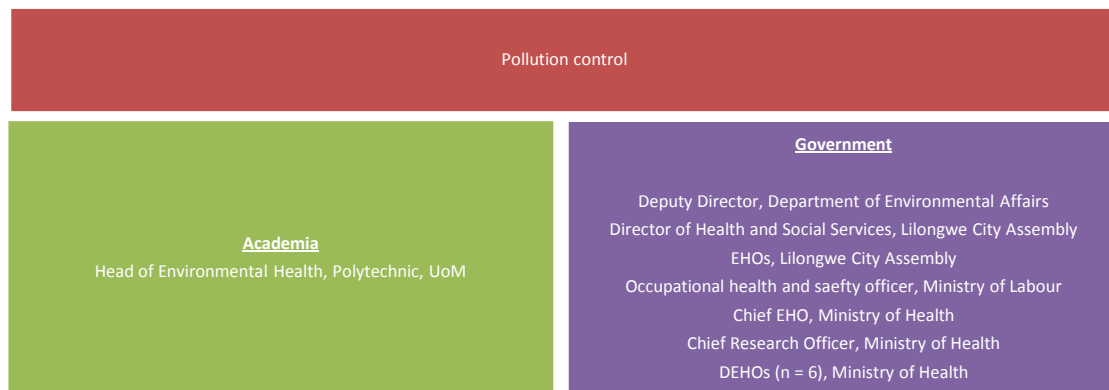
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9.3 Interviews and Respondents

Interviews were undertaken with stakeholders in government and academia (Figure 17). Due to time constraints the private sector was not interviewed as a key informant but will be asked to comment on the draft report to ensure wide consultation.

Figure 17: Key informants interviewed for gap analysis in pollution control sub-theme



9.4 Current priorities in Pollution in Malawi

Most of the priorities in pollution came into being following the National Environmental Action Program that sought views of the community from all the districts of Malawi. The overall responsible agency for this Program was the Department of Environmental Affairs. The priorities listed generated Agriculture and livestock, Forestry, National parks, water resources, Fisheries, Energy Tourism, Industry and mining sectoral policies. Examination of existing government reports, the above sectoral policies, and responses from the interviewed stakeholders indicate that there is awareness of gaps in pollution in Malawi some of which are as were grouped as follows based on the existing policies;

- Soil erosion;
- Deforestation;
- Water resources degradation and depletion;
- Human habitat degradation;
- High population growth;
- Air pollution;
- Climatic change
- Solid waste management

From the above priorities which are mostly contained in policy documents and reports, the most current priorities as cited by the Department of Environmental Affairs and Ministry of Labour and Lilongwe Assembly are:

- Climate change and health
- Waste management
- Occupational hazards

Using the criteria advocated by the Malawi National Research Agenda Initiative, climate change was given the first priority by all stakeholders as this is becoming a global concern

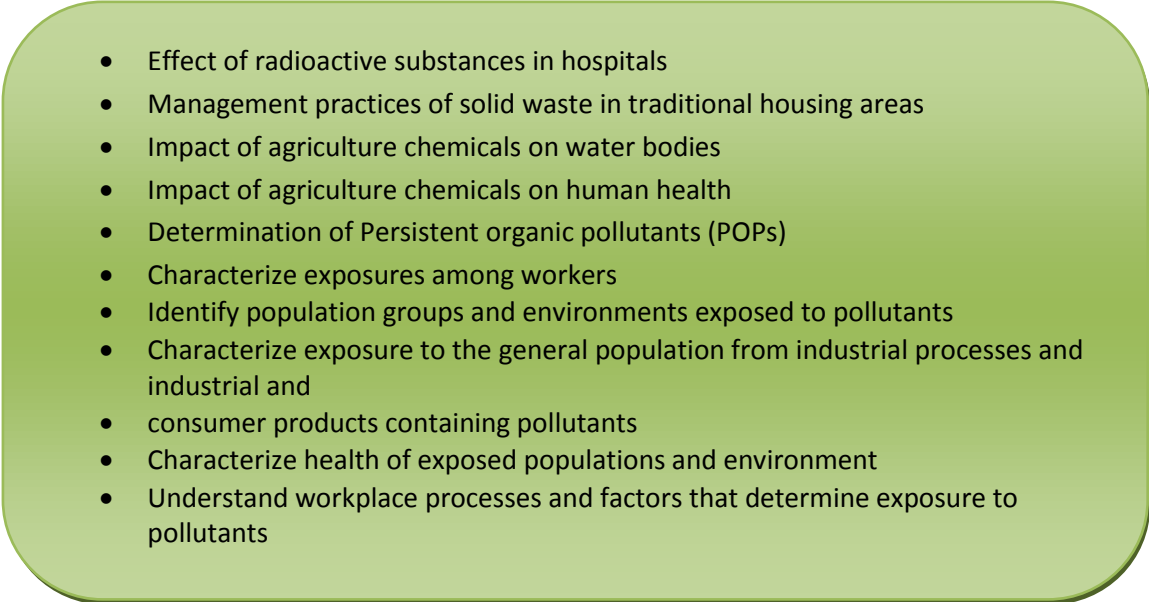
9.5 Recommended research priorities for pollution in Malawi

In order to establish research priority areas for pollution, interviews were conducted with the Department of Environmental Affairs, Ministry of Labour. However, FDG was held with the Environmental Health Officers from Lilongwe City Assemblies from where many research priority areas were identified in water pollution due to mismanaged wastes. The environmental Affairs provided a list of priority in the area of air, land pollution and climate change. The Ministry of Labor was relatively unaware of what research has been done or was being done in water and land pollution. All the respondents (from all stakeholders identified) had problems in deciding what weight to give to the listed priority list established/proposed. However, using the priority criteria provided by the National Research agenda, the priority list proposed by the Department of Environmental Affairs was harmonized with that of the Lilongwe city Assembly list was used due to their wide expertise and experience and the weights (in order of importance) was used;

- 1 Potential to disease burden reduction
- 2 Expected impact of research
- 3 Contribution to capacity strengthening in Malawi
- 4 Feasibility of research
- 5 Effect on equity and justice

Using the above criteria and consensus from discussion from the interviews using common knowledge and global concerns, the research priority list was established as detailed in Figure 18. (Note, that these priorities are not in order of merit)

Figure 18 Priority Research Areas for Pollution Control

- 
- Effect of radioactive substances in hospitals
 - Management practices of solid waste in traditional housing areas
 - Impact of agriculture chemicals on water bodies
 - Impact of agriculture chemicals on human health
 - Determination of Persistent organic pollutants (POPs)
 - Characterize exposures among workers
 - Identify population groups and environments exposed to pollutants
 - Characterize exposure to the general population from industrial processes and industrial and consumer products containing pollutants
 - Characterize health of exposed populations and environment
 - Understand workplace processes and factors that determine exposure to pollutants

9.6 Anticipated challenges and opportunities

Challenges	Opportunities
<ul style="list-style-type: none"> • Inadequate staff • Lack of financial resources • Inadequate collaboration and coordination between different stakeholders involved in pollution control • Conflict of the responsibility for protecting public health • Conflict of the responsibility for protecting public health 	<ul style="list-style-type: none"> • Frequent adjustments in fuel wood rates and urban and district water tariffs, • Stricter enforcement of estate conservation and afforestation covenants, • Strength regulatory framework for pesticide use and industrial pollution, • Development of new soil conservation measures, and • Strong institutional framework for environmental policy formulation.

9.7 Information dissemination

One of the information sought during the interviews was how research results are shared in Malawi. Respondents revealed that previously, this was done through conferences organized by the National Research Council of Malawi through annual research conferences and through individual contacts. Respondents therefore recommended that the National Commission for Science and Technology should revitalize information dissemination through conferences and through scientific forums e.g. fairs community days. It was also recommended that students and senior researchers should present their research findings through electronic media, publications in local journal and international journal that do not require subscription

9.8 References and Research Undertaken in Malawi

Baseline survey for Kayerekera mine: monitoring framework: Ministry of Labour **(Report not accessed)**

Department of Environmental Affairs. Identification of contamination sites in Malawi, **(unpublished report)**.

Filippi, M.L. & Talbot, M.R.(2005). The palaeolimnology of Northern Lake Malawi the last 25ka based on elemental and stable isotope composition of sedimentary organic matter. *Quaternary Science Reviews*, 24 (10-11), pp1303-1328

Fullerton, D.G., Semple, S., Kalambo, F., Suseno, A., Malamba, R., Henderson, G., Ayres, J.G., Gordon, S.B. 2009. Biomass fuel use and indoor air pollution in homes in Malawi. **Journal?**

Hadden, J. 2000. Heavy metal pollution in river water from Blantyre, Malawi. Bsc. Environmental Health Dissertation. University of Strathclyde, Glasgow, Scotland

Materechera, H.A. 1998. The identification of sources and assessment of levels of pollution in Limbe stream in the City of Blantyre. Bsc. Environmental Health dissertation, University of Malawi, The polytechnic.

Matope, J.J. 1999. Blantyre City Environmental Health profile (Draft report), City of Blantyre

Taulo, S., Grimason. A.M., Deacon, C., Young, L., Tembo, K., Chapepa, P (1998). Occurrence of protozoan parasite *Cryptosporidium* and *Giardia* by Limbe Stabilization Ponds, Malawi, University of Malawi in collaboration with Strathclyde University, Scotland, 1999 (**grey literature**).

Ozone consumption pattern in Malawi: Department of Environmental Affairs (**Report not accessed**)
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Taulo., S. Faye, M. Phuka, J., Mazick, A (2003). Assessment of health care waste and injection safety and Development of their National 5-year strategic plan for Health facilities of Malawi Contractors: Ministry of Health, Unicef, World Health Organization, World Bank, Malawi, 2003 (**Grey literature**).

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10.0 Nutrition and Health

10.1 Introduction

Nutrition is an input to foundation for health and development. Interaction between infection and malnutrition is well documented. Better nutrition means stronger immune system, less disease and better life. Better nutrition is a prime entry point to ending poverty and milestone to achievement of better life (WHO, 2010). Nutrition plays an integral role in sustainable development, and the number of national development strategies that include explicit nutrition objectives are growing. But raising nutrition's profile on national research and policy agendas are often not prioritized. Most well-intentioned national nutrition plan faces significant challenges to pragmatic implementation. Meerman (2008) argues that there are many governments that do not recognize the importance of mainstreaming Nutrition into broader initiatives for economic growth and poverty alleviation. Nutrition policy agendas can be hamstrung by a limited understanding by policymakers and politicians of the significant economic cost of malnutrition (Meerman, 2008).

10.2 Literature review

10.2.1 African perspective

In many developing countries, most development plans have included nutrition consideration for decades. However, such plans have traditionally been framed only as outcomes of economic growth. This perception has been overshoot as evidence indicates that economic development does not improve nutrition outcomes, it often does so at a very slow pace. Malnutrition can act as a brake on economic development. In developing countries such as Malawi, economic growth is retarded by malnutrition (Msuku, 1984; Maleta, 2003, NUFU Project. 2003a). It is therefore, imperative that governments pursuing an efficient development strategy should include nutrition policies that are substantiated by research (Meerman, 2008).

10.2.2 Malawi perspective

In Malawi, 90% of its population is rural and depends on rain-fed small scale agriculture. This dependence coupled with subsistence farming has contributed to chronic food insecurity and high levels of malnutrition and malnutrition is being aggravated by inadequate and inappropriate nutrition knowledge which can be addressed by research (FAO, 2007). Malnutrition challenges facing Malawi is chronic stunting, which is standing at 48%, the highest in Sub-Saharan Africa (UNICEF, 2003; Geresomo, 2007; WHO, Malawi country Report, 2009). Although Malawi has been working to address these challenges, stunting remains a tenacious problem throughout the country (National Statistical Office, 2004). Some of the reasons that may be contributed to such low progress may include, localized funding dictated by the responsible funding agency, thereby putting little emphasize on research and difficulties in monitoring in a comprehensive and comparable way (Shakir et al., 2006). In addition, there is lack of scientific evidence regarding impact of such interventions. There are few research based impact evaluations interventions that have been conducted in Malawi (World Bank, 2006)

In a more recent effort to address Malawi's national nutrition challenge, the Department of Nutrition, HIV and AIDS (DNHA) was established in the Office of the President and Cabinet (OPC) in 2004, and a new Food and Nutrition Policy was approved by the Cabinet in 2005 (Malawi National Nutrition Policy (MNNP, 2007). Upon approving the 2005 Policy, the OPC also made the decision to split the document into two parts, (1) a "Food Security Policy", to be implemented primarily through the Ministry of Agriculture and Food Security, and (2) a "National Nutrition Policy" (NNP), to be implemented primarily through the DNHA. The first NNP written under the auspices of the OPC was approved in December, 2007 and the second was launched in 2009. The revised NNP was formulated to improve co-ordination of

nutritional service delivery and create a national standard and strategy for intervention. This NNP triggered four subsidiary directives namely;

- National Nutrition Strategic Plans
- National Nutrition Programme
- National Nutrition Business Plan
- National Nutrition Community Strategy, aimed at facilitating the operation of the Policies.

Current research done in Malawi

Selection of the literature was based on peer-reviewed and publicized literature, Government reports, papers presented at conferences (conference proceedings), Masters and PhD work that is documented by accredited university institutions. Most of the information was found using Google search. The core of the information was also obtained from National Nutrition policies reports that are monitored by the OPC and Food Security programs initiated by Ministry of Agriculture and Food security together with its collaborating partner's consultancy work's reports. During literature search and stakeholders interviews, it was noted that a lot of qualitative research and information of Nutrition is available. However, it was observed that most of the publications could not be retrieved easily from the Ministries as the information was regarded as sensitive. In additions, most of the publications appeared in abstract forms (only obtained upon subscription). Hence the literature presented below and that appearing under Malawi was not fully read to obtain full information, hence they have just been included but not cited in the text.

- Cromwell, E. & Kyegombe, N. 2005. Food security options in Malawi: good neighbours make good friends? In *Forum for Food Security in Southern Africa*.
- Devereux, S. 1997. Household Food Security in Malawi. IDS discussion paper 362
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- Levy, S., Barahona, C. and Chinsinga, B. 2004. Food security, social protection, growth and poverty reduction synergies: The starter pack programme in Malawi. ODI Natural Resource Perspectives, no 95
- Maleta, K. 2003. Growth and under-nutrition in rural Malawian Children, PhD Thesis. Tampere University, Finland
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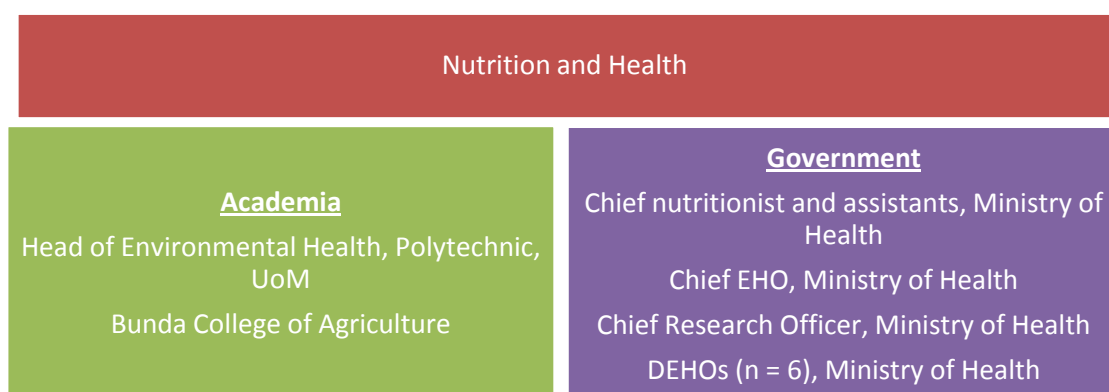
- (Restricted access, requires password)
- NUFU project (2005). Lungwena agriculture, water and sanitation baseline survey. Unpublished.
- Sarlio, Johanna (2000-2003). Lungwena-Makanjira Reproductive Health Project. Family Federation of Finland. Unpublished baseline data.
- Vaahtera, M., Kulmala, T., Hietanen, A., Ndekha, M., Cullinan, T., Salin, M. L. and Ashorn, P. 2001. Breastfeeding and complementary feeding practices in rural Malawi. Medical School, University of Tampere, Finland.

Although there has been a lot of quantitative and qualitative research work on nutrition and health in Malawi, some of the information is not published. Information on school Feeding programmes done by Mary Meals and GTZ is disseminated and shared, creating and research information gap in nutrition. These institutions were to be visited but there was limited finances and time. As noted from the literature from Malawi perspective and the current research priorities, it can be concluded that there is a wide gap in Health research in Malawi.

10.3 Interviews and Respondents

The stakeholders outlined in Figure 19 were recruited as research respondents for interviews using structured questionnaires partners. Recruitment was purposively done due to their involvement in nutritional issues in Malawi and their many of these stakeholders already had long standing interests in priority setting in their respective organizations. The stakeholders’ decision-making partners were invited to attend the forums and/or to send additional interested and appropriate colleagues. Purposeful efforts were made to engage a varied mix of people from different sectors, positions and job responsibilities (including for example Directors, Deputy Directors, lecturers and Program managers. Forums were not recorded but detailed notes were taken by the interviewee. A summary of the notes, including potential research questions, was circulated to respondents just before each forum; this allowed them to verify that their opinions were accurately captured. The forum notes were analyzed qualitatively by the interviewee, in order to group potential research priority areas and general comments.

Figure 19: Key informants interviewed for gap analysis in nutrition and health sub-theme



10.4 Current priorities

In order to obtain information pertaining to current priorities, we enlisted decision-makers partners from four university institutions, two non-governmental organizations and two government institutions. Interviews were conducted with the university institution while one FGD forum was

held with three respondents from Ministry of Health personnel. Some information was obtained from a consultancy report conducted by Meerman (2008) and the National Nutrition policy. However only one university and one government institutions were visited where forums were held, at which researchers and decision-makers from various levels in the health authorities considered possible current priorities. From the interviews and published reports (especially consultancy report by Meerman (2008) and National Nutrition Policy, six broad current priority listed below were identified on which specific research projects were deemed desirable. These have also been highlighted in the National Nutrition research policy (2007)

- Increased Cross-Sectoral Co-ordination
- Capacity building
- Research and Development
- Nutrition guidelines
- Education
- Prevention and Treatment of Nutrition-Related Disorders
- Dietary Diversification and Food Utilization
- Food Safety and Quality
- Nutrition, HIV and Aids
- Nutritional Needs of Vulnerable Groups
- Nutrition-Related Advocacy

After comparing the list of priorities from Ministry of Health and those found in publications/reports, we observed that the main current priorities are; prevention and treatment of nutrition related disorders, nutrition, HIV and AIDS, dietary diversification and food utilization and capacity building. Forum participants suggested that future research into nutrition priority setting would benefit from studies that were longitudinal, comparative, and/or interdisciplinary. Participants further suggested that, first, future research might usefully consider how formal priority setting and resource allocation projects are situated within a larger organizational and political context. Second, additional research efforts should be devoted to better understanding and improving the actual implementation of priority setting frameworks, particularly with respect to issues of change management and the resolution of impediments to action on recommendations for resource allocation.

10.5 Recommended research priorities

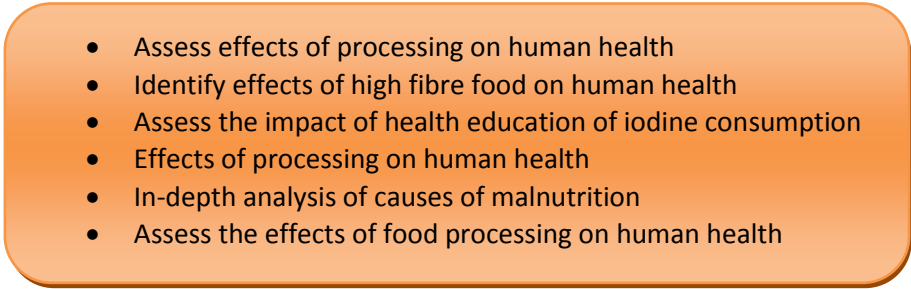
These choices of current priorities arose out of the researchers and stakeholders past experiences with priority setting research in nutrition organizations, and the consultant's own assessment of what appeared to be gaps in the literature. Importantly, these questions served as a starting point and initial guide to structure discussions, but it was expected that other related and/or unique issues would emerge as part of the discussion process at each forum. For instance, questions related to public engagement emerged at each of the forums.

Using the priority setting criteria set by the National Research Agenda the following criteria were prioritised by respondents:

1. Disease burden reduction
2. Contribution to capacity strengthening,
3. Expected impact of research,
4. Feasibility of research and
5. Effect of equity and social justice

Subsequently, the research priorities identified by key informants and literature review were identified as outlined in Figure 20.

Figure 20: Priority Research Areas for Nutrition and Health

- 
- Assess effects of processing on human health
 - Identify effects of high fibre food on human health
 - Assess the impact of health education of iodine consumption
 - Effects of processing on human health
 - In-depth analysis of causes of malnutrition
 - Assess the effects of food processing on human health

Participants emphasized three important features of future design in priority setting research: longitudinal studies, comparative studies, and inter- or multi-disciplinary studies. Longitudinal research would examine how priority setting processes in a nutritional organization develop and evolve over time. For instance, such research should consider how new approaches may be successfully implemented and maintained in the organization, as well as defining which factors facilitate or hinder this. Research could also investigate growth of organizational trust over time with respect to both leadership and joint or more collaborative, explicit decision making.

The dominant model of priority setting in nutrition and health research investments today continues to result in gross under-achievement of potential disease burden reduction among world's children and is actually generating further health inequity. There is growing need for a sound and informed process to make decisions on health research priorities, both globally and at lower levels – regional, national, and local community levels, and at single health facilities (Rudan et al., 2002). A methodology in a form of algorithm that would enable this and that would be simple and practical enough to gain wider acceptance is much needed as advocated by Rudan et al. (2002). The nutrition and health stakeholders' forums have given insight into what decision makers see as important, and have uncovered numerous areas where, jointly, research questions can be posed. We were able to validate the importance of our starting point as well as to observe the emergence of additional concerns and directions of critical importance to these decision makers at this time. While some, indeed probably most, of the research priorities are likely relevant elsewhere, we would advocate for others in different contexts to undertake their own research priority generating exercise. Providing an environment where researchers and decision makers can interact, debate and collaboratively generate a well established multi-sector and multidisciplinary partnerships. It is recommended that improved collaboration between academic institutions, government and non-governmental organizations and focus input on human capacity development and consideration of a successor plan to the emergency human resources plan for the strengthening and retention of the present human resources should be considered seriously in order to generate research data in nutrition and health.

10.6 Anticipated challenges and opportunities

Challenges	Opportunities
<ul style="list-style-type: none"> • Challenges in cross-sectoral collaboration • Lack of human capital • Fragmented and disjointed funding • Staff are research not oriented • There is weak stakeholders collaboration on school health and nutrition services • Disjointed funding 	<ul style="list-style-type: none"> • Presence of nutritional policies • Presence of qualified staff in institution to conduct research • Presence of equipment for laboratory analysis • Key national priority

10.7 Information dissemination

On how research information is shared and disseminated in Malawi, respondents revealed that previously, this was done through conferences organized by the National Research Council of Malawi at annual research conferences and through individual contacts. In the case of individual contacts, information was only shared to close friends within the same department/section. Though governments' reports were also cited as other available conduits, it was noted that such information was secretive and hence could not be accessed easily as discussed above. Respondents therefore recommended that the National Commission for Science and Technology should revitalize information dissemination conferences and through scientific forums e.g. trade fairs, community days. It was also recommended that students and senior researchers should present their research findings through electronic media, publications in local journals and international journal that do not require subscription

10.8 References

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Meerman, J. 2008. Making nutrition a national priority: review of policy processes in developing countries and a case study of Malawi. EC/FAO information

Rudan et al., 2002. Setting Priorities in Global Child Health Research Investments: Assessment of Principles and Practice. Croatian Medical Journal, 48. Pp598-605.

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WHO, 2010. Nutrition for Health Development. WHO. Geneva, Switzerland. Available at <http://www.who.int/nutrition>

World Bank. 2006. Malawi Poverty and vulnerability Assessment (Draft Report)

11.0 Occupational Health and Safety

11.1 Introduction

Occupational health and safety is a cross-disciplinary area concerned with protecting the safety, health and welfare of people engaged in work or employment. The goal of all occupational health and safety programs is to foster a safe work environment. The International Labour Organisation (ILO) and World Health Organisation (WHO) definition ratified in 1995 was given as "Occupational health should aim at: the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities; and, to summarize, the adaptation of work to man and of each man to his job." As a secondary effect, it may also protect co-workers, family members, employers, customers, suppliers, nearby communities, and other members of the public who are impacted by the workplace environment. It may involve interactions among many subject areas, including occupational medicine, occupational (or industrial) hygiene, public health, safety engineering, chemistry, health physics, ergonomics, toxicology, epidemiology, environmental health, industrial relations, public policy, industrial sociology, medical sociology, social law, labour law and occupational health psychology.

11.2 Literature Review

11.2.1 The African Perspective

The WHO conducted a situation analysis of occupational health and safety in the African Region in 2004. The report indicated that people everywhere are exposed to almost limitless risks to their health, including both communicable and non-communicable diseases. It was estimated that each year there are 160 million new cases and 1.1 million deaths associated with work-related diseases and injuries worldwide; this roughly equals the annual number of malaria deaths globally. The poor are especially at risk because their health is already compromised.

In the African Region, work-related threats to human health and life are becoming increasingly evident. A study of workers in gold mining in an east African country reported abnormally high concentrations of total mercury in the urine samples of miners exposed to mercury vapour during burning of gold-mercury amalgams. In the same country, there were injury rates between 10 and 18 per 1 000 workers in mining, building and construction industries. In another east African country, there has been a rate of 7.6 clinical health complaints per worker per year from women working in manufacturing industries. In west Africa, a study revealed abnormal lead levels in blood and urine samples of smelters, automobile mechanics and petroleum retailers. Between 1990 and 1998, one southern African country reported 2 200 accidents and 16 deaths in agriculture and forestry (WHO, 2004).

The regional survey showed that 48% of the countries have occupational health legislation however, there is lack of adequate human resources to monitor applications. Policies and legislation on occupational health and safety do indicate a commitment to workers' health.

The WHO report (2004) indicated a number of challenges which need to be addressed in African Region:

- Workers regularly face microbiological and occupationally-induced illnesses without adequate protection and training. For example, health workers are exposed to infectious

agents; workers in agriculture and industry are exposed to injuries or illness from chemicals and machines; those in service industries and crowded cities suffer from fatigue and stress.

- The informal sector is rapidly growing in Africa. With this in mind workers and employers in the informal sector need access to adequate health education. These need to address not only conventional hazards but also relate to the issues of noise, heat and new technologies.
- Child labour is now rampant in many countries. Child labour is associated with poverty, inadequate educational opportunities, lack of standards and failure to enforce relevant laws. Work that is harmless to adults can be extremely harmful to children.
- The health of women at work need to be addressed as it has not been accorded the attention it deserves. Normal working conditions can be stressful for women workers, particularly during pregnancy.
- The HIV/AIDS pandemic threatens the health and livelihood of the workforce and is already having an enormous impact on the productivity and economies of countries, businesses and families. This is particularly true of certain cadres of health professionals who are frequently in contact with blood and other body fluids. The challenge is to establish health and safety programmes in workplaces, especially health care settings.
- Endemic diseases also affect workers and workplaces. In addition to occupationally-induced diseases, endemic diseases need to be managed properly at work.

In terms of research, the WHO report (2008), indicated the following priority needs:

- The research agenda should focus on improving efficiency, identifying ways to promote better health at workplaces and anticipating new problems.
- There should be a provision of relevant up-to-date information, tools, work aids and organizational structures to assist in avoiding
- A registration system for occupational accidents, diseases and exposures should be established to assist in the development of both preventive and curative strategies.
- Extending the public health agenda to the workplace, thereby reducing absenteeism due to general health problems and increasing productivity.
- Establishing occupational health services to improve work safety and quality of life, reduce poverty and contribute to achieving the millennium development goals.

To address these issues, the WHO Global Network of Collaborating Centres for Occupational Health was developed with set priority areas with leading centres. The Network includes government, research, professional and academic institutions from 37 countries, and three international professional associations with only South Africa being representing in the African Region. In particular their 2009 – 2012 workplan (WHO 2010) refers to the contribution of the network to achieving the WHO Global Plan of Action on Workers Health 2008 – 2017 with 15 priority areas. All of these priority areas require research to be conducted in the area of occupational health and safety to allow an information base to be developed and to inform intervention and education programmes.

11.2.2 Malawi Perspective

Section 13 (d) of the Constitution of Malawi calls for healthy work environments and healthy communities. Subsequently the Occupational Safety, Health and Welfare Act 1997. The Act was formulated to have a multi-sectoral approach based on the fact that the working communities are targets of a special health risk, and safety is understood to cover not only causes of absence and infirmity among workers but also a state of positive well-being physically, mentally and socioeconomically. Nevertheless since its inception, the powers to develop and institute regulations for specific areas of occupational health and safety have not been used making the Act a very difficult tool to utilise in everyday businesses (pers comm. Director OHS, MoL). As a result, in Malawi, working conditions and environments do not meet occupational health and safety

standards. Malawi is even far from meeting universal minimum standards of occupational health and safety, such as the ILO Convention No. 161 on Occupational Health Services and No. 155 on Occupational Safety and Health. Therefore, the promulgation of explicit and detailed legislation and policies alone seems not to be the prime factor for achieving safe and healthy working conditions. Hence, it is important to analyse the development of occupational health and safety in Malawi and identify the challenges to and the opportunities for developing the field.

Compounding the problem is the lack of trained manpower and equipment, which creates a great hindrance both to enforcement of the law and to provision of services. Professional staff at the Directorate of Occupational Health and Safety in the Ministry of Labour are limited in their resources to fulfil their remit under the Occupational Safety, Health and Welfare Act 1997. Generally, in Malawi occupational health services are not accorded high priority at either national or enterprise level. Consequently, the Directorate of Occupational Safety and Health operates on a very small budget, and its services can at best only reach urban workers in formal employment.

Little is known about the health of Malawian workers in general. The present national register of health data, including information on work-related diseases and accidents, is not reliable. Likewise, the records of individual workplaces or dispensaries are unreliable or non-existent. It is probable that many Malawian industrial workers suffer from poorer health than the general public (Makandawire, 2000).

Research into the current state of occupational health and safety standards within Malawi is extremely limited. A recent study was conducted by Mbewe (2009) to determine the national profile of work and health. This survey is not reported here as a copy of the report has not been received to date. Other research relates to specific cadres with the majority addressing issues pertaining to health workers and exposure to work related diseases (Harries et al 2002)

Despite the need for occupational health and safety services in all sectors, these are not available for small enterprises and informal workers. However, with the present developments in the world's economies, it seems that the most probable form of providing new job opportunities will be small enterprises and self-employment which increases the informal work sector. Trade Unions may also play an important role in this and the formal sector however it seems the unions recognize issues of wages as the prime problems that workers. The Government has tried to activate trade unions in several instances by involving them in a number of occupational safety and health forums but their involvement is not very apparent (Mkandawire 2000).

11.3 Interviews and Respondents

Key informants were interviewed from Government, academia, and donor sector as detailed in Figure 21

Interviews were all conducted using the semi structured questionnaire and were used to determine:

- Current policies, priorities and research in OHS
- Perceived research priorities for the informant for OHS in Malawi
- Anticipated Challenges and opportunities for research in OHS in Malawi
- Role of information dissemination in the field of OHS in Malawi

Figure 21 Key informants interviewed for Gap Analysis of Occupational Health and Safety



11.4 Current priorities for Occupational Health and Safety within Malawi

Current priorities indicated through government documents and key informant interviews indicate that there is an awareness of the large gaps in occupational health and safety in Malawi. However, to date little priority has been placed on the area, unlike curative health care which may be due to its placement in the Ministry of Labour and a lack of awareness on the impact of working environments on health. Existing legislation needs to be brought into line with the Occupational Safety, Health and Welfare Act 1997, and funds have been allocated towards the design of laboratory facilities specifically for OHS services. With the exception of these potential developments there appear to be no current priorities in the sector at present.

11.5 Recommended research priorities for Occupational Health and Safety

Examination of existing reports and key informants, indicated that occupational health and safety is not currently awarded the important position it warrants in the preventative health sector. This is for a number of reasons:

- Lack of quality data on the current situation in health and safety in Malawi
- Positioning of the Directorate for Occupational Health and Safety within the Ministry of Labour which removes the emphasis on preventative health care from the role of inspectors
- Lack of coordination between relevant Ministry's in the area of OHS
- Lack of specific legislation to allow enforcement of requirements within the specific workplace sectors which cannot be developed without adequate data to demonstrate need for control and instigation.

With this in mind, the depth of proposed areas for research in OHS was lengthy to address these issues.

In summary areas for recommended areas of research in Malawi were as follows:

- Status of industrial hygiene
- Status of occupational health and safety in the agricultural sector
- Assessment and review of occupational accidents and injuries
- Identification and implementation of occupational and injury prevention measures
- Assessment and review of occupational diseases taking into consideration reportable diseases.

- Assessment of occupational respiratory diseases through inhalation of particulates and chemicals.
- Assessment and review of occupational health and safety standards in the health sector.
- Assessment and review of occupational health and safety standards in the informal work sector.
- Assessment of noise as an occupational hazard.
- The role of trade unions in occupational health and safety
- Assessment of radiation exposure and related cancers
- Assessment and review of ergonomic standards in the workplace

These areas very much reflect the lack of tangible baseline data available in Malawi in this sector as these predominantly relate to the need to collate data and assessment the current state of play within the various employment categories in Malawi.

Lack of participation of EHOs in the OHS sector was also evident within the responses to the questionnaires. Within those responding to questionnaire covering environmental health as a whole, the priorities were predominantly community based with an emphasis on disease surveillance, water and sanitation and health promotion. As these are the key roles of environmental health officers in the field the lack of involvement in OHS issues is reflected in their responses. Nevertheless, in response to the specific area of OHS it is clear that all environmental health practitioners see the areas of occupational exposure, diseases and injury as high priorities for research and development.

Assessment of key research priorities in terms of the five criteria, to assess appropriate priorities to be recommended for the National Research Agenda.

In terms of occupational health and safety, an average of all respondents gave the following ranking for the priority setting criteria:

1. Potential for disease burden reduction
2. Expected impact of the research
3. Feasibility of the research
4. Effect on equity and social justice
5. Contribution to strengthening research capacity in Malawi

As indicated by respondents, the impact of the research in terms of informing policy is high for all areas due to the lack of baseline data available for the current situation. With this in mind, emphasis is placed on the potential for disease burden reduction, feasibility and effect on equity and social justice.

In terms of feasibility, impact and equity, research priorities are currently achievable in Malawi given the human and financial resources are detailed in Figure 22.

Figure 22 Research Priorities for Occupational Health and Safety

1. Baseline study of accidents and injuries in the workplace leading to recommendations and interventions with a view to effective management and reduction.
2. Assessment of occupational health and safety standards in the following sectors:
 - a. Agricultural sector
 - b. Industrial sector
 - c. Health sector
 - d. Informal sector
3. Study the role of OHS enforcement and advisory agencies and trade unions in Malawi
4. A review of literature in specific high risk areas of occupational health and safety identified from baseline studies which can be used to inform policy and the development of technical guidance.
5. Detailed research in the areas of:
 - a. Occupational disease prevalence, assessment, monitoring and reporting (this should relate to the list of occupational diseases developed and updated by the ILO.
 - b. Monitoring exposure of high risk health workers to occupational hazards, for example pesticide exposures, HIV/AIDS, dusts and particulate, etc.

Fundamental obstacles to research in Occupational Health and Safety in Malawi is the lack of both human and infrastructural resources available. Despite the interest of the Government and Academic Institutions in the area, the literature review reflects the lack of research which has actually been conducted. The need for research on occupational exposures and diseases is paramount based on the high level of risk and informal employment in agricultural, health and industrial sectors. Nevertheless, the lack of current laboratory facilities, equipment and capacity to conduct this work is an ongoing concern which requires to be addressed.

It is important to ensure that Malawi is participating in available collaborative groups and research networks, such as those detailed above, to help overcome gaps in expertise and resources and to build capacity within the country for future research and intervention programmes.

Research in these areas has the potential to allow the Government of Malawi to find tangible ways to overcome the current obstacles in OHS implementation in Malawi. In addition, the data generated can inform potential outcomes recommended by previous authors such as:

1. The need for a multisectorial approach to occupational health and safety at national level, through the formation of an advisory Council for Occupational Safety Health and Welfare, to be made up of employer, employee and government representatives in order to mirror the principles of consultation, communication and co-operation among interested parties. The Advisory Council should also prescribe the framework necessary within the individual organizations and should establish a legal responsibility with which the management hierarchy must comply.
2. The need to form an autonomous institution for OHS which transcends ministerial boundaries. This is needed under the premise that OHS should not be seen as a single ministry's or academic

institutions responsibility in terms of enforcement, training and research. Such an institution would oversee this responsibility.

3. Malawi needs to be more active in regional, continental and international OHS networks such as the WHO and ILO Global Networks in order to contribute and benefit from research and technical assistance.

It is important to note that these areas of research are not unique to Malawi and may have been addressed in more developed countries. WHO reports have indicated a dearth of data on occupational health and safety exposures in the African continent and therefore these issues also need to be assessed on a regional as well as national basis to allow them to be effectively tackled.

11.6 Anticipated Challenges and Opportunities

All respondents in terms of occupational health and safety referred to the lack of capacity within Malawi to undertake research and progress the field. Despite some progress in the development of laboratory facilities, it was still felt that as a country we lack expertise both in terms of numbers and specific training. It was particularly felt that capacity at institutional level is sorely needed. Nevertheless, despite this there are a number of networks which exist, as detailed above, which Malawi may access. Use of knowledge generated from groups such as the WHO Global Network for Collaborating Centres for Occupational Health and participation in these groups and their research can only help to strengthen the capacity within Malawi.

As much as occupational health and safety constitutes a preventive health service and/or primary health care, it is not regarded and recognized as such in Malawi. This is partially attributable to the establishment of the Occupational Safety and Health Directorate under the Ministry of Labour and Vocational Training, while the Ministry of Health and Population Services is charged with the provision of preventive health services in Malawi. The situation has been aggravated by lack of co-ordination among different public institutions and in particular government departments in Malawi. The two ministries involved do not co-ordinate nor collaborate much in the provision of occupational health and safety and other preventive health services. This is also evident within the academic institutions, where College of Medicine have undertaken basic surveys on OHS and are exploring the potential of training courses in this area. However there is little collaboration between the College of Medicine and the Malawi Polytechnic which houses the environmental health degree programme of which OHS is a component. In addition, once trained environmental health practitioners are not involved in the inspection, assessment and training of workplaces which may assist in overcoming the capacity shortage within the country to deal with all workplaces and particularly the informal sector.

Significant opportunities can arise from a more collaborative approach in the OHS sector between government, private sector and academic institutions. This approach can attract an increase in funding and allow decisions and planning to be conducted as they are informed by effective research, monitoring and evaluation.

11.7 Information and Dissemination

There are currently no specific outlets for the sharing and dissemination for information and research in OHS in Malawi. This may in itself contribute to the lack of cohesion in the sector. Nevertheless, there are areas whereby information can be shared and disseminated on a regional and international basis.

Key informants also felt that development of regular newsletters, networking with trade unions and inter-organisational forums would be of benefit in the dissemination of information and the effective use of research and data in planning and improvements in the OHS sector.

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12.0 Animal Health

12.1 Introduction

The relationship between animal and health entails transmission of diseases from animals to humans as well as from humans to animals. In sub-Saharan Africa, certain key mammalian species have been identified as maintenance hosts or reservoirs of certain infectious agents and are therefore of epidemiological importance. For example, the role of the African buffalo in the maintenance of foot and mouth disease (Hedger 1972) and theileriosis (Irvin and Cunningham 1981) has been well documented, as has the association of wildebeest with alcelaphine malignant catarrhal fever (Plowright *et al.* 1960). Hence, research on animal health often involves complex, interrelated scientific concepts that are investigated most efficiently by a parallel, rather than serial, research paradigm. This parallel structure permits the investigation of single or integrated research questions and the leveraging of progress in related areas. Evaluation of the animal health research needs against this paradigm and the value-of-information principle led to identification of an overarching research priority.

12.2 Literature review

12.2.1 Africa perspective

In Africa, there have been great strides in the conservation of areas through trans-frontier conservation area initiatives (TFCA). In addition, there is integration of land across international borders that have generated positive economic benefits for specific regions. However, there is a massive encroachment as local communities expand their struggle to survive the onslaught of nature's climatic fluctuations and plagues that threaten their food security. There are potential animal health implications and challenges that may be expected when increasing the current geographic range of certain animal pathogens and disease vectors. Without barriers on international boundaries, and with biological bridges being formed by contiguous wildlife populations, any contagious/infectious agent or vector present in any one of the participating countries or areas will predictably eventually spread throughout the entire TFCA (Perry *et al.*, 2003; Bengis *et al.* 2004)

The donors supporting livestock research and development in the developing world embarked in 2000 on a new initiative to improve the communication, collaboration and complementarity among them to enhance the impact of their investments. As part of this initiative, they commissioned a study to identify collaborative animal health research opportunities with potential to contribute to poverty reduction that was funded by the Department for International Development (DFID) of the Government of the United Kingdom (Perry *et al.*, 2000, Thornton *et al.*, 2002).

Potentially problematic infections should be identified at an early stage through surveillance and monitoring, and proactive joint containment and control measures should be established as necessary. These animal disease issues may be compounded as a result of the enlarging wildlife/livestock interface, and this may have a negative impact on adjoining communities (Bengis *et al.* 2004). Several important animal disease risk factors have been identified with regard to the development of TFCAs.

12.2.2 Malawi Perspective

In Malawi, Department of Animal Health and Industry (DAHI) is the national institution responsible for livestock health that was set up in 1972 under the Act of Parliament, Chapter 51:02 of the Department administers the Control and Diseases of Animals Act (Cap. 66:02), the Meat and Meat Products Act (Cap.67:02), the Milk and Milk Products Act (Cap. 67:05) and the Veterinary and Para-Veterinary Practitioners Act (Cap. 53:04). The objectives of the Department are

- Control of major epizootic diseases of meat commodities in the commercial sector through minimum and safe usage of growth enhancing agents and feed additives to minimize risks to human and animal life or health.
- Provide reliable and timely key support veterinary diagnostic services to the livestock sector and monitor quality of livestock feed to ensure optimal livestock productivity.
- Regulate safe trade in livestock and livestock products through a sound Import/Export certification policy based on the internationally recognized provisions of the WTO sanitary and phytosanitary (SPS) agreements for trade in livestock and livestock products.
- To provide Meat Inspection and Milk Quality Control Services and Accredited Meat and Milk Processing Plants and Hatcheries.
- To provide Animal Quarantine Services

The Bvumbwe Research Station administers Plant Protection Act (1969) which empowers Department of Agricultural Research Services to protect Malawi from the entry of exotic pests, diseases and also to ensure that agricultural produce and plant or produce exporters export pest and disease free consignments outside Malawi. This is done through running of closed plant quarantine at Bvumbwe Research Station, issuing of phytosanitary certificates and import permits upon complying with acceptable standards conforming to the International Plant Protection Convention (IPPC) standards. The regulations under the Plant Protection Act stipulate the list of pests and diseases of quarantine importance. Also administers Pesticide 2000 Act which empowers Pesticide Control Board at

Bvumbwe Research Station to register, issue licenses import permits of pesticides ((Sundstol, Eik & Chilera, 2004; Chilera & Gondwe, 2005; Perry et al., 2007)

Malawi Bureau of Standards is the national standardizing body that was set up in 1972 under the Act of parliament, Chapter 51:02 of the Laws of Malawi. The organization has five functional departments i.e. Standard Development, Technical Services, Quality Assurance Services, Metrology Services and Corporate Services.

Research done in Malawi

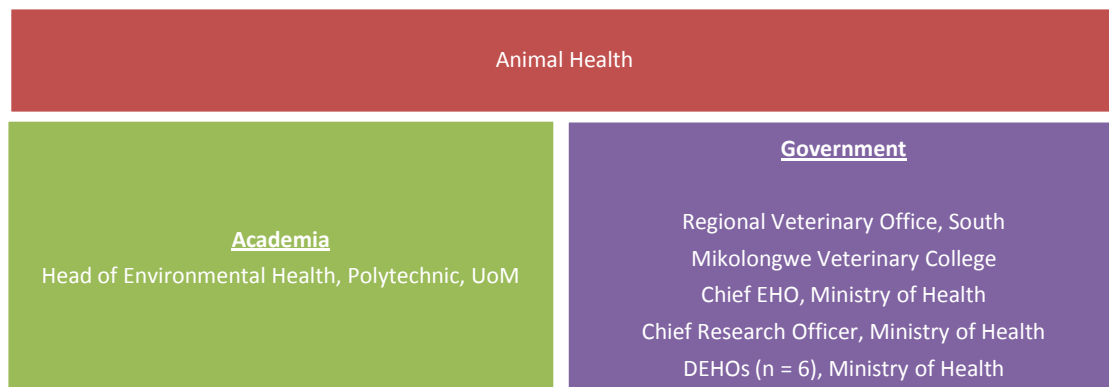
Selection of literature was based on research published in peer reviewed journal and government reports. In case of grey literature the inclusion criteria depended on the consultancy reports commissioned by Government as well as research work which was conducted jointly by government officers and research institutions. Grey literature from Masters' student research work was also included though this was not referred to in the text.

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12.3 Interviews and Respondents

Figure 23: Key informants interviewed for gap analysis in Animal health sub-theme



12.4 Current research priorities for animal health in Malawi

Priorities for animal health were formulated by the government in 2005. These were priorities obtained from the Regional veterinary Office and are usually updated after five years. The Mikolongwe veterinary school staff involved in teaching animal health is not aware of any existing priorities in Animal health. The following are the priority list provided (not in order of merit)

- Prevention and control of animal and zoonotic diseases
- Produce safe and wholesome animal products for human consumption
- Monitoring and surveillance of trans-boundary diseases
- Protecting the national herd/flock against trade sensitive diseases

12.5 Recommended research priorities for environmental health in Malawi

Priority setting involves not only the identification of different priorities but also establishment of criteria allowing choices to be made between competing priorities (European Commission, 2007). Priority setting between the interviewed stakeholders (Regional Veterinary Officer, South and Mikolongwe veterinary school) using the priority criteria of the National Agenda differed were

ranked differently. Therefore the criteria ranking from the two stakeholders were harmonized and the following ranking scale was use for the priority setting

- Disease burden reduction
- Impact of Research
- Feasibility of research
- Capacity strengthening in Malawi, and
- Equity and social justice

Using the above criteria ranking, stakeholders’ interviews yielded the list of research priority areas in Figure 23.

Figure 24 Research Priority Areas for Animal Health

- Assess the microbiological quality of street vended milk
- Identify causes of contamination of meat in abattoirs
- Determine the occurrence and levels of tetracycline and penicillin in milk
- Assess the microbiological quality of street vended meat
- Determine the prevalence of Trypanosomiasis in game and domesticated animals
- Quantify the prevalence of mastitis in dairy animals
- Analyse the transmission of animal and poultry feeds diseases through feeds
- Determine the prevalence and transmission of bovine tuberculosis

The above priorities reflect the motives underpinning the need for research from both the academia (those involved in research) and those with technical expertise as they are practicing Officers. We were able to validate the importance of initial areas posed to the group and observed emergence of additional concerns and directions of critical importance to the interviewed stakeholders. It is likely that the results are broadly applicable to other sub-themes in Environmental Health areas. The implementation of this research agenda in Malawi will depend upon the ability of the researchers and decision-makers to develop particular projects that fit within the constraints of existing funding opportunities. The process of engagement itself had benefits in terms of connecting decision-makers with academia and sparking increased interest in the use and refinement of priority setting frameworks. During the consultative meetings, it was noted that Department of Livestock has a strong research section but some officers are not fully briefed of the existence of such sections. We therefore, recommend that this section should be organizing forums for information sharing as well. Academic institution should also take the initiative to invite the section to give guest lectures.

12.6 Identified and anticipated challenges and opportunities

Opportunities	Challenges
<ul style="list-style-type: none"> • Availability of qualified staff • Availability of laboratories for sample analysis • Easy collaboration with other institution • Feasibility of Research priority areas 	<ul style="list-style-type: none"> • Lack of financial resources • Difficulties in enforcement of legislation • Cross-border control problems for diseases control • Difficulties in policy formulation • There is inadequate capacity to enforce the available Acts and Regulations.

12.7 Information dissemination

Information dissemination between the interviewed stakeholders was not different. Respondents indicated that information is only shared during organized open days and also through brochures. There is no local journal in which the research findings are published. In terms of barriers to conducting research, respondents indicated that they lack financial resources and this also constraints them from accessing research work published in journal that require subscription. Respondents proposed that National Research council should hold biannual conferences and also establish repositories

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13.0 Built Environment

13.1 Introduction

The term environment refers to surroundings which can be natural, man-made or a combination of these. Built environment refers to the man-made surroundings that provide the setting for human activity, ranging in scale from personal shelter (housing) to neighborhoods to the large-scale civic surroundings such as parks, roads, etc. For the purposes of this gap analysis on the built environment sub-theme, we restrict ourselves to housing and human health.

13.2 Literature Review

The link between housing and health is well known. In Malawi, research has shown that improved housing significantly reduces the burden of disease in children aged under 5 years, reducing the odds of respiratory infection, gastrointestinal illness, or malaria by 44% (Woff et. al., 2001; <http://www.bmj.com/cgi/content/full/322/7296/0/c>). Furthermore, good housing conditions have also been associated with a decreased risk of developing leprosy in younger people rural Malawi and it is hypothesized that schooling changes behavior and housing determines the environment in ways which are relevant for the transmission of Mycobacterium leprae or for the appropriate priming of the immune system (Ponnighaus, et. al. 1994). However, most Malawians live in rural areas and reside in traditional houses which are made of mud bricks and floors with thatched roofing. Improved houses have fired mud bricks, tile roofing, concrete foundations, and a pit latrine. Good housing has also been shown to be a major factor influencing employment in the public sector in Malawi (Mangham and Hanson, 2008). Good housing is also linked to improved ventilation. In their study of indoor air pollution from the use of biomass fuel, Fullerton et. al. (2009) found that indoor air pollution levels in Malawian homes are high. They further recommended that further investigation is justified because the levels of indoor air pollution were hazardous and are likely to be damaging to health. Interventions need to be sought to reduce exposure to concentrations less harmful to health (Fullerton et.al, 2009).

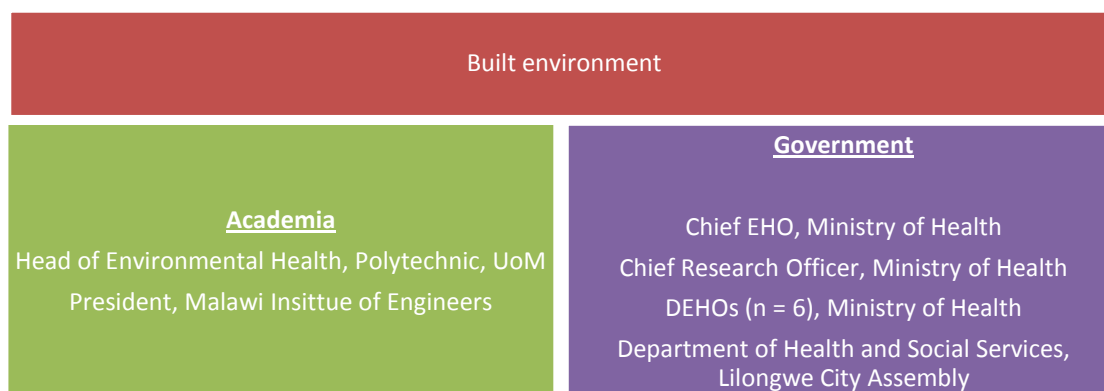
The government of Malawi created the Ministry of Housing which is in charge of policy and coordination of housing issues. The Ministry of Lands and Valuation is in charge of land policy and land allocation and the Ministry of Physical Planning and Surveys is in charge of enforcing planning standards. On the other hand, local authorities are in charge of the provision of human settlements and related issues.

The Ministry of Housing has formulated a draft National Housing Policy (copy could not be sourced). However, the Government wants to move away from being a provider of shelter and related services, but continue to provide an enabling environment.

13.3 Interviews and Respondents

Interviews were held with stakeholders in government and academia (Figure 24). Due to time constraints, stakeholders in Non-governmental organizations and private sector were not reached.

Figure 25: Key informants interviewed for gap analysis in health education and promotion sub-theme



13.4 Current Research Priorities

Government is currently encouraging home ownership and other strategies include:

Urban Land Market:

- Creation of dynamic, efficient and equitable urban land markets.
- Improving access to land by low income households and vulnerable groups.

Housing Finance:

- Improving competition in the conventional housing finance market.
- Improving access to housing finance for low and medium income groups.

Finance for infrastructure:

- Creating a viable financial base for the local authorities.
- Improving cost recovery for new infrastructure.
- Encouraging participation in infrastructure provision by private development.

Construction industry:

- Building the capacity of small contractors.
- Expanding the supply and use of alternative local building materials.

Rural Housing:

- Improving the quality of rural housing,
- Improving the performance of the rural housing programme.

Community Participation:

- Ensuring the sustainability of housing programmes,
- Promoting leadership capacities within communities.

With regard to decision making on housing and other related issues, the major stakeholders involved include: the Ministries of Housing; Lands and Valuation; Physical Planning; Research and Environmental Affairs; building sections (work and supply); the Malawi Housing Corporation; Habitat for Humanity; Christian Services Committee; New Building Society; Maone Parks; Malawi Development Corporation; individuals; and donor community.

13.5 Recommended research priorities for Built Environment

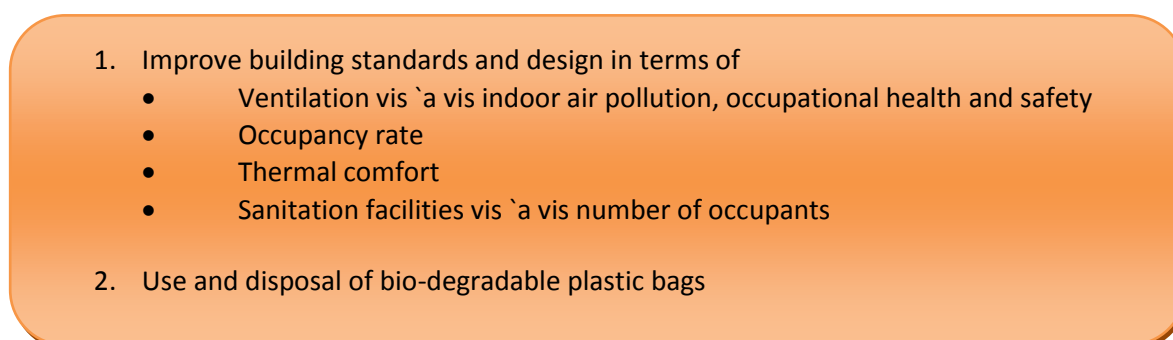
The Essential National Health Research (ENHR) Approach was used to identify research priorities on water and sanitation sub-theme. The feasibility of a research priority was assessed in term of (1) human resources, (2) financial resources, (3) availability of infrastructure and the potential impact of the research priority was assessed in terms of (4) influencing policy, (5) reducing disease burden, (6) improving service delivery and (7) increasing/adding new knowledge.

The priority setting criteria were prioritised as follows:

1. Potential for disease burden reduction
2. Expected impact of the research
3. Contribution to strengthening research capacity in Malawi
4. Feasibility of the research
5. Effect on equity and social justice

Based on these the research priorities for built environment were outlined as detailed in Figure 25.

Figure 26 Research priorities for Built Environment

- 
1. Improve building standards and design in terms of
 - Ventilation vis `a vis indoor air pollution, occupational health and safety
 - Occupancy rate
 - Thermal comfort
 - Sanitation facilities vis `a vis number of occupants
 2. Use and disposal of bio-degradable plastic bags

13.6 Opportunities and challenges for research in built environment

There is still lack of competition on the mortgage market. Hence, access to housing finance by low and medium income groups is almost non-existent. Finance for infrastructure is almost unavailable.

No information is available on researches and technologies in the built environment. However, UN-HABITAT presented the preliminary findings, conclusions and policy recommendations of the Malawi Housing Sector Profile to a broad range of stakeholders in Lilongwe in April 2009. The Profile was the result of field surveys and housing sector studies undertaken by a multi-disciplinary team of national and international experts led by UN-HABITAT. The stakeholders' workshop (20-21 April 2009) discussed the draft Housing Profile document and how it can be improved to provide evidences, in-depth knowledge and possible guidance to improve housing delivery and the draft Malawi National Housing Policy that is currently under review. Amongst the 65 participants were representatives from national and local governments, utility companies, NGOs, civil society, traditional leaders, donor organizations, private sector housing developers, financial institutions, professional institutions, and academia (www.undp.org.mw).

Malawi is a member of Shelter-Afrique and the African Housing Fund. Malawi also benefits from the World Bank and other UN bodies like UNDP, UNCDF, UNICEF. There is bilateral cooperation with countries such as Japan, USA, UK, Germany among others.

In order to enhance home ownership, a christian organization , Habitat for Humanity (Malawi) works in partnership with local communities and the government to build simple, decent houses and latrines. A locally-elected committee chooses applicants based on total combined income (less than US\$43 monthly - rural areas; less than US\$57 monthly - urban areas), their willingness to provide volunteer labour (transporting all materials from the HFH office, providing all bricks, performing all unskilled labour), and their willingness and ability to repay the cost of the inputs. Habitat for Humanity (Malawi) provides all materials and skilled labour. Repayments are put into a revolving fund which stays in the community to build more houses and latrines

13.7 Information dissemination

No mode of information sharing exist at national level. As a way forward, the Ministry of Housing should in addition to policy development and coordination role, initiate a national platform for information sharing on housing issues. In addition, newsletters and bulletins are other possible means of information sharing to be considered.

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14.0 Summary of Findings

14.1 Introduction

Environmental health is the branch of public health that is concerned with all aspects of the natural and built environment that may affect human health. In simple terms it is often referred to as preventative health and if managed and implemented effectively, can reduce disease burden, increase productivity and reduce the demand on the already encumbered on health services.

Nevertheless, at the dawn of the 21st century, Malawi is facing a gap in the training, implementation and management of environmental health issues, and in order to inform and develop effective policy and strategies on a national basis, we need relevant research and data to be available. This is a gap in critical knowledge that hinders our national efforts to reduce or eliminate diseases that might be prevented by better managing environmental factors. This is especially true for emerging and re-emerging diseases and conditions such as diarrhoea (including cholera), HIV/AIDS, malnutrition, neglected tropical diseases, malaria, tuberculosis, cancer, birth defects and asthma and which strike hundreds of thousands of Malawian families each and every year.

The Gap analysis undertaken by the environmental health working group has attempted to assess the main areas of environmental health in terms of current research, policy and programmes to identify the gaps within current knowledge which could help improve environmental health practice in Malawi.

The key findings are broken down into two areas, namely:

6. Cross cutting issues which relate to all subthemes
7. Recommended research priorities for environmental health

14.2 Cross Cutting Issues

One of the main outcomes to this consultancy is the lack of current research priorities in all of the Environmental health sub-themes. The key finding is that research in Malawi is mainly conducted by academic institutions specifically for academic development (promotion) rather than solving problems. As such the major concerns are:

- Lack of infrastructural and human resources to conduct effective research
- Lack or inadequate published research work,
- Lack of coordination and collaboration between different researchers, and agencies in Malawi,
- Uncoordinated or non-existence of set research dissemination procedures,
- Lack of effective interface to allow research to inform and influence policy development
- Lack of understanding of non academics that intervention projects and development programmes at District level are also research and can inform policy and strategy development,
- Lack of expertise within the profession to develop and execute research proposals to a good standard.

All in all these lead to an inconsistent and haphazard approach in terms of research and dissemination, which is currently reliant on the motivation of individuals rather than cooperation with policies and procedures.

14.3 Research Priority Areas for Environmental Health

Research priority areas were identified through a thorough assessment of existing literature and interviews with key informants for both environmental health and specific sub themes therein. Environmental health working group use a two stepped approach to identify priority areas.

1. Review of literature pertaining to all areas of environmental health
2. Identification of priority sub themes from environmental health experts
3. Identification of priority research areas within sub themes from environmental health and sub theme experts.

This approach identified specific research priorities which were then consolidated by the environmental health working group for form a comprehensive list of priority research areas for environmental health in Malawi. In many cases, some subthemes have areas of overlap in terms of research priorities, for example, the microbiological quality of milk sold by vendors was highlighted in both the food safety and the animal health subthemes. As such these are consolidated in one area. In addition, some subtheme research priorities did not relate specifically to health issues and as such they have been removed from the final research priority list.

A comprehensive outline of research areas are therefore given in Figure 26.

Figure 27 Outline of main research priority areas for environmental health

Research Priority	Sub themes for Research in Environmental Health					
	Disease Surveillance and Response	Water and Sanitation	Food Safety and Hygiene	Health Promotion and Education	Pollution Control	Occupational Health and Safety
1	Assess and evaluate reporting systems in terms of accuracy, neglected tropical diseases, new technologies and SWAp	Analyse reasons for lack of stakeholder coordination	Assess microbiological contamination of specific food groups	Develop and evaluate behaviour interventions for reducing harmful cultural practices related to reproductive health	Determine the impact of the following on water, soil, air and therefore human health: <ul style="list-style-type: none"> • Agricultural chemicals 	Establish a baseline for accidents and injuries in the workplace
2	Assess and evaluate quality of data from community, facilities and alternative systems	Assess availability of sustainable water and sanitation facilities	Assess chemical contamination of specific food groups	Develop and evaluate behaviour interventions reducing endemicity of cholera	<ul style="list-style-type: none"> • POPs • Solid waste • Clinical waste • Industrial waste 	Assess occupational health and safety standards in the following sectors: <ul style="list-style-type: none"> • Agricultural
3	Assess and evaluate quality of data in terms of 15 priority diseases and attitudes of data collectors	Assess sustainability and operation of sanitation technologies	Assess hygiene practices in commercial food premises	Develop and evaluate behaviour interventions for promoting improved sanitation and hygiene practices	Assess the levels of particulate pollutants in domestic, commercial and industrial settings	<ul style="list-style-type: none"> • Industrial • Health • Informal
4	Assess and evaluate use of data at facility, district, zonal and national level	Assess efficacy of point of use treatment for household water	Determine applicability of food safety management systems in commercial businesses in Malawi	Evaluate effectiveness of health promotion and education programmes		
5	Monitor and evaluate existing intervention programmes to inform planning and policy development	Assess impact of climate change on water resources				

14.4 Anticipated Challenges and Opportunities

The main challenge in all subthemes is the lack of formalised and consistent coordination and cooperation between government departments, academics, nongovernmental organisations, civil society and the private sector. This hinders the development of effective research relationships, information dissemination and capacity building within Malawi, which means that often when effective research is undertaken, then value of the results is not shared and does not inform policy and strategy development to improve the health sector.

Nevertheless, many opportunities lie within the environmental health sector to improve these current challenges.

14.5 Anticipated Opportunities for Environmental Health

Despite the various challenges facing environmental health research in Malawi, many opportunities lie within the sector which must be developed.

14.5.1 Development and involvement in national regional and international networks

As detailed within the specific sub theme sections, there are numerous effective networks into which environmental health and allied health professionals can access capacity building, networking and research opportunities. An example with reference to environmental health is the Africa Academy for Environmental Health (www.ifeh.org/afa). This is a continental network of academic institutions, organisations representing environmental health professionals and expert practitioners for the advancement of the science and practice of environmental health. University of Malawi is already a member of this network. Regional partnerships such as these strengthen the opportunity for funding and regional based collaboration and coordination to move environmental health forward in Malawi, SADC and Africa.

Nevertheless, emphasis must also be placed on the importance of national networking and collaboration which is currently very poor in environmental health in Malawi. Electronic networks, national research centres and technical working groups with effective stakeholder representation could successfully overcome this problem if implemented in a structured and coordinated manner. The funding of these developments must be considered as a matter of priority for both the HRCSI programme and SWAp for health.

14.5.2 Capacity building and research development

Environmental health in Malawi has a number of strong stakeholders. The environmental health department at the University of Malawi Polytechnic has a research active department with experienced and skilled staff. Recently the University with the Ministry of Health hosted the 2nd All Africa Environmental Health Congress (May 2010) which hosted over fifteen countries and offered an opportunity to share research and experience in all nine sub theme areas. The recent re-launch of the Malawi Environmental Health Association has already borne fruit in the form of a grant for the development of continuing professional development scheme for EHPs, and they are seeking further funding for the development of practical training schemes for graduates. It is essential that these active National groups coordinate and facilitate the development of the environmental health profession and research active professionals therein. With this in mind, the necessity for infrastructural capacity and development must be supported. It is recommended that a centre for environmental health be considered that will consolidate all areas of research and development for the profession to ensure a successful coordinated approach in the future.

14.6 Information Dissemination

At all levels the efficacy of information dissemination and the effective use of research data was found to be poor. While this remains the status quo there will be little room for research to inform and support policy and strategy development in Malawi.

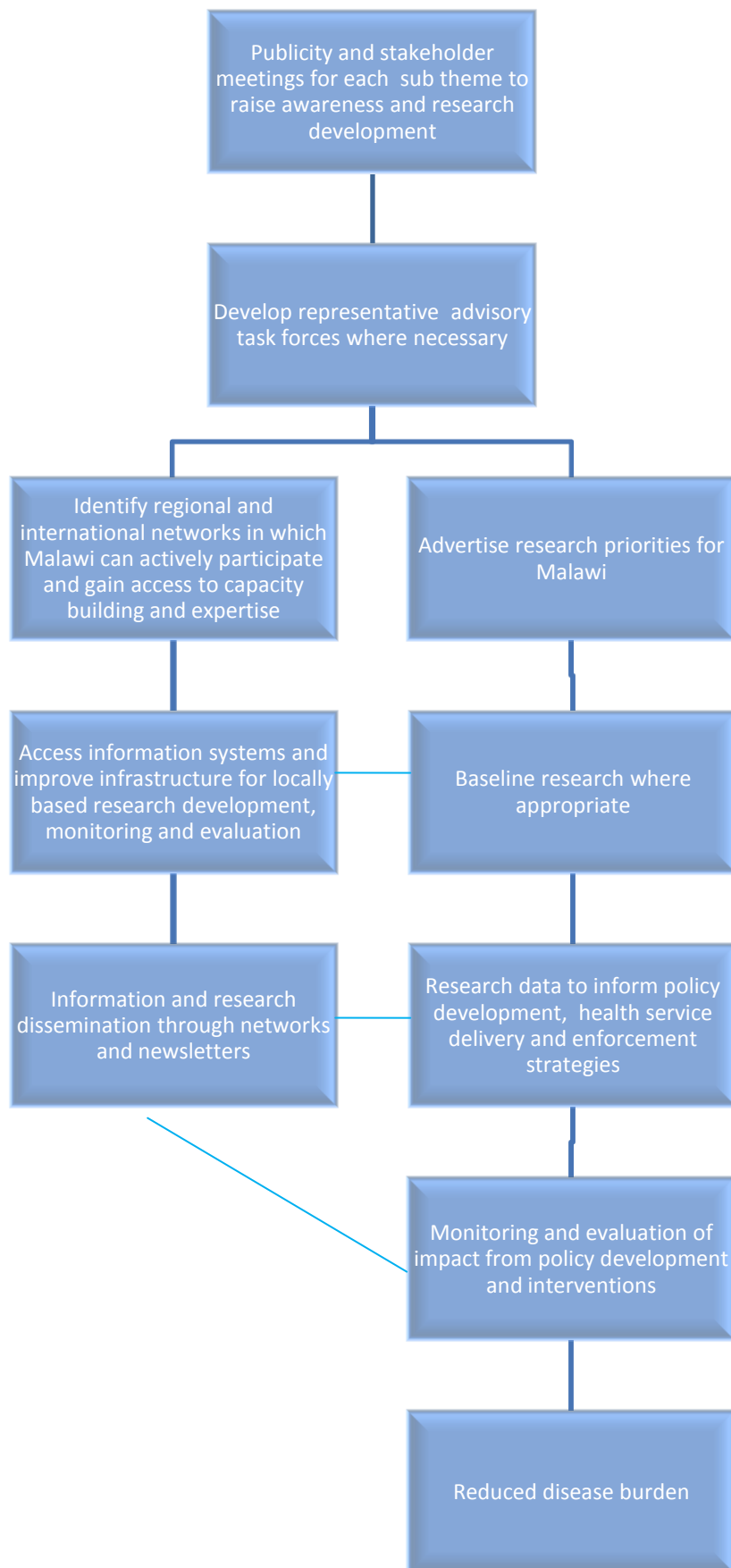
With this in mind the EH working group gives the following recommendations:

- Advocacy for environmental health must improve to increase the understanding within allied health professionals and general public of the role of EH in preventive health services
- As a cross cutting profession, it must be ensured that environmental health researchers from all backgrounds are invited and are aware of dissemination seminars and conferences taking place in Malawi.
- The initiation of an African Journal for Environmental Health should be considered as a route to disseminate research on a regional basis. Such a journal could be based in Malawi and the possibility of an e journal format should be considered as an effective means of circulating the periodical.
- National networks should be developed to allow environmental health practitioners to collaborate and share experiences in environmental health research.
- Environmental health researchers should be encouraged to join appropriate regional and international networks to facilitate collaboration, share experiences and access funding opportunities.
- The mass media must also be utilised to contribute to the knowledge base on which the public may make informed decision. Behaviour change is integral to policy and strategy implementation in environmental health.

14.7 Action Plan

To ensure the above gaps and recommendations are addressed in a coordinated and collaborative manner, the EH working group recommends the action plan outlined in Figure 28

Figure 28 Recommended Action Plan for Research Development for Environmental health in Malawi



Appendices

Appendix 1 Stakeholders/organizations interviewed

1 Environmental Health

- Ministry of Health (Chief Environmental Health Officer, Mr H. Masuku)
- World Health Organisation (Preventative Health and Environment, Mr B. Chandiyamba)
- Malawi Environmental Health Association (President, Mr Y. Samanyika)
- Ministry of Health (Chief Research Officer, Dr. Kutchola)
- University of Malawi – Polytechnic (Head of Environmental Health, Mr K Lungu)
- Malawi College of Health Sciences (Dean of Public Health, Mr M Lunhanga)
- Blantyre, Chitipa, Rumphi, Nsanje, Ntcheu, Salima District Health Offices (District Environmental Health Officer)

2 Pollution

- Ministry of Labour (Occupational and Health Safety Officer; Mr C. Mtawali)
- Department of Environmental Affairs (Deputy Director :Dr. A. Kamperewera)
- Lilongwe City Assembly (Director of Health and Social Services, Environmental Health Officers, Mr V. Mulula)

3 Food safety and hygiene

- Ministry of Health (Food and safety desk Officer, Mr. G. Chitimbe, Deputy Chief Environmental Health Officer, Mrs. H. Hausi; Principal Environmental Health Officer; Mr Silungwe)
- Malawi Bureau of Standards (Food safety Officers: Mrs. E. Thomo- Kunje, Mrs. M. Maideni, Mr. L. Malunga)

4 Nutrition and Health

- Ministry of Health (Chief Nutritionist, Mrs. D. Kang’ombe and 2 Assistant Nutritionists)
- Bunda College of Agriculture (Dr. B. Mtimuni)

5 Occupational Health and Safety

- Ministry of Labour (Director of Occupational Health and Safety, Mr Nyangulu and Deputy Director of Occupational Health and Safety)
- College of Medicine (Dr Bernard Mbewe)

6 Disease Surveillance and Response

- Ministry of Health (Director of Health Information Services, Mr Moyo)
- Ministry of Health (Head of Epidemiology Unit, CHSU, Dr M Kagoli)
- World Health Organisation (Disease Prevention and Control Officer, Dr K Msyamboza)

7 Water and Sanitation

- Ministry of Health (Principal Environmental Health Officer, Mr N Silungwe)
- UNICEF (WES Specialist, Mr A Kudzala; WASH Officer, Mr S.
- Water for People (Programme Manager, Mr E Chimulambe)
- WASH TED (Director, Dr G Chavula)

8 Built Environment

- Lilongwe City Assembly (Director of Health and Social Services, Environmental Health Officers, Mr V. Mulula)
- Malawi Institute of Engineers (President, Dr I Ngoma)

9 Health Education and Promotion

- Health Education Unit (Officer in Charge, Mr D Maseko; Principal Health Education Officer, Mr H.D. Kamkwamba)
- University of Malawi Polytechnic (Deputy Head of Department, Mrs C Kambala)

10 Animal Health

- Regional veterinary Office, South (Mr. G. B Maruwo)
- Mikolongwe Veterinary college (Dr. E. Nkhulungo)

Appendix 2 Questionnaire administered to Key Stakeholders

Key informant questionnaire on research priorities

National survey of environmental health research priorities

In collaboration with stakeholders including the Ministry of Health, the National Commission for Science and Technology through the Health Research Capacity Strengthening Initiative is supporting the development of a national Health research Agenda for Malawi. The goal is to provide a national framework for health research, and to identify issues of common concern, research needs and priorities of national interest. In particular, the health research agenda will identify priority areas for research and hence help to guide and inform the allocation of scarce health care resources. In addition the research agenda will create an enabling environment for high impact, more coordinated, collaborative and cost effective health research. It will also prevent duplication of research efforts and strengthen the research to policy and practice interface.

The purpose of this questionnaire is to determine your perception of the most important research priorities in the field of environmental health. We ask you to answer openly and honestly to all questions relating the importance of the area to your areas of work and your perception of Malawi's needs.

Note that during this exercise research is not limited to only research as an activity to generate new knowledge, but also has a vision of implementation that should help reduce present disease burden.

Section 1 – Respondent details

Name of Respondent		
Organisation		
Position within Organisation		
Focus of your organisation		
Duration in Position		
Contact details	Tel. Number	
	Address	
	E mail	
Gender of respondent		Male Female
Any other relevant information		

Section 2 – Current research

Question number	Question	Response	Go to
1	Are you aware of the current priorities for _____ in Malawi	Yes 1 No 2	Q5
2	Who set them	Don't know 1 Government 2 Donors 3 Consortium 4 NGOs 5 Other (specify) 6	
3	What are they?		
4	When were they set?		
5	Are you aware of any current research priorities in - _____ in Malawi	Yes 1 No 2	Q9
6	Who has set these research priorities?	Don't know 1 Government 2 Donors 3 Consortium 4 NGOs 5 Other (specify) 6	
7	When were they set?		
8	What are these research priorities?	Specify:	

Question number	Question	Response	Go to
9	Does your organisation have priorities for _____ in Malawi	Yes 1 No 2	Q13
10	Who set them	Don't know 1 Government 2 Donors 3 Consortium 4 NGOs 5 Other (specify) 6	
11	What are they?		
12	When were they set?		
13	Do you have any current research priorities in _____ in Malawi	Yes 1 No 2	Q17
14	Who has set these research priorities?	Don't know 1 Government 2 Donors 3 Consortium 4 NGOs 5 Other (specify) 6	
15	When were they set?		
16	What are these research priorities?	Specify:	

Section 3 – Establishing Research Priorities for _____

Question 9

What do you think are the top research priorities for _____ in Malawi.

Rank*	Priority	Which population groups affected	What is the feasibility of this research priority in terms of:			What is the potential impact of research into this priority? <i>(do not read options just note where mentioned)</i>				
			Human resources	Financial resources	Available infrastructure	Influencing policy	Reducing disease burden	Improving service delivery	Increasing/adding new knowledge	Any other impact
	1.									
	2.									
	3.									
	4.									
	5.									
	6.									
	7.									
	8.									
	9.									

*After answered then respondent should rank priorities in ascending order

Question 10

I would now like you to consider a numerical value for the various criterion we have just discussed, where 1 is the lowest likelihood and 5 is the highest likelihood of success.

Note: 1 = 0 – 20%; 2 = 21% - 40%; 3 = 41% – 60%; 4 = 61% - 80%; 5 = 81% - 100%

Priority	Rating of each identified research priority area against criteria				
	Potential for disease burden reduction	Feasibility of research	Expected impact of research	Effect on equity and social justice	Contribution to capacity research strengthening in Malawi
1.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
3.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
5.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
6.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
7.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
8.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
9.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
10.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

11. This gap analysis is based on five criteria for setting priorities. These criteria are as follows:

- Current and potential burden of disease
- Feasibility of the research and the deliverability of the research
- Expected impact of the research in terms of policy, decision making, disease burden reduction, delivery of services, new knowledge, design of interventions, direct and indirect effects, short and long term benefits and the implication of issues such as affordability, efficacy, equity and coverage.
- Effect on equity and social justice by assessing whether the concerns of vulnerable groups and disadvantaged are being considered.
- Contribution to capacity research strengthening in Malawi.

When considering the research priorities you have highlighted above, how would you rank these criteria in terms of importance when setting priorities. (1 being most important and 5 being least important.)

Criterion	Ranking
Potential for disease burden reduction	
Feasibility of research	
Expected impact of research	
Effect of equity and social justice	
Contribution to capacity research strengthening in Malawi	

12. What research in _____ is currently being done in Malawi

Area	Specific research	Organisation	Contacts

13. Have you done any research in _____ in Malawi in the last five years?

If yes, detail research and request copies of reports

14. What are the main barriers to _____ research in Malawi

15. How is information shared and disseminated on _____ research in Malawi?

16. How could sharing and dissemination of research in Malawi be improved?

17. Biggest _____ problems facing Malawi?

THANK YOU FOR YOUR TIME AND COOPERATION

Appendix 3 Questionnaire used for environmental health professionals

Key informant questionnaire on research priorities

National survey of environmental health research priorities

In collaboration with stakeholders including the Ministry of Health, the National Commission for Science and Technology through the Health Research Capacity Strengthening Initiative is supporting the development of a national Health research Agenda for Malawi. The goal is to provide a national framework for health research, and to identify issues of common concern, research needs and priorities of national interest. In particular, the health research agenda will identify priority areas for research and hence help to guide and inform the allocation of scarce health care resources. In addition the research agenda will create an enabling environment for high impact, more coordinated, collaborative and cost effective health research. It will also prevent duplication of research efforts and strengthen the research to policy and practice interface.

The purpose of this questionnaire is to determine your perception of the most important research priorities in the field of environmental health. We ask you to answer openly and honestly to all questions relating the importance of the area to your areas of work and your perception of Malawi's needs.

Note that during this exercise research is not limited to only research as an activity to generate new knowledge, but also has a vision of implementation that should help reduce present disease burden.

Section 1 – Respondent details

Name of Respondent		
Organisation		
Position within Organisation		
Focus of your organisation		
Duration in Position		
Contact details	Tel. Number	
	Address	
	E mail	
Gender of respondent		Male Female
Any other relevant information		

Section 2 – Current research

Question number	Question	Response	Go to
1	Are you aware of the current priorities for EH in Malawi	Yes 1 No 2	Q5
2	Who set them	Don't know 1 Government 2 Donors 3 Consortium 4 NGOs 5 Other (specify) 6	
3	What are they?		
4	When were they set?		
5	Are you aware of any current research priorities in environmental health in Malawi	Yes 1 No 2	Q9
6	Who has set these research priorities?	Don't know 1 Government 2 Donors 3 Consortium 4 NGOs 5 Other (specify) 6	
7	When were they set?		
8	What are these research priorities?	Specify:	
9	Does your organisation have priorities for _____ in Malawi	Yes 1 No 2	Q13

Question number	Question	Response	Go to
10	Who set them	Don't know 1 Government 2 Donors 3 Consortium 4 NGOs 5 Other (specify) 6	
11	What are they?		
12	When were they set?		
13	Do you have any current research priorities in _____ in Malawi	Yes 1 No 2	Q17
14	Who has set these research priorities?	Don't know 1 Government 2 Donors 3 Consortium 4 NGOs 5 Other (specify) 6	
15	When were they set?		
16	What are these research priorities?	Specify:	

Section 3 – Establishing Priorities for Environmental Health

Question 17

Please rate the following areas of environmental health for how high a priority they should be for Malawian research using the indicators of

- Very low, Low, Medium, High, Very high

Please as much as possible ensure that you use the full range of options or it will be very difficult to determine the priority areas.

Question number	Question	Very low	Low	Medium	High	Very high
a	Food hygiene and safety					
b	Occupational health and safety					
c	Built environment					
d	Communicable disease					
e	Disease surveillance and epidemiology					
f	Health promotion and education					
g	Water and sanitation					
h	Pollution control					
i	Nutrition and health					
j	Animal health					

Of all the above areas which do you think should be the top 5 priorities (in order of importance)

1st _____

2nd _____

3rd _____

4th _____

5th _____

Question 18

Please rate the following areas of **food safety and hygiene** for how high a priority they should be for Malawian research using the indicators of

- Very low, Low, Medium, High, Very high

Please as much as possible ensure that you use the full range of options or it will be very difficult to determine the priority areas.

Question number	Question	Very low	Low	Medium	High	Very high
a						
b						
c						
d						
e						
f						
g						
h						
i						
j						

Of all the above areas which do you think should be the top 3 priorities (in order of importance)

1st

2nd

3rd

Question 11

Please rate the following areas of **occupational health and safety** for how high a priority they should be for Malawian research using the indicators of

- Very low, Low, Medium, High, Very high

Please as much as possible ensure that you use the full range of options or it will be very difficult to determine the priority areas.

Question number	Question	Very low	Low	Medium	High	Very high
a						
b						
c						
d						
e						
f						
g						
h						
i						
j						

Of all the above areas which do you think should be the top 3 priorities (in order of importance)

1st

2nd

3rd

Question 12

Please rate the following areas of **built environment** for how high a priority they should be for Malawian research using the indicators of

- Very low, Low, Medium, High, Very high

Please as much as possible ensure that you use the full range of options or it will be very difficult to determine the priority areas.

Question number	Question	Very low	Low	Medium	High	Very high
a						
b						
c						
d						
e						
f						
g						
h						
i						
j						

Of all the above areas which do you think should be the top 3 priorities (in order of importance)

1st

2nd

3rd

Question 13

Please rate the following areas of **communicable disease control** for how high a priority they should be for Malawian research using the indicators of

- Very low, Low, Medium, High, Very high

Please as much as possible ensure that you use the full range of options or it will be very difficult to determine the priority areas.

Question number	Question	Very low	Low	Medium	High	Very high
a						
b						
c						
d						
e						
f						
g						
h						
i						
j						

Of all the above areas which do you think should be the top 3 priorities (in order of importance)

1st

2nd

3rd

Question 14

Please rate the following areas of **disease surveillance and epidemiology** for how high a priority they should be for Malawian research using the indicators of

- Very low, Low, Medium, High, Very high

Please as much as possible ensure that you use the full range of options or it will be very difficult to determine the priority areas.

Question number	Question	Very low	Low	Medium	High	Very high
a						
b						
c						
d						
e						
f						
g						
h						
i						
j						

Of all the above areas which do you think should be the top 3 priorities (in order of importance)

1st

2nd

3rd

Question 15

Please rate the following areas of **health promotion and education** for how high a priority they should be for Malawian research using the indicators of

- Very low, Low, Medium, High, Very high

Please as much as possible ensure that you use the full range of options or it will be very difficult to determine the priority areas.

Question number	Question	Very low	Low	Medium	High	Very high
a						
b						
c						
d						
e						
f						
g						
h						
i						
j						

Of all the above areas which do you think should be the top 3 priorities (in order of importance)

1st

2nd

3rd

Question 16

Please rate the following areas of **water and sanitation** for how high a priority they should be for Malawian research using the indicators of

- Very low, Low, Medium, High, Very high

Please as much as possible ensure that you use the full range of options or it will be very difficult to determine the priority areas.

Question number	Question	Very low	Low	Medium	High	Very high
a						
b						
c						
d						
e						
f						
g						
h						
i						
j						

Of all the above areas which do you think should be the top 3 priorities (in order of importance)

1st

2nd

3rd

Question 17

Please rate the following areas of **pollution control** for how high a priority they should be for Malawian research using the indicators of

- Very low, Low, Medium, High, Very high

Please as much as possible ensure that you use the full range of options or it will be very difficult to determine the priority areas.

Question number	Question	Very low	Low	Medium	High	Very high
a						
b						
c						
d						
e						
f						
g						
h						
i						
j						

Of all the above areas which do you think should be the top 3 priorities (in order of importance)

1st

2nd

3rd

Question 18

Please rate the following areas of **nutrition and health** for how high a priority they should be for Malawian research using the indicators of

- Very low, Low, Medium, High, Very high

Please as much as possible ensure that you use the full range of options or it will be very difficult to determine the priority areas.

Question number	Question	Very low	Low	Medium	High	Very high
a						
b						
c						
d						
e						
f						
g						
h						
i						
j						

Of all the above areas which do you think should be the top 3 priorities (in order of importance)

1st

2nd

3rd

Question 19

Please rate the following areas of **animal health** for how high a priority they should be for Malawian research using the indicators of

- Very low, Low, Medium, High, Very high

Please as much as possible ensure that you use the full range of options or it will be very difficult to determine the priority areas.

Question number	Question	Very low	Low	Medium	High	Very high
a						
b						
c						
d						
e						
f						
g						
h						
i						
j						

Of all the above areas which do you think should be the top 3 priorities (in order of importance)

1st

2nd

3rd

20. What are your top 5 priorities from all of the above:

Priority	Who should conduct	Which population groups	Who can fund	Does Malawi have the capacity to do the research

21. This gap analysis is based on five criteria for setting priorities. These criteria are as follows:

- Current and potential burden of disease
- Feasibility of the research and the deliverability of the research
- Expected impact of the research in terms of policy, decision making, disease burden reduction, delivery of services, new knowledge, design of interventions, direct and indirect effects, short and long term benefits and the implication of issues such as affordability, efficacy, equity and coverage.
- Effect on equity and social justice by assessing whether the concerns of vulnerable groups and disadvantaged are being considered.
- Contribution to capacity research strengthening in Malawi.

When considering the research priorities you have highlighted above, how would you rank these criteria in terms of importance when setting priorities. (1 being most important and 5 being least important.)

Criterion	Ranking
Potential for disease burden reduction	
Feasibility of research	
Expected impact of research	
Effect of equity and social justice	
Contribution to capacity research strengthening in Malawi	

22. What research in environmental health is currently being done in Malawi

Area of EH	Specific research	Organisation	Contacts

23. What are the main barriers to EH research in Malawi

.....
.....
.....
.....

24. How is information shared and disseminated on research in Malawi?

.....
.....
.....
.....

25. Biggest EH problems facing Malawi?

Will also add here details of the respondent

THANK YOU FOR YOUR TIME AND COOPERATION

Appendix 4 List of Main NGOs currently working in the water and sanitation sector in Malawi

Name of NGO	Area of interest in terms of WATSAN	Geographical Area
UNICEF	<ul style="list-style-type: none"> • Water, Sanitation and Hygiene (WASH) promotion focusing on rural communities, including triggering of Community-Led Total Sanitation (CLTS) • School Sanitation and Hygiene promotion in Schools focusing on rural primary schools ➤ provision of safe water, sanitation - urinals, hand washing facilities and latrines ➤ promotion of the 3 Key hygiene practices • Capacity Building for Sector Reform, such as through policy. 	Chitipa Mzimba Nkhata Bay Likoma Dowa Salima Mchinji Lilongwe Kasungu Blantyre Mangochi Mwanza
Water for People	<ul style="list-style-type: none"> • Development of locally sustainable drinking water resources, sanitation facilities - including ecological sanitation, and hygiene education programmes. 	Chikhwawa Rumphi Blantyre (peri-urban areas)
CCAP Livingstonia Synod – Relief and Development	<ul style="list-style-type: none"> • Ecological sanitation • Water and sanitation 	Embangweni Ekwendeni
WaterAid Malawi	<ul style="list-style-type: none"> • Water, Sanitation and Hygiene (WASH) 	Lilongwe Salima Nkhotakota
Centre for Community Organisation and Development (CCODE)	<ul style="list-style-type: none"> • Promotion of ecological sanitation (toilets) 	Lilongwe – peri urban areas Blantyre – peri urban areas
Hygiene Village Project	<ul style="list-style-type: none"> • Ecological Sanitation 	Blantyre - peri urban areas
Malawi Freshwater Project	<ul style="list-style-type: none"> • Development of locally sustainable drinking water resources 	Blantyre – rural (Chileka area)
Population Services International (PSI) Malawi	<ul style="list-style-type: none"> • Distribution of Point-of-Use Water Treatment Products 	Country wide
Save the Children	<ul style="list-style-type: none"> • School health and nutrition • WASH 	Mangochi Balaka
Evangelical Lutheran Development Programme	Water supply provision and sanitation	<ul style="list-style-type: none"> • Blantyre
World Vision Malawi	Water supply provision and sanitation promotion	<ul style="list-style-type: none"> • Blantyre
Concern Universal	Water supply provision and sanitation promotion	Blantyre Dedza
Inter Aide	Village Level Operation and Maintenance (VLOM) of boreholes	Zomba

