Protecting public health using environmental impact assessment in Malawi

Wells Utembe

University of Malawi,
Malawi Polytechnic,
Private Bag 303, Blantyre 3, Malawi
Email: wutembe@poly.ac.mw

Abstract: Development that does not adequately consider human health may pass increased disease burden costs to surrounding communities. EIA as a tool of sustainable development can be used to protect public health. The aim of this paper is to look at coverage of health impacts in the EIA system in Malawi. Under the current EIA system, EIA can be used to protect public health in Malawi. In EIA reports relationships between projects and determinants of health are merely discussed as they relate to conformance with legislation and standards. There is a need to promote specialised methods to tackle health impacts and also greater involvement of health institutions and professionals in EIA. In Malawi, it is possible to assess the impacts on health adequately within the EIA context and not necessarily in a distinct and stand-alone health impact assessment.

Keywords: public health; risk assessment; health determinants; sustainable development; health impact assessment; HIA; Malawi.

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Biographical notes: Wells Utembe is a Lecturer in Environmental Sciences in the University of Malawi constituent college of Malawi Polytechnic. He has been lecturing environmental impact assessment (EIA) for over ten years. He has also been part of teams that have carried out EIAs for many projects.

1 Introduction

Development projects that do not adequately consider human health may pass hidden costs on to surrounding communities in the form of an increased disease burden and reduced quality of life (Quigley et al., 2006). Such development does not fit the pattern of sustainable development (Davies and Sadler, 1997), defined as "development that meets the needs of present generations without compromising the ability of future generations to meet their needs" (Brundtland, 1987).

At the United Nations Conference on Environment and Development in 1992 nations signed the Rio Declaration, a set of principles that are believed to be able to guide nations

to sustainable development. Among these principles is principle number 17 which promotes the use of Environmental Impact assessment (EIA) (UNCED, 1992). Since EIA is a process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made, it can be used for protecting public health. The main purpose of EIA is to ensure that environmental considerations are explicitly addressed and incorporated into the development decision making process. EIA was made mandatory in Malawi in 1996.

Many authors have commented on unsatisfactory coverage of health impacts in EIA reports in different countries (Ahmad, 2004; Bhatia, 2007; Bhatia and Wernham, 2008; Harris et al., 2009; Noble and Bronson, 2005). In 1986 the WHO Regional Office for Europe called for greater emphasis on health effects when policies, programmes and projects are being designed (WHO, 1986). At about the same time the WHO started to promote health impact assessment (HIA) either in the context of EIA or as a distinct process. HIA is defined as a means of assessing the health impacts of policies, plans and projects in diverse economic sectors using quantitative, qualitative and participatory techniques (WHO, 2012).

There is no established analytical framework for considering health impacts in the context of EIA or HIA (Lock, 2000). However, conceptual frameworks that are used in the assessment of complex environmental health problems may be used to assess coverage of health impacts in EIA. The driving forces, pressure, state, exposure, effects (DPSEEA) framework (Corvalan et al., 1996) is one of the frameworks that has been widely adopted for systematic interpretation of environmental health indicators (Knol et al., 2010).

The aim of this paper is to assess coverage of health impacts (what, how and to what extent) in the Malawian EIA system by looking at the policies, laws, EIA guidelines and EIA reports.

2 Methodology

2.1 Data collection

EIA-related documents such as legislation and guidelines were reviewed. Eleven EIA reports were randomly sampled and their content was critically analysed. The projects included mining, construction, aquaculture, irrigation and industrial processing projects. The EIA reports reviewed include:

- Environmental Impact Assessment Report for Mozambique – Malawi Interconnection (2003)
- Environmental impact assessment report for the proposed Rehabilitation of the Blantyre-Zomba (M3) Road (2009)
- Environmental and Social Impact Assessment and Management Plan for Chakalamba Irrigation Scheme (Phalombe District) 2009

- Environmental and Social Impact Assessment And Management Plan for Bikinani Irrigation Scheme Irrigation Scheme (2009)
- Environmental Impact Assessment for the Upgraded Kamuzu Barrage (2011)
- Report for Proposed Construction of the Lilongwe Western Bypass Road (2009)
- Report for the Proposed Development of SIIOA Peri-Urban Aquaculture Venture on in Limbe (2006)
- Environmental and Social Impact Assessment and Management plan for Midule Irrigation Scheme Irrigation Scheme (2009)
- Environmental and Social Assessment (ESA) and Environmental and Social Management Framework for the Shire River Basin Management Project (2012)
- Environmental Impact Assessment Report for the Kanyika Niobium Project (2012)
- Environmental Impact Assessment Report on the Proposed Development of A Limestone Mining and Processing Plant at Chenkumbi Hills in Balaka (2011).

In addition to the EIA reports, pertinent literature on integration of health impacts in EIA and HIA was also reviewed.

2.2 Data analysis

Assessment of coverage of impacts on health in the Malawian EIA system was done using criteria for assessing EIA systems (Wood, 2003) with a particular focus on health. These criteria have used to assess the performance of EIA systems in many countries including USA, the UK, the Netherlands, New Zealand and South Africa (Wood, 2003), Columbia (Toro et al., 2010), Egypt, Turkey and Tunisia (Ahmad and Wood, 2002). The quality of the EIA reports as regarding coverage of health impacts was also assessed using criteria adopted from the European Commission's Guidance review of environmental impact assessment reports (EC, 2001). These criteria have been used to assess the quality of EIA reports in Brazil (Glasson and Salvador, 2000), Portugal and Spain (Canelas et al., 2005) and Estonia. The adopted criteria are given Table 1.

Table 1 Criteria for assessing coverage of health impacts in the EIA reports in Malawi

Are any hazardous materials used, stored, handled or produced by the project during construction, during operation, during decommissioning identified and quantified?
Are health implications of the transport of raw materials to the project and the number of traffic movements involved discussed?
Are health implications of employment created or lost as a result of the project discussed for all the phases, construction, during operation and decommissioning?
Are health implications of the housing and provision of services for any temporary or permanent employees for the Project discussed?
Are the health implications of the types and quantities of wastes generated by the project identified and discussed?

Source: Adopted from European Commission (EC) criteria (EC, 2001)

Table 1 Criteria for assessing coverage of health impacts in the EIA reports in Malawi (continued)

Are any sources of noise, heat, light or electromagnetic radiation from the project identified and quantified?
Are any risks associated with the project discussed: risks from handling of hazardous materials; risks from spills fire, explosion; risks of traffic accidents; risks from breakdown or failure of processes or facilities; risks from exposure of the Project to natural disasters (earthquake, flood, landslip, etc)
Are measures to prevent and respond to accidents and abnormal events described?
Are demographic, social and socio-economic conditions (including health) in the area described?
Are direct, primary effects on health from uses of the water environment described and quantified?
Are direct, primary effects on health of air quality and climatic conditions described and quantified?
Are direct, primary effects on health of noise or vibration, heat, light or electromagnetic radiation described and where appropriate quantified?
Are direct, primary effects on health of material assets and depletion of non-renewable natural resources (e.g. fossil fuels, minerals) described?
Are direct, primary effects on demography, health, social and socio-economic condition in the area described and where appropriate quantified?
Are effects which could result from accidents, abnormal events or exposure of the Project to natural or man-made disasters described and where appropriate quantified?
Are effects on health caused by activities ancillary to the main project described?
Are indirect effects on health caused by consequential development described?
Are cumulative effects on health off the project together with other existing or planned developments in the locality described?
Are positive effects on health described as well as negative effects?
Is the significance of each effect clearly explained?
Are methods used to predict effects described and are the reasons for their choice, any difficulties encountered and uncertainties in the results discussed?
Where there is uncertainty about the precise details of the Project and its impact on the environment are worst case predictions described?
Where there have been difficulties in compiling the data needed to predict or evaluate effects are these difficulties acknowledged and their implications for the results discussed?
Are any measures which the developer proposes to implement to mitigate effects clearly described and their effect on the magnitude and significance of impacts clearly explained?
Is it clear whether the Developer has made a binding commitment to implement the proposed mitigation or that the mitigation measures are just suggestions or recommendations?
Are responsibilities for implementation of mitigation including funding clearly defined?

Source: Adopted from European Commission (EC) criteria (EC, 2001)

Content analysis was also used to review the documents. A concept analysis on the word health and related words was effected, in terms of occurrence. The World Health Organization defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (WHO, 2003). Therefore, this assessment looked for explicit mentioning of health and well-being as well as similar

words such as illness, noise, quality of life, physical condition, infirmity, death, morbidity, mortality, sleep, hunger, strength, vigour, disease, poverty, peace etc. The analysis sought the assessment of impacts on health in the reports using the DPSEEA conceptual framework (Corvalan et al., 1996) within the environmental impact assessment framework.

3 Findings

3.1 Coverage of health impacts in EIAs in Malawi

3.1.1 Legislation, policies, guidelines and institutional set up

Section 13 of the Constitution of Malawi gives provisions for a healthy living and working environment and rights of future generations by means of environmental protection and sustainable development of natural resources for the people of Malawi (GoM, 1994). Specifically regarding EIA, the main piece of legislation that governs EIA in Malawi is the Environment Management Act (EMA) (Act No. 23 of 1996). According to section 3 of the Act, a developer shall not commence a prescribed project or a licensing authority shall not issue a license to a developer concerning a prescribed project unless an EIA approval has been issued by the responsible minister (GoM, 1996). The EIA process in Malawi is shown in Figure 1.

In the EMA the environment is defined as physical factors of the surroundings of the human being including land, water, atmosphere, climate, sound, odour, taste, and the biological factors of fauna and flora, and also cultural, social and economic aspects of human activity, the natural and the built environment. Although this definition that does not explicitly mention the word health, it includes environmental and social determinants of health (GoM, 1996). The Act further alludes to the fact that every person shall have a right to a clean and healthy environment (GoM, 1996).

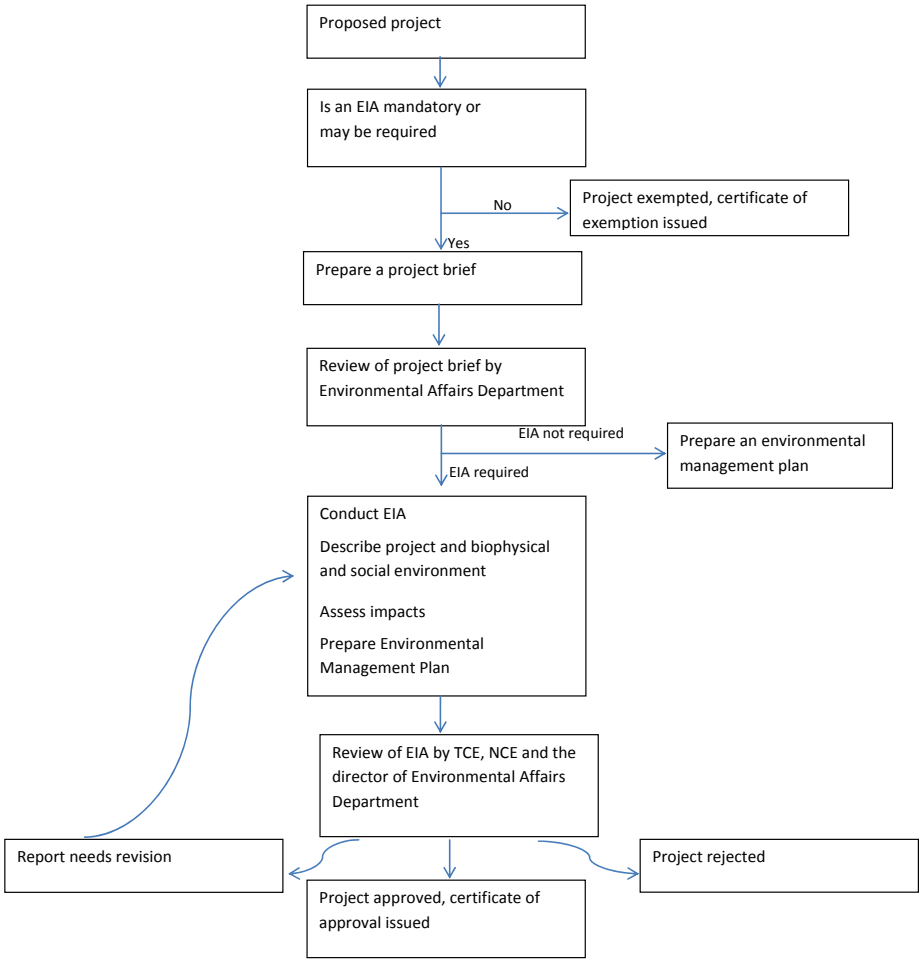
The Act also defines EIA as a systematic environment of a project to determine its impact on the environment and the conservation of natural resources. However, this definition seems to be more concerned with environmental management and protection and not so much with human health. This argument carries more weight when one considers the fact that EIA is overseen by a department and ministry whose mandates are primarily environmental management.

Health issues are also addressed in the environmental policies. For example, the National Environmental Policy recognises the importance of environment to health and has one its objectives "to promote urban and rural housing planning services that provide all inhabitants with a healthy environment and sustainable human settlements" (GoM, 2004). The policy goes on to say that one of strategies to achieve this is by strengthening the health inspectorate for urban and rural areas in order to assess the risks and consequences of environmentally related health problems.

Although health issues are not explicitly addressed in the EIA section of the EMA, the Environmental Affairs Department (EAD), as the competent authority for EIA, has addressed some health issues in its EIA guidelines. The general *Environmental Impact Assessment Guidelines* (EAD, 1997), *Environmental Impact Assessment Guidelines for Irrigation Projects* (EAD, 2002a), *Environmental Impact Assessment Guidelines for Mining Projects* (EAD, 2002b), *Environmental Impact Assessment Guidelines for*

Sanitation Projects (EAD, 2002c) and the National Roads Authority's (NRA, 2007) *Environmental and Social Management Guidelines* in the road sector make explicit requirements for addressing impacts on health and safety during construction phase, the operation phase and decommissioning phase of projects. These impacts include both occupational and general health and safety. The *Environmental Impact Assessment Guidelines for Irrigation Projects* includes risk of accidents and ill health, agro-chemical poisoning, disease and health problems arising from use of waste water for irrigation, increase in incidence of water-borne and water related diseases such as bilharzia and malaria as possible impacts that need to be addressed (EAD, 2002a). The guidelines go further to suggest consideration of provision of healthcare, provision of HIV/AIDS awareness education to all farmers and irrigation workers, as mitigation measures for impacts on local communities. The general EIA guidelines require that the report should have an 'environmental planning and design' section that discusses the environmental planning that has gone into the project. It is urged in this section that the "design process should pay particular attention to human health issues" (EAD, 1997).

Figure 1 The general EIA process (see online version for colours)



In addition to the EAD as a competent authority for EAD there exist statutory committees that deal with EIA. Section 16 of the EMA, establishes a committee called the Technical Committee on the Environment (TCE) whose duties, among others, include making recommendations on the form and content of environmental impact assessments and reviewing of terms of reference (TORs) and EIA reports (GoM, 1996). According to the EMA the committee shall consist of not less than ten members and not more than twenty members each of whom shall have sufficient knowledge and training in the protection and management of the environment and the conservation and sustainable utilisation of natural resources. Section 12 of the same Act calls for formation of National Council for the Environment whose duties, among others, include advising the Minister on all matters and issues affecting the protection and management of the environment and the conservation and sustainable utilisation of natural resources (GoM, 1996). The minister responsible for health is represented in this council. In Malawi, EIA reports are reviewed by the TCE, who make their recommendations to the NCE for second review, who in turn make recommendations to the Director of EAD. Therefore, health experts in the TCE and NCE have opportunities to make significant input in the EIA reports.

In addition, Section 26 of the EMA stipulates that the EIA report is open to public inspection and that the director shall invite oral or written comments from the public on an EIA report. The general *Environmental Impact Assessment Guidelines* (EAD, 1997) and the sector-specific EIA guidelines stress on the need for consulting the public, including relevant government agencies. Since there are legal and institutional provisions to have input from the public and health experts on the EIA process in Malawi, EIA provides a potentially powerful mechanism for protecting public health in Malawi.

The assessment of coverage of health in the EIA system in Malawi using criteria by Wood (2003) is given in Table 2. Briefly, the table shows that the EMA does not directly address health in EIA although the EIA guidelines do; all prescribed projects must undergo screening although concerns for public health are not explicitly mentioned among the screening criteria; all relevant impacts on health must be assessed.

Table 2 Coverage of health in the EIA system in Malawi using performance criteria that only focus on health as adopted from Wood (2003)

Criterion	*Yes/no*	*Comment*
Are requirements on health in the system based on clear legal provisions?	Partly	The EMA does not directly address health in EIA. EIA guidelines do
Must the relevant impacts on health of all significant actions be assessed?	Yes	
Must screening of actions take place and are concerns for public health among the screening criteria	Partly	EIA screening criteria have implicit reference to health
Must scoping of environmental impacts take place and specific guidelines be produced?	Partly	Yes, according to guideline, not always in practice
Must EIA reports meet prescribed content requirements and is health among those requirements?	Yes	
Must EIA reports be publicly reviewed and proponent respond to the points raised?	Partly	Yes, according to EMA, not always in practice

Table 2 Coverage of health in the EIA system in Malawi using performance criteria that only focus on health as adopted from Wood (2003) (continued)

Criterion	*Yes/no*	*Comment*
Must monitoring of action impacts be undertaken and is it linked to the earlier stages of the EIA process?	Partly	The report must contain some monitoring programme, not clear how it is done
Must mitigation of action impacts (health) be considered at various stages in the EIA process	Yes	The report must contain an environment management plan (EMP)
Must consultation and public participation take place prior to, and following, EIA report publication	Partly	There must be consultation and public participation prior to EIA report publication

3.1.2 Assessment of health impacts in EIA reports

Depending on the complexity of the project, TORs for a particular EIA are either prepared by the EAD or prepared by the EIA team and approved by the EAD. In the TORs the EAD makes a recommendation of composition of the experts in the EIA team, in terms of expertise. The EAD insists on the inclusion of a public health expert in the EIA team. The inclusion of the public health expert provides a chance of having inputs that can affect the proposed project's impacts on health.

The TORs also have sections on social responsibility. The inclusion of social responsibility in the TORs reminds the developers even before the project has started that they need to balance economic interests with an obligation to promote the well-being of people in the surrounding areas, not only through environmental protection but also social programmes (Mittelmark, 2001). In addition to social responsibility, TORs also demand a consideration acts, regulations and policies that may affect the project. This is an avenue of reminding the EIA team that in the assessment they must consider these acts, regulations and policies, including those that deal with health.

The TORs also demand that the EIA reports should include the existing baseline conditions of the bio-physical and human environments. All the EIA reports surveyed gave some description of the existing economic environment in the surrounding areas. Five of the eleven reports include health facilities and prevalent diseases in the area as part of the baseline information. Five of the eleven reports include only health facilities and no prevalent diseases whereas 1 report only include prevalent diseases and no information of the existing health care services in the area. The emphasis on health facilities in most of the reports may indicate the common notion of equating health with the existence of health care facilities. This is not correct as there are other factors that affect health beyond healthcare facilities (WHO, 2012), as viewed more easily in the DPSEEA model.

From the viewpoint of the DPSEEA model, the driving force includes the social, demographic and economic developments and the corresponding changes in life styles, overall levels of consumption and production factors that motivate and push the environmental process involved. Pressure (on the environment) is normally expressed through human exploitation of the environment. State presents the status of the environment. Exposure takes place when humans are exposed to environmental conditions. Effect indicates health effects from exposure to the environmental hazard. Action stands for policies or interventions aimed at reducing or avoiding health effects

(Liu et al., 2012). Each of the reports reviewed in this study identifies the key drivers and tries to predict at least qualitatively the state of the environment and the likely exposures. The impacts are delineated for each phase of the project and therefore it is clear to see those that are short-term and those that are long-term. Each project activity is linked to some drivers.

What is not very clear in all the reports is the link between the health baseline conditions and predicted impacts. In some cases the baseline environmental conditions and the prevalent measures of health status were used to provide general evidence of priorities and needs and ways in which the proposed project may improve the health status of people in the surrounding areas. There is no attempt to establish the increase in the incidence of some health outcome above the baseline. This is a missed opportunity as the baseline studies are only useful as they relate to the project in producing impacts.

Generally the impacts on health are not thoroughly discussed, apart from the proximal conformance with environmental and occupational standards. This is a trend that has been observed internationally (Bhatia and Wernham, 2008). Diseases that are analysed are mostly those that are linked to changes in environmental factors. For example, the EIA reports that were dealing with irrigation projects always predicted the increase in malaria and bilharzias cases. As shown in Table 3, few reports used direct measurement or modelling to quantify changes in environmental conditions such as water quality, water quantity, noise, air and water quality, access to health services etc. Although quantitative estimates of environmental measures such as noise, air quality and water quality are not health outcomes, these measures can still be useful for making inferences about prospective health effects (Dannenberg et al., 2008).

Table 3 Some of the impacts covered in the EIA reports

EIA report	*Coverage of health in existing baseline conditions*	*Some impacts on health discussed*	*State of environmental determinants of health*	*Some socio-economic determinants of health discussed*
Mozambique – Malawi interconnection	Health facilities and public services	Safety during construction and exposure to electromagnetic fields	Qualitative estimates	Improved reliability of public services, employment
Blantyre-Zomba (M3) Road	Health facilities and diseases	Impacts of air pollutants on health No prediction of levels Exacerbation of the HIV/AIDS and sexually transmitted diseases (STDs)	Qualitative estimates	Improved access to markets, schools and health facilities, employment
Chakalamba Irrigation Scheme	Health facilities	Increase in water borne and vectored diseases like bilharzias and malaria HIV/AIDS Occupational health Accidents caused by drowning in drains and canals	Qualitative estimates	Increased food, security and access to income, employment

Table 3 Some of the impacts covered in the EIA reports (continued)

EIA report	*Coverage of health in existing baseline conditions*	*Some impacts on health discussed*	*State of environmental determinants of health*	*Some socio-economic determinants of health discussed*
Bikinani Irrigation Scheme	Health facilities	Improvement in health and nutritional status of farmers due to availability of food at domestic level Access to clean water Increase in water borne and vectored diseases like bilharzias and malaria Proliferation of HIV/AIDS Accidents caused by drowning in drains Occupational health	Qualitative estimates	Increased food, security and access to income, employment
Upgraded Kamuzu Barrage	Health facilities and diseases	Water borne/vector diseases, air, soil and water pollutants	Qualitative estimates	Food security, employment
Lilongwe western bypass road	Facilities and diseases	Air and water pollutants, noise with some reference to health, occupational health and safety, accidents	Qualitative estimates	Increased economic growth, employment
Aquaculture Venture on in Limbe	Health facilities	Health and safety, dust emissions, water quality, mosquitoes	Estimated changes in production of fish	Food security, employment
Midule Irrigation Scheme	Health facilities	Proliferation of HIV/AIDS Health and safety hazards	Qualitative estimates	Food security, employment
The Shire River Basin Management Project	Common diseases	Improved sanitation and hygiene Dust emissions from construction activities Poor sanitation and hygiene practices in construction areas	Qualitative estimates	Improved livelihoods through enhanced food security, nutrition and availability of disposable income.

Table 3 Some of the impacts covered in the EIA reports (continued)

EIA report	*Coverage of health in existing baseline conditions*	*Some impacts on health discussed*	*State of environmental determinants of health*	*Some socio-economic determinants of health discussed*
The Kanyika Niobium Project	Health facilities and common diseases	HIV/AIDS and other sexually transmitted infections	Dispersion modelling of air pollutants	Disruption of leadership structures
		Increased safety risk to road users	Contamination of water resources	Influx of persons into the area
		Proliferation of disease causing species, e.g., malaria and bilharzia		Increase in crime
Chenkumbi Hills in Balaka	Health facilities	Pressure on health services	Dispersion modelling applied	Impacts on quality of life
		Emission of dust, noise	Estimation of levels of noise	Influx of persons into the area, employment
		Occupational health and safety and general safety		
		The spread of HIV-AIDS		
		Impacts on air quality		

There is a lot of emphasis on pollution prevention and primary effects on health arising from contamination of water, food and air. These hazards, however, are just discussed qualitatively. The relationships between a project and each of the determinants of health are not adequately discussed. Even in the case when assessment of risk to harmful exposures is done there is no attempt to quantify the health effect that a proposed project may bring. Quantification of health effects would help decision makers to distinguish between the details and the main issues that need to be addressed (Veerman et al., 2005). One reason for lack of the quantification of the health effects is that health effects often tend to be related to broader aspects of the environment, such as the volume of traffic in a geographical area rather than to specific projects such as construction of a new residential side (Xiaoli, 2004).

Although, according to one of the criteria in Table 1, each report attempts to discuss impacts (risks to health) associated with the project, there is little linkage between health effects and exposure to the environmental hazard. In other words, the reports do not use validated dose – response functions to quantitatively predict changes in health conditions from the changes in environmental conditions. This may be the case because incorporation of risk assessment in EIA is not an explicit requirement in the Malawian EIA system. Incorporating health risk assessment in the EIA report could make "impact prediction and evaluation more rigorous and scientifically defendable" (Canter, 1993, Demidova and Cherp, 2005). It has been said that an environmental assessment should be done before any investment is made in a rigorous health risk assessment (HRA). However, environmental assessment cannot be successful without at least a screening-level HRA. If any action is proposed that involves toxic materials handling, then it follows that there are potential risks of human exposure. So the analyst must begin

with a screening-level HRA, and if the risks are negligible, then perhaps a rigorous HRA is unnecessary (Shinn, 1998).

In addition, there is need to calculate the burden of disease attributable to change in a particular environmental factor through the use of standard measures such as quality adjusted life years (QALYs) and disability adjusted life years (DALYs). These are absent in all the reports with the result that a decision maker may not have an idea to what extent a change in an environmental factor will negatively impact the surrounding communities. Making quantitative of health effects allows a distinction to be made between the details and the main issues that must be assessed (Veerman et al., 2005).

One of the criteria in Table 1 deals with measures to prevent and respond to accidents and abnormal event. Three of the 11 reports addressed issues regarding emergency planning and response. This is commendable as industrial emergencies, though rare, have the ability to affect public health. Looking in hindsight, EIA could have played a role in preventing the accident that affected thousands of lives at Bhopal in India (Bowonder, 1985). Just like in India at that time, there are many industrial sites in developing countries including Malawi that are nothing other than major catastrophes just waiting for a trigger. EIA can protect the public from such risky industries through choice of location and technology, emergency planning and monitoring.

One of the criteria in Table 1 deals with assessment of health implications of housing brought by influx of new employees around the project site. New developments have ability to impact the quality of local health care by affecting crowdedness and accessibility to both newcomers and existing residents. The location of a new project with respect to nearby hospitals and local traffic conditions may significantly affect travel time to the emergency hospital (Rau and Wooten, 1980). Although a project can affect the health of surrounding communities through the biophysical environment, there is now a wide recognition of the impacts of social structures and socioeconomic factors on health (Raphael, 2006; WHO, 2012). These must be included in the EIA report in order to protect human health. New developments affect health indirectly by affecting jobs, local economy, prices of goods and housing demand. Projects that displace people altogether may have serious implications on public health. In the reports surveyed the linkages of these changes to health are not adequately covered. Indirect health impacts are almost always limited to impacts of the projects on the spread of HIV, almost invariably that the project may increase the spread of HIV. All the reports analysed discussed some positive impacts such as employment and living standards with little reference to health. There is a serious lack of in-depth analysis of how the project may affect health though changes in traffic, hospital space, housing demand, jobs, and immigration in relation to the baseline conditions. As pointed out earlier, the reports do give the baseline conditions in terms of socio-economic conditions, health facilities, schools and the like. However, these are not brought into the discussion on the assessment and prediction of impacts.

As Bhatia (2007) notes assessment of impacts on health needs new specialised methods that forecast the effects of changes in social and environmental measures on human health outcomes such as life expectancy, mortality and morbidity. There are already sound methods for forecasting health effects within the existing health research disciplines. For example, numbers and types of jobs that are the result of a project may be used to estimate effects on income and health-related outcomes (Bhatia, 2007).

In all the reports assessed, public consultation was conducted with the authorities from the district assemblies invited. In all the reports there were representatives from the district, town or city assembly although it is not clear that the health department of the

assembly was represented in all the cases. Such consultations provide an opportunity for health authorities to make an input in the project before it is implemented.

All of the reports included recommendations to mitigate predicted adverse health impacts of the proposed project and the enhancements of health-promoting components of the proposal. This may be taken as the Action part of the DPSEEA framework. The EAD requires that these should be addressed in the environmental management plan section of the report.

Adequate assessment of impacts of health in Malawi does not necessarily require a separate and distinct HIA process in Malawi. This can be achieved within the same 'integrated' EIA. An important advantage of integrated assessment is that it reduces the burden on officials, who would otherwise be required to review a large number of impact assessments reports (Mindell and Joffe, 2003). An integrated assessment also reduces cost burdens from the developer as some developers already complain about the high costs of the current EIA set up (Kosamu, 2011). Some of the reasons for inadequate coverage of health impacts in the EIA set-up include the complex nature of human HIA and lack of clear procedures or methodologies for assessing the health implications of new developments (BMA, 2009). Nevertheless, the EAD needs to promote full coverage of health impacts in EIA reports by promoting specialised methods of covering health impacts in EIA guidelines and by promoting dialogue between health care professional and environmental regulators.

4 Conclusions

EIA is one of the tools needed for the achievement of sustainable development. Though impacts on health are not explicit in the law concerning EIA in Malawi, they are tackled in the EIA guidelines. The legal and institutional set up in Malawi regarding EIA can enable EIA to be used to as tool for protection of public health. However, although impacts on health are covered in Malawian EIA reports, there is a lot of emphasis on pollution prevention and control. Baseline conditions are not brought into the discussion on the assessment and prediction of impacts. There is a serious lack of in-depth analysis of how the project may affect health though changes socioeconomic conditions. There is need to calculate the burden of disease attributable to change in a particular environmental factor through the use of standard measures such as QALYs and DALYs.

Malawi does not necessarily require a separate and distinct HIA process. Public health managers need to realise the role that EIA can play in public health systems. They should deliberately promote use of specialised methods to tackle health impacts and greater involvement of health institutions and professionals in EIA. EIA consultants need to be urged to include more assessment of health impacts, beyond compliance with emission or effluent standards and to incorporate social determinants of health in the assessment. Incorporation of a thorough health risk assessment could make impact prediction and evaluation more rigorous and scientifically defendable.

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